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G. E.	REV. GEORGE EDMUNDSON, M.A , F R.HIST.S. Formerly Fellow and Tutor of Brasenose College, Oxford. Author of *History of Holland* (Camb. Hist. Series).	**Flanders** (*in part*)
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G. M. McB.	GEORGE M. MCBRIDE, B A., PH D. University of California at Los Angeles, California Author of *Agrarian Indian Communities of Highland Bolivia.*	**Florianopolis.**
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G. T. M.	GILBERT T. MORGAN, O B E . F R.S Director, Chemical Research Laboratory, Department of Scientific and Industrial Research Formerly Mason Professor of Chemistry, University of Birmingham, Professor in the Faculty of Applied Chemistry, Royal College of Science for Ireland, etc. Author of *Organic Compounds of Arsenic and Antimony.* Editor of Chemistry section, 14th Edition, *Encyclopædia Britannica.*	**Fulminic Acid; Furfuran; Fusel Oil; Gallic Acid; Gallium.**
G. T. W.	SIR GILBERT THOMAS WALKER, C S.I , F.R A S , Sc.D., PH.D., M.A., F.R S. Professor of Meteorology, Imperial College of Science and Technology. Fellow of Trinity College, Cambridge Mathematical Lecturer, 1895. Director-General of Indian Observatories, 1904–24. Author of *Aberration, The Theory of Electromagnetism,* various papers on mathematical physics and meteorology.	**Flight, Natural.**
G. W. D.	GEORGE WALTER DAWSON. Department of Fine Arts, University of Pennsylvania, Philadelphia, Pa	**Flower Painting.**
H. A. Ha.	H. AINSWORTH HARRISON, M.Sc., PH D., A I.C. Research Chemist, Chemical Research Laboratory, Teddington, Middlesex	**Fluorene.**
H. A. T.	HOWARD A. TURNER, B.A Assistant Agricultural Economist, United States Department of Agriculture	**Farm Rents** (*in part*).
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H. Cr.	HERBERT CRAFT. Board of Trade, London.	**Free Ports.**
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H. G.	HARVEY GRACE. Editor of *The Musical Times* since 1918. Author of *The Organ Works of Bach, The Complete Organist;* etc.	**Festivals, Musical.**
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H. H. Me.	H. H. MEYERS, B.S. Director of Chemical Research for Armour Fertilizer Works, Mellon Institute of Industrial Research, Pittsburgh, Pa.	**Fertilizers** (*in part*).
H. J. G.	HERMAN JOHN GOUGH. Of the National Physical Laboratory, Teddington, Middlesex.	**Fatigue of Metals.**

H. J. R.	HERBERT JENNINGS ROSE, M.A. Professor of Greek, University of St. Andrews, Fife. Fellow and Lecturer of Exeter College, Oxford, 1907–11. Associate Professor of Classics, McGill University, 1911–5. Professor of Latin, University College of Wales, Aberystwyth, 1919–27. Author of *Primitive Culture in Greece, Primitive Culture in Italy;* etc.	**Fate.**
H. K.	HOLLOWAY KILBORN, PH.D., E.E. Vice-President and Treasurer of The Kilborn and Bishop Company, New Haven, Conn Author of *Iron Age, Hardware Age*	**Forging.**
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H. W. S.	H. WICKHAM STEED Proprietor and Editor of the *Review of Reviews* since 1923. Editor of *The Times,* London, 1919–22, and Correspondent at Rome, 1897–1902.	**Fabrizi, Nicola.**
I. A. R.	IRMA A. RICHTER. Artist and Writer.	**Farinato, Paolo; Ferrari, Gaudenzio; Feuerbach, Anselm; Fiorenzo Di Lorenzo; Franceschi, Piero de; Gainsborough, Thomas.**
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J. A. H.	JOHN ALLEN HOWE, O.B E , B Sc , F G S , M INST M M Assistant Director, Geological Survey Author of *The Geology of Building Stones, Stones and Quarries;* etc.	**Fuller's Earth.**
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J. A. Si.	JUDITH ANN SILBURN. Diplomée of Domestic Science, M I H (Formerly Trade Investigator, Ministry of Labour) Journalist and Domestic Science Consultant	**Fats in Cookery; Fruit Cookery.**
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J. F. Me.	JOHN F. MEEHAN, LL B Football Coach, New York University.	**Football, Rugby** (*in part*).
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J. O. D.	J. O. DAHL. Director, Institutional Food Bureau. Service Manager, *Hotel Management Magazine,* New York. Author of *Selling Public Hospitality; Kitchen Management,* etc.	**Food Service.**
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J. Si.	J. SIME, M.A. Author of *A History of Germany.*	**Frederick II.** (*in part*).
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J. Wi.	JAMES WILLIAMSON, M.I.C.E. Member of the Firm of Sir Alexander Gibb and Partners.	**Ferro-Concrete.**
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L. Ha.	LOUIS HALPHEN Professor of History in the University of Bordeaux.	**Fulk Nerra.**
L. H. D. B.	L. H DUDLEY BUXTON, M.A. Lecturer in Physical Anthropology in the University of Oxford.	**Formosa** (*in part*).
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L. Ra.	LEWIS RADCLIFFE Department of Commerce, Bureau of Fisheries, Washington	**Fisheries, Law of** (*in part*).
L. Sc.	RT HON. SIR LESLIE FREDERIC SCOTT, P.C., K.C., M.A., Member of Parliament for Liverpool Exchange. Solicitor General, 1922. Represented His Majesty's Government at International Conference, Brussels, 1909, 1910, 1922 and 1926 Chairman of Governors of Agricultural Organisation Society till 1922.	**Factor** (*in part*).
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L. V.	LUIGI VILLARI. Italian Vice-Consul in New Orleans, 1906; Philadelphia, 1907; Acting-Consul at Boston, 1907–10. Attached to Foreign Office, Rome, 1910 (Emigration Department). On the Secretariat of the League of Nations, 1920–3. Author of *The Awakening of Italy; The Fascist Experiment,* etc.	**Fanti, Manfredo** (*in part*); **Fascism; Florence** (*in part*); **Frederick III.**
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N. W. T.	NORTHCOTE WHITBRIDGE THOMAS, M.D. Government Anthropologist in Southern Nigeria. Corresponding Member of the Societé d'Anthropologie de Paris. Author of *Thought Transference; Kinship and Marriage in Australia.*	**Faith Healing.**
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O. R. A.	OLIVIA ROSSETTI AGRESTI. Writer, Lecturer and Interpreter to the Assemblies of the League of Nations and the International Economic Conference. Connected with the founding of the International Institute of Agriculture in Rome Lecturer in the U S. on Italian Economic Conditions, 1919, 1920, 1923. Author of *Giovanni Costa, His Life and Times* On the editing staff of the General Fascist Confederation in Industries, Rome	**Fascism, Economics of.**
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P. M. R.	P. M. ROXBY, M A. Professor of Geography in Liverpool University	**Formosa** (*in part*)
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P. V.	PASQUALE VILLARI Italian Historian and Statesman Author of *I primi due secoli della storia di Firenza*, etc *See* biographical article VILLARI, PASQUALE.	**Florence** (*in part*).
P. Vi.	SIR PAUL VINOGRADOFF, D C L , LL D Late Corpus Professor of Jurisprudence in the University of Oxford Formerly Honorary Professor of History in the University of Moscow Author of *Villeinage in England, English Society in the 11th Century*, etc	**Folkland.**
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EXTRACTION TO GAMBRINUS

EXTRACTION, in a broad sense, is any process for separating a desired constituent from a mass, whether of solids or liquids Mechanical expression, shaking or "percolating" with a cold solvent, treating with a hot solvent condensed from its vapour, are amongst the methods used. Examples of extractions are the separation of active principles from drugs, and the treatment of gold ore with cyanide solutions.

EXTRADITION is the handing over of a fugitive from justice by the country to which he has fled to the country demanding him It is convenient to call the former the required State and the latter the requiring State. Is a country, apart from treaty, bound to deliver up to the country of the place of commission of the alleged crime a fugitive from justice? The ideal international convention is one like the Universal Postal Union, in which all nations are equally interested Such a matter likewise is the suppression of crime but this matter had no urgency until the enormous development of transport facilities during the 19th century In bygone times common criminals rarely had the opportunity of escaping but so called political criminals sometimes succeeded and these were often given up, treaty or no treaty. Grotius held that it is the duty of a State either to surrender, or itself to punish, fugitive criminals; but he seems to confuse fact and theory. Now a State manifestly cannot agree with other nations to do what its own laws do not allow it to do. The reluctance of Great Britain to deliver up fugitives and her readiness to grant asylum (*q.v.*) proceeded perhaps from a belief, not only by herself but by foreign observers, in the superiority of her institutions; but the almost universal adoption of representative government in recent times has made this championship of the oppressed perhaps unnecessary and certainly embarrassing. As an example of the old state of affairs, some Spanish convicts were wrecked in 1836 on the Bahama islands and the governor detained them awaiting the opinion of the attorney-general and the solicitor-general in England as to whether he should deliver them up to Spain: he was advised that by the law of England he could not do so. In 1841 some negro slaves mutinied and murdered a passenger in the brig "Creole" and took the ship to the West Indies. At the request of the American consul the governor put a guard on board but refused to give the prisoners up to the American Government. Nineteen were tried locally for piracy and acquitted. The law authorities in England were unanimously of the opinion that they could not be given up in the absence of an act of parliament giving power to the executive. At this time France had extradition treaties with Spain, Switzerland, Belgium and Sardinia and could obtain extradition from other countries, without treaties, but not from Great Britain or the United States, from Great Britain because her laws did not allow it; from the United States because it was not then settled whether the power resided in the constituent States or in the Union. By giving effect in 1843 to the Ashburton Treaty with the United States this power was first given to the English executive. The previous chapter of the act (6 and 7 Vic. c. 75) carried into effect a treaty with France which had been signed in the same year (1843)

Extradition Treaties.—Great Britain has extradition treaties with the following countries. Austria (Sept. 22, 1920); Austria Hungary (Dec. 3, 1873; June 26, 1901); Argentine republic (May 22, 1889); Belgium (Oct. 29, 1901; March 5, 1907; March 3, 1911; Aug. 8, 1923); Bolivia (Feb. 22, 1892); Brazil (Nov. 13, 1872); Bulgaria (Jan. 26, 1897); Chile (Nov. 11, 1924); Czechoslovakia (June 4, 1926); China (March 1, 1894); Colombia (Oct. 27, 1888), Cuba (Oct. 3, 1904), Denmark (March 31, 1873); Ecuador (Sept. 20, 1880); Esthonia (Nov. 18, 1925); Finland (May 30, 1924; Nov. 25, 1926); France (Aug. 14, 1876; Dec. 31, 1889; Feb. 13, 1896; Oct. 17, 1908; Nov. 13, 1923); Germany (May 14, 1872; May 5, 1894; Jan. 30, 1911, Sept. 1, 1913; June 25, 1920); Greece (Sept. 24, 1910); Guatemala (July 4, 1885; May 30, 1914); Haiti (Dec. 7, 1874); Hungary (Oct. 24, 1921); Italy (Feb 5, 1873; May 7, 1873); Latvia (July 16, 1924); Liberia (Dec. 16, 1892); Lithuania (May 18, 1926); Luxemburg (Nov. 24, 1880); Mexico (Sept. 7, 1886); Monaco (Dec. 17, 1891); Netherlands (Sept. 26, 1898; Aug. 17, 1914; April 13, 1920); Nicaragua (April 19, 1905); Norway (Feb. 18, 1907); Panama (Aug. 25, 1906); Paraguay (Sept. 12, 1908); Peru (Jan. 26, 1904); Poland; Portugal (Oct. 17, 1892; Nov. 30, 1892; Jan. 10, 1921); Rumania (March 21, 1893); Russia (Nov. 24, 1886); Salvador (June 23, 1881); San Marino (Oct. 16, 1899); Serbia (Dec. 6, 1900); Siam (Sept. 3, 1883; Nov. 30, 1885; March 4, 1911); Spain (June 4, 1878; Feb. 19, 1889; June 20, 1919); Switzerland (Nov. 26, 1880; June 29, 1904; July 14, 1920); Sweden and Norway (June 26, 1873); Sweden (July 2, 1907); Tonga (Nov. 29, 1879); Turkey; United States (Aug. 9, 1842; July 12, 1889; Dec. 13, 1900; April 12, 1905; May 15, 1922); Uruguay (March 26, 1884; March 20, 1891).

It has been said that two things stand in the way of the proposals for uniformity in this matter which have been made from time to time: (1) the variation in the definition of crimes in different countries; (2) the fear that extradition may be made use of in order to get hold of a fugitive who is wanted by his country, not really for a criminal but for a political offence The first difficulty is doubtless considerable but it is by no means insuperable The Draft Convention approved by the International Law Association at Warsaw in August 1928 provides (art. 17) that the signatories will furnish each other, before ratification or adherence, with schedules, to be annexed to this convention, of crimes in terms in their own penal law following the order of art. 2 as well as their respective requirements as to proof. (Art 2 contains a list of 35 offences commonly regarded as heinous in civilized countries)

Two propositions seem fundamental: (1) every State can insist that in the whole extent of its territory no laws but its own shall be recognized; (2) no State should extend beyond its own territory the application of its own penal laws To hold otherwise is in effect to demand exterritoriality (*q v.*) which can only be demanded of uncivilized nations The criteria of civilization, it is submitted, are the rule of law (*q v.*) and the impartial administration of justice; subsidiary considerations perhaps are the incidence of crimes of violence and the status of women A simpler way of putting it is that some countries have not the same way of looking at things as others have If the above propositions are sound it follows that a State ought to give up its own nationals, properly accused of having committed a crime abroad; but many countries still refuse to deliver their own nationals, though the better practice would seem to be to make the matter optional Treaties with the following nations reciprocally refuse the extradition of their own subjects Austria, Brazil, Denmark, Germany, Greece, Guatemala, Haiti, Hungary, Italy, Nicaragua, Norway, Portugal, Salvador, Sweden and Norway, and Uruguay. In the case of the following the surrender is optional: Argentine, Belgium, Bolivia, Chile, China, Colombia, Cuba, Czechoslovakia, Ecuador, Estonia, France, Finland, Latvia, Liberia, Lithuania, Luxembourg, Mexico, Monaco, Netherlands, Panama, Paraguay, Peru, Rumania, Russia, San Marino, Serbia, Siam, Spain, Switzerland, Tonga, United States Spain, Switzerland and Luxemburg, in their treaties with Great Britain, refuse the extradition of their own subjects, but Great Britain is free to surrender hers to them, subject of course to the restrictions governing all surrenders, contained in s. 3 of the Extradition Act of 1870 One of these restrictions is that the offence must not be of a political character nor must the requisition have been made with a view to punish a fugitive for an offence of a political character.

Extraditable Offences.—There are not lacking signs that countries once the champions of revolution in any other country but their own are beginning to think better of it and to wonder whether it is not the interest of each member of the family of nations if not to support at least not to hinder the rest in their task of keeping order within their own borders; especially when so-called political offences involve murder and other heinous crimes. In two treaties concluded by Italy in 1922 (with Czechoslovakia and Yugoslavia) it was agreed not to give up political offenders unless the Act constitutes a "common crime." The Warsaw Draft already referred to proposes (art 7 par. 2) that acts involving loss of human life or serious bodily injury shall not be considered political. All attempts to lay down hard and fast rules as to what constitutes a political crime have hitherto failed and each case must be decided on its merits: a method familiar to us. It was decided in *Castioni's case,* 1891, 1 Q.B. 149, that such an offence must be "incidental to and form part of political disturbances." With regard however to the provision that a requisition must not be made with a view to try and punish for an offence of a political character a fugitive whose extradition is demanded on other grounds, it was held in *Arton's case,* 1896, 1 Q.B. 509, amongst other things, that the court had no jurisdiction to question the good faith of a friendly Power.

Extraditable offences in general are those considered heinous by the consensus of opinion of mankind, though there are some notable omissions in some treaties, particularly with respect to sexual offences. Participation in or attempt or conspiracy to commit such crimes is not covered by all treaties by any means. It is interesting to note that Rumania may refuse, and Portugal does refuse, to surrender where capital punishment (*q v.*) may be inflicted. Some countries refuse to extradite if prescription (*q v.*) has been acquired; such is the case with France after six years.

The procedure in extradition cases is in general not complicated though some countries fail to realize, with regard to Great Britain, the implications of the presumption of innocence and do not support their application by sufficient evidence, that is to say, the original warrant must have been obtained by evidence on oath—or affirmation where English law allows it—and must not be hearsay The requisition is made through diplomatic channels

The return of fugitives within the British empire—that is to say between the home country and the dominions and colonies and between the dominions and colonies themselves—is not technically called extradition and is governed by the Fugitive Offenders' Act 1881

See Clarke on *Extradition* (4th ed, 1904), Oppenheim, *International Law,* vol 1 (4th ed, 1928) International Law Association, *35th Report* (1928) (F T G)

United States.—In the absence of treaty, the United States has consistently refused to surrender fugitive criminals Beginning with the Jay Treaty of Nov. 19, 1794, numerous extradition treaties have been concluded between the United States and other civilized nations Recent treaties have tended to broaden the scope of extraditable offences, the convention with France of 1909 making breach of trust under certain circumstances by a person acting in a fiduciary capacity an extraditable offence Political offences are excepted from the provisions of these treaties either in express terms or by implication Most treaties in express terms except nationals of the State of asylum from their provisions In the absence of such an express provision the United States has taken the position that nationals of both contracting parties are extraditable

The commitment of the person sought to be extradited is effected by resort to judicial authority Specific provision has been made since 1845 by act of Congress for the procedure to be followed in extradition proceedings Any Federal judge, U S commissioner, or judge of a court of record of general jurisdiction of any State, may act as a committing magistrate, issuing warrants of arrest and passing upon the sufficiency of the evidence to establish the crime charged His function is not to determine the ultimate guilt of the fugitive but simply to determine whether the evidence is sufficient to warrant trial before the courts of the demanding country, together with the question of whether the offence charged comes within the applicable treaty provisions The determination of whether the offence is of a political character is consequently a judicial function To establish a political offence it is necessary to show that the accused was connected with an uprising of a revolutionary character in the demanding State and that the acts charged were incidental to his participation in the movement The jurisdiction of the committing magistrate can be reviewed by *habeas corpus,* but such review extends only to the sufficiency of the evidence and not to the correctness of the magistrate's conclusions therefrom. A revisory power over the final commitment is possessed by the Secretary of State, but such power is exercised within very narrow limits.

In contradistinction to interstate rendition, U.S. courts can try an extradited criminal only for the offence with which he was charged in the extradition proceedings, unless reasonable time has been given him after his release to return to the country from which he was extradited.

Interstate extradition rests upon the provisions of Article IV., Sect. 2, of the Constitution of the United States, which requires a State to which a person charged with "treason, felony, or other crime" in another State has fled to surrender him upon the demand of the latter State. Legislation necessary to carry the constitutional provisions into execution was enacted by Congress in 1793. The extraditable offences are not limited to serious felonies but include all acts made criminal by the demanding

State. By the rules adopted by the International Extradition Conference of 1877 requisitions for petty offences, however, are not to be honoured save in exceptional circumstances. Interstate extradition differs from international extradition primarily in two particulars: the duty of the State asylum to surrender the fugitive does not rest on treaty or comity but upon the imperative command of the Constitution; the proceedings relating to interstate extradition are informal in character, conducted before the executive, no hearing being required and the executive being enabled to act even in the absence of the accused and without notice to him.

See Hyde, *International Law;* Moore, *Extradition and Interstate Rendition;* Hawley, *Law and Practice of International Extradition* (J. M. La.)

EXTRADOS, in architecture, the top or upper surface of the series of wedge-shaped stones (*voussoirs*) of which an arch is composed. (*See* illustration under Arch.) The term is usually confined to those cases in which the upper sides of the *voussoirs* form a continuous curve

EXTRAPOLATION: *see* Interpolation.

EXTRAVAGANZA, a work for the stage of a go-as-you-please type, which is generally distinguished further by the lavishness and extravagance of its scenery and dresses The term is also applied sometimes to musical and literary compositions of a humorous and burlesque order.

EXTREME UNCTION, a sacrament of the Catholic Church. It has been general since the 9th century. The Council of Florence A.D. 1439 thus defined it.—

"The fifth sacrament is extreme unction Its matter is olive oil, blessed by a bishop It shall not be given except to a sick person whose death is apprehended He shall be anointed in the following places the eyes, ears, nostrils, mouth, hands, feet, reins The form of the sacrament is this Through this anointing of thee and through its most pious mercy, be forgiven all thy sins of sight, etc. . . . and so in respect of the other organs A priest can administer this sacrament But its effect is to make whole the mind, and, so far as it is expedient, the body as well"

This sacrament supplements that of penance (viz, remission of post-baptismal sin) in the sense that any guilt unconfessed or left over after normal penances imposed by confessors is purged thereby. It was discussed in the 12th century whether this sacrament is indelible like baptism, or whether it can be repeated; and the latter view, that of Peter Lombard, prevailed.

It was a popular opinion in the middle ages that extreme unction extinguishes all ties and links with this world, so that he who has received it must, if he recovers, renounce the eating of flesh and matrimonial relations Such opinions, combated by bishops and councils, were due to the influence of the *consolamentum* of the Cathars (*q.v.*). In both sacraments the death-bed baptism of an earlier age seems to survive, and they both fulfil a deep-seated need of the human spirit.

EYBESCHÜTZ, JONATHAN (1690–1764), German rabbi, was from 1750 rabbi in Altona. A man of erudition and personality, Eybeschütz became specially notorious because of a curious controversy concerning the amulets which he was suspected of issuing. These amulets recognized the Messianic claims of Sabbatai Sebi (*q.v.*), and a famous rabbinic contemporary of Eybeschütz, Jacob Emden, boldly accused him of heresy. Though there is insufficient evidence against Eybeschütz, Emden may be credited with having crushed the lingering belief in Sabbatai current even in some orthodox circles. For a list of Eybeschütz's works see *Jewish Encyclopedia.*

EYCK, VAN, the name of a family of Flemish painters in whose works the rise and mature development of art in western Flanders are represented. Though bred in the valley of the Meuse, they established their professional domicile in Ghent and in Bruges; and there, by skill and inventive genius, introduced a complete revolution into the technical methods of execution familiar to their countrymen.

1. Hubert (Huybrecht) van Eyck (?1366–1426) was the oldest and most remarkable of this race of artists. The date of his birth and the records of his progress are lost. Hubert was born about 1366, at Maeseyck, under the shelter or protection of a Benedictine convent. But the schools which had flourished in the towns having decayed, the artist wandered to Flanders, and there for the first time gained a name. As court painter to the hereditary prince of Burgundy, and as client to one of the richest of the Ghent patricians, Hubert is celebrated Here, in middle age, between 1410 and 1420, he signalized himself as the inventor of a new method of painting. Here he lived in the pay of Philip of Charolais till 1421. Here he painted pictures for the corporation, whose chief magistrates honoured him with a state visit in 1424. His principal masterpiece, the "Worship of the Lamb," at St Bavon in Ghent,[1] commissioned by Jodocus Vijdts, lord of Pamele, is the noblest creation of the Flemish school, one upon which Hubert laboured till he died, leaving it to be completed by his brother Almost unique as an illustration of contemporary feeling for Christian art, this great composition can only be matched by the "Fount of Salvation," in the museum of Madrid. It represents, on numerous panels, Christ on the judgment seat, with the Virgin and St. John the Baptist at His sides, hearing the songs of the angels, and contemplated by Adam and Eve, and, beneath Him the Lamb shedding His blood in the presence of angels, apostles, prophets, martyrs, knights and hermits On the outer sides of the panels are the Virgin and the angel annunciate, the sibyls and prophets who foretold the coming of the Lord, and the donors in prayer at the feet of the Baptist and Evangelist. After this great work was finished it was placed, in 1432, on an altar in St Bavon of Ghent, with an inscription on the framework describing Hubert as "maior quo nemo repertus," and setting forth, in colours as imperishable as the picture itself, that Hubert began and John afterwards brought it to perfection John van Eyck certainly wished to guard against an error which ill-informed posterity showed itself but too prone to foster, the error that he alone had composed and carried out an altarpiece executed jointly by Hubert and himself. His contemporaries may be credited with full knowledge of the truth in this respect, and the facts were equally well known to the duke of Burgundy or the chiefs of the corporation of Bruges, who visited the painter's house in state in 1432, and the members of the chamber of rhetoric at Ghent, who reproduced the Agnus Dei as a *tableau vivant* in 1456 Yet a later generation of Flemings forgot the claims of Hubert and gave the honours that were his due to his brother John exclusively.

The solemn grandeur of church art in the 15th century never found, out of Italy, a nobler exponent than Hubert van Eyck. His representation of Christ as the judge, between the Virgin and St. John, affords a fine display of realistic truth, combined with pure drawing, gorgeous colour, and a happy union of earnestness and simplicity with the deepest religious feeling It is finished with great skill, and executed with the new oil medium, of which Hubert shared the invention with his brother, but of which no rival artists at the time possessed the secret—a medium which consists of subtle mixtures of oil and varnish applied to the moistening of pigments, after a fashion kept secret only for a time from guildsmen of neighbouring cities, but unrevealed to the Italians till near the close of the 15th century. When Hubert died on Sept. 18, 1426 he was buried in the chapel on the altar of which his masterpiece was placed. According to a tradition as old as the 16th century, his arm was preserved as a relic in a casket above the portal of St. Bavon of Ghent

2. John (Jan) van Eyck (?1385–1441). The date of his birth is not more accurately known than that of his elder brother, but he was born much later than Hubert, who took charge of him and made him his "disciple." Under this tuition John learnt to draw and paint, and mastered the properties of colours from Pliny. Later on, Hubert admitted him into partnership, and both were made court painters to Philip of Charolais After the breaking up of the prince's household in 1421 John became his own master, left the workshop of Hubert and took an engagement as painter to John of Bavaria, at that time resident at The Hague as count of Holland. From The Hague he returned in 1424 to take

[1] The whole of this altarpiece was reunited after the peace of Versailles, which provided for the restoration of the panels which had hitherto been in the Berlin Museum.

service with Philip, now duke of Burgundy, at a salary of 100 livres per annum, and from that time till his death John van Eyck remained his servant He was frequently employed in missions of trust; and appears for a time to have been in ceaseless motion, receiving extra pay for secret services at Leyden, drawing his salary at Bruges, yet settled in a fixed abode at Lille. In 1428 he joined the embassy sent by Philip the Good to Lisbon to beg the hand of Isabella of Portugal His portrait of the bride fixed the duke's choice. After his return he settled definitely at Bruges, where he married. His wife bore him a daughter, known in after years as a nun in the convent of Maeseyck. At the christening the duke was sponsor. Numerous altarpieces and portraits now give proof of Van Eyck's extensive practice As works of art and models of conscientious labour they are all worthy of the name they bear, though not of equal excellence, none being better than those which were completed about 1432. Of an earlier period, a "Consecration of Thomas à Becket" has been preserved, and may now be seen at Chatsworth, bearing the date of 1421; no doubt this picture would give a fair representation of Van Eyck's talents at the moment when he started as an independent master, but that time and accidents of omission and commission have altered its state to such an extent that no conclusive opinion can be formed respecting it. The panels of the "Worship of the Lamb" were completed nine years later They show that John van Eyck was quite able to work in the spirit of his brother, and John continued the work with almost as much vigour as his master. His own experience had been increased by travel, and he had seen the finest varieties of landscape in Portugal and the Spanish provinces This enabled him to transfer to his pictures the scenery of lands more sunny than those of Flanders. We may ascribe much of the success which attended his efforts to complete the altar-piece of Ghent to the cleverness with which he reproduced the varied aspect of changing scenery, reminiscent here of the orange groves of Cintra, there of the bluffs and crags of his native valley. In all these backgrounds, though we miss the scientific rules of perspective with which the Van Eycks were not familiar, we find such delicate perceptions of gradations in tone, such atmosphere, yet such minuteness and perfection of finish that our admiration never flags. Nor is the colour less brilliant or the touch less firm than in Hubert's panels. John differs only from his brother in being less masculine and less sternly religious. He excels in two splendid likenesses of Jodocus Vijdts and his wife Catherine Burluuts. The same vigorous style and coloured key of harmony characterizes the small "Virgin and Child" of 1433 at the National Gallery, Melbourne, Australia, formerly at Ince, and the "Madonna," probably of the same date, at the Louvre, Paris, executed for Rollin, chancellor of Burgundy. Contemporary with these, the male portraits in the National Gallery, and the "Man with the Pinks," in the Berlin Museum (1432–1434), show no relaxation of power; but later creations display no further progress, unless we accept as progress a more searching delicacy of finish, counterbalanced by an excessive softness of rounding in flesh contours. An unfaltering minuteness of hand and great tenderness of treatment may be found, combined with angularity of drapery and some awkwardness of attitude in the full length portrait couple (John Arnolfini and his wife [1434]), at the National Gallery, in which a rare insight into the detail of animal nature is revealed in a study of a terrier dog. A "Madonna with Saints," at Dresden, equally soft and minute, charms us by the mastery with which an architectural background is put in. The bold and energetic striving of earlier days, the strong bright tone, are not equalled by the soft blending and tender tints of the later ones. Sometimes a crude ruddiness in flesh strikes us as a growing defect, an instance of which is the picture in the museum of Bruges, in which Canon van der Paelen is represented kneeling before the Virgin under the protection of St. George (1434). From first to last Van Eyck retains his ability in portraiture. Fine specimens are the two male likenesses in the gallery of Vienna (1436), and a female, the master's wife, in the gallery of Bruges (1439). His death in 1441 at Bruges is authentically recorded. He was buried in St. Donat. Hubert's disciple, Jodocus of Ghent, hardly honours his master's teaching, and only acquires importance after he has thrown off some of the peculiarities of Flemish teaching. Petrus Christus, who was taught by John, remains immeasurably behind him in everything that relates to art. But if the personal influence of the Van Eycks was small, that of their works was immense, and it is not too much to say that their example, taken in conjunction with that of Van der Weyden, determined the current and practice of painting throughout the whole of Europe north of the Alps for nearly a century. (J. A. C.)

The following pictures, besides those mentioned above, are generally attributed to the Van Eycks:—

"St Barbara," signed and dated 1437, "The Virgin by a Fountain," signed and dated 1439, both in the museum at Antwerp, the "Annunciation" in the Hermitage at Leningrad; these pictures are ascribed to Jan The following works of an earlier date are generally ascribed to Hubert, though some critics believe them to be by Jan: "The Crucifixion" and the "Last Judgment," two wings of an altarpiece in the Hermitage at Leningrad; the "Three Maries at the Sepulchre" in the Cook collection at Richmond, the "Virgin" in the nave of a Gothic church, at Berlin; two pictures of St Francis, one in the Johnson collection at Philadelphia, the other in the museum at Turin An attempt to distinguish between the styles of the two brothers has recently been made by Hulin, who attributes certain illuminations which were executed for Duke William of Holland, and which can therefore be dated, 1417, to the Van Eycks *See* G de Loo (Hulin) *Heures de Milan* (1911) and P Durrieu, *Heures de Turin* (1902).

See also G. F. Waagen, *Hubert and Johann van Eyck* (1822); C. Voll, *Werke des Jan van Eyck* (1900); L Kammerer on the two families in Knackfuss's *Kunstler-Monographien* (1898); W. H J. Weale, *H and J v. Eyck* (1908; abridged 2nd ed, 1912), Martin Conway, *The van Eycks and their Followers* (1921); Max Friedlander, *Die van Eyck* (1924).

EYE, a market-town and municipal borough in the Eye parliamentary division of East Suffolk, England, 94¼ m. N E from London on a branch from Mellis of the L N E R (Ipswich-Norwich section). Pop (1921) 1,781 The church of St Peter and St. Paul of Perpendicular flint work, with Early English portions and a fine 15th century rood screen, was formerly attached to a Benedictine priory. Fragments of a Norman castle crown a mound of probably earlier construction There are a town hall, corn exchange and ancient grammar school Brewing is the chief industry. The town is governed by a mayor, four aldermen and 12 councillors, and has a separate commission of the peace

Eye (*Heya, Aye*) was once surrounded by a stream, from which it is said to have derived its name. Leland says it was situated in a marsh and had formerly been accessible by river vessels from Cromer. From the discovery of numerous remains, it has been thought that the place was once the cemetery of a Roman camp. William I. gave the lordship to Robert Malet, a Norman, who built a castle and a Benedictine monastery which was at first subordinate to the abbey of Bernay in Normandy. Eye is a borough by prescription. In 1205 King John granted to the townsmen a charter freeing them from various tolls and customs and from the jurisdiction of the shire and hundred courts Later charters were granted by Elizabeth, James I. and William III. Two members were returned to parliament from 1571 till 1832, when the membership was reduced to one; in 1885 the representation was merged in the Eye division of the county. The making of pillow-lace was formerly carried on extensively.

EYE, ANATOMY OF. The eye consists of the eyeball, certain muscles which move it, and the lachrymal apparatus which keeps the front of it moist. The *eyeball* is contained in the front of the orbit and is a sphere of about an inch (24 mm.) in diameter. From the front of this a segment of a lesser sphere projects slightly and forms the *cornea* (*see* fig 1) The eyeball has three coats, external (protective), middle (vascular), and internal (sensory). There are also three refracting media, the aqueous humour, the lens and the vitreous humour or body.

The protective coat consists of the *sclerotic* in the posterior five-sixths and the cornea in the anterior sixth. The sclerotic or "white of the eye" (*see* fig. 1) is a firm fibrous coat, posteriorly pierced by the optic nerve. [illegible] is continuous with the

sclerotic but has a greater convexity. It consists of five layers, the outermost of which is stratified epithelium. Its transparency is due to the fact that all these layers have the same refractive index.

The middle or vascular coat of the eye consists of the *choroid*, the *ciliary processes* and the *iris*. The choroid (*see* fig. 1) does not come quite as far forward as the corneo-scleral junction; it is composed of numerous blood-vessels and pigment cells bound together by connective tissue.

The *ciliary processes* are some 70 triangular ridges, radially arranged, with their apices pointing backward (*see* fig 1), while their bases are level with the corneo-scleral junction. They are as vascular as the rest of the choroid, and contain in their interior the *ciliary muscle*, which consists of radiating and circular fibres The radiating fibres (*see* fig. 1) pull forward the choroid when they contract. The circular fibres lie just internal to these and are few or wanting in short-sighted people.

The *iris* (*see* fig 1) is the coloured diaphragm of the eye, the centre of which is pierced to form the pupil; it is composed of a connective tissue stroma containing blood-vessels, pigment cells and muscle fibres The pigment in the substance of the iris is variously coloured in different individuals, and is often deposited after birth, so that, in newly born European children, the colour

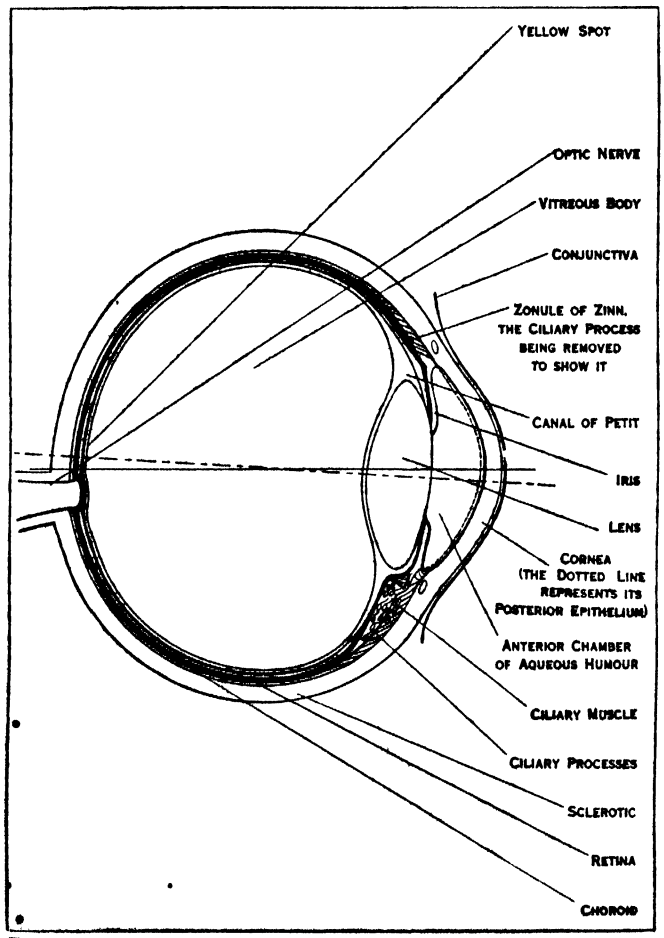


FIG. 1.—DIAGRAMMATIC SECTION THROUGH EYEBALL SHOWING CONSTITUENT PARTS

of the eyes is often slate-blue owing to the black pigment at the back of the iris showing through. White, yellow or reddish-brown pigment is deposited later in the substance of the iris, causing the appearance, with the black pigment behind, of grey, hazel or brown eyes. In blue-eyed people very little interstitial pigment is formed, while in Albinos the posterior pigment is also absent and the blood vessels give the pink coloration. The muscle fibres of the iris are circular and radiating, but it is uncertain whether the latter are really muscular or elastic.

The inner or sensory layer of the wall of the eyeball is the *retina*; it is a delicate transparent membrane which becomes thinner as the front of the eye is approached. A short distance behind the ciliary processes the nervous part of it stops, and forms a scalloped border called the *ora serrata*. Under the microscope the posterior part of the retina is seen to consist, from front to back, of eight layers (fig. 2) as follows: (1) Layer of nerve fibres; (2) Layer of ganglion cells; (3) Inner molecular layer;

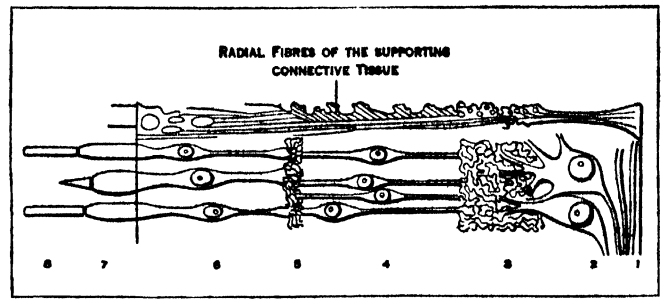


FIG 2.—DIAGRAMMATIC SECTION THROUGH RETINA SHOWING LAYERS (1) Nerve fibres, (2) ganglion cells, (3) inner molecular layer, (4) inner nuclear layer, (5) outer molecular layer, (6) outer nuclear layer, (7) rods and cones, (8) pigmented layer

(4) Inner nuclear layer; (5) Outer molecular layer; (6) Outer nuclear layer; (7) Layer of rods and cones; (8) Pigmented layer. Supporting the delicate nervous structures of the retina and binding them together is a series of radial fibres, or connective tissue rods, known as the *fibres of Müller*.

When the retina is looked at with the naked eye from in front two small marks are seen on it. One of these is an oval depression about 3 mm across, which, owing to the presence of pigment, is known as the yellow spot (*macula lutea*); it is situated directly in the antero-posterior axis of the eyeball, and at its margin the nerve fibre layer is thinned and the ganglionic layer thickened. At its centre, however, both these layers are wanting, and in the layer of rods and cones only the cones are present. This central part is called the *fovea centralis* and is the point of acutest vision. The second mark is a little below and to the inner side of the yellow spot; it is a circular disc with raised margins and a depressed centre and is called the *optic disc*; in structure it is a complete contrast to the yellow spot, for all the layers except that of the nerve fibres are wanting, and consequently, as light cannot be appreciated here, it is known as the "blind spot." It marks the point of entry of the optic nerve, and at its centre the retinal artery appears and divides into branches. An appreciation of the condition of the optic disc is one of the chief objects of the ophthalmoscope

The *crystalline lens* (*see* fig 1) with its ligaments separates the aqueous from the vitreous chamber of the eye; it is biconvex and the posterior surface is more curved than the anterior. Radiating from the anterior and posterior poles are three faint lines forming a Y, the posterior Y being erect and the anterior inverted. Running from these figures are lamellae, like the layers of an onion, each of which is made up of fibrils called the lens fibres. The whole lens is enclosed in an elastic structureless membrane, and, like the cornea, its transparency is due to the fact that all its constituents have the same refractive index.

The ligament of the lens is the thickened anterior part of the hyaloid membrane which surrounds the vitreous body; it is closely connected to the iris at the ora serrata, and then splits into two layers, of which the anterior is the thicker and blends with the anterior part of the elastic capsule of the lens, so that, when its attachment to the ora serrata is drawn forward by the ciliary muscle, the lens by its own elasticity, increases its convexity. Between the anterior and posterior splitting of the hyaloid membrane is a circular lymph space surrounding the margin of the lens known as the *canal of Petit*.

The *aqueous humour* (*see* fig. 1) is contained between the lens and its ligament posteriorly and the cornea anteriorly. It is practically a very weak solution of common salt (chloride of sodium 1·4%). The space containing it is unequally divided into a large anterior and a small posterior chamber by a perforated diaphragm

—the iris.

The *vitreous body* or *humour* is a jelly which fills all the contents of the eyeball behind the lens. It is surrounded by the hyaloid membrane, and anteriorly is concave for the reception of the lens The composition of the vitreous is practically the same as that of the aqueous humour

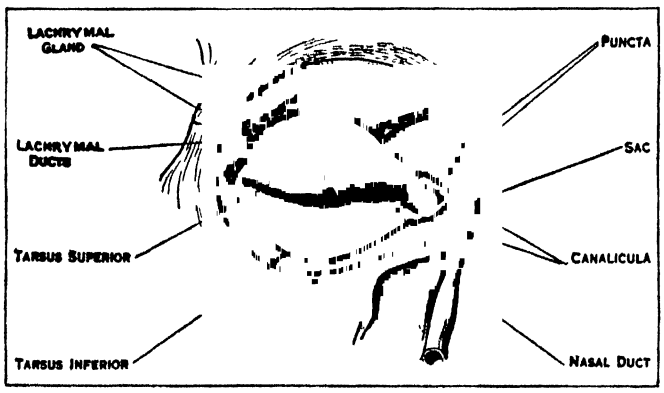
The *arteries of the eyeball* are derived from the ophthalmic branch of the internal carotid, and consist of the retinal which enters the optic nerve far back in the orbit, the two long ciliaries, which run forward in the choroid and join the anterior ciliaries to form a circle round the margin of the iris, and the six to twelve short ciliaries which pierce the sclerotic round the optic nerve and supply the choroid and ciliary processes.

The *veins of the eyeball* emerge as four or five trunks rather behind the equator and open into the superior ophthalmic vein In addition there is a retinal vein which accompanies its artery

Accessory Structures of the Eye.—The *eyelids* are composed of the following structures from in front backward (1) Skin; (2) Superficial fascia, (3) Orbicularis palpebrarum muscle; (4) *Tarsal plates* of fibrous tissue; (5) *Meibomian glands,* which are large modified sebaceous glands lubricating the edges of the lids, and *Glands of Moll,* large sweat glands which, when inflamed, cause a "sty"; (6) the *conjunctiva,* a layer of mucous membrane which lines the back of the eyelids and is reflected on to the front of the globe, on the front of the cornea the conjunctiva is continuous with the layer of epithelial cells already mentioned

The *lachrymal gland* is found in the upper and outer part of the front of the orbit and is about the size of an almond Its six to twelve ducts open on to the upper reflection of the conjunctiva

The *lachrymal canals* (canaliculi) (indicated in fig. 3) are superior and inferior, and open by minute orifices (puncta) on to the free margins of the two eyelids near their inner point of junction They collect the tears, secreted by the lachrymal gland, which thus pass right across the front of the eyeball, continually



FROM JULER, "HANDBOOK OF OPHTHALMIC SCIENCE AND PRACTICE" (MURRY)

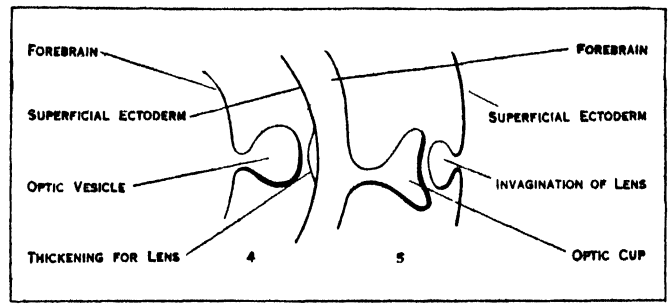
FIG 3 —DISSECTION OF LACHRYMAL APPARATUS SHOWING LACHRYMAL DUCTS, LACHRYMAL SAC AND NASAL DUCT

moistening the conjunctiva The two ducts are bent round a small pink tubercle (*caruncula lachrymalis*) (*see* fig. 3) at the inner angle of the eyelids, and open into the *lachrymal sac* (*see* fig. 3), which lies in a groove in the lachrymal bone The sac is continued down into the *nasal duct* (*see* fig 3), which is about ¾ in. long and opens into the inferior meatus of the nose, its opening being guarded by a valve

The orbit contains seven muscles, six of which rise close to the optic foramen. The *levator palpebrae superioris* is the highest, and passes forward to the superior tarsal plate and fornix of the conjunctiva. The *superior* and *inferior recti* are inserted into the upper and lower surfaces of the eyeball respectively; they make the eye look inward as well as up or down. The external and internal recti are inserted into the sides of the eyeball and make it look outward or inward. The superior oblique runs forward to a pulley in the inner and front part of the roof of the orbit, round which it turns to be inserted into the outer and back part of the eyeball. It turns the glance downward and outward. The inferior oblique rises from the inner and front part of the floor of the orbit, and is also inserted into the outer and back part of the eyeball. It directs the glance upward and outward Of all these muscles the superior oblique is supplied by the fourth cranial nerve, the external rectus by the sixth and the rest by the third.

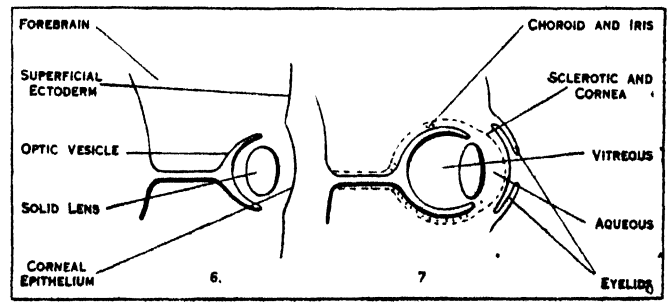
The posterior part of the eyeball and the anterior parts of the muscles are enveloped in a lymph space, known as the *capsule of Tenon,* which assists their movements.

Embryology.—The *optic vesicles* grow out from the forebrain, and the part nearest the brain becomes constricted and



FIGS 4 AND 5 —EMBRYOLOGY OF EYE (LEFT) FIRST STAGE OF DEVELOPING EYE AND (RIGHT) SECOND STAGE OF THE SAME

elongated to form the optic stalk (*see* figs 4 and 5) At the same time the ectoderm covering the side of the head thickens and becomes invaginated to form the lens vesicle (*see* figs 4 and 5), which later loses its connection with the surface and approaches the optic vesicle, causing that structure to become cupped for its reception, so that what was the optic vesicle becomes the optic cup and consists of an external and an internal layer of cells (*see* fig 6). Of these cells the outer ones become the retinal pigment, while the inner form the other layers of the retina The invagination of the optic cup extends, as the *choroidal fissure* (not shown in the diagrams), along the lower and back part of the optic stalk, and into this slit sinks some of the surrounding mesoderm to form the vitreous body When this has happened the fissure closes up. The anterior epithelium of the lens vesicle remains, but from the posterior the lens fibres are developed and these gradually fill up the cavity. The superficial layer of head ectoderm, from which the lens has been invaginated and separated, becomes the anterior epithelium of the cornea (fig 6), and between it, and the lens the mesoderm sinks in to form the cornea, iris and anterior chamber of the eye, while surrounding the optic cup the mesoderm forms the sclerotic and choroid coats (indicated in fig 7) Up to the seventh month the pupil is closed by the *membrana pupillaris,* derived from the capsule of the lens which is part of the mesodermal ingrowth through the choroidal fissure already mentioned Most of the



FIGS. 6 AND 7.—EMBRYOLOGY OF THE EYE (LEFT) THIRD STAGE OF THE DEVELOPING EYE AND (RIGHT) FOURTH STAGE

fibres of the optic nerve are centripetal and begin as the axons of the ganglionic cells of the retina; a few, however, are centrifugal and come from the nerve cells in the brain.

The eyelids are developed as ectodermal folds, which blend with one another about the third month and separate again before birth in man (*see* fig. 7). The lachrymal sac and duct are formed from solid ectodermal thickenings which later become canalized.

It will thus be seen that the optic nerve and retina are formed from the brain ectoderm; the lens, anterior epithelium of the cornea, skin of the eyelids, conjunctive and lachrymal apparatus

from the superficial ectoderm; while the sclerotic, choroid, vitreous and aqueous humours as well as the iris and cornea are derived from the mesoderm.

Comparative Anatomy.—The Acrania, as represented by Amphioxus (the lancelet), have a patch of pigment in the fore part of the brain which is regarded as the remains of a degenerated eye. In the Cyclostomata the hag (Myxine) and larval lamprey (Ammocoetes) have ill-developed eyes lying beneath the skin and devoid of lens, iris, cornea and sclerotic as well as eye muscles In the adult lamprey (Petromyzon) these structures are developed at the metamorphosis, and the skin becomes transparent, rendering sight possible. Ocular muscles are developed, but, unlike most vertebrates, the inferior rectus is supplied by the sixth nerve while all the others are supplied by the third In all vertebrates the retina consists of a layer of senso-neural cells, the rods and cones, separated from the light by the other layers which together represent the optic ganglia of the invertebrates; in the latter animals, however, the senso-neural cells are nearer the light than the ganglia

In fishes the eyeball is flattened in front, but the flat cornea is compensated by a spherical lens, which, unlike that of other vertebrates, is adapted for near vision when at rest The iris in some bony fishes (Teleostei) is not contractile In the Teleostei, too, there is a process of the choroid (*processus falciformis*) which projects into the vitreous chamber and runs forward to the lens; besides nourishing the lens it is concerned in accommodation. This group of fishes is also remarkable for the possession of a so-called *choroid gland,* which is really an arterial network between the choroid and sclerotic The sclerotic in fishes is usually chondrified and sometimes calcified or ossified In the retina the rods and cones are about equal in number, and the cones are very large In the cartilaginous fishes (Elasmobranchs) there is a silvery layer (*tapetum lucidum*), on the retinal surface of the choroid

In the Amphibia the cornea is more convex than in the fish, but the lens is circular and the sclerotic often chondrified The class shows the first rudiments of the ciliary muscle, although accommodation is brought about by shifting the lens In the retina the rods outnumber the cones The latter are smaller than in other animals.

In Reptilia the eye is spherical and its anterior part is often protected by bony plates in the sclerotic (Lacertilia and Chelonia) The ciliary muscle is striated, and in most reptiles accommodation is effected by relaxing the ciliary ligament as in higher vertebrates, though in the snakes (*Ophidia*) the lens is shifted as it is in the lower forms Many lizards have a vascular projection of the choroid into the vitreous, foreshadowing the pecten of birds and homologous with the processus falciformis of fishes In the retina the rods are scarce or absent.

In birds the eye is tubular, especially in nocturnal and raptorial forms; this is due to a lengthening of the ciliary region, which is always protected by bony plates in the sclerotic The pecten, already mentioned in lizards, is a pleated vascular projection from the optic disc towards the lens which in some cases it reaches. In Apteryx this structure disappears In the retina cones outnumber rods, but are not as numerous as in reptiles.

In the Mammalia the eye is largely enclosed in the orbit, and bony plates in the sclerotic are only found in the monotremes. The cornea is convex except in aquatic mammals, in which it is flattened. The lens is biconvex in diurnal mammals, but in nocturnal and aquatic it is spherical. There is no pecten, but the numerous hyaloid arteries which are found in the embryo represent it. The iris usually has a circular pupil, but in some ungulates and kangaroos it is a transverse slit. In the Cetacea this transverse opening is kidney-shaped, the hilum of the kidney being above. In many carnivores, especially nocturnal ones, the slit is vertical, and this form of opening seems adapted to a feeble light, for it is found in the owl, among birds. The tapetum lucidum is found in Ungulata, Cetacea and Carnivora. The ciliary muscle is unstriped. In the retina the rods are more numerous than the cones, while the macula lutea only appears in the Primates in connection with binocular vision.

Among the accessory structures of the eye the retractor bulb muscle is found in amphibians, reptiles, birds and many mammals; its nerve supply shows that it is probably a derivative of the external or posterior rectus. The nictitating membrane or third eyelid is well developed in amphibians, reptiles, birds and some few sharks; it is less marked in mammals, and in man is only represented by the little *plica semilunaris.* When functional it is drawn across the eye by special muscles derived from the retractor bulbi. In connection with the nictitating membrane the Harderian gland is developed, while the lachrymal gland secretes fluid for the other eyelids to spread over the conjunctiva These two glands are specialized parts of a row of glands which in the Urodela (tailed amphibians) are situated along the lower eyelid the outer or posterior part of this row becomes the lachrymal gland, which in higher vertebrates shifts from the lower to the upper eyelid, while the inner or anterior part becomes the Harderian gland. Below the amphibians glands are not necessary, as the water keeps the eye moist.

The lachrymal duct first appears in the tailed amphibians; in snakes and gecko lizards, however, it opens into the mouth.

BIBLIOGRAPHY.—For further details *see* any standard text-book of anatomy Later literature is noticed in the catalogue of the Museum of the Royal College of Surgeons (London). (F. G. P.)

EYE, DISEASES OF. The specially important diseases of the eye are those which temporarily or permanently interfere with sight (*See* BLINDNESS, CAUSES OF) In considering the subject it must be remembered that (1) the eye is a double organ while (2) either eye may have its own trouble

1 Normally, the two eyes act together Impressions made upon either retina, to the one side of a vertical line through the centre the *fovea centralis,* before giving rise to conscious perception cause a stimulation of the same area in the brain Impressions formed simultaneously, for instance, on the right side of the right retina and on corresponding areas of the right side of the left retina, are conveyed to the same spots in the right occipital lobe of the brain Pathological processes, therefore, which are localized in the right or left occipital lobes, or along any part of the course of the fibres which pass from the right or left optic tracts to these "visual centres," cause defects in function of the right or left halves of the two retinae *Hemianopia,* or half-blindness arising from these pathological changes, is of very varying degrees of severity, according to the nature and extent of the particular lesion The blind areas in the two fields of vision, corresponding to the outward projection of the paralysed retinal areas, are always symmetrical both in shape and degree. The central lesion may for instance be very small, but at the same time destructive to the nerve tissue This will be revealed as a sector-shaped or insular symmetrical complete blindness in the fields of vision to the opposite side Or a large central area, or an area comprising many or all of the nerve fibres which pass to the visual centre on one side, may be involved in a lesion which causes impairment of function, but no actual destruction of the nerve tissue. There is thus caused a symmetrical weakening of vision (*amblyopia*) in the opposite fields In such cases the colour vision is so much more evidently affected than the sense of form that the condition has been called *hemiachromatopsia* or half-colour blindness Hemianopia may be caused by haemorrhage, embolism, or tumour growth which either directly involves the visual nerve elements or affects them by compression and by inflammation Transitory hemianopia is rare and is frequently of toxic origin

The two eyes also act as if they were one in accommodating It is impossible for the two eyes to accommodate simultaneously to different extents, so that where there is, as occasionally happens, a difference in focus between them, this difference remains the same for all distances for which they are adapted. In such cases, therefore, both eyes cannot ever be accurately adapted at the same time, though either may be alone. It often happens as a consequence that the one eye is used to receive the sharpest images of distant, and the other of near objects. Any pathological change which leads to an interference in the accommodating power of one eye alone must have its origin in a lesion which lies peripherally to the nucleus of the third cranial nerve. Such a

lesion is usually one of the third nerve itself. Consequently, a unilateral accommodation paresis is almost invariably associated with paresis of some of the oculo-motor muscles. A bilateral accommodation paresis is not uncommon. It is due to a nuclear or more central cerebral disturbance. Unlike a hemianopia, which is mostly permanent, a double accommodation paresis is frequently transitory. It is often a post-diphtheritic condition, appearing alone or associated with other paresis.

Both eyes are also, normally, associated in their movements They move in response to a stimulus or a combination of stimuli, emanating from different centres of the brain, but always equally distributed to the corresponding muscles in both eyes, so that the two lines of fixation meet at the succession of points on which attention is directed. The movements are thus associated in the same direction, to the right or left, upwards or downwards, etc. In addition, owing to the space which separates the two eyes, convergent movements, caused by stimuli equally distributed between the two internal recti, are required for the fixation of nearer and nearer-lying objects. These movements would not be necessary in the case of a single eye. It would merely have to accommodate The converging movements of the double eye occur in association with accommodation, and thus a close connection becomes established between the stimuli to accommodation and convergence. All combinations of convergent and associated movements are constantly taking place normally.

Associated and convergent movements may be interfered with pathologically in different ways. Cerebral lesions may lead to their impairment or complete abolition, or they may give rise to involuntary spasmodic action, as the result of paralysing or irritating the centres from which the various co-ordinated impulses are controlled or emanate. Lesions which do not involve the centres may prevent the response to associated impulses in one eye alone by interfering with the functional activity of one or more of the nerves along which the stimuli are conveyed. Paralysis of oculo-motor nerves is thus a common cause of defects of association in the movements of the double eye. The great advantage of simultaneous binocular vision—viz , the appreciation of depth, or stereoscopic vision—is thus lost for some, or it may be all, directions of fixation. Instead of seeing singly with two eyes, there is then double-vision (*diplopia*). This persists so long as the defect of association continues, or so long as the habit of mentally suppressing the image of the faultily-directed eye is not acquired.

In the absence of any nerve lesions, central or other, interfering with their associated movements the eyes continue throughout life to respond equally to the stimuli which cause these movements, even when, owing to a visual defect of the one eye, binocular vision has become impossible. It is otherwise, however, with the proper co-ordination of convergent movements. These are primarily regulated by the unconscious desire for binocular vision, and more or less firmly associated with accommodation. When one eye becomes blind, or when binocular vision for other reasons is lost, the impulse is gradually, as it were, unlearnt. This is the cause of *divergent concomitant squint*. Under somewhat similar conditions a degree of convergence, which is in excess of the requirements of fixation, may be acquired from different causes. This gives rise to *convergent concomitant squint*.

For *Astigmatism*, etc , *see* the article VISION.

2 Taking each eye as a single organ, we find it to be subject to many diseases. In some cases both eyes are affected in the same way, *e.g* , where the local disease is a manifestation of some general disturbance. Apart from the fibrous coat of the eye, the sclera, which is little prone to disease, and the external muscles and other adnexa, the eye may be looked upon as composed of two elements: (*a*) the dioptric media, and (*b*) the parts more or less directly connected with perception.

The dioptric media, or the transparent portions which are concerned in the transmission of light to, and the formation of images upon, the retina, are the following: the *cornea*, the *aqueous humour*, the *crystalline lens* and the *vitreous humour*. Loss of transparency in any of these media leads to blurring of the retinal images of external objects. In addition to loss of transparency the cornea may have its curvature altered by pathological processes. This necessarily causes imperfection of sight. The crystalline lens, on the other hand, may be dislocated, and thus cause image distortion.

The Cornea.—The transparency of the cornea is mainly lost from inflammation (*keratitis*). This causes an infiltration of its tissues with leucocytes, or a focal, destructive ulcerative process.

Inflammation of the cornea may be primary or secondary, *i e.*, the inflammatory changes may be directly connected with one or more foci of inflammation in the cornea itself or the focus or foci may be in some other part of the eye Only the very superficial forms of primary keratitis, those confined to the epithelial layer, leave no permanent change; there is otherwise always a loss of tissue resulting from the inflammation and this loss is made up for by more or less densely intransparent connective tissue (*nebula, leucoma*). These according to their site and extent cause greater or less visual disturbance. Primary keratitis may be ulcerative or non-ulcerative, superficial or deep, diffuse or circumscribed, vascularized or non-vascularized It may be complicated by deeper inflammations of the eye such as iritis and cyclitis In some cases the anterior chamber is invaded by pus (*hypopyon*). The healing of a corneal ulcer is characterized by the disappearance of pain where this has been a symptom and by the rounding off of its sharp margins as epithelium spreads over them from the surrounding healthy parts. Ulcers tend to extend either in depth or superficially, rarely in both manners at the same time A deep ulcer leads to perforation with more or less serious consequences according to the extent of the perforation. Often an eye bears permanent traces of a perforation in adhesion of the iris to the back of a corneal scar or in changes in the lens capsule (capsular cataract). In other cases the ulcerated cornea may yield to pressure from within, which causes it to bulge forwards (*staphyloma*).

The principal causes of primary keratitis are injuries and infection from the conjunctiva. Injuries are most serious when the body causing the wound is septic or when micro-organisms from some other source, often the conjunctiva and tear-sac, effect a lodgement before healing of the wound has sufficiently advanced. In infected cases a complication with iritis is not uncommon owing to the penetration of toxines into the anterior chamber.

Primary Keratitis.—Inflammations of the cornea are the most important diseases of the eye. Treatment of primary keratitis must vary according to the cause. Generally speaking the aim should be to render the ulcerated portions as aseptic as possible without using applications which are apt to cause a great deal of irritation and thus interfere with healing. On this account it is important to be able to recognize when healing is taking place, for then rest, and frequent irrigation of the conjunctiva with sterilized water at the body temperature, and occasional mild antiseptic irrigation of the nasal mucous membrane is all that is required. It is dangerous to overtreat

Among the many local antiseptics may be mentioned the actual cautery, chlorine water, freshly prepared silver nitrate or protargol, and the yellow oxide of mercury. These agents are not equally applicable in any given case. For instance, the actual cautery is employed only in the case of the deeper septic ulcers, in which the destruction of tissue is already considerable and tending to spread further. Again the yellow oxide of mercury should only be used in the more superficial, tuberculous forms of inflammation.

Secondary Keratitis takes the form of an interstitial deposit of leucocytes between the layers of the cornea as well as often of vascularization, sometimes intense, from the deeper network of vessels (anterior ciliary) surrounding the cornea. The duration of a secondary keratitis often lasts many months. More or less complete restoration of transparency is the rule, however, eventually.

No local treatment is called for except shading of the eyes and in most cases use of a mydriatic to prevent adhesions when the iris is involved. Inherited syphilis, tuberculous and other inflammations are the causes of secondary keratitis.

Neuro-paralytic Keratitis.—When the fifth nerve (sensory) is paralysed there is a tendency for the cornea to become inflamed. Different forms of inflammation may then occur which all show a marked slowness in healing. The explanation of neuro-paralytic keratitis is that in the insensitive condition of the cornea it is less guarded against injuries. The prognosis is necessarily bad. The treatment consists in as far as possible protecting the eye from external influences and frequently irrigating with antiseptic lotions.

Certain degenerative changes occur in the cornea. In *keratoconus* or conical cornea, the normal curvature of the cornea becomes altered with consequent impairment of vision. Other degenerative changes are *arcus senilis*, a whitish opacity due to fatty degeneration, extending round the corneal margin, varying in thickness in different subjects and usually only met with in old people *transverse calcareous film*, consisting of a finely punctiform opacity extending, in a tolerably uniformly wide band, occupying the zone of the cornea which is left uncovered when the lids are half closed.

Scleritis.—Inflammation of the sclera is confined to its anterior part which is covered by conjunctiva. Scleritis may occur in circumscribed patches or in the shape of a belt round the cornea. The former is usually more superficial and uncomplicated, the latter deeper and complicated with corneal infiltration, iridocyclitis and anterior choroiditis Superficial scleritis (*episcleritis*) is a long-continued disease which is associated with very varying degrees of discomfort Its chronic nature depends mainly upon the tendency that the inflammation has to recur in successive patches at different parts of the sclera. Often only one eye at a time is affected. Each patch lasts for a month or two and is succeeded by another after an interval of varying duration Months or years may elapse between the attacks The cicatricial site of a previous patch is rarely again attacked. The scleral infiltration causes a firm swelling, often sensitive to touch, over which the conjunctiva is freely moveable The overlying conjunctiva is always injected. The infiltration itself at the height of the process is densely vascularized Seen through the conjunctiva its vessels have a darker, more purplish hue than the superficial ones. The swelling caused by the infiltration gradually subsides, leaving a cicatrix to which the overlying conjunctiva becomes adherent The cicatrix has a slaty, porcellanous-looking colour. Superficial scleritis occurs in both sexes with about equal frequency No definite cause for the inflammation is known

Deep scleritis with its attendant complications is a more serious disease Etiologically it is equally obscure Both eyes are almost always attacked It more generally occurs in young people, mostly in young women It is more persistent and less subject to periods of intermission than episcleritis Eventually it leads to weakening of the sclerotic coat causing it to yield to the intraocular pressure. Vision suffers from extension of the infiltration to the cornea, or from iritis with its attendant adhesions, or from anterior choroiditis, and sometimes also from secondary glaucoma. Iridectomy, especially if done early in the process, may be of use

The Aqueous Humour.—Intransparency of the aqueous humour is always due to some exudation. This comes either from the iris or the ciliary processes, and may be blood, pus or fibrin An exudation in this situation tends naturally to gravitate to the most dependent part, and, in the case of blood or pus, is known as *hyphaema* or *hypopyon*.

The Crystalline Lens Cataract.—Intransparency of the crystalline lens is technically known as *cataract*. Cataract may be idiopathic and uncomplicated, or traumatic, or secondary to disease in the deeper parts of the eye. The modified epithelial structure of which the lens is composed is always being added to throughout life. The older portions of the lens are consequently the more central They are harder and less elastic. This arrangement seems to predispose to difficulties of nutrition. In many people, in the absence altogether of general or local disease, the transparency of the lens is lost owing to degeneration of the incompletely-nourished fibres. This idiopathic cataract mostly occurs in old people; hence the term *senile cataract*. So-called *senile* cataract is not, however, necessarily associated with any general senile changes. An idiopathic uncomplicated cataract is also met with as a congenital defect due to faulty development of the crystalline lens. A particular and not uncommon form of this kind of cataract, which may also develop during infancy, is *lamellar* or *zonular cataract*. This is a partial and stationary form of cataract in which, while the greater part of the lens retains its transparency, some of the lamellae are intransparent Traumatic cataract occurs in two ways: by laceration or rupture of the lens capsule, or by nutritional changes consequent upon injuries to the deeper structures of the eye. The transparency of the lens is dependent upon the integrity of its capsule. Penetrating wounds of the eye involving the capsule, or rupture of the capsule from severe blows on the eye without perforation of its coats, are followed by rapidly developing cataract. Severe non-penetrating injuries, which do not cause rupture of the capsule, are sometimes followed, after a time, by slowly-progressing cataract. Secondary cataract is due to abnormalities in the nutrient matter supplied to the lens owing to disease of the ciliary body, choroid or retina. In some diseases, as diabetes, the altered general nutrition tells in the same way on the crystalline lens. Cataract is then rapidly formed. All cases of cataract in diabetes are not, however, necessarily true diabetic cataracts in the above sense *Dislocations of the lens* are traumatic or congenital. In old-standing disease of the eye the suspensory ligament may yield in part, and thus lead to lens dislocation The lens is practically always cataractous before this takes place.

The Vitreous Humour.—The vitreous humour loses its transparency owing to exudation from the inflamed ciliary body or choroid. The exudation may be fibrinous or purulent; the latter only as a result of injuries by which foreign bodies or septic matter are introduced into the eye or in metastatic choroiditis. Blood may also be effused into the vitreous from rupture of retinal, ciliary or choroidal vessels. The pathological significance of the various effusions into the vitreous depends greatly upon the cause. In many cases effusion and absorption are constantly taking place simultaneously. Whether clearing occurs depends on whether absorption preponderates.

Diseases of the Iris and Ciliary Body.—Inflammation of the iris, *iritis*, arises from different causes. Some forms have relations with rheumatism, gout, albuminuria, tuberculosis, fevers, syphilis, gonorrhoea Traumatic and infected cases are attributable to accidents, the presence of foreign bodies, operations, etc. In addition, iritis may be secondary to keratitis, scleritis or choroiditis The beginning of an attack of inflammation of the iris is characterized by alterations in its colour due to hyperaemia and by circumcorneal injection Later on, exudation takes place into the substance of the iris, causing thickening and also a loss of gloss to its surface According to the nature and severity of the exudation there may be deposits formed on the back of the cornea, adhesions between the iris and lens capsule (synechiae), or even gelatinous-looking coagulations or pus in the anterior chamber.

The symptoms to which the inflammation may give rise are dread of light (*photophobia*), pain, generally most severe at night and often very great, lacrimation, more or less impairment of sight. An acute attack of iritis usually lasts about six weeks. Some cases become chronic and last much longer. Others are chronic from the first, and in one clinical type, in which the ciliary body is also affected, viz., *iritis serosa*, there is usually little injection of the eye or pain, so that the patient's attention may only be directed to the eye by gradual impairment of sight. In some cases, particularly in men, there is recurrence at longer or shorter intervals of attacks of iritis (*recurrent iritis*). In these cases, as well as in all cases of plastic iritis, serious consequences to sight are apt to follow from adhesion of the iris to the lens capsule and occlusion of the pupil by exudation.

Inflammation of the ciliary body, *cyclitis*, is frequently associated with iritis. This association is probable in all cases where there are deposits on the posterior surface of the cornea. It is certain where there are changes in the intra-ocular tension. Often in cyclitis there is a very marked diminution in tension. Cyclitis is also present when the degree of visual disturbance is greater than can be accounted for by the visible changes in the pupil and

anterior chamber. The exudation may, as in iritis, be serous, plastic or purulent It passes from the two free surfaces of the ciliary body into the posterior aqueous, and into the vitreous, chambers. This produces more or less intransparency of the vitreous humour, a constant sign of cyclitis. Where there has been excessive exudation into the vitreous, subsequent shrinking and liquefaction take place, leading to detachment of the retina and consequent blindness. The most serious form of iridocyclitis is that which may follow penetrating wounds of the eye. This may lead to a similar inflammation of the other eye (*sympathetic ophthalmia*) which ends in its complete destruction.

The treatment of iritis necessarily differs to some extent according to the cause. The general treatment applicable to all cases need only be here considered The aim should be to put the eye as far as possible at rest, to prevent the formation of adhesions and alleviate the pain. An attempt should be made to keep the pupil thoroughly dilated with atropine as long as any circumcorneal injection lasts. If a case of iritis be left to itself or treated without the use of a mydriatic, posterior synechiae almost invariably form Some fibrinous exudation may even organize into a membrane stretching across, and more or less completely occluding, the pupil. Synechiae, though not of themselves causing impairment of vision, increase the risk that the eye runs from subsequent attacks of iritis. It should, however, be remembered that as the main call for a mydriatic is to prevent synechiae, the *raison d'être* for its use no longer exists when, having been begun too late, the pupil cannot properly be dilated by it Under these conditions it may even do harm. The eyes should also be kept shaded from the light by the use of a shade or neutral-tinted glasses. During an attack any use of the eyes for reading, sewing or work of any kind calling for accommodation must be prohibited. This applies equally to the case of inflammation in one eye alone and in both.

Pain is best relieved by hot fomentations, cocaine, and in many cases the internal use of salicin or phenacetin The treatment sometimes required for cases of old iritis is iridectomy. The operation is called for in two different classes of cases In the first place, to improve vision where the pupil is small, and to a great extent occluded, though the condition has not so far led to serious nutritive changes; and in the second place, with the object of preventing the complete destruction of vision threatened by either the existing condition or the danger of recurrence of the inflammation. Iridectomy for iritis should be performed when the inflammation has entirely subsided The portion of iris excised should be large. The operation is urgently called for where the condition of *iris bombans* exists.

Iris tumours, either simple or malignant, are rare. A frequent result of a severe blow on the eye is a separation of a portion of the iris from its peripheral attachment. Of congenital anomalies the most common are a cleft condition (*coloboma*) and more or less persistence of the foetal pupillary membrane.

The Retina.—Choroidal inflammations are generally patchy. These patches may in course of time become more or less confluent. The effect upon vision depends upon the extent to which the external or percipient elements of the retina become involved. It is especially serious when the more central portions of the retina are thus affected.

In *glaucoma* there is an increase of intra-ocular tension, which acts injuriously on the optic nerve end and its ramifications in the retina. The cause of the rise of tension is partly congestive, partly mechanical. The effect of glaucoma, when untreated, is to cause ever-increasing loss of sight, although the time occupied by the process before it leads to complete blindness varies within such extraordinary wide limits as from a few hours to many years. The onset of glaucoma is characterized by subjective flashes of light or a halo around objects and stony hardness of the eyeball to touch. Such symptoms call for immediate treatment, instillation of pilocarpine to contract the pupil to the utmost and thus dilate the lymphatic canal of Petit (*see* EYE, ANATOMY OF) or iridectomy. The uveal tract may be the site of *sarcoma*.

The retina is subject to inflammation, to detachment from the choroid, to haemorrhages from the blood-vessels and to tumour. Retinal inflammation may primarily affect either the nerve elements or the connective tissue framework. The former is usually associated with some general disease such as albuminuria or diabetes and is bilateral The tissue changes are oedema, the formation of exudative patches, and haemorrhage. Where the connective tissue elements are primarily affected, the condition is a slow one, similar to *sclerosis* of the central nervous system. The gradual blindness which this causes is due to compression of the retinal nerve elements by the connective tissue hyperplasia, which is always associated with characteristic changes in the disposition of the retinal pigment. This retinal sclerosis is generally known as *retinitis pigmentosa*, a disease with hereditary predisposition. Haemorrhages into the retina are met with in phlebitis of the central retinal vein, which is almost invariably unilateral, and in certain conditions of the blood, as pernicious anaemia, when they are always bilateral.

The optic nerve is subject to inflammation (optic neuritis) and atrophy. Double optic neuritis, affecting, however, only the intra-ocular ends of the nerves, is an almost constant accompaniment of brain tumour. Unilateral neuritis has a different causation, depending upon an inflammation, mainly perineuritic, of the nerve in the orbit. It is analogous to peripheral inflammation of other nerves, such as the third, fourth, sixth and seventh cranial nerves.

Diseases of the Conjunctiva.—These are the most frequent diseases of the eye with which the surgeon has to deal. They generally lead to some interference with vision and to great impairment if the cornea is implicated

Hyperaemia.—When the conjunctiva becomes hyperaemic its colour is heightened and its transparency lessened. Sometimes it becomes thickened, and in long standing cases velvety. The redness is most marked in the fold between the palpebral and the ocular conjunctiva, and diminishes towards the cornea. An important diagnostic mark is thus furnished between purely conjunctival hyperaemia and circumcorneal congestion, which is always an indication of more deep-seated vascular dilatation. It also differs materially from a scleral injection, in which there is a visible dilatation of the superficial scleral vessels.

Hyperaemia of the conjunctiva where not followed by inflammation causes more or less lacrimation but no alteration in the character of its secretion The hyperaemia may be acute and transitory or chronic. Much depends upon the cause as well as upon the persistence of the irritation which sets it up.

Traumata, the presence of foreign bodies in the conjunctival sac, or the irritations of superficial chalky infarcts in the Meibomian ducts, cause more or less severe transitory congestion. Continued subjection to irritating particles of dust, etc., causes a more continued hyperaemia, often circumscribed and less pronounced. Bad air also causes a chronic hyperaemia in which it is common to find a follicular hyperplasia. Long exposure to too intense light, astigmatism and other ocular defects which cause asthenopia lead also to chronic hyperaemia. Anaemic individuals often suffer from hyperaemia of this nature.

The treatment of conjunctival hyperaemia consists first in the removal of the cause when it can be discovered. Often this is difficult. The application of hot sterilized water is useful.

Conjunctivitis.—When the conjunctiva is actually inflamed its secretion becomes copious and altered in character. A practical though by no means sharply defined clinical division of cases of conjunctivitis is afforded by the character of the secretion from the inflamed membrane and the visible tissue alterations which the membrane undergoes. The common varieties of conjunctivitis which may thus be distinguished are (*a*) Catarrhal conjunctivitis, (*b*) Purulent conjunctivitis, (*c*) Phlyctenular conjunctivitis, (*d*) Granular conjunctivitis, and (*e*) Diphtheritic conjunctivitis.

The treatment should have the primary object of preventing implication of the cornea and extension to the other eye.

Catarrhal conjunctivitis, which is characterized by an increased mucoid secretion accompanying the hyperaemia, is usually bilateral and may be either acute or chronic. Acute conjunctivitis lasts as a rule only for a week or two: the chronic type may persist, with or without exacerbations, for years. The subjective symptoms vary in intensity with the severity of the inflammation.

There is always troublesome "burning" in the eyes with a tired, heavy feeling in the lids. This is aggravated by reading In acute cases, indeed, reading is impossible In all cases the symptoms are also more marked if the eyes have been tied up, though this may produce a temporary relief.

A special variety of acute catarrhal conjunctivitis is the so-called *hay-fever* (q.v.; *see* ANAPHYLAXIS). Other ectogenetic causes are mostly microbic. The most common are the Morax-Axenfeld and the Koch-Weeks conjunctivitis.

The Morax-Axenfeld bacillus sets up a contagious conjunctivitis which affects individuals of all ages and conditions. The inflammation is usually chronic, at most subacute. It is often sufficiently characteristic to be recognized without a microscopical examination of the secretions. In typical cases the lid margin, palpebral conjunctiva, and it may be a patch of ocular conjunctiva at the outer or inner angle are alone hyperaemic: the secretion is not copious and is mostly found as a greyish coagulum lying at the inner lid-margin The subjective symptoms are usually slight Complications with other varieties of catarrhal conjunctivitis are not uncommon This mild form of conjunctivitis generally lasts for many months, subject to more or less complete disappearance followed by recurrences It can be rapidly cured by the use of an oxide of zinc ointment, which should be continued for some time after the appearances have altogether passed off.

The conjunctivitis caused by the Koch-Weeks microbe is still more common It is a more acute type, affects mostly children, and is very contagious and often epidemic. Here the hyperaemia involves both the ocular and the palpebral conjunctiva, and usually there is considerable swelling of the lids and a copious secretion. Both eyes are always affected. Occasionally the engorged conjunctival vessels give way, causing numerous small extravasations (ecchymoses). Complications with phlyctenulae (vide *infra*) are common in children The acute symptoms last for a week or ten days, after which the course is more chronic. Treatment with nitrate of silver in solution is generally satisfactory. Less frequent microbic causes yield to the same treatment.

A form of *epidemic muco-purulent conjunctivitis* is not uncommon, in which the swelling of the conjunctival folds and lids is much more marked and the secretions copious. It is less amenable to treatment and also apt to be complicated by corneal ulceration. The microbe which gives rise to this condition has not been definitely established. This inflammation is also known as *school ophthalmia* It is extremely contagious, so that isolation of cases becomes necessary The treatment with weak solutions of sub-acetate of lead during the acute stage, provided there be no corneal complication, and subsequently with a weak solution of tannic acid, may be recommended.

Purulent Conjunctivitis.—Some of the severer forms of catarrhal conjunctivitis are accompanied not only by much swelling of both conjunctiva and lids but also by a muco-purulent secretion. Nevertheless there is a sufficiently sharply-defined clinical difference between the catarrhal and purulent types of inflammation In purulent conjunctivitis the oedema of the lids is always marked, often excessive, the hyperaemia of the whole conjunctiva is intense: the membrane is also infiltrated and swollen (chemosis), the papillae enlarged and the secretion almost wholly purulent Although this variety of conjunctivitis is principally due to infection by gonococci, other microbes, which more frequently set up a catarrhal type, may lead to the purulent form.

All forms are contagious, and transference of the secretion to other eyes usually sets up the same type of severe inflammation. Infection mostly takes place by direct transference through the hands, or secretions containing gonococci either from the eye or some other mucous membrane. The poison may also be carried by flies. The dried secretion loses its virulence.

In new-born children (*ophthalmia neonatorum*) infection takes place from the maternal passages during birth. Notwithstanding the great changes which occur during the progress of a purulent conjunctivitis, there is on recovery a complete *restitutio ad integrum* so far as the conjunctiva is concerned. Owing to the tendency to severe ulceration of the cornea, more or less interference with sight may result before the inflammation has passed off This is a special danger in adults. For this reason, when only one eye is affected the first point to be attended to in the treatment is to secure the second eye from contagion by efficient occlusion. The appliance known as Buller's shield, a watch-glass strapped down by plaster, is the best for this purpose. It not only admits of the patient seeing with the sound eye but allows the other to remain under direct observation. The treatment otherwise consists in frequent removal of the secretions from the affected eye, and the use of nitrate of silver solution as a bactericide applied directly to the conjunctival surface; sometimes it is necessary to cut away the chemotic conjunctiva immediately surrounding the cornea When the cornea has become affected efforts may be made with the thermo-cautery or otherwise to limit the area of destruction and thus admit of something being done to improve the vision after all inflammation has subsided.

Phlyctenular conjunctivitis is an acute inflammation of the ocular conjunctiva, in which little blebs or phlyctenules form in the vicinity of the corneal margin and on the epithelial continuation of the conjunctiva which covers the cornea. The inflammation is distributed in little circumscribed foci and not diffused as in all other forms of conjunctivitis. In it the conjunctival secretion is not altered, unless there should exist at the same time a complication with some other form of conjunctivitis. This condition is most frequent in children, particularly if ill-nourished or recovering from some illness, *e g.*, measles. The susceptibility occurs in fact mainly where there exists what used to be called a "strumous" diathesis This basis has to do with the susceptibility only, at all events to begin with. The local changes are not tuberculous; their exact origin has not been clearly established. They are in all probability produced by staphylococci.

Many children with phlyctenular conjunctivitis suffer after a short time from eczematous excoriation of the skin of the nostrils, the result of lacrimation Another frequently distressing symptom is a pronounced dread of light (*photophobia*), which often leads to convulsive and very persistent closing of the lids (*blepharospasm*). Indeed the relief of the photophobia is often the most important point to be considered in the treatment of phlyctenular conjunctivitis. Photophobia may be very severe when the local changes are slight The best local application is yellow oxide of mercury.

Granular Conjunctivitis.—This disease, also known as *trachoma,* is characterized by an inflammatory infiltration of the adenoid tissue of the conjunctiva The inflammation is accompanied by the formation of so-called *granules*, and by a hyperplasia of the papillae. The changes further lead in the course of time to cicatricial transformations, so that a gradual and progressive atrophy of the conjunctiva results. The disease takes its origin most frequently in the conjunctival fold of the upper lid, but eventually as a rule involves the cornea and the deeper tissues of the lid, particularly the tarsus.

The cause of trachoma is a filter-passing virus (*q.v.*). In a distinctive affection when fully established, differential diagnosis from other forms of conjunctivitis, particularly those with much follicular enlargement or purulent from the first, may be difficult Trachoma is mostly chronic. When occurring in an acute form it is more amenable to treatment and less likely to end in cicatricial changes. Fully half the cases of trachoma extend to the cornea and produce superficial vascularized infiltration (*pannus*). The veiling which pannus produces causes more or less defect of sight

Various methods of treatment are in use for trachoma. Expression by means of roller-forceps or repeated grattage are amongst the more effective means of surgical treatment, while local applications of copper sulphate or of alum are useful in suitable cases. Recently, the beta radiation from radium emanation enclosed in specially shaped applicators has been used with good effect.

Diphtheritic conjunctivitis may be due to B. diphtheriae when the changes are those of diphtheria (*q.v.*) modified by the

site affected. It may or may not be associated with diphtheria of the throat. It is essentially a disease of early childhood, not more than 10% of all cases occurring after the age of four. A streptococcus infection produces somewhat similar and often quite as disastrous results

Of non-inflammatory conjunctival affections reference may be made to the following:

Amyloid degeneration, in which waxy-looking masses grow from the palpebral conjunctiva of both lids, often attaining very considerable dimensions The condition is not uncommon in China and elsewhere in the East.

Essential Shrinking of the Conjunctiva.—This is the result of pemphigus, in which the disease has attacked the conjunctiva and led to its atrophy

Pterygium is a hypertrophic thickening of the conjunctiva of triangular shape firmly attached by its apex to the superficial layers of the cornea. It is a common condition in warm climates and often calls for operative interference.

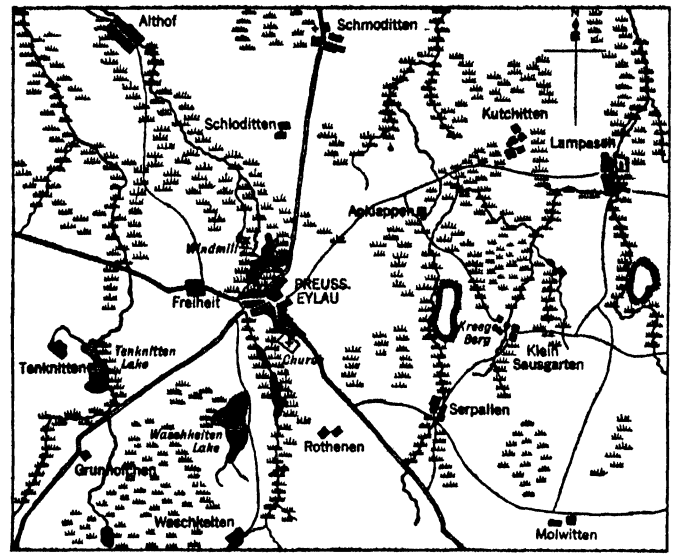
Lastly, short reference must be made to the commonest malignant new growths affecting the eye (*see* TUMOUR) These are melanoma, starting in the choroid, glio-sarcoma starting in the optic nerve or its retinal expansion, epithelioma starting in the conjunctiva, and sarcoma, usually spindle or round celled, starting in the bones of the orbit. (G. A. B.)

EYEMOUTH, a burgh of barony and parish of Berwickshire, Scotland. Pop. (1921) 2,477. It is situated at the mouth of the Eye, 7½ m NNW. of Berwick-on-Tweed by the LNER via Burnmouth. The main industry is herring fishing and allied trades, and Eyemouth was known as a port in the 15th century. The harbour was enlarged in 1887, and the bay is easily accessible and affords good anchorage. The rugged coast, and its numerous ravines and caves, were formerly infested with smugglers The promontory of St. Abb's Head is 3 m to the N.W.

EYLAU, a town of Germany, in east Prussia, on the Pasmar, 23 m. S by E of Königsberg by rail on the line Pillau-Prostken. It has an Evangelical church, a teachers' seminary, a hospital, foundries and saw mills. Pop 3,200. Eylau was founded in 1336 by Arnolf von Eilenstein, a knight of the Teutonic Order It is famous as the scene of a battle between the army of Napoleon and the Russians and Prussians commanded by General Bennigsen, fought on Feb. 8, 1807

The battle was preceded by a severe general engagement on the 7th The head of Napoleon's column advancing from the south-west, found itself opposed at the outlet of the Grünhofchen defile by a strong Russian rearguard which held the (frozen) lakes on either side of the Eylau road The French turned both wings of the enemy, and Bagration, who commanded the Russian rearguard, retired through Eylau to the main army, which was now arrayed for battle east of Eylau. Barclay de Tolly made a strenuous resistance in Eylau itself, and in the churchyard, and these localities changed hands several times before remaining finally in possession of the French It is very doubtful whether Napoleon actually ordered this attack upon Eylau, and it is suggested that the French soldiers were encouraged to a premature assault by the hope of obtaining quarters in the village. There is, however, no reason to suppose that this attack was prejudicial to Napoleon's chance of success, for his own army was intended to pin the enemy in front, while the outlying "masses of manoeuvre" closed upon his flanks and rear (*see* NAPOLEONIC CAMPAIGNS). In this case the vigour of the "general advanced guard" was superfluous, for Bennigsen stood to fight of his own free-will.

The foremost line of the French bivouacs extended from Rothenen to Freiheit, but a large proportion of the army spent the night in quarters farther back. The Russian army on the other hand spent the night bivouacked in order of battle. The cold was extreme, and food was scarce in both armies. The ground was covered at the time of battle with deep snow, and all the lakes and marshes were frozen, so that troops of all arms could pass everywhere, so far as the snow permitted. Two of Napoleon's corps (Davout and Ney) were still absent, and Ney did not receive his orders until the morning of the 8th. His task was to descend upon the Russian right, and also to prevent a Prussian corps under Lestocq from coming on to the battlefield. Davout's corps advancing from the south-east on Mollwitten was destined for the attack of Bennigsen's left wing. In the meantime Napoleon made preparations for the frontal attack. His infantry extended from the windmill, through Eylau, to Rothenen, and the artillery was deployed along the whole front; behind each infantry corps and on the wings stood the cavalry. The Guard was in second line south



MAP OF EYLAU AND SURROUNDING COUNTRY IN GERMANY

The scene of battle between the French army under Napoleon, who, advancing from the southwest, met the Russians and Prussians at Grünhöfchen The action began at 8 A.M. on Feb. 8, 1807, and ended at nightfall with the retreat of the Russian and Prussian armies

of Eylau, and an army reserve stood near the Waschkeiten lake Bennigsen's army was drawn up in line from Schloditten to Klein Sausgarten, the front likewise covered by guns, in which arm he was numerically much superior—having some 200. A detachment occupied Serpallen.

The battle opened in a dense snowstorm. About 8 A.M. Bennigsen's guns opened fire on Eylau, and after a fierce but undecided artillery fight the French delivered an infantry attack from Eylau. This was repulsed with heavy losses, and the Russians advanced towards the windmill in force. Thereupon Napoleon ordered his centre, the VII. Corps of Augereau, to move forward from the church against the Russian front, the division of St. Hilaire on Augereau's right participating in the attack. If we conceive of this first stage of the battle as the action of the "general advance guard," Augereau must be held to have overdone his part. The VII. Corps advanced in dense masses, but in the fierce snowstorm lost its direction. St. Hilaire attacked directly and unsupported; Augereau's corps was still less fortunate. Crossing obliquely the front of the Russian line, as if making for Schloditten, it came under a *feu d'enfer* and was practically annihilated. In the confusion the Russian cavalry charged with the utmost fury downhill and with the wind behind them. Three thousand men only out of about fourteen thousand appeared at the evening parade of the corps. The marshal and every senior officer were amongst the killed and wounded. The Russian counterstroke penetrated into Eylau itself and Napoleon himself was in serious danger. His staff was seized with panic for his safety, and sent for the horses, but Napoleon himself, with the utmost coolness, judged the pace of the Russian advance and ordered up a battalion of the Guard at the exact moment required. In the streets of Eylau the Guard had the Russians at their mercy, and few escaped. Still the situation for the French was desperate and the battle had to be maintained at all costs. Napoleon now sent forward the cavalry along the whole line. In the centre the charge was led by Murat and Bessières, and the Russian horsemen were swept off the field. The Cuirassiers under D'Hautpoult charged through the Russian guns, broke through the first line of infantry and then through the second, penetrating to the woods of Anklappen.

The shock of a second wave of cavalry broke the lines again,

and though in the final retirement the exhausted troopers lost terribly, they had achieved their object. The wreck of Augereau's and other divisions had been reformed, the Guard brought up into first line, and, above all, Davout's leading troops had occupied Serpallen Thence, with his left in touch with Napoleon's right (St. Hilaire), and his right extending gradually towards Klein Sausgarten, Davout pressed steadily upon the Russian left, rolling it up before him, until his right had reached Kutschitten and his centre Anklappen. By that time the troops under Napoleon's immediate command, pivoting their left on Eylau church, had wheeled gradually inward until the general line extended from the church to Kutschitten. The Russian army was being driven westward, when the advance of Lestocq gave them fresh steadiness. The Prussian corps had been fighting a continuous flank-guard action against Marshal Ney to the north-west of Althof, and Lestocq had finally succeeded in disengaging his main body, Ney being held up at Althof by a small rearguard, while the Prussians, gathering as they went the fugitives of the Russian army, hastened to oppose Davout. The impetus of these fresh troops led by Lestocq and his staff-officer Scharnhorst was such as to check even the famous divisions of Davout's corps which had won the battle of Auerstädt single-handed. The French were now gradually forced back until their right was again at Sausgarten and their centre on the Kreege Berg

Both sides were now utterly exhausted, for the Prussians also had been marching and fighting all day against Ney The battle died away at nightfall, Ney's corps being unable effectively to intervene owing to the steadiness of the Prussian detachment left to oppose him, and the extreme difficulty of the roads A severe conflict between the Russian extreme right and Ney's corps which at last appeared on the field at Schloditten ended the battle. Bennigsen retreated during the night through Schmoditten, Lestocq through Kutschitten—unpursued The numbers engaged in the first stage of the battle may be taken as—Napoleon, 50,000, Bennigsen, 67,000, to which later were added on the one side Ney and Davout, 29,000, on the other Lestocq, 7,000. The losses were roughly 15,000 men to the French, 18,000 to the Allies, or 21 and 27% respectively of the troops actually engaged

EYRA, *Felis eyra,* a South American wild cat, of weasel-like build, and uniform colouration, varying from reddish-yellow to chestnut. It is found in Brazil, Guiana and Paraguay, and up to the Rio del Norte, but is rare north of Panama. It is a forest-dweller, active and fierce The name is sometimes applied to the jaguarondi.



BY COURTESY OF THE N. Y. ZOO SOC.

THE EYRA, A FIERCE WILDCAT FOUND IN THE FORESTS OF SOUTH AMERICA

EYRE, SIR JAMES (1734–1799), English judge, was educated at Winchester college and at St. John's college, Oxford. He was called to the bar at Gray's Inn in 1755 and was appointed recorder of London in 1763. He was counsel for the plaintiff in the case of *Wilkes* v. *Wood,* and made a brilliant speech in condemnation of the execution of general search warrants. He was appointed a judge of the Exchequer in 1772. From June 1792 to January 1793 he was chief commissioner of the Great Seal. In 1793 he was made chief justice of the common pleas, and presided over the trials of Horne Tooke, Thomas Crosfield and others, with great ability and impartiality. He died on July 1, 1799, and was buried at Ruscombe, Berkshire.

See Howell, *State Trials,* xix. (1154–1155); Foss, *Lives of the Judges.*

EYRE, EDWARD JOHN (1815–1901), British colonial governor, the son of a Yorkshire clergyman, was born at Hornsea on Aug 5, 1815. He emigrated to New South Wales, where he transported stock westward to the new colony of South Australia, then in great distress He became magistrate and protector of the aborigines, whose interests he warmly advocated. Already an experienced Australian traveller, he undertook extensive and difficult journeys in the desert country north and west of Adelaide, and proved the possibility of land communication between South and West Australia. In 1845 he returned to England and published the narrative of his travels *Expeditions into Central Australia and Overland from Adelaide to King George's Sound, 1840–41* (2 vols 1845) In 1846 he was appointed lieutenant-governor of New Zealand, where he served under Sir George Grey. After successively governing St. Vincent and Antigua, he was in 1861 appointed acting-governor of Jamaica and in 1864 governor. In October 1865 he repressed a negro insurrection. The severity and alleged illegality of Eyre's subsequent proceedings raised a storm in England Eyre was suspended, and an inquiry instituted. The committee reported that he should not be reinstated. In spite of many indictments brought by various persons against Eyre and his officers for their severities no action was taken by the Government and Eyre retired on pension in the usual way. He died on Nov. 30, 1901.

EYRIE, the alternative English form of the words aerie or aery, the lofty nest of a bird of prey, especially of an eagle; hence any lofty place of abode. The term is also used of the brood of the bird.

EZEKIEL the prophet has recorded, or left us to infer, a few facts about himself He had been a priest in Jerusalem, most likely a member of the clan of Zadok; while still young he was carried away to Babylonia in the First Captivity, 597 B.C.; his call to prophesy came in 593, after that, he lived in a house of his own, with his wife (xxiv. 18), among the Jewish exiles at Tel Abîb on the Grand canal ("the river Chebar" iii. 15), somewhere in the neighbourhood of Babylon or Nippur. His fellow-exiles evidently treated him with respect, and waited upon his words (viii. 1, xiv 1, xxxiii. 31 f.), judging from xxix. 17, 571 B.C., his ministry lasted 22 years. Some notion of the man may be gathered from his book. He possessed in a high degree the prophetic temperament, a sensitiveness to the reality of the invisible world, which made him respond at once to the touch of the Divine hand (1 3, viii. 1, etc), a capacity for absorbed meditation, often passing into the state of trance While in this condition he saw the moving throne (i), performed a mimic siege of Jerusalem (iv.), felt himself transported from Babylonia to Jerusalem and back (viii.–xi.), saw the valley full of bones (xxxvii. 1–14), and the great temple of the future (xl. ff). Often he made use of symbolic actions to enforce his message. At times these acts were performed in the presence of spectators; *e g.,* xii. 3–16, xxiv. 15–24, xxxvii. 16–20; but some of them must have taken place in vision, while the trance lay on him; *e g.,* iii 1–3. Such, at any rate, seems the best account to give of the weird symbolism of ch iv. and v 1–4. He was subject to periods of speechlessness, iii. 25f , xxiv. 27; but when the impulse seized him, he would burst into poetry: xv. 1–5; xvii. 1–10; xix.; xxi. 14–22; xxvi. (in part); xxvii. (in part); xxxi. 2–9; xxxii. 2–16. These fine oracles stand out vividly from the monotonous background of his prose.

The Teaching of Ezekiel.—(A.) His conception of God is marked by a deep sense of awe: the holiness and sovereignty of Jahveh were impressed upon the prophet in the vision which constituted his call (ch. i). Jahveh will brook no rival, and therefore will punish Israel for its disloyalty and the heathen for their false notions of His divinity and power; His motive, whether in punishment or mercy, is to bring about the recognition of His sole Godhead: "and they, *or* ye, shall know that I am Jahveh" sounds like a refrain throughout the book Ezekiel thinks in symbols; the ultimate, according to his view, finds expression in the concrete. (B.) Far away in Babylonia, his attention was riveted upon the course of events at home. He denounces Israel's practical heathenism; he insists on the speedy overthrow of the Jewish state, in just requital for centuries of ill-doing (i.–xxiv.). That pessimism in reviewing Israel's past, which became characteristic of later writers, is strongly marked in Ezekiel. He rarely betrays any sympathy with his countrymen (except ix. 8, xi. 13). His hopes were fixed upon the exiles; they were not indeed wholly loyal, yet the future of the true faith lay with them. The message is stern and uncompromising; it was no time for half-measures; Israel's religion was at stake; that it survived at all was largely due to Ezekiel. (C.) As with Israel, so with the nations round, both the petty States that were nearest (xxv.), and

the greater powers of Tyre (xxvi.–xxviii.) and Egypt (xxix–xxxii., xxxv.): they deserve nothing but the severest judgment, and Nebuchadrezzar is to be the scourge (xxvi., xxx). Curiously enough, Babylon itself comes in for no denunciation, probably because the prophet, in his bitterness against his own people, regarded the instrument of retribution as on the side of God. Ezekiel holds out no hope for the heathen. (D.) When the news reached Babylonia that Jerusalem had fallen ([586 B.C.] xxxiii 21 f), Ezekiel's tone changed. His prophecies of punishment had been fulfilled, he could now look forward to the restoration of the exiles If he had previously argued the freedom and responsibility of the individual (xviii), it was not with the aim of encouraging an individualistic type of religion, but of building up a community out of converted individuals That is the ideal which henceforth occupies his mind. a new Israel, risen as it were from the dead, living in a land transformed, with Jahveh's sanctuary in the midst of them for evermore (xxxvi, xxxvii). Yet there remains one more act in the Divine plan; the invasion and defeat of all the forces of heathenism, the acknowledgment of Jahveh by all, the final act of history (xxxviii, xxxix). This apocalyptic conception had an immense influence upon subsequent thought (E) But Ezekiel was the most practical of dreamers In the last section of the book, xl–xlviii., he describes his vision of the restored temple, the centre of the new community, built on an imposing scale like one of the Babylonian sanctuaries (xl–xlii) The glory of Jahveh hallows it once more (xliii 1–5); every source of defilement is removed; the only priests who minister there are to be the sons of Zadok (xliv 15 ff); and from the temple itself flows a mystic stream, cleansing, healing and beneficent (xlvii. 1–12).

Text and Authorship.—The textual criticism of Ezekiel was put upon a new footing by Cornill in 1888; and since that time progress has been made in the scientific use of the Greek and other versions for the correction of the Hebrew text, which is one of the most corrupt and obscure in the Old Testament At present attention is being devoted to the higher criticism of the book, its literary structure, the origin of its ideas, the history and psychology which it contains The book gives the impression of being arranged on a systematic plan, with four divisions, i–xxiv, xxv–xxxii., xxxiii–xxxix, xl–xlviii, in chronological order. Exact dates occur 13 times, but the sequence, though observed in the main, is broken on three occasions, xxvi 1, xxix 17, xxxii 1; the plan, therefore, is not so perfect as it looks On closer inspection, the four chief divisions turn out to be collections of oracles often independent of each other in time and contents; moreover, the date at the head of a section does not always hold good till the next date is given; for example, ch vii, which stands under the year 593 (i 1 f), seems to belong to 586 B.C., and xl.–xlviii, headed 573 B.C., is mostly composed of far later material. In fact the impression of unity and chronological arrangement gives way under examination; the general plan may have been laid down by the prophet, but other hands have enlarged it Editors must be held responsible for some, at least, of the headings, and for the double texts which are met with now and then, *e.g.*, ch i. repeated partly in x., xxxiii. in iii, vii. 5–9=2–4, x 19=xi 22 f.

The element of conventionality and repetition which enters largely into the prose of Ezekiel may be in some measure due to scribes, who felt no scruple in glossing the text or altering it to suit their taste. A good instance of their methods is seen in ch xxvii.; the splendid dirge over Tyre has been cut in two by the insertion of a prose passage, vv. 11–25*a*, which ruins the unity of the poem Evidently Ezekiel's writings were studied with keen interest, as we may gather from the final section, xl.–xlviii. The first three chapters, with the additions of xliii. 1–12, xliv. 9–25, 28–30, xlvii. 1–12, are probably the work of the prophet; all that remains in xliii–xlviii is made up of fragments, which here and there reveal the technique of the priestly school. They are experiments in legislation. Most of them were never carried out, *e.g.*, the re-distribution of the land, xlvii. 13–xlviii. 35; some were modified later, *e g.*, the two days of atonement, xlv. 18–20; in fact, what we come upon here is an early stage of the movement which in the end produced the Priestly Code. The task of reconstruction which Ezekiel had begun was carried on for years in priestly circles, and their tentative regulations were attached to his book, a natural place for them to find a lodging. Historically these enactments stand midway between Deuteronomy and P. Another law-book with which Ezekiel has relations is Lev. xvii.–xxvi., the law of holiness, as it is called, and in this case the relationship is so close that it points to a common time of origin and the same circle of ideas and interests.

The affinity between Ezekiel and Jeremiah is also remarkable. Thus both prophets insist, often in similar language, upon the overthrow of Jerusalem and the temple (*e g.*, Jer. vii, xxvii.; Ezek. iv. f., vii., xix–xxiv), both give up the people of Judah in despair, and fix their hopes upon the exiles (Jer xxiv, xxix 10 ff; Ezek xi 16–21, xxxvi 24 ff); both proclaim the responsibility of the individual (Jer. xxxi. 29 f.; Ezek xviii). They are equally certain that the dispersed will be gathered and return to their native land (Jer. xxiii 3, xxix 14, xxxi. 8 ff, Ezek xi, 17, xx 34, 41 f), and that a second David will come to rule over a united nation (Jer. xxiii. 5 f, xxxiii. 14–16, Ezek xxxiv 23 f., xxxvii 24 f); and while Jeremiah has not the priestly temper of Ezekiel, yet he too looks forward to the continuance of the Levitical ministry (Jer xxxiii 18, 21 f; Ezek xliv 15 ff) Nevertheless, in spite of all these points of contact with other writings, Ezekiel has an impressive character of its own among the great books of prophecy, none exercised more influence upon subsequent thought and practice, and none perhaps baffles our understanding more.

A different conception from that outlined above has been worked out by Hölscher (1924) Ezekiel, he maintains, was the prophet of doom and of nothing else, he saw but two visions· the one induced him to prophesy the fall of Jerusalem, the other revealed the idolatry in the temple, and roused his fury against the city and its allies, Tyre and Egypt Ezekiel's own oracles are few, and invariably poetical in form; all else in the book is the work of a redactor, or of several redactors, who lived just before the time of Nehemiah (*c* 444–430 B C) This view of the book does account for the difference, noticed by every reader, between the monotony of the prose and the passion of the lyrics, but the effect of Holscher's criticism is to empty the prophecies of all serious meaning, and it is applied on *à priori* principles in a ruthless way which excites distrust

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EZRA, the priest and scribe, one of the principal characters in the chronicler's history of Israel (Chronicles–Ezra–Nehemiah). He is here said to have been sent from Babylon to Jerusalem by the Persian king Artaxerxes (*i.e.*, A. II 398 B C.) to restore the neglected law (the Pentateuch). On his arrival, he reads the law to the people, and in accordance with it (Ezra x 3) accomplishes important reforms A considerable part of the account of his work has been transposed to the book of Nehemiah, as the result of a copyist's mistake (*See* EZRA AND NEHEMIAH, BOOKS OF) In still later legend, preserved in 2 Esdras xiv., he is said to have restored not only the law, which had been burnt (v. 21), but also all the other Hebrew scriptures which had been destroyed, and seventy apocryphal works in addition. Since the narrative concerning him is written throughout in the chronicler's peculiar diction and style, and in every portion directly serves the apologetic aim of the history of which it is an essential feature, while it is unsupported from any other source, there is very strong reason, in the present writer's opinion, for the conclusion that the character of Ezra was created by the chronicler. (*See* also CHRONICLES, BOOKS OF.) (C. C. T.)

EZRA, THIRD BOOK OF (*1 Esdras*). This "book" is variously called 1 Esdras (Greek, Old Latin and Syriac versions, and the English Bible from 1560 onwards); 2 Esdras (Latin Vul-

gate); 3 Esdras (Ethiopic version and some Greek mss.); the Greek Ezra (or Esdras), from the mistaken belief that Greek was the original language; the third book of Ezra (in German usage especially); and there are still other titles. Though one of the so-called Apocrypha, it is very different in character from the other members of the group, for it is merely a portion of the oldest Greek translation of Chronicles–Ezra–Nehemiah. It begins with 2 Chron. xxxv. 1 *seq*, the account of Josiah's passover, and ends (in the middle of a sentence!) at Neh. viii. 13. The explanation of this fact, as first shown by Torrey, *Ezra Studies*, p. 36, is that a certain number of folded sheets (probably a single ten-leaved quire) had been taken from a Greek codex, with the purpose of preserving a highly important recension which had been abandoned by the Jewish authorities and was in danger of perishing. The portion of the text thus rescued was thenceforth reproduced without change, even the fragmentary clause at the end being retained.

This Greek version was made from a Hebrew-Aramaic text generally identical with our Massoretic text, a skilful translation throughout; not a free rendering, nor a paraphrase. It is rarely difficult to see what Hebrew it represents. It is the work of a single translator and existed in the middle of the 2nd century B C, and thus antedates by about 300 years the rendering of the canonical Hebrew-Aramaic text by Theodotion which, designated as 2 Esdras, was adopted for the Greek Bible. (*See* CHRONICLES.)

The 1 Esdras recension differs from the canonical in two very striking particulars: (1) the inclusion of the *Story of the Three Youths* at the court of Darius, with some appended narrative (iii. 1–v. 6) and the accompanying transposition of the account of events in the time of Artaxerxes (ii. 15–25=Ezra iv. 7–24); and (2) the transfer of a portion of the book of Nehemiah to the book of Ezra, the last verse of Ezra x being immediately followed by Neh. vii. 73–viii. 13*a*, where the fragment ends.

The Story of the Three Youths.—The three young soldiers who constitute the private bodyguard of Darius engage in a public contest of wit and wisdom. The victor, said to be Zerubbabel, is promised a rich reward by the king; but asks instead to be given permission to restore Jerusalem and the temple. This is granted, and Zerubbabel and Jeshua set out from Babylonia with the company described in chap. ii. of the canonical Ezra. This, however, is not the original form of the story. The parenthesis "this is Zerubbabel" (iv. 13) has long been recognized as an interpolation. The story as told by its author contained no mention of the Jews, nor even a religious element, and seems to have ended with iv. 42. All that follows this verse is incident to the interpolation of the story in the chronicler's history. A portion of the latter, *originally forming the immediate sequel of Ezra i. 11*, is to be recognized in 1 Esdr. iv. 47*b*–56; v. 1–5 and 6*b*. The necessary patches composed by the interpolator are iv. 43–47*a*; 57–61; v. 6*a*; and he also changed "Cyrus" to "Darius" in v. 2 and slightly altered 6*b*, which originally read: "in the second year of Cyrus," etc. The impossible "Joakim the son of" in v. 5 came from a misreading of the Hebrew *wayyaqom bo*, "and there arose with him."

The purpose of the interpolator seems to have been threefold: to show that Darius II. had a special personal interest in Zerubbabel; to improve the picture of the latter by bringing all his recorded activities into the single reign; and to secure for the Jews this very entertaining bit of wisdom. The attempt succeeded, so completely that the original version perished, leaving only the interpolated form in circulation. This was the form rendered by the Greek translator of the 2nd century B.C., apparently the only form known to Josephus, certainly the only form known in Jerusalem at the beginning of the 2nd century A.D. It was nevertheless in its contradictions of the narrative and chronology of the chronicler an absolutely impossible version of the history; hence the Jewish scholars who finally gave out an authoritative text were obliged to cut out the *Story of the Three Youths* with its appendage. Since the latter contained a portion of the chronicler's history (*see* above), there is a gap in our canonical Ezra between chaps. i. and ii.

The *Story of the Three Youths* was in Aramaic. The Darius of the story was perhaps Darius III. (*Ezra Studies*, pp. 40 *seq.*), but more probably Darius I. Hystaspis ("the Mede"); *cf.* iii. 1 *seq.*, with Dan. vi. 1 *seq.* The names in iv. 29 have been thought to denote actual personages, but it is much more likely that they are mere properties of the story-teller. The name Apama points to the 3rd century as the date of composition of the tale.

The Position of Neh. viii. in 1 Esdras.—The account of the reading of the law by Ezra appears in the 1 Esdras fragment as the sequel of Ezra x. It occupied this position also in the text used by Josephus (*Ant.* xi., v. 5), and it is therefore evident that a version of the history embodying this peculiarity circulated widely and for a long period. The recension containing our Massoretic order of the chapters was also in circulation, however, and it was from this that the rearrangement exhibited by 1 Esdras and Josephus was made, as is shown by the fact that the transposed section begins with v. 72 (not 69!) in Neh. vii. (*See* EZRA AND NEHEMIAH, BOOKS OF.) The reason for the transposition is very obvious; it was the appreciation of the fact that Ezra, sent by the Persian king to Judaea for the express purpose of proclaiming and administering there the law of God which was already "in his hand" (Ezra vii 14, 25 *seq.*), could not possibly have waited 13 years before making any public use of it. There may also have persisted a tradition that the account of the reading of the law originally stood in other surroundings, namely in the story of Ezra. In Josephus, Neh. viii. is continued to the end of the chapter, with mention of the feast of tabernacles, and this was certainly the continuation also in the codex from which the 1 Esdras fragment was plucked.

It is important to ascertain, if possible, what followed the account of the reading of the law, in this peculiar and widely used recension Josephus proceeds with Neh. i.–vi., and makes also brief but plain allusion to vii. 4, xi. 1, xii. 27, and xiii. 10 *seq.* Of chaps. ix. and x he makes no use. It is possible, but not probable, that these two chapters preceded Neh. i. in this recension (as was held in *Ezra Studies*, 31 *seq*). It seems much more likely that the interpolation of the name of "Nehemiah the son of Hachaliah" in x. 2 (*Ezra Studies*, 282 *seq*) was made at an early date; and this, with the appearance of "Ezra the Scribe" in xii. 36, would have held the two chapters firmly in their position between vii. 71 (72) and xi 1. Here, probably, they stood in the 1 Esdras codex and in the text used by Josephus.

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(C. C. T.)

EZRA, FOURTH BOOK (or APOCALYPSE) **OF.** This is the most profound and touching of the Jewish Apocalypses. It stands in the relation of a sister work to the Apocalypse of Baruch, but though the relation is so close, they have many points of divergence. Thus, whereas the former represents the ordinary Judaism of the 1st century of the Christian era, the teaching of IV Ezra on the Law, Works, Justification, Original Sin and Free Will approximates to the school of Shammai and serves to explain the Pauline doctrines on those subjects

In the Latin version our book consists of 16 chapters, of which, however, only iii.–xiv. are found in the other versions. To iii.–xiv, accordingly, the present notice is confined. After the example of most of the Latin mss we designate the book IV Ezra (*see* Bensly-James, *Fourth Book of Ezra*, pp. xxiv.–xxvii.). As the numerous Graecisms indicate, the Latin version has obviously been derived from a Greek original.

The book consists of seven visions. (1.) iii.–v. 19.—"In the thirtieth year after the ruin of the city I Salathiel (the same is Ezra) was in Babylon and lay troubled upon my bed." In a long prayer Ezra asks how the desolation of Sion and the prosperity of Babylon can be in keeping with the justice of God. The angel Uriel answers that God's ways are unsearchable and past man's understanding. When Ezra asks when the end will be and what are the signs of it, the angel answers that the end is at hand and enumerates the signs.

(2) v. 14–vi. 34.—Phaltiel, chief of the people, reproaches Ezra for forsaking his flock. Ezra fasts, and in his prayer asks

why God had given up his people into the hands of the heathen. Uriel replies: "Lovest thou that people better than He that made them?" Man cannot find out God's judgment. The end is at hand; its signs are recounted

(3) vi 35–ix. 25.—Ezra recounts the works of creation, and asks why Israel does not possess the world since the world was made for Israel. The answer is that the present state is a necessary stage to the coming one. Then follows an account of the Messianic age and the resurrection, the punishment of the wicked and the blessings of the righteous There can be no intercession for the departed. Few will be saved—only as it were a grape out of a cluster or a plant out of a forest.

(4.) ix. 26–x 60.—Ezra eats of herbs in the field of Ardat, and sees in a vision a woman mourning for her only son. Ezra reminds her of the greater desolation of Sion. Suddenly she is transfigured and vanishes, and in her place appears a city. The woman, Uriel explains, represents Sion.

(5.) xi. 1–xii. 39.—Vision of an eagle with three heads, twelve wings and eight winglets, which is rebuked by a lion and destroyed. The eagle is the fourth kingdom seen by Daniel, and the lion is the Messiah.

(6.) xiii.—Vision of a man (*i.e.*, the Messiah) arising from the sea, who destroys his enemies who assemble against him, and gathers to him another multitude, *i.e.*, the lost ten tribes.

(7) xiv.—Ezra is told of his approaching translation He asks for the restoration of the Law, and is enabled by God to dictate in 40 days 94 books (the 24 canonical books of the Old Testament that were lost, and 70 secret books for the wise among the people)

While there is diversity of opinion as to whether all these separate pieces are the work of one author, on two points there can hardly be any difference of view: (*a*) The book contains a great deal of traditional material, especially the eschatological portions; written sources were in all probability drawn upon for this, but the excerpts which were made from such writings have been so interwoven with what the writer himself composed that to indicate precisely how much belongs to a particular source is an extremely difficult, perhaps impossible, task. (*b*) The final form of the work is due to a redactor who has brought these various pieces into a more or less connected whole.

Since the writer used traditional material much of the essence of the book goes back to a time long before he lived; moreover, the book in its present form, having been worked over by a redactor, must be of later date than that of the original form. But indications in the component parts of the book themselves prove that they were written at different times, though these may all have been within the lifetime of one writer. Details cannot be given here, but there are good reasons for dating the various component parts, as they left the writer's hands, as follows: the first four Visions (iii.–x), known also as the "Salathiel Apocalypse" (Salathiel = Ezra in iii. 1) belong to about A D 100; the "Eagle Vision" (xi.–xii) to A.D. 96; the "Vision of the Man rising from the Sea" (xiii.) and the "Ezra Legend" (xiv.) to A.D. 100.

See G. H. Box, *The Ezra-Apocalypse* (1912).

(R. H. Ch.; W. O. E. O.)

EZRA AND NEHEMIAH, BOOKS OF, in the Old Testament. A Hebrew apologist of the 3rd century B.C. (known as "the Chronicler") wrote with much skill a history of Israel beginning with Adam and ending in the 4th century. Jewish scholars of a later day set apart the latter portion of this history, covering the entire Persian period, under the convenient name "Ezra." In much later Christian usage this in turn was divided into *two* books, Ezra and Nehemiah. The Jewish terminology, however, remained unchanged, and was followed in the Greek and Latin translations. (*See* Chronicles, Books of.)

The Book of Ezra.—This contains: (1) the story of the return of the Jews, by permission of Cyrus, from Babylonia to Judaea, and of their attempts to restore the worship and rebuild the temple, finally successful under Darius Nothus. (2) the story of Ezra, the leader of a second expedition from Babylonia to Jerusalem, and of his reforms, culminating in the expulsion of the gentile wives, and in a solemn pledge to keep separate from "the peoples of the land" and to support the service of the temple.

The Hebrew text, as it has come down to us, is not in its original form. A long and important passage of 18 verses, the continuation of Ezra i. 1–11, was cut out, along with the interpolated *Story of the Three Youths*, in the 2nd century A D. (*See* Ezra, Third Book of.) It contained the account of the provision of Cyrus for the returning exiles, now preserved in the Apocrypha in strange surroundings (1 Esdr. iv 47*b*–56; 62–v. 6*b*). Another accident to the text, in the process of its transmission, has had far more serious consequences Three chapters which originally belonged to the story of Ezra have been transposed to the book of Nehemiah—with chaos as the result Neh vii. 69 (70)–viii 18 originally followed immediately upon Ezra viii. 36 (The transposition was occasioned by the close resemblance of Ezra ii 68–iii 1 to Neh vii 69–viii. 1*a*, coupled with the fact that the chronicler *repeated* his all-important list of returning exiles, giving it official authentication at both ends of the Persian period) This first transposition rendered a second absolutely necessary The original order of the remainder of the Ezra story was Ezra ix, x, Neh. ix, x. Then followed the story of Nehemiah. (Torrey, *Ezra Studies*, chap viii)

The chronicler himself was the sole author of the book of Ezra, with the probable exception of the Aramaic section iv 8–vi 14 It is plain that every part of the book was composed with the same apologetic purpose, the purpose of the chronicler's whole history, to define and defend (but especially to define) the true "Israel," in opposition particularly to the very dangerous pretensions of the Samaritans, who claimed to be the true heirs of the religious tradition after the destruction of Jerusalem The question was settled once for all by means of a historical fiction which seems to have originated in the 3rd century B C According to this fiction, the Jewish exiles in Babylonia (the sole survivors of the southern kingdom, 2 Chron xxxvi 20) returned to Judaea in large numbers, under the Persian rule, and thus restored to Palestine the only pure Israelite blood and the only genuine tradition. The chronicler was persuaded of this, and compiled his history to establish it. The great list (Ezra ii. and Neh vii), composed by the chronicler presumably from a census of the loyal families dwelling in Jerusalem and Judaea in the 3rd century, is formally attested both by the Persian officer Sheshbazzar ("the Tirshatha") in 538 and also by Nehemiah in 384 (*see* below). All the other lists, earlier and later, were constructed with this one in view. The story of Ezra and his law (the Pentateuch) was designed to show—in a most dramatic and impressive manner—that the pure blood received not the slightest contamination

The list of Persian kings furnished by Ezra–Nehemiah deserves especial attention. The order. Cyrus, Xerxes (iv. 6), Artaxerxes I (iv. 7–24), Darius II. (v., vi), Artaxerxes II. (Ezra and Nehemiah), compared with the order of the kings named in the book of Daniel, shows plainly that in the Jewish learned tradition of this late period Darius I Hystaspis (as "Darius the Mede") was believed to have preceded Cyrus. (*See* Daniel, Book of.) With this one exception the chronicler has the correct order, and the history in our Hebrew-Aramaic text is all precisely as he himself composed it, when the story of Ezra is restored to its original sequence (*see* above). The chronology is of course defective; by the dating which was current Zerubbabel could flourish under both Cyrus and Darius II. (Moore, *Judaism*, i. 6).

Portions of the book are written in the Aramaic language. Of these, vi. 15–18 and vii 12–26 were certainly composed by the chronicler. It is possible that he was also the author of the remainder, iv. 8–vi. 14. He did not originate the fiction of the totally deserted cities of Judaea, the return from the exile, and the uncontaminated Israel, though it arose in his day. The Aramaic of all these passages has plain characteristics which render it impossible to date it earlier than the 3rd century. (See *Ezra Studies*, pp. 161–166; and especially Baumgartner, *Zeit. alt. test. Wissens*, 1927, pp. 81–133.)

The Book of Nehemiah.—This contains: (1) the account of the rebuilding of the wall of Jerusalem by Nehemiah. (2) continuation and conclusion of the chronicler's history, consisting mainly of his indispensable census; containing also the (equally

indispensable) account of measures taken in order to confirm and perfect the work of purification accomplished by the chronicler's Ezra.

Nehemiah's remarkable narrative of his great undertaking and its successful accomplishment begins abruptly with a brief superscription. It ends in chap. vi, with the completion of the wall and its gates in the face of opposition by enemies The leader of these adversaries is not the Sanballat of the Elephantine papyri (408 B.C), but his grandson, the one mentioned by Josephus, *Ant.* XI, vii 2, viii 2 *sqq*. If we may give credence to the account preserved in Josephus, Nehemiah's adversary afterwards spent some time at the Persian court, and ultimately received his appointment at Samaria from Darius III. It is plain that he was not governor at the time of the events narrated in Neh i–vi ; his father (Delaiah?) presumably held that office The epithet "Horonite" bestowed on him by Nehemiah may mean that he had taken his residence at Beth-horon with the purpose of taking a hand in Jewish affairs. The rebuilding of the wall of Jerusalem was completed in 384 (*see* the evidence presented by Torrey, *The Second Isaiah*, pp 455–460) Nehemiah's account seems to have been written in 371 (v. 14). Not all of i–vi. is from his hand, however In chap iii., verses 1–32, and probably also 33–37, were written by the chronicler

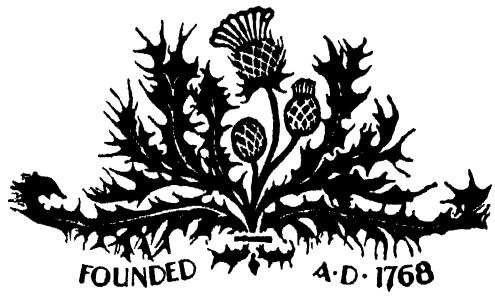
The remainder of the book, from vii 1 onwards, is occupied solely with the chronicler's well known interests His language, style and habits of composition are everywhere present, and there is no trace of any other hand than his As was remarked above, the section vii. 69–x 40 originally formed part of the chronicler's narrative of Ezra, and was at a later day transposed to his narrative of Nehemiah as the result of a copyist's mistake, vii 68 (69) was immediately followed by xi. One other feature of the *pseudo*-Nehemiah requires mention: xiii 28 *seq* is not a *direct* allusion to the break with the Samaritans, the chronicler wishes to show how Nehemiah had dealt with a similar case. He brings his account of Nehemiah's reforms to a close in precisely the manner in which he had ended the story of Ezra; *cf* especially xiii. 31 with x. 35 (34) *seq*. This concluding verse of Nehemiah was the original and fitting close of the whole great work

BIBLIOGRAPHY.—S. R. Driver, *Lit of the Old Testament;* the commentaries of Bertheau-Ryssel (1887), Siegfried (1901), Bertholet (1902), Batten (1913), with full bibliography; the "**Ezra**" and "Nehemiah" articles in the *Encycl Bibl.* and the *Jew Encycl* For the views here presented, *see* Torrey, *Composition and Historical Value of Ezra-Nehemiah* (1896) and *Ezra Studies* (1910) *See* also JEWS. (C C. T.)

EZZO or **EHRENFRIED** (*c* 954–1024), count palatine in Lorraine, was the son of a certain Hermann (d *c* 1000), also a count palatine in Lorraine who had possessions in the neighbourhood of Bonn Having married Matilda (d. 1025), a daughter of the emperor Otto II , Ezzo came to the front during the reign of his brother-in-law, the emperor Otto III (983–1002); his power was increased owing to the liberal grant of lands in Thuringia and Franconia which he received with his wife, and some time later his position as count palatine was recognized as an hereditary dignity. Otto's successor, the emperor Henry II , was less friendly towards the powerful count palatine, though there was no serious trouble between them until 1011; but some disturbances in Lorraine quickly compelled the emperor to come to terms, and the assistance of Ezzo was purchased by a gift of lands Henceforward the relations between Henry and his vassal appear to have been satisfactory Ezzo died at Saalfeld on March 21, 1024 He left three sons, among them being Hermann, archbishop of Cologne from 1036 to 1056, and Otto, who was for a short time duke of Suabia; and seven daughters, six of whom became abbesses

EZZOLIED or **ANEGENGE,** a popular old German poem on the life of Christ, written about 1060, by Ezzo of Bamberg It had a great influence on south German poetry, of which it is an important monument

Text in Mullenhoff and Scherer, *Denkmaler der d Poesie und Prosa aus dem 8–12 Jahrh.* (1892)



F This letter corresponds to the sixth letter of the Greek, Etruscan and Latin alphabets, known to the Greeks as digamma The sound represented by the letter in Greek was a bilabial spirant similar to English *w* This sound had disappeared early from the eastern Greek dialects, so that the eastern or Ionic alphabet contained no digamma It was retained, however, in the Chalcidic and Corinthian alphabets, the sound remaining in these dialects through classical times. The form of the letter in Greek was ⋀, ⋀, F or ⊏. It does not occur in the Semitic alphabets Its origin in the Greek alphabet has been a matter of dispute, some maintaining that it descends from Semitic *vau* Y and using as evidence the fact that N occurs as a form of the

Name of Form	Approximate Date	Form of Letter
PHOENICIAN	B C 1 200	(Y)
CRETAN	1.100-900	ꟻ ⋀
THERAEAN	700-600	?
ARCHAIC LATIN	700-500	(F)
ATTIC	600	?
CORINTHIAN	600	ꟻ
CHALCIDIAN	600	F
IONIC	403	?
ROMAN COLONIAL	PRE-CLASSICAL AND CLASSICAL TIMES	F I'
URBAN ROMAN		F
FALISCAN		↑
OSCAN		8
UMBRIAN		ꟻ
CLASSICAL LATIN AND ONWARDS		F

THE DEVELOPMENT OF THE LETTER "F" FROM THE PHOENICIAN THROUGH THE CLASSICAL LATIN TO THE PRESENT FORM

digamma in Crete, others that it was merely differentiated from the preceding letter ⋚ by the omission of a horizontal stroke In either case it is probable that the Greeks were not the innovators, seeing that a form of the letter (ꟻ) occurs in the Lydian alphabet. The letter was probably contained in an Asianic alphabet from which Greek, Lydian and Etruscan were derived. The letter passed into the Latin alphabet from the Chalcidic, and we find it used in early inscriptions in combination with *h* to represent the unvoiced labial spirant (English *f*), *e.g.*, in the word **FHEFHAKED.** The *h* was soon dropped, and the sound represented by the letter F alone. It had this value in Etruscan. It was not required in Latin to represent the bilabial spirant (*w*), for the Latins had taken the letter V to represent both this sound and the vowel U. It has represented the unvoiced labial spirant ever since.

In the Faliscan alphabet the letter had the curious form ↑, and in Latin there was a form I' corresponding to the form II of the preceding letter. Latin cursive of the 5th century A.D employed a lengthened form ſ, and the letter was generally extended below the line in uncial writing, *e.g.*, F. In Irish writing of the 7th century the form was F, and the Carolingian with further rounding of the top ſ From this developed the modern minuscule *f*.

In music, F is the name of the sixth note of the musical alphabet, otherwise the fourth note of the scale of C. It also gives its name to the bass clef, whose distinguishing sign is put on the F line Further, it serves as an abbreviation for *forte* (*f*) and *fortissimo* (*ff*).

FA, the name given in French and Italian nomenclature to the fourth note of the natural scale of C, *i e*, F, and in the Tonic-Sol-fa system and others employing what is called a "movable Do," or tonic, to the fourth note of any major scale

FABBRONI, ANGELO (1732–1803), Italian biographer, was born at Marradi in Tuscany on Sept 25, 1732, and died at Pisa on Sept 22, 1803 His principal work is *Vitae Italorum doctrina excellentium qui saeculis XVII et XVIII floruerunt* (20 vols, Pisa, 1778–1799, 1804–1805). The last two vols, published posthumously, contain a life of the author

FABER, the name of a family of German lead-pencil manufacturers Their business was founded in 1760 at Stein, near Nuremberg, by Kaspar Faber (d. 1784) It was then inherited by his son Anton Wilhelm (d 1819) Georg Leonhard Faber succeeded in 1810 (d. 1839), and the business passed to Johann Lothar von Faber (1817–1896), the great-grandson of the founder At the time of his assuming control about twenty hands were employed, under old-fashioned conditions, and owing to the invention of the French *crayons Contés* of Nicolas Jacques Conté (*q.v.*) competition had reduced the entire Nuremberg industry to a low ebb. Johann brought his factory to the highest state of efficiency, and it became a model for all the other German and Austrian manufacturers. He established branches in New York, Paris, London and Berlin, and agencies in Vienna, St. Petersburg and Hamburg, and made his greatest *coup* in 1856, when he contracted for the exclusive control of the graphite obtained from the East Siberian mines Faber had also branched out into the manufacture of water-colour and oil paints, inks, slates and slate-pencils, and engineers' and architects' drawing instruments, and built additional factories to house his various industries at New York and at Noisy-le-Sec, near Paris, and had his own cedar mills in Florida. For his services to German industry he received a patent of nobility and an appointment as councillor of state. After the death of his widow (1903) the business was inherited by his granddaughter Countess Otilie von Faber-Castell and her husband, Count Alexander.

See Schwanhäusser, *Die Nürnberger Bleistiftindustrie* (1895).

FABER, FREDERICK WILLIAM (1814–1863), British hymn-writer and theologian, was born on June 28, 1814 at Calverley, Yorkshire. Educated at Harrow and at Balliol college, Oxford, he was elected fellow of University college in 1837. Meanwhile he had given up Calvinistic views, and had become an enthusiastic follower of John Henry Newman. In 1843, he became rector of Elton in Huntingdonshire, but after a prolonged mental struggle joined the Roman Catholic communion in Nov. 1845 He founded a religious community at Birmingham, called Wilfridians, which was ultimately merged in the oratory of St Philip Neri, with Newman as Superior. In 1849 a branch of the oratory was established in London, first in King William street, and afterwards at Brompton, over which Faber presided till his death on Sept 26, 1863 It is mainly as a hymn-writer that Faber is remembered. His other works include *Lives of Modern Saints* (1847 *sq*); *The Blessed Sacrament* (1855); *The Creator and the Creature* (1858); *Growth of Holiness* (1854); *Spiritual Conferences* (1859); *The Foot of the Cross* (8 vols., 1853–60); and *Notes on Doctrinal Subjects*, 2 vols. (1866).

See J E. Bowden, *Life and Letters of Fr Faber* (2nd ed 1888), and *A Brief Sketch of the Early Life of the late F. W. Faber, D D.*, by his brother the Rev. F A. Faber (1869).

FABER, FABRI or **FABRY** (surnamed STAPULENSIS), **JACOBUS** [Jacques Lefèvre d'Étaples] (*c.* 1455–1536), a pioneer of the Protestant movement in France, was born of humble parents at Étaples, Pas de Calais He had already been ordained priest when he entered the university of Paris, where Hermonymus of Sparta was his master in Greek He visited Italy before 1486, for he heard the lectures of Argyropulus, who died in that year; he formed a friendship with Paulus Aemilius of Verona. In 1492 he again travelled in Italy, studying in Florence, Rome and Venice, making himself familiar with the writings of Aristotle, though greatly influenced by the Platonic philosophy. Returning to Paris, he became professor in the college of Cardinal Lemoine. Among his famous pupils were F W Vatable and Farel; his connection with the latter drew him to the Calvinistic side of the movement of reform At this time he began the publication, with critical apparatus, of Boëtius (*De Arithmetica*), and Aristotle's *Physics* (1492), *Ethics* (1497), *Metaphysics* (1501) and *Politics* (1506). In 1507 he settled in the Benedictine Abbey of St. Germain des Prés, near Paris, where his former pupil, William Briçonnet, later cardinal bishop of Meaux, was abbot. He now began his Biblical studies, the first-fruit of which was his *Quintuplex Psalterium: Gallicum, Romanum, Hebraicum, Vetus, Conciliatum* (1509); the *Conciliatum* was his own version. This was followed by *S Pauli Epistolae xiv ex vulgata editione, adjecta intelligentia ex Graeco cum commentariis* (1512), a work of great independence and judgment. His *De Maria Magdalena et triduo Christi disceptatio* (1517) provoked violent controversy and was condemned by the Sorbonne (1521). At Briçonnet's invitation he went in 1520 to Meaux, and in 1523 published his French version of the New Testament. From this, in the same year, he extracted the versions of the Gospels and Epistles "à l'usage du diocèse de Meaux." Faber was protected by Francis I. and the princess Margaret, but Francis being in captivity after the battle of Pavia (Feb 25, 1525), he was condemned and his works suppressed by commission of the parliament. With the other Meaux preachers he fled to Strasbourg, but, as soon as Francis returned, he with others, was recalled. Faber now became tutor to one of the king's sons. He issued *Le Psautier de David* (1525), and was appointed royal librarian at Blois (1526); his version of the Pentateuch appeared two years later. His complete version of the Bible (1530), on the basis of Jerome, took the same place as his version of the New Testament. Margaret (now queen of Navarre) led him to take refuge (1531) at Nérac from persecution He is said to have been visited (1533) by Calvin on his flight from France. He died at Nérac in 1536.

See C. H. Graf, *Essai sur la vie et les écrits* (1842); G. Bonet-Maury, in A. Herzog-Hauck's *Realencyklopädie* (1898).

FABER (or LEFÈVRE), **JOHANN** (1478–1541), German theologian, styled from the title of one of his works "Malleus Haereticorum," son of one Heigerlin, a smith (*faber*), was born at Leutkirch, Suabia, in 1478. He studied theology and canon law at Tübingen and at Freiburg im Breisgau, and became vicar of Lindau and Leutkirch and shortly afterwards canon of Basel In 1518 Hugo von Landenberg, bishop of Constance, made him one of his vicars-general, and Leo X. appointed him papal protonotary He was an advocate of reforms, in sympathy with Erasmus, and corresponded (1519–20) with Zwingli While he defended Luther against Eck, he was as little inclined to adopt the position of Luther as of Carlstadt His journey to Rome in the autumn of 1521 had the result of estranging him from the views of the Protestant leaders. He published *Opus adversus nova quaedam dogmata Lutheri* (1522), appeared as a disputant against Zwingli at Zurich (1523), and then put forth his *Malleus in haeresin Lutheranam* (1524) In 1526 he became court preacher to the emperor Ferdinand, and in 1527–28 was sent by him as envoy to Spain and England. He approved the death by burning of Balthasar Hubmeier, the Baptist, at Vienna on March 10, 1528. In 1531 he was consecrated bishop of Vienna, and combined with this (till 1538) the administration of the diocese of Neustadt He died at Vienna on May 21, 1541. His works were collected in three volumes, 1537, 1539 and 1541.

See C. E. Kettner, *Diss de J. Fabri Vita Scriptisque* (1737); Wagenmann and Egli in Herzog-Hauck's *Realencyklopädie* (1898)

FABERT, ABRAHAM DE (1599–1660), marshal of France, was the son of Abraham Fabert, seigneur de Moulins (d 1638), a famous printer who rendered great services, civil and military, to Henry IV. At the age of fourteen he entered the *Gardes françaises*, and from 1618 was almost constantly in service. He was a brilliant engineer, and at the siege of Stenay he introduced new methods of siegecraft which anticipated in a measure the great improvements of Vauban. In 1658 Fabert was made a marshal of France, being the first commoner to attain that rank He died at Sedan on May 17, 1660.

See *Histoire du maréchal de Fabert* (Amsterdam, 1697); P. Barre, *Vie de Fabert* (1752); A. Feillet, *Le Premier Maréchal de France plébéien* (1869), Bourelly, *Le Maréchal Fabert* (1880).

FABIAN (FABIANUS), **SAINT** (d. 250), pope and martyr, was chosen pope in Jan 236. He was martyred during the persecution under Decius on Jan. 20, 250, and was buried in the catacomb of Calixtus. He is said to have baptized the emperor Philip and his son, to have improved the organization of the church in Rome, to have appointed officials to register the deeds of the martyrs, and to have founded several churches in France

See *Liber Pontificalis* vol. i. ed Duchesne (1886) and Eusebius, *Hist. Eccl* vi. 29.

FABIAN SOCIETY, a Socialist society founded in the winter of 1883–4 by a few obscure young people in London with the ambitious object of "reconstructing society in accordance with the highest moral possibilities." They named themselves after Fabius Cunctator because they realized that "long taking of counsel" was necessary before they could decide how to do it. During the next two or three years the society was joined by four men who have since become eminent, George Bernard Shaw (*q v*), Sidney Webb (*q.v.*), Sydney Olivier (later Lord Olivier) and Graham Wallas, and by Mrs Annie Besant (*q.v.*). In 1889 the society published a volume of essays by these five, with two others, entitled *Fabian Essays in Socialism* which made a considerable stir in Radical circles The revolutionary Socialism of that period was Marxian and the followers of H. M Hyndman and even of William Morris based their propaganda on the Marxian law of value. The Fabians rejected the Marxian doctrine both in economics and in politics, holding that Socialism was not a scheme to be adopted on the morrow of the revolution, but a principle already partially embodied in municipal as well as central government and capable of further extension by the action of existing political parties. The publication of *Fabian Essays* explaining these ideas led to the foundation of Fabian societies throughout England, which, however, a few years later were mostly turned into branches of the new Independent Labour Party, a Socialist society which was Fabian except in its political method. Fabian policy explained by numerous *Fabian Tracts* and expounded everywhere by Fabian lecturers exercised much influence, both on the

Liberal Party and on the Progressive Party which controlled the London County Council from 1889 to 1906

Although the Fabians always rejected the idea of making a political party out of the adherents to Socialism, they had long urged the trade unions to form a party of their own, and consequently they co-operated with the unions in founding the British Labour Party in 1900 The success of this new party in the General Election of 1906 startled the country into realizing that Socialism was a coming factor in politics, and at the same time Mr H G Wells (*q.v.*) attempted to hasten its coming by reorganizing the Fabian Society His controversy with Mr Bernard Shaw over this scheme attracted much public attention to the society

The Fabian Society has never had as many as 4,000 members at once, but partly through affiliated societies at the chief universities, many people who have subsequently become influential have passed through its ranks and the plays and writings of its leading members have brought its doctrines before a wide public. Nearly all the leading Socialists and many of the foremost trade unionists have at one time or another become members Since the War the importance of the Labour Party has somewhat overshadowed that of its constituent elements

See *The History of the Fabian Society*, by Edward R Pease (2nd ed., 1925). (E. R P.)

FABIUS, the name of a number of Roman soldiers and statesmen The Fabian gens was one of the oldest and most distinguished patrician families of Rome Its members claimed descent from Hercules and a daughter of the Arcadian Evander From the earliest times it played a prominent part in Roman history, and was one of the two gentes exclusively charged with the management of the most ancient festival in Rome—the Lupercalia (Ovid, *Fasti,* ii 375) The chief family names of the Fabian gens or clan, in republican times, were Vibulanus, Ambustus, Maximus, Buteo, Pictor, Dorso, Labeo; with surnames Verrucosus, Rullianus, Gurges Aemilianus, Allobrogicus (all of the Maximus branch). The most important members of the family are the following —

1 Marcus Fabius Ambustus, *pontifex maximus* in the year of the capture of Rome by the Gauls (390). His three sons, sent as ambassadors to the Gauls when they were besieging Clusium, subsequently took part in hostilities (Livy v. 35) The Gauls thereupon demanded their surrender, on the ground that they had violated the law of nations, the Romans, by way of reply, elected them consular tribunes in the following year The result was the march of the Gauls upon Rome, the battle of the Allia, and the capture of the city (Livy vi 1)

2 Q Fabius Maximus, surnamed *Rullianus* or *Rullus,* master of the horse in the second Samnite War to L Papirius Cursor, by whom he was degraded for having fought the Samnites contrary to orders (Livy viii 30), in spite of the fact that he gained a victory In 315, when dictator, he was defeated by the Samnites at Lautulae (Livy ix. 23). In 310 he defeated the Etruscans at the Vadimonian Lake. In 295, consul for the fifth time, he defeated, at the great battle of Sentinum, the combined forces of the Etrurians, Umbrians, Samnites and Gauls (*see* Rome: *History,* II. "The Republic") As censor (304) he limited the freedmen to the four city tribes

3. Quintus Fabius Maximus, surnamed *Cunctator* ("the delayer," from his cautious tactics in the war against Hannibal), grandson of the preceding. He served his first consulship in Liguria (233 B.C.), was censor (230) and consul for the second time (228). In 218 he was sent to Carthage to demand satisfaction for the attack on Saguntum (Livy xxi. 18). According to the well-known story, he held up a fold of his toga and offered the Carthaginians the choice between peace and war. When they declared themselves indifferent, he let fall his toga with the words, "Then take war." After the disasters of the Trebia and Lake Trasimenus, Fabius was named dictator (Livy calls him prodictator, since he was nominated, not by the consul, but by the people) in 217, and began his tactics of "masterly inactivity." Manoeuvring among the hills, where Hannibal's cavalry were useless, he cut off his supplies, harassed him incessantly, and did everything except fight His steady adherence to his plan caused dissatisfaction at Rome and in his own camp. Minucius Rufus, his master of the horse, during the absence of Fabius at Rome, made a successful attack upon the enemy. The people then divided the command between Minucius and Fabius (Livy xxii. 15 24; Polybius iii. 88). Minucius was led into an ambuscade by Hannibal, and his army was only saved by the opportune arrival of Fabius Minucius confessed his mistake and henceforth submitted to the orders of Fabius (Livy xxiii. 32) At the end of the legal time of six months Fabius resigned the dictatorship, and the result of the abandonment of Fabian tactics was the disaster of Cannae (216). In 215 and 214 (as consul for the third and fourth times) he was in charge of the operations against Hannibal together with Claudius Marcellus (Livy xxiii. 39). He laid siege to Capua, which had gone over to Hannibal after Cannae, and captured the important position of Casilinum; in his fifth consulship (209) he retook Tarentum, which had been occupied by Hannibal for three years (Livy xxvii 15, Polybius xiii 4; Plutarch, *Fabius*). He died in 203. Fabius was a strenuous opponent of the new aggressive policy, and did all he could to prevent the invasion of Africa by Scipio. In his later years he became morose, and showed jealousy of rising young men, especially Scipio (*Life* by Plutarch; Livy xx–xxx, Polybius iii 87–106).

4 Q. Fabius Vibulanus, with his brothers Caeso and Marcus, filled the consulship for seven years in succession (485–479 B.C.) In the last year there was a reaction against the family, in consequence of Caeso's espousing the cause of the plebeians. Thereupon the Fabii emigrated from Rome under the leadership of Caeso, and settled on the banks of the Cremera, a few miles above Rome For two years they defended the city against the Veientes, until at last they were surprised and cut off. The only survivor of the gens was Quintus, the son of Marcus, who apparently took no part in the battle. This Quintus was consul in 467, 465 and 459, and a member of the second decemvirate in 450, on the fall of which he went into voluntary exile (Livy ii. 42, 48–50, iii 1, 9, 41, 58, vi 1; Dion Halic. viii. 82–86, ix 14–22; Ovid, *Fasti,* ii 195)

The Fabian name is met with as late as the 2nd century A.D. A complete list of the Fabii will be found in de Vit's *Onomasticon, see* also W N du Rieu, *Disputatio de Gente Fabia* (1856), containing an account of 57 members of the family

FABIUS PICTOR, QUINTUS, the father of Roman history, was born about 254 B.C. He took an active part in the subjugation of the Gauls in the north of Italy (225), and after the battle of Cannae (216) was sent by the Romans to consult the Delphic oracle. He was the earliest prose writer of Roman history. His sources were the *Annales Maximi, Commentarii Consulares,* and similar records; the chronicles of the great Roman families; and his own experiences in the second Punic war He is also said to have made much use of the Greek historian Diocles of Peparethus. His work, which was written in Greek, began with the arrival of Aeneas in Italy, and ended with the Hannibalic war. Polybius uses him as his chief authority for the second Punic war A Latin version existed in the time of Cicero, but it is doubtful whether it was by Fabius Pictor or by a later writer with whom he was confused—Q. Fabius Maximus Servilianus (consul 142); or there may have been two annalists of the name of Fabius Pictor.

Fragments in H. Peter, *Historicorum Romanorum Fragmenta* (1883); *see* also Annalists and Livy, and Teuffel-Schwabe, *History of Roman Literature,* § 116. *See* E. S. Duckett, *Studies in Ennius* (Bryn Mawr college monographs, No. 18).

FABLE. With certain restrictions, the necessity of which will be shown in the course of the article, we may accept the definition of "fable" which Dr. Johnson proposes in his *Life of Gay:* "A *fable* or *apologue* seems to be, in its genuine state, a narrative in which beings irrational, and sometimes inanimate (*arbores loquuntur, non tantum ferae*), are, for the purpose of moral instruction, feigned to act and speak with human interests and passions." The description of La Fontaine, the greatest of fabulists, is a poetic rendering of Johnson's definition:

> Fables in sooth are not what they appear;
> Our moralists are mice, and such small deer
> We yawn at sermons, but we gladly turn
> To moral tales, and so amused we learn.

The fable is distinguished from the myth which grows and is not made, the spontaneous and unconscious product of primitive fancy as it plays round some phenomenon of natural or historical fact. The literary myth, such as, for instance, the legend of Pandora in Hesiod or the tale of Er in the *Republic* of Plato, is really an allegory, and differs from the fable in so far as it is self-interpreting; the story and the moral are intermingled throughout Between the parable and the fable there is no clear line of demarcation The soundest distinction is drawn by Neander In the fable human passions and actions are attributed to beasts; in the parable the lower creation is employed only to illustrate the higher life and never transgresses the laws of its kind There is an affinity between the fable and the proverb A proverb is often a condensed or fossilized fable, and not a few fables are amplified or elaborated proverbs

With the fable, as we know it, the moral is indispensable As La Fontaine puts it, an apologue is composed of two parts, body and soul The body is the story, the soul the morality But in the primitive beast-fable, which is the direct progenitor of the Aesopian fable, the story is told simply for its own sake, and is as innocent of any moral as the fairy tales of Little Red Riding-Hood and Jack and the Beanstalk Thus, in a legend of the Flathead Indians, the Little Wolf found in cloud-land his grandsires the Spiders with their grizzled hair and long crooked tails, and they spun balls of thread to let him down to earth; when he came down and found his wife, the Speckled Duck, whom the Old Wolf had taken from him, she fled in confusion, and this is why she lives and dives alone to this very day Such animal myths are as common in the New World as in the Old, and abound from Finland and Kamchatka to the Hottentots and Australasians

From these beast-fables of savages must be derived, through some common store of primitive moralizing, the fables of Greece and India In the form in which we have them the Greek fables are the older: there is a fable of true type in Hesiod In the latter part of the 5th century B C they became connected with the name of Aesop The first collection we hear of was made about 300 B C These Greek fables are best represented by the verse collection of Babrius (*q v*) made about A D 200 An inferior version is found in the Latin of Phaedrus (early part of the 1st century) Phaedrus and a third ancient fabulist Avianus (4th century) were text-books in mediaeval schools and were constantly imitated and expanded

The oldest Indian collection, the *Panchatantra*, goes back to Buddhist sources of the 4th century or earlier The *Hitopadesa* is a mediaeval form of the same work, the fables being strung together on a thread of narrative As *Kalilah and Dimnah* or *Fables of Bidpai* (*Pilpay*) the Indian fables passed through Old Persian and Arabic into Latin, and joined the stream flowing from the Latin fabulists, thus fertilizing the rising vernacular literatures with a variety of *motifs* which could be used either for entertainment or edification One of the most successful mediaeval collections is that of Odo of Cheriton, a Kentish preacher of the 12th century, who published separately the fables he had used in his sermons

Modern Literature.—As the supremacy of Latin declined, the fable took a new life in the modern languages. Not only were there numerous adaptations of Aesop, known as Ysopets, but Marie de France in the 13th century composed many original fables, some rivalling La Fontaine's in simplicity and gracefulness Later, also, fables were not wanting, though not numerous, in the English tongue. Chaucer has given us one, in his Nonne Preste's Tale, which is an expansion of the fable *Don Coc et don Werpil* of Marie de France; another is Lydgate's tale of The Churl and the Bird.

Several of Odo's tales, like Chaucer's story, can be ultimately traced to the History of Reynard the Fox. This great beast-epic is known to us in three forms, Latin, French and German, each with independent episodes, but all woven upon a common basis, and it probably took shape in Picardy in the 10th or 11th century. The Latin form is probably the earliest, and next the German versions. The French poem of more than 30,000 lines, the *Roman du Rénard*, belongs probably to the 13th century. In 1498 appeared *Reynke de Voss*, almost a literal version in Low Saxon of the older Flemish poem, *Reinaert de Vos*. Hence the well-known version of Goethe into modern German hexameters was taken We have here no short and unconnected stories Materials, partly borrowed from older apologues, but in a much greater proportion new, are worked up into one long and systematic tale The moral, so prominent in the fable proper, shrinks so far into the background that the epic might be considered a work of pure fiction, an animal romance recounting a contest maintained successfully, by selfish craft and audacity, against enemies of all sorts, in a half-barbarous and ill-organized society

France alone in modern times has attained any pre-eminence in the fable, and this distinction is almost entirely owing to one author Marie de France in the 13th century, Gilles Corrozet, Guillaume Haudent and Guillaume Gueroult in the 16th, are now studied mainly as the precursors of La Fontaine, from whom he may have borrowed a stray hint or the outline of a story. The unique character of his work has given a new word to the French language. other writers of fables are called *fabulistes*, La Fontaine is named *le fablier* He is a true poet; his verse is exquisitely modulated, his love of nature often reminds us of Virgil, as do his tenderness and pathos (*see*, for instance, The Two Pigeons and Death and the Woodcutter) He is full of sly fun and delicate humour; like Horace he satirizes without wounding, and "plays around the heart" Lastly, he is a keen observer of men The whole society of the 17th century, its greatness and its foibles, its luxury and its squalor, from *Le grand monarque* to the poor *manant*, from his majesty the lion to the courtier of an ape, is painted to the life To borrow his own phrase, La Fontaine's fables are "une ample comédie à cent actes divers" Rousseau did his best to discredit the *Fables* as immoral and corruptors of youth, but in spite of *Émile* they are studied in every French school and are more familiar to most Frenchmen than their breviary. Among the French successors of La Fontaine the most distinguished is Florian: among foreigners who have worked in his vein are the Spaniard Yriarte, the Russian Krylov, and the Italian Pignotti. John Gay's *Fifty-one Fables in Verse* (1727) has much of the charm of La Fontaine Dryden's *Fables* (1699) are adaptations of Chaucer's and Boccaccio's tales and Ovid's *Metamorphoses* and are fables only in name.

The fables of Lessing represent the reaction against the French school of fabulists. "With La Fontaine himself," says Lessing, "I have no quarrel, but against the imitators of La Fontaine I enter my protest." His attention was first called to the fable by Gellert's popular work published in 1746 Gellert's fables were closely modelled after La Fontaine's, and were a vehicle for lively railings against women, and hits at contemporary follies Lessing's early essays were in the same style, but his subsequent study of the history and theory of the fable led him to discard his former model as a perversion of later times, and the "Fabeln," published in 1759, are the outcome of his riper views Lessing's fables, like all that he wrote, display his vigorous common sense, but he has little of La Fontaine's sly humour and lightness of touch. On the other hand, he has the rare power of looking at both sides of a moral problem; he holds a brief for the stupid and the feeble, the ass and the lamb; and in spite of his formal protest against poetical ornament, there is in not a few of his fables a vein of true poetry, as in the Sheep (II 13) and Jupiter and the Sheep (ii. 18). But the monograph which introduced the *Fabeln* is of more importance than the fables themselves According to Lessing the ideal fable is that of Aesop. All the elaborations and refinements of later authors, from Phaedrus to La Fontaine, are perversions of this original. The fable is essentially a moral precept illustrated by a single example, and it is the lesson thus enforced which gives to the fable its unity and makes it a work of art.

Bibliography.—A. A. Macdonell, *Sanskrit Literature* (1900) with the literature there quoted; *Babrius*, ed W C. Rutherford, with excursus on Greek fables (1883); L. Hervieux, *Les Fabulistes latins d'Auguste à la fin du moyen âge* (1884); Jakob Grimm, *Reinhart Fuchs* (1834); Sudre, *Les Sources du roman du Rénard* (1893) with G. Paris's review (*Mélanges*, 1902); Taine, *Essai sur les fables de La Fontaine* (1853); Saint-Marc Girardin, *La Fontaine et les fabulistes* (1867); *Krylov's Fables*, Eng. trans. by B. Pares (1921); *Biography of John Gay*, ed. W. H. K. Wright (1923)

FABLIAU. The entertaining tales in eight-syllable rhymed verse which form a marked section of French mediaeval literature are called *fabliaux,* the word being derived by Littré from *fablel,* a diminutive of *fable.* It is a mistake to suppose, as is frequently done, that every legend of the middle ages is a fabliau. In a poem of the 12th century a clear distinction is drawn between songs of chivalry, war or love, and *fabliaux,* which are recitals of laughter A fabliau always related an event; it was usually brief, containing not more than 400 lines; it was neither sentimental, religious nor supernatural, but comic and gay. About 150 fabliaux have come down to us more or less intact, a vast number have doubtless disappeared. As early as the 8th century fabliaux must have existed, since the faithful are forbidden to take pleasure in these *fabulas inanes* by the *Paenitentiale* of Egbert. But the earliest surviving fabliau is that of *Richeut,* which dates from 1159 This is a rough and powerful study of the coarse life of the day, with little plot, but engaged with a realistic picture of manners Such poems, but of a more strictly narrative nature, continued to be produced, mainly in the north and north-east of France, until the middle of the 14th century. It does not seem probable that any ancient or exotic influences were brought to bear upon the French jongleurs, who simply invented or adapted stories of that universal kind which springs unsown from every untilled field of human society. More remarkable than the narratives themselves is the spirit in which they are told. This is full of the national humour and the national irony, the true *esprit gaulois.* A very large section of these popular poems deals satirically with the pretensions of the clergy. There are also tales whose purpose is rather voluptuous than witty, and whose aim is to excuse libertinage and render marriage ridiculous Among these are prominent *Court Mantel* and *Le Dit de Berenger.* Yet another class repeated, with a strain of irony or oddity, such familiar classical stories as those of Narcissus, and Pyramus and Thisbe.

The object of the writers was the immediate amusement of their audience; by reference to familiar things, they hoped to arouse a quick and genuine merriment. Hence in the fabliaux we get closer than elsewhere to the living diction of mediaeval France Such scholars as Gaston Paris and Paul Meyer have praised, in the general laxity of style and garrulity of the middle ages, the terseness of the jongleurs; in the period of false ornament, their fidelity to nature; in a time of general vagueness, the sharp and picturesque outlines of their art One feature of the fabliaux, however, cannot be praised and yet must not be overlooked. In no other section of the world's literature is the scorn and hatred of women so prominent It is difficult to account for the anti-feminine rage which pervades the fabliaux, and takes hideous shapes in such examples as *Le Valet aux deux femmes, Le Pêcheur de Pont-sur-Seine* and *Chicheface et Bigorne.* Probably this was a violent reaction against the extravagant cult of woman as expressed in the contemporary *lais* as well as in the legends of saints. We must remember, too, that those who listened were not nobles or clerks, they were the common people The fabliaux were *fabellae ignobilium,* little stories told to amuse persons of low degree, who were irritated by the moral pretensions of their superiors.

The names of about 20 of the authors of fabliaux have been preserved, although in most cases nothing is known of their personal history. The most famous is the man whose name, or more probably pseudonym, was Rutebeuf. He wrote *Frère Denyse* and *Le Sacristain,* while to him is attributed the *Dit d'Aristote,* in the course of which Aristotle gives good advice to Alexander. Fabliaux, however, form but a small part of the work of Rutebeuf, who was a satirical poet of wide accomplishment and varied energy. Henri d'Andeli was an ecclesiastic, attached, it is supposed, to the cathedral of Rouen. Jean de Condé, who flourished in the court of Hainaut from 1310 to 1340, and who is the latest of the genuine writers of fabliaux, lived in comfort and security, but most of the professional jongleurs seem to have spent their years in a Bohemian existence, wandering among the clergy and the merchant class, alternately begging for money and food and reciting their mocking verses

BIBLIOGRAPHY.—The principal authorities for the fabliaux are Anatole de Montaiglon and Gaston Raynaud, who published the text, in 6 vols., between 1872 and 1890. This edition supplemented the labours of Méon (1808–23) and Jubinal (1839–42). The works of Henri d'Andeli were edited by A. Heron in 1880, and those of Rutebeuf by Léon Clédat in 1891. *See* also the editions of separate fabliaux by Gaston Paris, Paul Meyer, Ebeling, August Schéler and other modern scholars. Joseph Bédier's *Les Fabliaux* (1925) is a useful summary of critical opinion on the entire subject.

FABRE, FERDINAND (1830–1898), French novelist, was born at Bédarieux, in Hérault, a very picturesque district of the south of France, which he made completely his own in literature. He was brought up by his uncle, the Abbé Fulcran Fabre, at Camplong among the mulberry woods. Of his childhood and early youth he has given a charming account in *Ma Vocation* (1889). He was sent to the seminary of St. Pons de Thomières, where, in 1848, he had, as he believed, a vision in which he was warned not to become a priest He was then articled as a lawyer's clerk in Paris In 1853 he published a volume of verses, *Feuilles de lierre,* broke down in health, and returned to his old home at Bédarieux. After some eight or nine years he reappeared in Paris, with the ms. of his earliest novel, *Les Courbezon* (1862), in which he treated the daily business of country priests in the Cevennes George Sand praised it, Sainte-Beuve hailed in its author "the strongest of the disciples of Balzac," and it was crowned by the French Academy Fabre wrote about 20 novels. His masterpiece was *L'Abbé Tigrane, candidat à la papauté* (1873), a very powerful picture of unscrupulous priestly ambition. Others are. *Mon Oncle Célestin* (1881), a study of the entirely single and tender-hearted country abbé; and *Lucifer* (1884), a marvellous gallery of serious clerical portraits.

In 1883 Fabre was appointed curator of the Mazarin library, with rooms in the Institute, where on Feb. 11, 1898, he died after a brief attack of pneumonia. Ferdinand Fabre was a "regional" novelist, dealing almost exclusively with the population of the mountain villages of Hérault, and particularly with its priests

See J. Lemaître, *Les Contemporains* (1886–99) vol ii , G Pellissier, *Études de littérature contemporaine* (1898), E. W. Gosse, *French Profiles* (1905).

FABRE, JEAN HENRI (1823–1915), French entomologist, was born of humble parents at St. Léons in Aveyron on Dec. 21, 1823. Having received an elementary classical education at Rodez and at the école normale of Vaucluse, he taught successively at Carpentras, at the college of Ajaccio, Corsica, and in 1852 at the lycée of Avignon Meanwhile he had taken his doctor's degree in Paris and had discovered that his life-work was to be the study of the life-history, habits and instincts of insects, a study which became his sole occupation after his retirement to Sérignan in 1871. There he lived an extremely secluded life, absorbed in his study. He took no account of books, and all his work was based on direct observation. Although the ways of all insects interested him, his attention was given chiefly to the hymenoptera, coleoptera, orthoptera, as well as to spiders. Of the first, the wasps, with their skill in stinging their prey in the region of the nervous ganglia so as to paralyse it and preserve it living as food for their young, seemed to Fabre to show an intelligence irreconcilable with the theory of fixed habits. Other researches led him to oppose the theory of evolution. His incomparable observations, his deductions concerning the relation between the animal and the human mind, and between entomology and agriculture, are detailed in *Annales des sciences naturelles* (1855–58) and in the 10 vols. of *Souvenirs entomologiques* (1879–1907) (Eng. trans. by De Mattos, 1912 *sqq.*) which was crowned by the Institute of France A member of many academies and scientific societies, Fabre died at Sérignan, Provence, on Oct. 11, 1915.

See A. Fabre, *Jean-Henri Fabre* (Eng. trans., 1921); C. V. Legros, *Fabre, Poet of Science* (Eng. trans., 1913); and P. F. Bicknell, *The Human Side of Fabre* (New York, 1923). *See* also BEE and INSECTS.

FABRE D'EGLANTINE, PHILIPPE FRANÇOIS NAZAIRE (1750–1794), French dramatist and revolutionist, was born at Carcassonne. His real name was simply Fabre, the "d'Eglantine" being added in commemoration of his receiving the golden eglantine of Clémence Isaure from the academy of the floral games at Toulouse. Of his plays, *Philinte, ou la suite du*

Misanthrope (1790), which professes to be a continuation of Molière's *Misanthrope,* is best remembered. The character of Philinte had much political significance. Alceste received the highest praise, and evidently represents the citizen patriot, while Philinte is a dangerous aristocrat in disguise. Fabre was president and secretary of the club of the Cordeliers, and belonged also to the Jacobin club. He was private secretary to Danton, and sat in the National Convention. He voted for the king's death, supporting the *maximum* and the law of the suspected, and he was a bitter enemy of the Girondins. He sat on the committee entrusted with the formation of the republican calendar, and to him was due a large part of the new nomenclature, with its poetic *Prairial* and *Floréal,* its prosaic *Primidi* and *Duodi.* On Jan 12, 1794, he was arrested by order of the committee of public safety on a groundless charge of malversation and forgery in connection with the affairs of the Compagnie des Indes. During his trial Fabre showed the greatest calmness and sang his own well-known song of *Il pleut, il pleut, bergère, rentre tes blancs moutons.* He was guillotined on April 5, 1794 On his way to the scaffold he distributed his manuscript poems to the people.

A posthumous play, *Les Précepteurs,* steeped with the doctrines of Rousseau's *Emile,* was performed on Sept. 17, 1794, and met with an enthusiastic reception Among Fabre's other plays are *Convalescent de qualité* (1791), and *L'Intrigue épistolaire* (1791). In the latter play Fabre is supposed to have drawn a portrait of the painter Greuze.

The author's *Oeuvres mêlées et posthumes* were published at Paris, 1802, 2 vols. *See* A Maurin, *Galerie hist. de la Révolution française,* tome 11; J. Janin, *Hist de la litt dram* , Chénier, *Tableau de la litt. française;* F. A Aulard in the *Nouvelle Revue* (July 1885) ; D'Alméras, *Fabre d'Eglantine* (1905).

FABRETTI, RAPHAEL (1618–1700), Italian antiquary, was born in 1618 at Urbino in Umbria He studied law at Cagli and Urbino, where he took the degree of doctor at the age of 18 He was treasurer and auditor of the papal legation in Spain, where he remained 13 years. By Innocent XII he was made keeper of the archives of the castle St. Angelo, a charge which he retained till his death. He died at Rome on Jan. 7, 1700.

He wrote: *De Aquis et Aquae-ductibus veteris Romae* (1680), three dissertations on the topography of ancient Latium, printed also in Graevius's *Thesaurus,* iv. (1677); *De Columna Trajani Syntagma* (1683), and *Inscriptionum Antiquarum Explicatio* (1699)

See J Lamius, *Memorabilia Italorum eruditione praestantium* (Florence, 1742–48)

FABRIANI, SEVERINO (1792–1849), Italian author and teacher, was born at Spilamberto, Italy, on Jan. 7, 1792. In consequence of complete loss of voice he resolved to devote himself to teaching deaf mutes, and founded a small school specially for them This school the duke of Modena made into an institute, and a teaching staff of nuns was appointed. Fabriani's method of instruction is summed up in his *Logical Letters on Italian Grammar* (1847). He died on April 27, 1849.

FABRIANO, GENTILE DA: *see* GENTILE DA FABRIANO.

FABRIANO, a town and episcopal see of the Marches, Italy, province of Ancona, from which it is 44 m. S.W. by rail, 1,066 ft. above sea-level. Pop. (1921) town 8,679, commune 25,209. It has been noted since 1276 for its paper mills. A number of the churches, several of which are of the 13th century, contain works by Allegretto Nuzi (1308–1385) and other local masters. His pupil, Gentile da Fabriano (1370–1427), was a painter of greater skill. The mediaeval Palazzo del Podestà (13th century) is picturesque, and there are other interesting buildings. The municipal picture gallery also contains an interesting collection of pictures. The Archivio Comunale contains documents on watermarked paper of local manufacture going back to 1293–94. Cement, pottery and vats are also made. A branch railway leads hence to Arbino (*q.v.*).

See A. Zonghi, *Antiche Carte-Fabrianesi.*

FABRICIUS, GAIUS LUSCINUS (*i.e.* "the one-eyed"), Roman general, was the first member of the Fabrician gens who settled in Rome. He migrated to Rome from Aletrium (Livy ix. 43). In 285 he was one of the ambassadors sent to the Tarentines to dissuade them from making war on the Romans. In 282 B.C. (when consul) he defeated the Bruttians and Lucanians, who had besieged Thurii (Livy, *Epit.* 12). After the defeat of the Romans by Pyrrhus at Heraclea (280), Fabricius was sent to treat for the ransom and exchange of the prisoners. All attempts to bribe him were unsuccessful, and Pyrrhus is said to have been so impressed that he released the prisoners without ransom (Plutarch, *Pyrrhus,* 18). In 278 Fabricius was elected consul for the second time, and was successful in negotiating terms of peace with Pyrrhus Fabricius afterwards gained a series of victories over the Samnites, the Lucanians and the Bruttians, and on his return to Rome received a triumph. He died poor, and provision had to be made for his daughter out of the funds of the state (Val. Max. iv. 4, 10).

FABRICIUS, GEORG (1516–1571), German poet, historian, and archaeologist, was born at Chemnitz in upper Saxony on April 23, 1516, and educated at Leipzig. While travelling in Italy he studied the antiquities of Rome. He published the results in his *Roma* (1550), in which the correspondence between every discoverable relic of the old city and the references to it in ancient literature were traced in detail. In 1546 he was appointed rector of the college of Meissen, where he died, July 17, 1751.

Principal works; editions of Terence (1548) and Virgil (1551); *Poëmatum sacrorum libri xxv.* (1560); *Poetarum veterum ecclesiasticorum opera Christiana* (1562); *De Re Poetica libri septem* (1565), *Rerum Misnicarum libri septem* (1569); (posthumous) *Originum illustrissimae stirpis Saxonicae libri septem* (1597); *Rerum Germaniae magnae et Saxoniae universae memorabilium mirabiliumque volumina duo* (1609). A life of Georg Fabricius was published in 1839 by D. C. W. Baumgarten-Crusius, who in 1845 also issued an edition of Fabricius's *Epistolae ad W. Meurerum et alios aequales,* with a short sketch *De Vita Ge. Fabricii et de gente Fabriciorum; see* also F. Wachter in Ersch and Gruber, *Allgemeine Encyklopädie.*

FABRICIUS, HIERONYMUS AB AQUAPENDENTE (Fabrizio, Geronimo) (1537–1619), Italian anatomist and embryologist, studied at Padua, where he succeeded his master Fallopius, as teacher of anatomy and surgery, in 1562. Here his studies of the effect of ligatures and the valves in the veins influenced the discoveries of his famous pupil, William Harvey. Fabricius was greatest as a teacher; he failed to follow his own discoveries to their logical conclusion. Dr C Singer (*History of Medicine,* 1928) calls him the "effective founder of modern embryology." He died at Venice on May 21, 1619. His works include *De visione, voce et auditu* (1600), *De formato foetu* (1600), *De venarum ostiolis* (1603) and *De formatione ovi et pulli* (1621). His collected works were published at Leipzig in 1687 as *Opera omnia Anatomica et Physiologica,* but the Leyden edition, published by Albinus in 1738, is more complete.

FABRICIUS, JOHANN ALBERT (1668–1736), German classical scholar and bibliographer, was born at Leipzig His father, Werner Fabricius, director of music in the church of St. Paul at Leipzig, was the author of several works, the most important being *Deliciae Harmonicae* (1656). Johann Albert studied under J. G Herrichen and afterwards at Quedlinburg under Samuel Schmid. At Leipzig he published anonymously (1688) his first work, *Scriptorum recentiorum decas,* an attack on ten writers of the day. His *Decas Decadum, sive plagiariorum et pseudonymorum centuria* (1689) is the only one of his works to which he signs the name Faber. In 1693 he settled at Hamburg as librarian to J. F. Mayer In 1696 he accompanied his patron to Sweden; and in 1699 succeeded Vincent Placcius in the chair of rhetoric and ethics, a post which he held till his death.

Fabricius is credited with 128 books, but very many of them were only books which he had edited One of the most famed and laborious of these is the *Bibliotheca Latina* (1697, republished in an improved and amended form by J. A Ernesti, 1773). The divisions of the compilation are—the writers to the age of Tiberius; thence to that of the Antonines; and thirdly, to the decay of the language; a fourth gives fragments from old authors, and chapters on early Christian literature A supplementary work was *Bibliotheca Latina mediae et infimae Aetatis* (1734–36; supplementary volume by C. Schöttgen, 1746; edit. Mansi, 1754). His *chef-d'oeuvre,* however, is the *Bibliotheca Graeca* (1705–28, revised and continued by G C Harles, 1790–1812), a work

which has justly been denominated *maximus antiquae eruditionis thesaurus*. Its divisions are marked off by Homer, Plato, Christ, Constantine, and the capture of Constantinople in 1453, while a sixth section is devoted to canon law, jurisprudence and medicine Of his remaining works we may mention *Bibliotheca Antiquaria*, an account of the writers whose works illustrated Hebrew, Greek, Roman and Christian antiquities (1713), *Centifolium Lutheranum*, a Lutheran bibliography (1728); *Bibliotheca Ecclesiastica* (1718). His *Codex Apocryphus* (1703) is still considered indispensable as an authority on apocryphal Christian literature

The details of the life of Fabricius are to be found in *De Vita et Scriptis J A. Fabricii Commentarius* (Hamburg, 1737), by his son-in-law, H S Reimarus, the well known editor of Dio Cassius; *see* also C F Bähr in Ersch and Gruber's *Allgemeine Encyklopädie*, and J E Sandys, *Hist Class Schol*, iii (1908).

FABRICIUS, JOHANN CHRISTIAN (1745–1808), Danish entomologist and economist, was born at Tondern on Jan 7, 1745 He studied at Altona and Copenhagen and at Uppsala under Linnaeus. In 1769, he lectured on political economy and in 1775 was appointed professor of natural history, economy and finance at Kiel. He died on March 3, 1808 It is as an entomologist that his memory survives, and for many years his great scientific reputation rested upon the system of classification which he founded upon the structure of the mouth-organs instead of the wings

A list of his entomological publications in Hagen's *Bibliotheca Entomologiae*, the following are the chief *Systema Entomologiae* (1775), *Genera Insectorum* (1776), *Philosophia Entomologica* (1778), *Species insectorum* (1781), *Entomologia Systematica* (1792–1794), with a supplement (1798), *Systema Eleutheratorum* (1801) In the *Transactions of the Entomological Society of London* (1845), 4, his autobiography is translated from the Danish

FABRITIUS, CAREL (1624?–1654), Dutch painter The date and place of his birth is unknown From a description of Delft dated 1667, wherein it is said that the master was killed in an explosion at Delft on Oct 12, 1654, and that he was then about 30 years of age we learn that he must have been born about 1624 He was a pupil of Rembrandt, and he appears as a serious and cultivated artist in the conversation on art of Rembrandt's pupils which is reported by Hoogstraten. In 1650 he married Agathe van Pruyssen, a widow in Delft, and in 1652 he entered the painters' gild in that city He was a master of the first rank, an independent spirit who did not lose his own individuality while studying under the great Rembrandt He seems to have first established a reputation in painting mural decorations with views of architecture in perspective But of these works nothing remains However, the pictures which are still extant show an artist of great power

The earliest work is the half-length portrait of Abraham de Notte in the Rijks museum at Amsterdam It is dated 1640 and is the work of a mature artist A portrait of a man in the museum at Rotterdam was attributed to Rembrandt until the signature of Fabritius was discovered The National Gallery, London, has a splendid half-length portrait of a soldier. In the same collection is the picture of "A musical instrument dealer with a view of Delft" The museum at Schwerin contains "The sentinel," dated 1654, and the Ferdinandeum at Innsbruck the picture of "Tobias and his wife" In the Mauritshuis at The Hague is the famous "Goldfinch," signed and dated 1654 In distinction to Rembrandt, whose figures emerge modelled by the action of light from a dark background, the figures of Fabritius are silhouetted against a light background, a scheme which was adopted and developed by Fabritius's great pupil, Vermeer

See Hofstede de Groot, *Catalogue of Dutch Painters* (1902).

FABRIZI, NICOLA (1804–1885), Italian patriot, was born at Modena on April 4, 1804 He took part in the Modena insurrection of 1831, and attempted to succour Ancona, but was arrested at sea and taken to Toulon, whence he proceeded to Marseilles. Afterwards he organized with Mazzini the ill-fated Savoy expedition Taking refuge in Spain, he fought against the Carlists, and was decorated for valour on the battlefield (July 18, 1837). At the end of the Carlist war he established a centre of conspiracy at Malta, endeavoured to dissuade Mazzini from the Bandiera enterprise, but aided Crispi in organizing the Sicilian revolution of 1848. He took part in the defence of Venice and of San Pancrazio Upon the fall of Rome he returned to Malta, accumulating arms and stores, which he conveyed to Sicily, after having, in 1859, worked with Crispi to prepare the Sicilian revolution of 1860 While Garibaldi was sailing from Genoa towards Marsala Fabrizi landed at Pizzolo, and, after severe fighting, joined Garibaldi at Palermo Under the Garibaldian dictatorship he was appointed governor of Messina and minister of war Returning to Malta after the Neapolitan plebiscite, which he had vainly endeavoured to postpone, he was recalled to aid Cialdini in suppressing brigandage. While on his way to Sicily in 1862, to induce Garibaldi to give up the Aspromonte enterprise, he was arrested at Naples by Lamarmora During the war of 1866 he became Garibaldi's chief of staff, and in 1867 fought at Mentana In parliament he endeavoured to promote agreement between the chiefs of the Left, and from 1878 onwards worked to secure the return of Crispi to power, but died on March 31, 1885, two years before the realization of his object His life was characterized by ardent patriotism and unimpeachable integrity (H W S)

FABROT, CHARLES ANNIBAL (1580–1659), French jurisconsult, was born at Aix in Provence on Sept 15, 1580 He translated the *Basilica* (1647, 7 vols) and edited the works of Cujas He died at Paris on Jan. 16, 1659.

FABYAN, ROBERT (d 1513), English chronicler, belonged to an Essex family, members of which had been connected with trade in London He married Elizabeth Pake, by whom he had a large family. He was a member of the Drapers' Company, and served as sheriff in 1493–94 In 1496 he was one of those appointed to make representations to the king on the new impositions on English cloth in Flanders Next year he was one of the aldermen employed in keeping watch at the time of the Cornish rebellion He resigned his aldermanry in 1502, and spent his latter years on his estate in Essex He died on Feb 28, 1513

Fabyan's Chronicle was first published by Richard Pynson in 1516 as *The new chronicles of England and of France* In this edition it ends with the reign of Richard III, and this probably represents the work as Fabyan left it, though with the omission of an autobiographical note and some religious verses, which are first found in the second edition, printed by John Rastell in 1533 with continuations down to 1509 A third edition appeared in 1542, and a fourth in 1559 with additions to that year The only modern edition is that of Sir Henry Ellis, 1811 There is evidence that Fabyan had continued his Chronicle to 1511, but no trace of the manuscript can now be found

Fabyan's own merits are little more than those of an industrious compiler, who strung together the accounts of his different authorities without any critical capacity. Nevertheless he deserves the praise which he has received as an early worker, and for having made public information which through Hall and Holinshed has become the common property of later historians, and has only recently been otherwise accessible. Bale alleges that the first edition was burnt by order of Cardinal Wolsey because it reflected on the wealth of the clergy; this probably refers to his version of the Lollards bill of 1410, which Fabyan extracted from one of the London Chronicles.

See further Ellis' *Introduction;* W. Busch, *England under the Tudors* (trans. A. M. Todd, 1895), i. 405–410, and C L. Kingsford, *Chronicles of London*, pp. xxvi.–xxxii. (1905)

FAÇADE, an architectural term signifying the external face of a building, especially applied to the principal front

FACCIOLATI, JACOPO (1682–1769), Italian philologist, was born at Torriglia, near Padua, on Jan 4, 1682. As professor of logic, and regent of the schools, Facciolati was the ornament of the Paduan university for 45 years. His *magnum opus* is the *Totius Latinitatis Lexicon*, which was ultimately published at Cardinal Priole's expense, 4 vols. fol, Padua, 1771 (revised ed by de Vit, 1858–87) In the compilation of this work the chief burden seems to have been borne by Facciolati's pupil Forcellini. It has been said that the whole body of Latinity, if it were to perish, might be restored from this lexicon. In 1808 a volume containing nine of his *Epistles* was issued at Padua.

See J. E. Sandys, *Hist. Class. Schol.* ii. (1908).

FACE, a word used as noun or verb whose various meanings of surface, front, expression of countenance, look or appearance, are derived from its application to the exterior of the front of the head, from the top of the forehead to the point of the chin, and from ear to ear (*see* ANATOMY: *Superficial and Artistic;* and PHYSIOGNOMY)

FACE CREAMS are the basis of most modern systems of caring for the skin Normally, the oil glands which lie in the lower layers of the skin secrete a natural lubricant which escapes from the thousands of pores and spreads out over the surface Its purpose is to keep the skin smooth and soft, supple and waterproof However, the conditions of modern life—faulty diet, lack of exercise, living in super-heated houses surrounded by excessively dry air—serve to upset the functioning of the skin's lubricating system Dry skin and early fine lines resulting from this parched condition are characteristic of the skin of this era To counteract this dryness, specialists recommend face creams, whose purpose it is to supply the lack of natural lubricant in the skin These creams are to be applied by means of massage They soften the horny surface layer of the skin, and render the skin smooth and supple There is much discussion between dermatologists and beauty specialists as to whether or not the skin cells actually assimilate these creams presented externally But their use does improve the appearance of the skin and prevent and correct fine lines and wrinkles, and so the discussion may be left in the realm of science The thousands of advertised face creams fall into several general classes

A *cleansing cream* is generally a cream of very light consistency, containing no waxy ingredients. It is intended to be used as a cleansing agent for the face and neck (to supplement, or supplant, the use of soap and water on the face) This should be a cream which melts at skin temperature, so that it can be smoothed easily over the skin It should pick up dust, powder and impurities on the skin, without the necessity of deep massage movements It should be made of oils which are not readily absorbed by the skin, otherwise the impurities might be absorbed with the cream A cleansing cream softens and removes heavier grease on the skin and melts down impurities which clog the pores

A *massage cream* is variously named a "tissue cream," "muscle-building cream," "skin food," "face moulding cream," by the several makers of creams of this type It is a heavier cream than the cleansing cream, it is designed as a medium for massaging, patting, moulding and manipulating the muscles to increase circulation in the face and neck. It is made of oils which are absorbed by the skin, for its purpose is to round out the tissues and prevent or correct wrinkles Cosmetic specialists disagree as to the relative merits of mineral, vegetable and animal fats as ingredients for supplying the needs of the skin Vegetable and animal fats may perhaps be absorbed more readily, but they have the disadvantage of turning rancid if left on the skin for several hours (as over night), and releasing fatty acids in the pores which pave the way for pimples and other skin infections

A *vanishing cream* is a cream which literally vanishes as it is smoothed on the skin It has generally a soap base It smooths out rough patches and leaves a soft bloom which makes a becoming and lasting base for powder and make-up Its use prevents rouge from entering the pores There are, in addition, other types of cream represented on the market. A "rolling cream" is made of casein base "Astringent creams" are designed for their refining action on the pores. Many liquid creams are actually creamy lotions containing glycerine, gum tragacanth, benzoin or other emollients. (D Co)

FACE VALUE. Term describing the nominal value borne upon the face of stock or share certificates, loans, debentures, bank-notes, etc., indicating the value at which they are issued, or par value. The real or market value may be very different from the face value, if higher, a premium is said to exist; if lower, the security or sum thus stated in the face value is then at a discount

FACILITATION, a term used in neurology to designate the favourable influence exerted over a conduction path by the passage of an impulse having an identical end-effect with the impulse favoured This facilitation of one nerve impulse by another may be successive or simultaneous. Activation of any reflex path leaves that path in a more favourable "set" for subsequent repetitions of the same response Subliminal stimuli, simultaneously applied, may facilitate one another sufficiently to produce an overt response, if these impulses are allied in a final common path. Facilitation probably occurs at the synapse The facilitating influence exercised by one impulse on another is generally known as "bahnung"

See C S Sherrington, *Integrative Action of the Nervous System*

FACING BRICK: *see* BRICK

FACTION, a term commonly employed, especially in the 18th century, to denote a group of partisans who set the aims of themselves and their party before the public welfare It bears a more technical sense in Roman and Byzantine history, there denoting the factions of the circus and hippodrome which played a prominent part in politics both at Rome and Constantinople. The *factiones* were properly the four companies into which the charioteers were divided, and were distinguished by the colours they wore Originally at Rome there were only two, white (*albata*) and red (*russata*), when each race was open to two chariots only; on the increase to four, the green (*prasina*) and blue (*veneta*) were added At Constantinople the last two absorbed the red and white factions

See Gibbon, *Decline and Fall,* ch xl , and J B Bury's *Appendix* 10 in vol. iv of his edition (1898), for a discussion of the relationship between the *factiones* and the demes of Constantinople

FACTOR, strictly "one who makes," thus in ordinary parlance, anything which goes to the composition of anything else is termed one of its "factors," and in mathematics the term is used of those quantities which, when multiplied together, produce a given product In a special sense, however—and that to which this article is devoted—"factor" is the name given to a mercantile agent (of the class known as "general agents") employed to buy or sell goods for a commission When employed to sell, the possession of the goods is entrusted to him by his principal, and when employed to buy it is his duty to obtain possession of the goods and to consign them to his principal In this he differs from a *broker* (*q v*), who has not such possession, and it is this distinguishing characteristic which gave rise in England to the series of statutes known as the Factors Acts By these acts, consolidated and extended by the act of 1889, third parties buying or taking pledges from factors are protected as if the factor were in reality owner, but these enactments have in no way affected the contractual relations between the factor and his employer, and it will be convenient to define them before discussing the position of third parties as affected by the act

FACTOR AND PRINCIPAL

A factor may be appointed or he may be dismissed in the same way as any other agent He may be employed for a single transaction or to transact all his principal's business of a certain class during a limited period or till such time as his authority may be determined It does not matter that a factor carries on a separate business on his own account, either of the same kind as that in which he is employed as factor, or of some other kind A factor's duty is to sell or buy as directed; to carry out with care, skill and good faith any instructions he may receive; to receive or make payment; to keep accounts and to render them to his principal regularly, or when requested to do so, and to hand over to his principal the balance standing to his principal's credit, without any deduction save for commission and expenses A factor is bound to account for any moneys he receives for his principal, and if between receiving it and paying it over, the money is lost (as for instance if the factor deposited it with a banker who became insolvent), the loss must be borne by the factor. All express instructions he must carry out to the full, and generally speaking literally, provided they do not involve fraud or illegality, but under circumstances of emergency he may deviate from his instructions (as for instance when goods are perishing) and if in so doing he exercises reasonable and proper skill and care he will not be liable for any loss there may

ensue. Where he is not given any express instructions, or on any point not covered by these, he must act bona fide and to the best of his skill and judgment, and he is bound to follow the usual practice of his particular business and any usages of the trade which may exist, if not inconsistent with his instructions or his position as factor, or unless, to a man of ordinary prudence, it would be manifestly disadvantageous to his employer's interests to do so Many usages of businesses in which factors are employed have been proved in court, and may now be regarded as legally established For instance, he may, unless otherwise directed, sell in his own name, and (apart from any express limit) at such price as to the best of his judgment he thinks proper, give warranties as to goods sold by him, sell by sample (in most businesses), give such credit as is usual in his business, receive payment in cash or as customary, and give receipts in full discharge, sell by indorsement of bills of lading, and insure the goods He is not bound to insure goods unless to do so is according to the course of business with his principal If he does effect an insurance he must see that all necessary risks are covered, satisfy himself as to the solvency of the underwriters, and disclose to them all material facts relating to the risk to be undertaken by them. It is his duty to clear the goods at the customs, take charge of them and keep them as safely as reasonable care and diligence will permit; give such notices to his principal and others as may be required, and in particular give punctual notice to his principal of all matters by which the rights or interests of the principal may be affected, as for instance the insolvency of a customer, or failure to effect an insurance, and if necessary take legal proceedings for the protection of the goods On the other hand, he has not authority to delegate his employment, unless by usage of the trade or by express permission, or to barter, or to accept or negotiate bills of exchange except by authority of his principal and as between himself and his principal he has no right to pledge the goods, although as between the principal and the pledgee, an unauthorized pledge made by the factor may by virtue of the Factors Act 1889 be binding upon the principal In the same way a factor has of course no right as between himself and his principal to sell goods in contravention of his principal's instructions, although as between his principal and the purchaser the sale may be binding upon the principal. It is, moreover, inconsistent with the factor's employment as agent that he should buy or sell on his own account from or to his principal

On the due performance of his duties the factor is entitled to his commission, which is usually a percentage on the value of the goods sold or bought by him on account of his principal, regulated in amount by the usages of each business or by express agreement Failing that, or any usage in the trade, the factor is entitled to a "reasonable" sum as commission. Sometimes the factor makes himself personally responsible for the solvency of the persons with whom he deals, in order that his principal may avoid the risk entailed by the usual trade credit. In such a case the factor is said to be employed on *del credere* terms, and is entitled to a higher rate of commission, usually 2½% extra. Such an arrangement is not a contract of guarantee within the Statute of Frauds, and therefore need not be in writing. Besides his remuneration, the factor is entitled to be reimbursed by his principal for any expenses, and to be indemnified against any liabilities which he may have properly incurred in the execution of his principal's instructions He cannot as a rule recover for any expenditure which is not expressly or impliedly covered by his instructions but he may do so in case of emergency if it is reasonable and in his employer's interests For the purpose of enforcing his rights a factor has, without legal proceedings, two remedies. First, by virtue of his general *lien* (*q v.*) he may hold any of his principal's goods which come lawfully to his hands in the course of his agency as security for the payment to him of any commission, out-of-pocket expenses, or even general balance of account in his favour, and in virtue of his particular lien he may hold any particular chattel in respect of which he has incurred expense. He may not sell the goods unless they have been entrusted to him for sale, in which case he may sell and claim a lien on the price. He can pledge the goods to the extent of his lien but no further, and exercise a lien on the money so raised, and by virtue of the Factors Acts the principal will not be able to recover the goods from the pawnbroker except by discharging the advance made by him. The lien is lost if the goods are improperly sold or pledged, or the possession of them is parted with, or the factor takes security from his principal for the debt, or enters into any special arrangement with him, such as to give him credit. Secondly, when by contracting in his own name he has rendered himself personally liable to pay for goods he has bought for his principal, and where he has consigned goods to his principal but not been paid, he may *"stop in transit"* subject to the same rules of law as an ordinary vendor; that is to say, he must exercise his right before the transit ends; and his right may be defeated by his principal transferring the document of title to the goods to some third person, who takes it in good faith and for valuable consideration (Factors Act 1889, and Sale of Goods Act 1893, s. 47). If the factor does not carry out his principal's instructions, or carries them out so negligently or unskilfully that his principal gets no benefit thereby, the factor loses his commission and his right to reimbursement and indemnity. If by such failure or negligence the principal suffers any loss, the latter may recover it as damages So too if the factor fails to render proper accounts his principal may by proper legal proceedings obtain an account and payment of what is found due; and threatened breaches of duty may be summarily stopped by an injunction "An action will of course lie against a *del credere* agent for the price of goods sold to a purchaser who has failed to make payment" Criminal acts by the factor in relation to his principal's goods are dealt with by ss 20 and 22 of the Larceny Act 1916.

PRINCIPAL AND THIRD PARTY

The rights of a third party as regards the power of a factor to bind his principal have been well-established at common law and amplified in the provisions of a special act.

(*a*) *At Common Law*—The actual authority of a factor is defined by the same limits as his duty, the nature of which has been described; *i e.*, firstly, by his principal's express instructions, secondly, by the rules of law and usages of trade, in view of which those instructions were expressed But his power to bind his principal as regards third parties is often wider than his actual authority; for it would not be reasonable that third parties should be prejudiced by secret instructions, given in derogation of the authority ordinarily conferred by the custom of trade; and, as regards them, the factor is said to have *"apparent"* or *"ostensible"* authority, or to be *held out* as having authority to do what is customary, even though he may in fact have been expressly forbidden so to do by his principal. But this rule is subject to the proviso that if the third party have notice of the factor's actual instructions, the "apparent" authority will not be greater than the actual "The general principle of law," said Lord Blackburn in the case of *Cole* v. *North-Western Bank*, 1875, L R 10, C P. 363, "is that when the true owner has clothed any one with apparent authority to act as his agent, he is bound to those who deal with the agent on the assumption that he really is an agent with that authority, to the same extent as if the apparent authority were real." Under such circumstances the principal is for reasons of common fairness precluded, or, in legal phraseology, *estopped*, from denying his agent's authority. On the same principle of estoppel, but not by reason of any trade usages, a course of dealing which has been followed between a factor and a third party with the assent of the principal will give the factor apparent authority to continue dealing on the same terms even after the principal's assent has been withdrawn; provided that the third party has no notice of the withdrawal.

Such apparent authority binds the principal both as to acts done in excess of the actual authority and also when the actual authority has entirely ceased. For instance, A. B. receives goods from C. D. with instructions not to sell below 1s. per lb.; A. B. sells at 10½d., the market price; the buyer is entitled to the goods at 10½d., because A. B. had apparent authority, although he exceeded his actual authority. On the same principle the buyer would get a good title by buying from A. B. goods entrusted to

him by C. D, even though at the time of the sale C. D. had revoked A. B.'s authority and instructed him not to sell at all. In either case the factor is held out as having authority to sell, and the principal cannot afterwards turn round and say that his factor had no such authority. As in the course of his business the factor must necessarily make representations preliminary to the contracts into which he enters, so the principal will be bound by any such representations as may be within the factor's actual or apparent authority to the same degree as by the factor's contracts.

(*b*) *Under the Factors Act, 1889.*—The main object of the Factors Acts, in so far as they relate to transactions carried out by factors, has been to add to the number of cases in which third parties honestly buying or lending money on the security of goods may get a good title from persons in whose possession the goods are with the consent, actual or apparent, of the real owners, thus calling in aid the principle of French law that *"possession vaut titre"* as against the doctrine of the English common law that *"nemo dat quod non habet"* As regards sales by factors and the title which purchasers thereby acquire against the principal, the Factors Acts are mainly declaratory of the common law as stated above, but with this difference, that whereas at common law it was always an open question of fact to be determined by the court whether the principal had in truth held out his agent as having authority to effect the sale, the effect of the Factors Acts is that the principal is *deemed* to have authorized the agent by the fact of entrusting him with the goods. Under the act of 1889 it can be put even higher, and the agent is deemed to have authority by the mere fact of having the goods in his possession with the owner's consent, although there is no evidence of the owner having actually 'entrusted' them to him; the owner's 'consent' being presumed in the absence of evidence to the contrary (*Oppenheimer* v. *Attenborough,* 1908, 1 K B. 221, C A.; *Oppenheimer* v. *Frazer and Wyatt,* 1907, 2 K.B. 50, C A.) The chief change, however, in the law relating specially to factors has been to put pledges by factors on the same footing as sales, so as to bind a principal to third parties by his factor's pledge as by his factor's sale The Factors Act 1889 in part re-enacts and in part extends the provisions of the earlier acts of 1823, 1825, 1842 and 1877. Its most important provisions concerning sales, pledges and other dispositions by factors are as follows:—

Section II, s s 1. Where a mercantile agent is, with the consent of the owner, in possession of goods or of the documents or title to goods, any sale, pledge or other disposition of the goods made by him when acting in the ordinary course of business of a mercantile agent shall, subject to the provisions of this act, be as valid as if he were expressly authorized by the owner of the goods to make the same; provided that the person taking under the disposition acts in good faith, and has not at the time of the disposition notice that the person making the disposition has not authority to make the same.

2. Where a mercantile agent has, with the consent of the owner, been in possession of goods or of the documents of title to goods, any sale, pledge or other disposition which would have been valid if the consent had continued shall be valid notwithstanding the determination of the consent; provided that the person taking under the disposition has not at the time thereof notice that the consent has been determined.

With regard to these provisions the following points should be noticed: (i.) the term 'notice' is stated by Chalmers (*Sale of Goods Act,* 10th ed p. 166) to mean probably 'actual though not formal notice: that is to say, either knowledge of the facts or a suspicion of something wrong, combined with a wilful disregard of the means of knowledge.' The onus of proving good faith and want of notice is on the purchaser of the goods. (ii.) The 'consent' of the owner to the factor's possession of the goods is to be presumed in the absence of evidence to the contrary (s. 2, s.s. 4 of the Factors Act 1889). (iii.) Although the Factors Act may operate to make an unauthorized sale or pledge by a factor good as between principal and third party, nothing in the act makes such a sale or pledge good as between principal and factor, or operates to exempt the factor from civil or criminal liability (s. 12, s.s. 1 of the Factors Act 1889). (iv.) In order that s. 2, s.s. 1 and 2 of the Factors Act 1889 (quoted above) may apply, and a sale pledge or other disposition by the factor be good as between principal and third party, it is necessary that the goods should have been in the possession of the factor *in his capacity as such,* and not in some other capacity. If, for instance, a factor also carries on business as a warehouseman, and goods are entrusted to him not in his capacity as factor, but in his capacity as warehouseman, and solely to be warehoused, any disposition of the goods by him will not be covered by the Factors Act.

Enforcement of Contracts.—1. Where a factor makes a contract in the name of his principal and himself signs as agent only, he drops out as soon as the contract is made, and the principal and third party alone can sue or be sued upon it. As factors usually contract in their own name this is not a common case. It is characteristic of brokers rather than of factors.

2. Where a factor makes a contract for the principal without disclosing his principal's name, the third party may, on discovering the principal, elect whether he will treat the factor or his principal as the party to the contract; provided that if the factor contract expressly as factor, so as to exclude the idea that he is personally responsible, he will not be liable. The principal may sue upon the contract, so also may the factor, unless the principal first intervene.

3. Where a factor makes a contract in his own name without disclosing the existence of his principal, the third party may, on discovering the existence of the principal, elect whether he will sue the factor or the principal. Either principal or factor may sue the third party upon the contract But if the factor has been permitted by the principal to hold himself out as the principal, and the person dealing with the factor has believed that the factor was the principal and has acted on that belief before ascertaining his mistake, then in an action by the principal the third party may set up any defences he would have had against the factor if the factor had brought the action on his own account as principal.

4. Where a factor has a lien upon the goods and their proceeds for advances made to the principal it will be no defence to an action by him for the third party to plead that he has paid the principal, unless the factor by his conduct led the third party to believe that he agreed to a settlement being made with his principal.

5. The factor who acts for a foreign principal will always be personally liable unless it is clear that the third party has agreed to look only to the principal, and equally the factor may always sue on the contract

6. If a factor contract by deed under seal, or draws, accepts, or indorses a bill of exchange or promissory note, he alone can sue or be sued upon the contract. (L. Sc.)

See J. Story, *Commentaries on the Law of Agency* (Boston, 1882); H. F. Boyd and A. B. Pearson, *The Factors Acts 1823 to 1877* (1884); P T. Blackwell, *The Law relating to Factors* (1897); also Mechem, *Agency* (2d ed., 1914); Williston, *Sales* (2d. ed., 1924); Weld, *Marketing of Farm Products* (1914).

United States.—In only a few particulars does the American law differ from the English as set forth above, notably in regard to the Factors Act 1889 About eight American States—chiefly on the seaboard—have Factors Acts, and those Acts are hardly so far-reaching in their effects as the English, so that in general it is not law in the United States that a factor can effectively pledge his principal's goods—beyond the extent of his own interest by virtue of advances made to his principal—to secure his own debts. There is, however, an important qualification of the rule, derived from the widespread adoption of the uniform commercial Acts. Under the Sales Act (27 States) and in some additional States, without that Act, the factor (or any other person to whom an owner has entrusted a bill of lading running to order, and properly endorsed) can effectively pledge or sell the document, and so the goods represented by the document, although he does so in breach of duty; and under the Federal Bills of Lading Act the rule holds as well for all order bills of lading arising out of inter-State shipments. Moreover, under the Warehouse Receipts Act (45

States), the same holds as to goods covered by warehouse receipts running to order. This is not true of documents which lack the word "order" or "negotiable," nor as to transactions involving goods in specie; but since most (not all) such attempted pledges involve such order documents, the old rule has been very substantially impaired.

The factor appears in the United States chiefly under the commercial designation "commission man"; goods sent to a factor, large or small, are commonly said to be shipped "on consignment," as distinguished from shipment pursuant to a contract for sale In the main, such a commission man is a feature of a central market, to which sellers, especially of raw materials, are shipping: so especially agricultural produce such as fruits and vegetables, or cotton, coffee, live stock, etc. Factorage here serves as an alternative to the middle man who goes about among growers buying up their produce in advance Both ways of dealing presuppose a seller who is relatively weak financially; hence the importance of factors' advances to their principals, and of factors' liens

It should be noted that wherever the factor attains great financial power—as, in the United States, particularly in some phases of importing and in the merchandising of textiles—he tends to develop into a peculiar and specialized type of commercial (and even investment) banker, whose loans are limited to the one specific field in which he is skilled, whose earnings include commissions on his own selling of the merchandise delivered to him as security, and whose banking assets are not recruited by deposits, so as to subject him to State control

Along another line the factor, being located in a central market and becoming skilled in its operations, tends to branch out into independent trading—as do similarly situated brokers. Hence at times a conflict of interest between himself and his principals, as to whose goods shall get sold on a falling or fluctuating market; hence also some of those financial involvements which raise the question of how far the factor has power to pledge away his principal's goods, hence, finally, occasional legislation aimed at control of the commission man's business in the interest of his principals

(K. N. L.)

FACTORS OF PRODUCTION. In economics, the four factors which together are necessary to the production of wealth These are land, capital, labour and organisation (*see* AGENTS OF PRODUCTION)

FACTORY ACTS: *see* LABOUR LAW.

FACTORY CONSTRUCTION AND PLANNING. The selection of the site and the design of factory buildings are vital economic factors in manufacture, as they contribute seriously to the cost of production, not only on account of the initial outlay of capital required, but because of their influence on efficient production. The elimination of waste, whether of material, time or effort, is the chief feature of all manufacturing, and the design of factory buildings plays its part in this elimination.

The haphazard methods of erecting factory buildings are passing, and more systematic consideration is being given to their planning and erection, though even at the present time more effort is devoted to providing good machinery than good, suitable buildings. The factors most largely influencing the design of factory buildings are large scale and standardized production; factory legislation, both government and local; building by-laws; insurance conditions and the welfare of the employees.

Regarding the actual design and building of factories, the determining factor is naturally the character of the product, but certain general considerations apply whatever the product The architect of every new factory should make himself thoroughly familiar with the processes and products of the factory before attempting his design, which should be made with a view to meeting adequately the future needs of the industry which, under favourable conditions, will naturally expand, especially as the present-day tendency is towards amalgamations and the formation of large corporations. One of the best ways of providing for this contingency is to design all buildings on the principle of suitable standardized units which can be increased as necessity arises. These standardized units should represent a complete organization, but should be so arranged as to make future extensions possible without interfering with the existing business.

Selection of Site.—The effect of location is common to all factory design, and in selecting a site all the following should be taken into account:—

Nearness to raw material supply is an important factor where raw materials are bulky and cheap, but as the bulk decreases and the value increases this factor becomes less important. It is necessary to study the convenience of existing railway lines, freightage, etc Proximity to a canal is not the important feature it was formerly The contour of the land should be studied, not only in so far as it presents a suitably level site for building purposes, but also in relation to canals, railways and other means of transport.

The supplies of electricity, gas and water are all important considerations, especially where, as in the case of some industries, enormous quantities of any one are needed, as, for example, in the pulp and paper industry, which requires a vast amount of water; or where the cost of power represents a large part of the ultimate cost of the product The climate is an important factor in certain industries, as, for example, in the textile industry, where a humid atmosphere is necessary; though in this case it is becoming less important than formerly because the humidity can be controlled artificially

Suitable Labour Supply—Where the necessary labour supply is of the unskilled type this is not an important factor, but where skilled labour is essential it is necessary to locate the industry in a district where training and heredity have developed the required type Skilled labour is not so migratory as unskilled on account of social and family attachments, etc.

Room for Expansion—It would, of course, be futile to place a factory in a crowded and congested area where there is no space for expansion The present tendency is for factories to be built on the outskirts of existing industrial areas because here (providing transport facilities are satisfactory, which is not always the case) land is usually cheaper, taxation lower and working conditions better than in the towns It is, however, difficult to induce labour that is accustomed to town life to migrate to country districts and this, coupled with the housing question (*see* HOUSING), may be an important factor operating against an otherwise ideal site Further, some industries may be dangerous or offensive and these must be located well away from congested areas

Other Factors—Capital available for investment, laws affecting the tenancy of land, sewage, floods, drinking water supply, etc, are all important points to consider in the selection of a site

Types of Factory Building.—The type of building erected for a factory depends entirely on the product to be manufactured, and the architectural form is dominated by this factor, and, in the majority of cases, by the great need for economy; but an attractive looking plant has a marked effect on employees, and has an advertising value.

Main Types.—There are, in general, three main types of factory building:—

1. The single story building of the weaving-shed type, having a saw-toothed roof consisting of a series of unequally inclined ridges, glazed usually only on the north side, which permits of uniform lighting without shadows In the single story type when the site does not permit of north lighting, the ridges, which must be equally inclined, can be glazed on both sides. This type is not well adapted for overhead shafting, cranes, etc.

2. The one-story building with large truss spans, provided with accommodation for travelling cranes, etc This is the foundry, forge and machine shop type and is suitable for medium and heavy work.

3 Multi-story buildings for all kinds of manufacture and storage, except in the case of the heaviest industries.

Naturally, each type has its advantages and disadvantages and must be considered in relation to the product of the factory; but generally, when cost of land is not prohibitive and the product is bulky, the natural choice would be towards a one-story building. Each of these three types of building permits of a construction of any one of the following kinds:—

(*a*) Timber and masonry, known as "Mill construction."

(*b*) Steel framework.
(*c*) Reinforced concrete.

Whatever type of construction is employed, the predominating necessity is "fireproofness." In the event of a fire, although the actual amount of material damage is recoverable by insurance, the loss through disorganization is not recoverable, and frequently is so overwhelming as to prevent ultimate reorganization

Mill Construction.—Mill construction is of various types, but in the main, the outside walls are of masonry, the floors of wood, and the roofs, posts, joists and girders of wood or metal Where much timber is involved the great disadvantage of this type, which for other than heavy work is in other respects satisfactory, is that for fire-resisting purposes it cannot be recommended. This type of building is seldom used for heights of more than six floors on account of its lack of lateral stability, which is chiefly dependent on the masonry of the walls, and which, if developed to any height, would require to be supported by excessive-sized pillars and increased thickness in the lower stories The adoption of this type of building is getting less and less.

Steel Framework.—Buildings of this type were made possible by the introduction of the Bessemer process of steel manufacture Here rolled steel structural members are used and filled in with walls, floor and roof, etc The steel members are riveted or bolted together Where long spans without support are necessary, steel framework is essential, and it is also necessary in the case of high walls exposed to wind pressure and to the lateral forces of moving cranes. Steel framework buildings are not fireproof because exposed steelwork twists and buckles when subject to intense heat, thus wrecking the building more quickly than the fire itself If the structural steel framework is encased in fire-resisting material such as concrete, it is admirably suitable for the interior of a factory (*see* FERRO-CONCRETE).

Reinforced Concrete.—Buildings of this material have come to be recognized as one of the standard types for industry. The material is classed as "fireproof" and will stand the destructive effects of fire as well as any material. It is not usually damaged beyond repair by fire, and seldom, if ever, destroyed It is a particularly durable material, and its durability improves with age. It is particularly well suited for multi-story buildings containing vibrating machinery or machines with heavy reciprocating parts. "Daylight factories" giving the maximum of natural lighting have come into vogue with reinforced concrete because columns or pillars may be more slender and the steel framework windows which are used give an increased lighting area. In cases where the floor load is higher than 200 lb. per sq ft, reinforced concrete buildings are cheaper than those of mill construction

Reinforced concrete buildings have developed almost entirely since 1910. The first line of development was along the form of beam and girder construction, but now the flat slab method of flooring is used, especially in cases where the live load is 150 lb. or more per square foot. For lighter loads, the development has been towards the long span joist construction with a filler of metal, tile, terra-cotta or gypsum block, which reduces dead load and saves concrete.

Details of Construction.—*Foundations*.—In choosing a site an important point is that of levels, and a site poor in this respect purchased at a low figure may eventually prove a most costly one It is also important to have full knowledge of any mineral workings going on, or likely to go on, as these might cause subsidence. The foundations of buildings which are to house heavy machinery must be ample enough to absorb vibration, and in the case of such implements as the steam and power hammer, or jarring machinery for foundries, the foundations should be entirely separate from all building structures or their foundations. It is important to choose a site where there exists a good subsoil of clay or rock, otherwise the expense of piling or rafting might make the cost of the buildings very high or even prohibitive.

Floors.—These should be designed to provide facilities for future changes, especially if they are of reinforced concrete, and ducts should be arranged to accommodate pipes, etc. Conduits should be properly placed and openings provided for belts, shafting and other accessories, properly protected. Where apparatus must be taken through floors, ample openings and trap doors or removable floor slabs are essential. Floors formed of concrete and merely spade-finished are unsuitable, and their durability should be increased by some form of floor-hardener or by the application of paving Pavings are of many kinds, metallic, granolithic, cemented, of fir boarding laid on battens, pitchpine boarding, bricking, maple boarding, rock asphalt, wood blocks, etc Each of these types has its advantages and disadvantages, some being unsuitable on account of dust, others on account of the discomfort to workers, and every building requires separate consideration. Floor areas must be laid out so as to avoid the conflict of travel in opposite directions and to permit of easy transport.

Lighting.—Windows, while no more expensive in initial outlay than walls, are an expensive item in upkeep, and with a large area of glazing the size of glass forming a unit should be of the order of 1ft. 4in by 2ft. or even larger, if of the roughcast or "prismatic" type. It is not usually essential that all parts should be made to open Steel sashing, although difficult to clean and a source of lost heat, is preferable to wooden sashing as it provides increased lighting facilities, giving 80% to 90% light area as against 50% to 70% for wooden sashes and frames One-story saw-toothed buildings should have roof windows facing north to avoid direct sunlight.

Walls.—The thickness of building walls is dictated by building acts and by-laws, and in most countries there is no possibility of erecting such walls of less thickness than 9in. or 14in depending on the height and length of the wall and whether steel framework is used As already stated in connection with the various types of building construction, various materials are used for walls such as brick, concrete, stone, etc. Where hoists and cranes are fitted these must be provided with ample support

Roofs.—Roofs are one of the large items in building construction. Their particular form is dependent upon the intended purpose of the building; a high pitched gabled roof is the best for forges, foundries and other shops engaged in hot processes in which large quantities of heat require to be dissipated, and in other cases where a level ceiling is not required, the glazed saw-toothed form of roof provides the best condition of steady, uniform, natural lighting; the flat roof is the natural type for buildings with interior columns. Whatever the type the essential features are water- and fire-proofness For general purposes the best material is mineral rock asphalt, which is unaffected by heat or cold and requires no yearly treatment, and is also capable of withstanding traffic without damage. Where sloping roofs are used, steel or reinforced concrete roof principals are employed, and this method of support is now as cheap as steel Slates as a covering are high in first cost and heavy for long span roofs, but if of good quality are very durable. Bituminous felts and other compositions in sheet form are low in first cost, but require special treatment every few years.

Heating and Ventilation.—Of these two subjects the latter is the more important. In an ordinary factory the air should be changed three to five times per hour, while under some circumstances it should be changed as many as 20 times per hour. The temperature also varies with the nature of the work carried on, but a good average is 57° F, though for heavy manual labour a lower temperature should prevail, and for sedentary work, a higher. Various systems of ventilation and heating are employed, but the most suitable for the particular case must be selected, care being taken to economize space and avoid interference with cranes, conveyors, etc. (*see* PUBLIC HEALTH).

Stairways, Lifts, Elevators, etc.—Stairways should be ample for emergencies and give passengers the least inconvenience, a 6½in rise being considered good practice. Lifts should be encased with brick walls to prevent the spread of fire, and the openings should be fitted with doors of fire-resisting material made to close automatically in case of fire.

Power Supplies.—Where power is generated on the site, the plant should be located at a point most convenient for the handling of fuel and ashes, and all boiler and engine-room equipment should be capable of extension. Where live steam is used in the manufacturing processes, the power plant should be situated cen-

rally in order to avoid the necessity of long lengths of piping and excessive loss of heat.

Fire Protection.—The installation of apparatus to deal with outbreaks of fire is a necessity in all industrial buildings. The most usual form is by the sprinkler system in which pipes are fixed horizontally along the ceiling, and supplied with water which is not released until the temperature in the building is sufficiently high to melt the solder which holds the automatic valve of the sprinklers in position. When this is released the water is discharged over the affected area. Where sprinklers are not used, hydrants with lengths of hose should be fixed near stairs and in easily accessible positions and fire buckets and chemical fire extinguishers should be placed within the reach of anyone in the building In the case of some trades, buckets of sand are more useful than water Lightning-conductors should be fixed to all buildings (*See* also INDUSTRIAL ARCHITECTURE)

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FACTORY INSPECTION. In Great Britain, the duties of the factory inspectors consist broadly in the enforcement of the Factory and Workshop Acts, Truck Acts (in factories and workshops), and the Lead Paint (Protection against Poisoning) Act, 1926, and may be grouped under the following main heads:—

Sanitation.—The inspectors see that all factories are kept clean, are properly ventilated and not overcrowded, and that a reasonable temperature is maintained in each workroom The local sanitary authorities are primarily responsible for these duties in workshops, but there is close co-operation between them and the Factory Department; the inspectors report all irregularities observed during their inspections, while the local authorities advise the inspectors of workshops they discover where the prescribed Abstract of the Factory and Workshop Acts is not affixed.

Sufficient and suitable sanitary conveniences must be provided, with separate accommodation for each sex, in all areas. This requirement is directly enforceable by the inspectors both in factories and workshops, except in the administrative county of London, or in any place where Part III. of the Public Health Act (Amendment Act), 1890, is in force. As both the Public Health (London) Act, 1891, and the Public Health Act (Amendment Act), 1890, impose the same obligations, works in areas coming under those acts are excluded from the operation of the Factory and Workshop Act, but the factory inspectors co-operate by reporting to the local authorities any irregularities observed. In those parts of England and Wales where Part III. of the Public Health Act, 1890, is not in force and in Scotland the District Council may still deal with the matter under the Public Health Acts, subject to the observance of the standard of sufficiency and suitability determined by order of the secretary of State, but in these areas the duty of seeing that sufficient and suitable accommodation is provided and of administering the secretary of State's order rests primarily with the factory inspectors. At the same time, the inspectors inform the District Council of any instructions issued to occupiers, in order that the council may have the opportunity of enforcing simultaneously any additional conditions under the Public Health Acts which they think desirable. Thus full co-operation is secured.

Safety.—All machinery is inspected to see that a proper standard of fencing is maintained. Though no definite standards are laid down in the act, regulations have been made in the more dangerous industries, specifying in detail the protection required. In other industries agreements have been reached at trade conferences between the department and employers and operatives as to the safeguards to be provided in those industries. Further, departmental instructions based on long experience, and partly also on High Court decisions, have resulted in the establishment of well recognized standards which enable the inspectors to secure uniformity of practice.

The inspectors receive notice of all accidents, investigate their cause, and advise as to measures for preventing a recurrence. They also assist the coroners at inquests. They are responsible for seeing that steam boilers are regularly examined, and reports obtained on the condition of the boiler and its mountings, specifying the maximum permissible working pressure. Another important duty is that of seeing that adequate means of escape in case of fire is provided and maintained. Though the local authorities are primarily responsible in this matter, the inspector must report to these authorities cases where, in his opinion, the means of escape is inadequate, and he must be informed of the action taken as a result of his complaint.

Besides enforcing the statutory requirement in regard to safety, the inspectors are constantly in touch with employers on the question of accident prevention generally. Many accidents arise from conditions and practices which cannot be controlled by legal enactments. The inspectors are thus called upon to take up the question of safety generally, and in particular they do all they can to encourage the modern movement towards the adoption of safety organization as a definite part of works management.

Employment.—The inspectors must see that the hours of employment of women and young persons are within the prescribed limits, both during normal hours and during such overtime or night work as is permissible and that proper meal times are allowed. They have to report on applications for permission to work on a system of two shifts, and to enforce the conditions attached to orders sanctioning this system of employment. They must see, too, in those trades to which this requirement of the act applies, that workers paid on a piece-work basis receive such particulars regarding the work to be done and the rate of wages to be paid as will enable them to calculate the wages earned They are responsible for seeing that no fines or deductions are made from the wages in contravention of the Truck Acts.

Dangerous Trades.—Special duties arise in relation to trades certified as dangerous, either because of the special risk of injury to health from lead, anthrax and silicious and other injurious dusts, or because of the specially dangerous character of the work, as in building, shipbuilding, dock work, wood-working, the use of celluloid and the generation or use of electricity. For these trades special regulations are in operation dealing with such matters as exhaust ventilation, medical supervision, cleanliness, messroom and cloakroom accommodation for the first class, and with detailed measures of protection for the second. The inspectors not only enforce these regulations but take a leading part in their establishment by collecting information as to the best existing practice and by advising as to the requirements to be included in the code.

Welfare.—Similar to the dangerous trades regulations are the welfare orders made to secure the comfort and wellbeing of workers in industries where special welfare arrangements are needed These deal with the provision of first-aid and ambulance arrangements where accidents are specially numerous; the provision of messrooms, cloakrooms, and lavatories in dirty or offensive trades; arrangements to secure cleanliness and first-aid treatment in industries such as fish-curing, baking, chrome dyeing and tanning, where the workers suffer from minor injuries through the materials used. These orders also are framed on reports from the inspectors and are enforced by them.

The department is under the control of the chief inspector, assisted by three deputy chief inspectors (one a woman). The country is divided into divisions, each under a superintending inspector, and each division is divided into districts, under district inspectors, to the more important of which junior and assistant inspectors are attached. Until 1921, the women inspectors were organized as a separate branch, but the two branches have since been amalgamated.

In 1928 the general staff was as follows:—10 superintending inspectors (one a woman) 86 inspectors Class I., 32 inspectors Class II., 7 women deputy superintending inspectors, 8 women district inspectors, 15 women inspectors, 1 senior inspector of particulars, 4 assistant inspectors of particulars, 23 inspectors' assistants.

With the development of industry and the increased attention paid to ventilation, engineering, medical and other problems, the work of the department has become much more technical Separate technical branches have, therefore, been established. The medical branch consists of a senior medical inspector with four medical inspectors (one a woman) under him. The electrical branch recently strengthened to cope with the rapid increase in the use of electricity, consists of one senior inspector with four inspectors under him. The engineering branch consists of a senior engineering inspector with a staff of five

There are under the jurisdiction of the department some 270,000 factories, 8,000 docks, quays and warehouses, and many buildings in course of construction. Nearly 350,000 visits of inspection are paid every year. The position of the inspectors has, however, greatly changed in recent years Whereas formerly they had to enforce an unpopular act and contend with all kinds of opposition, they have become more the advisers of the employers, who often consult them on all kinds of questions. They are, indeed, by virtue of their previous scientific, professional and technical training, added to their long and varied experience of the industries of the country, a body of industrial experts, whose services are at the disposal of industry to assist and advise The value of their special industrial knowledge was amply shown during the World War when they were called upon to carry out many different kinds of war work, including such varied duties as inspection of steel for the Admiralty, service as superintending engineers and in the organization of welfare work at the Ministry of Munitions, assisting in recruiting and advising on substitution at the Ministry of National Service (G. BEL.)

United States.—Inspection by the national Government applies to all Federal Government work places and to operations in inter-State commerce and to employments aboard vessels on navigable waters Broad inspection powers are exercised by the U S Employees Compensation Commission, by the Shipping Commissioners and by Inter-State Commerce Committee representatives. Most industrial inspection in America is under authority of the 48 individual States, New York having 183 inspectors of whom 31 are women, visiting 66,000 factories and 100,000 mercantile establishments in addition to homes where factory work is carried on, places of public assembly and extensive construction enterprises. The New York Labor Department also administers accident compensation, thus unifying and giving special force to industrial safety and health inspections. The head is a commissioner with an industrial board of five members, the chairman of which is a woman. (J. B. A.)

FACTORY SYSTEM. The system under which modern industry is carried on is often spoken of as the "factory system," and contrasted with a preceding "domestic system," or system of household industry This contrast is in fact true only in a very broad sense; for the name "domestic system" is by no means generally applicable to the forms of industrial organization before the great changes of the late 18th and early 19th centuries There were many factories, usually small, and still more fairly large workshops in which the workers laboured under the eye of a master or his manager long before the days of the Industrial Revolution. The case of the famous Jack of Newbury (16th century) as an early factory owner is well known; and there were many others, the number of fairly large industrial establishments steadily increasing, even before the advent of steam power The contrast between domestic and factory industry is indeed in the main a generalization drawn from the rapid transformation of the spinning and weaving trades in the late 18th and early 19th centuries under the stimulus of mechanical invention and the development of steam power If these cautions are borne in mind, the factory system can be regarded as the typical organization of industry since the Industrial Revolution. Steam power is, indeed, the very basis of the factory economy as it has appeared in the modern world. Only with the coming of power-driven machinery and the power-house did it become an economic necessity in one manufacturing trade after another to collect the operatives together under the roof of the employer, and to insist on regular hours of labour and a regular discipline. Thereafter, increasingly, the power-plant set the pace and governed the conditions of labour. Under the "domestic system," it mattered relatively little to the capitalist what hours, or with what intensity, the worker laboured. He was paid by the piece, and how much he produced in response to the piece-work incentive was in the main his own affair. But as soon as the factory, with its power-plant, had to earn its keep, the intensity and duration of labour became matters of direct economic concern to the employer. Hence the excessively long hours, and the barbarous speeding-up of the early days of the factory system, when it was not uncommon for children, as well as adults, to be worked as much as 14 hours a day. Similar conditions have to some extent reproduced themselves in the Eastern countries now in process of industrialization.

Rise of Trade Unions.—As the factory system spread, and the workers were collected into large masses in the new factory towns, trade unionism naturally arose among them, partly as the response to evil conditions, and partly as the expression of an instinctive desire for association. To a great extent, the factory system called trade unionism into being, supplementing the much older small trade clubs of the skilled artisans by the larger-scale combinations which arose, and won their way to toleration, in the earlier half of the 19th century in England, and later elsewhere, as the factory system developed in other countries. At first the typical factories were, by modern standards, small; but with the development of industrial technique they grew rapidly in size, and their organization was transformed. Increasingly, the limited company took the place of the personal employer; and working conditions came to be regulated by State intervention (Factory Acts of 1802, 1819, 1833, 1847, 1867 . to 1901, Mines Acts, Truck Acts, etc), and by collective bargaining, as the employers, especially after the Trade Union Act of 1871, growingly recognized trade unions and entered into (unenforceable) collective agreements with them To-day, save in a few surviving "sweated" trades, in which "home-work" still lingers, the factory system is practically universal in developed industrial countries, and is rapidly spreading in such countries as India and China. In the advanced countries its evils have been a good deal mitigated by trade union custom, and by industrial legislation; but in the more recently industrialized areas conditions are still very bad One of the main functions of the International Labour Organization founded, as an integral part of the League of Nations, in 1919, is the regulation of factory conditions throughout the world by means of international conventions ratified and made effective by corresponding national legislation. But progress in this respect has been so far (1928) very slow.

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FACULA (diminutive of *fax*, Lat. for "torch"), in astronomy, a minute shining spot on the sun's disk, markedly brighter than the photosphere in general, usually appearing in groups Faculae are most frequent in the neighbourhood of spots. (*See* SUN.)

FACULTY, power or capacity of mind or body, for particular kinds of activity, feeling, etc. In the early history of psychology the term was applied to various mental processes considered as causes or conditions of the mind—a treatment of class concepts of mental phenomena as if they were real forces producing these phenomena. In mediaeval Latin *facultas* was used to translate *δύναμις* in the Aristotelian application of the word to a branch of learning or knowledge, and thus it is particularly applied to the various departments of knowledge as taught in a university and to the body of teachers of the particular art or science taught. A further extension of this use is to the body of members of any particular profession.

In law, "faculty" is a dispensation or licence to do that which

; not permitted by the common law. The word in this sense is sed only in ecclesiastical law. (*See* BENEFICE; MARRIAGE; LI-ENCE; NOTARY PUBLIC) Any alteration in a church, such as an ddition or diminution in the fabric or the utensils or ornaments, annot strictly be made without the legal sanction of the ordinary, hich can be expressed only by the issue of a faculty. So a faculty ould be required for a vault, for the removal of a body, for the urpose of erecting monuments, for alterations in a parsonage ouse, for brick graves, for the apportionment of a seat, etc. athedrals, however, are exempt. The court of faculties is the ourt of the archbishop for granting faculties. In Scotland the ociety of advocates of the court of session, and local bodies of gal practitioners, are described as faculties.

FACULTY PSYCHOLOGY is the name given to the older sychology which "explained" the various mental processes by eference to corresponding "faculties" (Latin *facultas*, a capacity) hich exercised them. Thus the process of thinking was explained y reference to the faculty of "understanding" or of "reason," ie process of volition was referred to the faculty of "will," and) on. Although the faculty psychology has been frequently erived from the days of Locke onwards, it is not entirely dead, or it still seems to haunt some of the latest books on psychology i the guise of "abilities"

FADING is the variation of the signal intensity received at given location from a radio transmitting station as a result of anges in the transmission path

FADNIA, a Guhayina sub-group, partly nomadic, partly sed-ntary, in the Sudan.

FAED, THOMAS (1826–1900), British painter, born in irkcudbrightshire, studied at the school of design, Edinburgh, as a member of the Royal Scottish Academy, and became R A 1864 Three of his pictures, "The Silken Gown," "Faults on oth Sides" and "The Highland Mother," are in the National allery of British Art (Tate Gallery), London.

See William D. McKay, *The Scottish School of Painting* (1906).

FAENZA, a city and episcopal see of Emilia, Italy (anc. *aventia*), province of Ravenna, 31 m. S W from the town of avenna by rail, 110 ft above sea-level It is 31 m. S E. of ologna by rail, on the line from Bologna to Rimini, and it is the nction of a line to Florence through the Apennines Pop. (1921) 2,469 (town), 43,101 (commune). The town still preserves aces of the Roman rectangular plan, and is surrounded by walls hich date from 1456 The cathedral of S. Pietro stands in the ntre of the town It was begun in 1474 by Giuliano da Maiano, e façade is, however, incomplete. In the interior is the beau-ful early Renaissance tomb of S Savinus with reliefs showing enes from his life, by Benedetto da Maiano Opposite the thedral is a fountain with bronze ornamentation (1621) The unicipal buildings have been restored, the picturesque arcades of e Palazzo del Comune date from the 15th century and those of e Palazzo del Podestà from the 18th. The municipal art gallery ntains fine specimens of majolica, a variety of which, faience, kes its name from the town It was largely manufactured in the 3th and 16th centuries, and the industry has been revived in odern times with success. *See* CERAMICS. There is an interna-onal museum here of ceramics with specimens of every date and untry. The name Faventia is clearly Roman. The town lay on e Via Aemilia. here Papirius Carbo and C Norbanus were feated by Q. Caecilius Metellus Pius in 82 B.C Pliny speaks of e whiteness of its linen, and the productiveness of its vines is entioned. In 740 it was taken by Liutprand. Desiderius gave it the church with the duchy of Ferrara It was a free city at the ginning of the 12th century and at first took the imperial side, it in 1240 it stood a long siege from Frederick II. and was taken ly after eight months. In 1313 the Manfredi made themselves asters of the place and remained in power until 1501, when the wn was taken by Caesar Borgia.

FAEROE ISLANDS (also written FAROE or THE FAEROES, anish *Faeröerne* or *Faröerne,* "the sheep islands"), a group of lands in the north Atlantic ocean belonging to Denmark. They e situated between Iceland and the Shetland islands, about 30 m. N W. of the latter, about 7° E and 62° N. The total land area of the group is 515 sq.m. and there are 21 islands (excluding small rocks and reefs), of which 17 are inhabited Pop. (1925) 22,835. The principal islands are Strömö, Osterö, Südero, Vaago, Sando and Bordo. The islands were formed by a series of submarine outpourings of basalt in Tertiary times Together with the thin intercalated beds of tuff, they have a total thickness of 70 to 100 feet. The columnar structure of the basalt can be well seen in the islands of Sudero. Upon the basalt rests the so-called coal formation 35 to 50ft. thick; the lower part of this is mainly fireclays and sandstone, and the upper is weathered clay with thin layers of shale and brown coal. The latter occurs, especially in Sudero, in sufficient quantities to be worth exploitation Above this, over the greater part of the surface, lie beds of dolerite 15 to 20ft thick. All these beds lie practically horizontal. During the Glacial period the whole surface up to 1,500ft. was covered by ice sheets, and the present relief is due mainly to the action of ice upon the horizontal beds. The islands are high and rugged, with perpendicular cliffs and flat summits separated by deep narrow ravines. The coasts are deeply indented and a series of fjords run from north-west to south-east The narrow passages between the islands tend to follow the same direction and are made dangerous by very strong tidal currents The coastal scenery is very fine, especially in the more westerly islands. The greatest height in the islands is Slattaretindur in Ostero, 2,894 feet. There are several lakes in which trout is abundant, and char is also found, the largest is Sorvaag lake in Vaago which discharges into the sea by a sheer fall of about 160 feet

The climate is oceanic, with mild but stormy winters and cool summers Rainfall is heavy and well distributed, the maximum occurring in autumn and winter The sky is generally overcast, and fogs are frequent There are seldom long periods of frost and the harbours are very rarely ice-bound At midsummer the sun is above the horizon for about 19¾ hours

Owing to the strong westerly winds and frequent gales the islands are naturally treeless but there has been successful planting of hardy conifers, also maple and mountain ash Much of the natural vegetation has been dwarfed by continuous grazing. Berry fruits flourish, and potatoes are one of the most successful crops, but the methods of agriculture are extremely primitive and less than 3% of the total area is under cultivation As the plough is ill-suited to the rugged surface of the land, the ground is usually turned up with the spade. The pasture is on the whole good, but horses and cows are few, and the cows give little milk, in consequence of the coarse hay upon which they are fed The number of sheep, however, justifies the name of the islands, the total number in the islands now exceeding 60,000. The catching of the numerous sea-birds which build their nests upon the face of the cliffs forms an important source of subsistence to the inhabitants. The puffin is taken for its feathers and for food, and the feathers of the eider duck are collected Fowling has somewhat decreased in modern times, as the fisheries have risen in importance. The cod fishery is especially important, dried fish being exported in large quantity, and the swim-bladders made into gelatine The whaling industry came into importance towards the close of the 19th century, and stations for the extraction of the oil and whalebone have been established at several points The finner whale is the species most commonly taken.

More than one-third of the population is engaged in fishing There is a small home industry in spinning and knitting. The produce of the whaling and fishing industries, woollen goods, lamb skins and feathers, are the chief exports, while in Thorshavn the preserving of fish and the manufacture of carpets are carried on to some extent. Thorshavn, the seat of government, is situated on the south-east side of Stromö, upon a narrow tongue of land, having creeks on each side, where ships may be safely moored. The houses are generally built of wood and roofed with birch bark covered with turf. The character of the people is marked by simplicity of manners, kindness and hospitality. They are healthy, and the population increases steadily. The Faeroes form an *amt* (county) of Denmark. They have also a local parliament (*lagthing*), consisting of the *amtmann* and 19 other members. Among other duties, this body elects a representative to the upper

house of parliament (*landsthing*) in Denmark; the people choose by vote a representative in the lower house (*folkething*). The islands are included in the Danish bishopric of Zealand.

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HISTORY

It seems probable that the islands were peopled in the 9th century by Norse settlers. In the 11th century Sigmund Bresterson took possession of the islands for Olaf Trygvason, king of Norway, and introduced Christianity into the islands The Norwegian supremacy continued till 1386, when the islands were transferred to Denmark. English adventurers gave great trouble in the 16th century, and the name of Magnus Heineson, a native of Strömo, who was sent by Frederick II. to clear the seas, is still celebrated in many songs and stories. There was formerly a bishopric at Kirkebo, south of Thorshavn, but it was abolished at the introduction of Protestantism by Christian III. Denmark retained possession of the Faeroes at the peace of Kiel in 1815. The native literature of the islands consists of the *Faereyinga Saga,* dealing with the period of Sigmund Bresterson, and popular songs and legends of early origin.

Rise of Nationalism.—Since 1910 the development of an active movement in favour of self-government has been the most prominent feature of politics in the Faeroes Though the *Sjálvstýrisflokkur,* or Home Rule party, was first organized in 1906, some points in the nationalist programme have an earlier origin. The endeavour to secure for the national speech of the inhabitants a position of equality with the official Danish dates from the middle of last century

Since 1912 the use of the local as well as the Danish language in education and in conduct of religious services has, to some extent, been authorized The claims of extreme nationalists, however, are not yet satisfied The complaints of Danish misrule made by Home Rulers seem based more on the events of the past than the present. The Danish Government has voted considerable sums towards the construction of roads and harbour works, as well as to the support of education. The large increase in the population, which has nearly doubled since the beginning of the century, indicates a considerable measure of prosperity.

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FAESI, ROBERT (1883–), Swiss poet, dramatist, story-writer and literary critic, was born at Zürich on April 10, 1883, and became professor of German literature at the university of that town. He is one of the very few successful playwrights that Switzerland can boast, his tragedies *Odysseus und Nausikaa* (1911) and *Opferspiel* (1925) and the comedy of *Die Fassade* (1918) attaining a high level of excellence His chief poems are *Aus der Brandung* (1917; an outcome of the World War) and *Der Brennende Busch* (1926). The *Zürcher Idylle* (1908) and the *König von Ste. Pelagie* (1924) are attractive short stories. His critical works include studies of Carl Spitteler (1915), Rainer Maria Rilke (1919), and C. F. Meyer (1925), and a volume entitled *Gestalten und Wandlungen Schweizerischen Dichtung* (1922).

FAESULAE, an ancient city of Etruria, on the height 3 m. to the N.E. of Florentia, 970 ft. above sea-level (mod. *Fiesole, q v.*) Remains of its walls of large blocks of stone are preserved on all sides, especially on the north-east The whole circuit extended for about 1¾ m The Franciscan monastery (1,130 ft) occupies the site of the acropolis, once encircled by a triple wall, of which no traces are now visible. The Roman theatre, below the cathedral to the N E , has 19 tiers of stone seats and is 37 yd in diameter To the north of the theatre was an Etruscan temple with three *cellae,* apparently converted into the Capitolium in Roman times; while to the east of it are the Roman baths. There was also an ancient temple on the site occupied by the church of S. Alessandro. A small museum contains the objects found in the excavations.

Though Faesulae was an Etruscan city, we have no record of it in history until 225 B C , when the Gauls passed near it in their march on Rome. Eight years later Hannibal seems to have taken this route in his march south after the victory of the Trebia Sulla expelled some of the inhabitants from their lands to make room for his veterans, but some of the latter were soon driven out in their turn by the former occupiers Both joined the partisans of Catiline, and Manlius, one of his supporters, made his headquarters at Faesulae In A D 405 Radagaisus was crushed in the neighbouring hills, and Belisarius besieged and took it in A.D 539

FAFNIR, in Scandinavian mythology, the son of the giant Hreidmar He was the guardian of the hoard of the Nibelungs

FAGACEAE, in botany, the beech family, dicotyledonous plants, most of the 350 species being trees The family includes five genera, the most important being *Fagus* (beech, *q.v.*), *Quercus* (oak, *q v.*) and *Castanea* (chestnut, *q.v.*). The flowers are borne in catkins in the axils of the leaves, and are unisexual. The pollen is wind-borne The fruit is a one-seeded nut.

FAGAN, JAMES BERNARD (1873–), an Irish playwright and producer whose works include *Shakespeare versus Shaw,* produced (1905), an adaptation of *Bella Donna* (1911), *The Happy Island* (1913), *And So to Bed* (1926) and *The Greater Love* (1927) He studied law at Trinity college, Oxford, and was attached for a time to the Indian Civil Service, later he joined the F R Benson company, his principal stage appearances being in this connection and at His Majesty's theatre, London, with Sir Herbert Tree.

FAGGING, in English public schools, a system under which, generally with the full approval of the authorities, a junior boy performs certain duties for a senior (from "fag" meaning "weary"; of uncertain etymology). Dr. Arnold of Rugby defined fagging as "the power given by the supreme authorities of the school to the Sixth Form, to be exercised by them over the lower boys, for the sake of securing a regular government among the boys themselves, and avoiding the evils of anarchy: in other words, of the lawless tyranny of brute force." Fagging was a fully established system at Eton and Winchester in the 16th century at least. In almost all the great public schools founded during the 19th century fagging has been deliberately adopted by the authorities The right to fag carries with it certain well-defined duties The fag-master is the protector of his fags and responsible for their happiness and good conduct. In cases of bullying or injustice their appeal is to him, not to the form or house master, and, except in the gravest cases, all such cases are dealt with by the fag-master on his own responsibility. Until recent years a fag's duties included such humble tasks as blacking boots, brushing clothes, and cooking breakfasts, and there was no limit as to hours Fagging is now restricted to such light tasks as running errands, bringing tea to the "master's" study, sweeping and tidying the studies, and fagging at cricket or football.

FAGGOT, a bundle of sticks used for firewood. Recanted heretics wore an embroidered faggot on the arm as a symbol of the punishment they had escaped. In the 18th century the word is used of a "dummy" soldier appearing on the rolls of a regiment.

"faggot-vote" is one artificially created by the minute splitting up of property so as to give a bare qualification for the anchise.

FAGNIEZ, GUSTAVE CHARLES (1842–), French storian and economist, born in Paris, Oct. 6, 1842. His *Études r l'industrie et la classe industrielle à Paris au XIIIe et au XIVe ècle* (1877) opened a new field for historical study. He also rote *Documents relatifs à l'histoire de l'industrie et du commerce t France* (1898–1900), *L'Économie sociale de la France sous enri IV.*, *Le Père Joseph et Richelieu* (1894), and *Journal pasien de Jean de Maupoint, prieur de Ste. Catherine-de-la-Coure.*

FAGUET, ÉMILE (1847–1916), French critic and man of tters, was born at La Roche sur Yon. He was educated at the ormal school in Paris, and after teaching for some time in La ochelle and Bordeaux he came to Paris. After acting as assistant ofessor of poetry in the university he became professor in 1897 e was elected to the academy in 1900, and received the ribbon of e Legion of Honour in the next year He acted as dramatic itic to the *Soleil;* from 1892 he was literary critic to the *Revue eue*, and in 1896 took the place of M. Jules Lemaître on the urnal des débats Among his works are monographs on *Flaubert* (1899), *André Chénier* (1902), *Zola* (1903), *Balzac* (1913), *gr. Dupanloup* (1914), etc ; an admirably concise *Histoire la Littérature française depuis le XVIIe siècle jusqu'à nos urs;* series of literary studies on the 17th, 18th and 19th cenries, *Questions politiques* (1899), *Propos littéraires* (3 series, 02–05); *Le Libéralisme* (1902); *L'Anticléricalisme* (1906); *Paceficisme* (1908); and several works on Rousseau (between 10 and 1912) He died in Paris on June 7, 1916

FA-HIEN (*fl* AD 399–414), Chinese Buddhist monk, pilgrim-aveller and writer, author of one of the earliest and most valule Chinese accounts of India He started from Changgan or Sin-fu, then the capital of the Tsin empire and, passing the Great all, crossed the "River of Sand" or Gobi Desert beyond, that me of "evil demons and hot winds," which he vividly describes where the only way-marks were the bones of the dead, where no rd appeared in the air above, no animal on the ground below. riving at Khotan, the traveller witnessed a great Buddhist fes-al; here, as in Yarkand, Afghanistan and other parts thoroughly lamized before the close of the middle ages, Fa-Hien shows us ddhism still prevailing India was reached by a perilous descent "ten thousand cubits," from the "wall-like hills" of the Hindu ush into the Indus valley (about AD. 402); and the pilgrim ssed the next ten years in the "central" Buddhist realm—making rneys to Peshawur and Afghanistan (especially the Kabul region) one side, and to the Ganges valley on another His especial conrn was the exploration of the scenes of Buddha's life, the copying Buddhist texts, and converse with the Buddhist monks and sages om the Brahman reaction had not yet driven out Thus we find n at Buddha's birthplace on the Kohana, north-west of Benares; Patna and on the Vulture Peak near Patna; at the Jetvana nastery in Oudh; as well as at Muttra on the Jumna, at Kanauj, d at Tamluk near the mouth of the Hugli. Later the narrative, ich in its earlier portions was primarily historical and geoaphical, abandons records of fact for theology. From the Ganges lta Fa-Hien sailed with a merchant ship, in fourteen days, Ceylon, where he transcribed all the sacred books, as yet unown in China, which he could find; witnessed the festival of exhibition of Buddha's tooth; and remarked the trade of ab merchants to the island, two centuries before Mohamed.

Fa-Hien's work is valuable evidence of the strength of Buddhism central Asia and in India at the time of the collapse of the man empire in western Europe. His record is careful and acrate, and most of his positions can be identified

See James Legge, *Record of Buddhistic Kingdoms, being an account the Chinese Monk Fâ-hien of his travels in India and Ceylon;* nslated and edited, with map, etc. (Oxford, 1886); S. Beal, *Travels Fah-Hian and Sung-Yun, Buddhist pilgrims from China to India,* . *400 and 518,* translated with map, etc. (1869); C. R. Beazley, wn *of Modern Geography*, vol i., pp. 478–485 (1897). *The travels Fa-hsien,* retranslated by H. A. Giles (1923).

FAHLCRANTZ, CHRISTIAN ERIK (1790–1866), Swedish author, was born at Stora Tuna and studied at Uppsala, where he became tutor in Arabic in 1821, and professor of oriental languages in 1825. He then entered the Church, and in 1849 became bishop of Vesterås. He died on Aug. 6, 1866. His works include: *Noachs Ark* (2 parts, 1825 and 1826), a satire on the political and social life of his time; *Ansgarius* (1835–46), an epic in 11 parts; and *Rom förr och nu* (5 vols., 1858–61), a polemical work directed against the Jesuits.

FAHRENHEIT, GABRIEL DANIEL (1686–1736), German physicist, was born at Danzig on May 14, 1686. For the most part he lived in England and Holland, devoting himself to the study of physics and making a living, apparently, by the manufacture of meteorological instruments. He was the author of important improvements in the construction of thermometers, and he introduced the thermometric scale known by his name and still extensively used in Great Britain and in the United States (*see* THERMOMETRY). He also invented an improved form of hygrometer, a description of which, together with accounts of various observations and experiments made by him, was published in the *Phil. Trans.* for 1724. He died in Holland on Sept. 16, 1736.

FAIDHERBE, LOUIS LÉON CÉSAR (1818–1889), French general and colonial administrator, born on June 3, 1818, at Lille, received his military education at the École Polytechnique and at Metz, and entered the engineers in 1840. From 1844 to 1847 he served in Algeria, then two years in the West Indies, and again in Algeria, taking part in many expeditions against the Arabs. In 1852 he was transferred to Senegal as sub-director of engineers, and in 1854 became governor of the colony. He held this post with one brief interval until July 1865 The work he accomplished in West Africa constitutes his most enduring monument At that time France possessed in Senegal little else than the town of St Louis and a strip of coast Faidherbe dreamed of creating a French African empire stretching from Senegal to the Red sea. By boldly advancing the French outposts on the upper Senegal he stemmed the Muslim advance on the Middle Niger, and by an advantageous treaty with Omar al-Hadji, the ruler of these countries, in 1860 he brought the French possessions into touch with the Niger He also conquered the country lying between the Senegal and Gambia. When he resigned his post the foundation of the French dominion in West Africa had been laid In 1863 he became general of brigade

From 1867 to 1870 he commanded the subdivision of Bona in Algeria, and was commanding the Constantine division at the commencement of the Franco-German War. Promoted general of division in Nov. 1870, he was appointed (Dec. 3) commander-in-chief of the army of the North The struggle between the I. German army and that commanded by Faidherbe, in which were included the hard-fought battles of Pont Noyelles, Bapaume and St. Quentin, was perhaps the most honourable to the French army in the whole of the People's War. Elected to the National Assembly for the department of the Nord, he resigned his seat in consequence of its reactionary proceedings. Faidherbe was made chancellor of the order of the Legion of Honour. In 1872 he went on a scientific mission to Upper Egypt, where he studied the monuments and inscriptions. He was elected a senator in 1879. He died on Sept. 29, 1889, and received a public funeral. Statues and monuments to his memory were erected at Lille, Bapaume, St. Quentin and St. Louis, Senegal. His works include: *Collection des inscriptions numidiques* (1870); *Epigraphie phénicienne* (1873); *Essai sur la langue poul* (1875); *Le Zénaga des tribus sénégalaises* (1877); *Campagne de l'armée du Nord* (1871); *Le Soudan Français* (1884); *Le Sénégal* (1889).

See Brunel, *Le Général Faidherbe* (2 vols., 1892); Riethy, *Histoire populaire du général Faidherbe* (1901) and Froelicher, *Trois Colonisateurs: Bugeaud, Faidherbe, Galliéni* (1903).

FAIDIT, GAUCELM (d. *c.* 1220), French troubadour, was born at Uzerche. He married Guillelma Monja, and on account of his dissolute life fell into great need from which he was relieved by Richard, Coeur de Lion. His later passion for Marie de Ventadour, who persuaded him to go on the crusade, formed the subject of many of his love poems. Besides these, the chief

of which is *Le Triomphe de l'Amour,* imitated by Petrarch, Gaucelm's most important works are the poem on the death of Richard and *L'Hérésie des Prêtres,* a satire on the corruptions of the church.

See R. Meyer, *Das Leben des Trobadors Gaucelm Faidit* (Heidelberg, 1876), and F. Diez, *Leben und Werke der Troubadours* (2nd ed., Leipzig, 1883).

FAÏENCE, a term applied generally to all kinds of glazed pottery, but properly the French word for the *porzellana di Faenza,* a fine kind of glazed and painted earthenware made in Faenza, Italy (*see* POTTERIES AND PORCELAINS).

FAILLY, PIERRE LOUIS CHARLES DE (1810–1892), French general, was born at Rozoy-sur-Serre (Aisne) on Jan. 21, 1810, and entered the army from St. Cyr in 1828. In the war of 1859 de Failly commanded a division, and in 1867 he defeated Garibaldi at Mentana, this action being the first in which the chassepot was used In 1870 de Failly commanded the V. corps His inactivity at Bitsch on the 6th of August while the I. corps on his right and the II corps on his left were crushed at Wörth and Spicheren respectively, gave rise to the greatest indignation in France, and his military career ended, after the V corps had been severely handled at Beaumont on Aug. 30, with the catastrophe of Sedan The rest of his life was spent in retirement De Failly wrote *Campagne de 1870, Opérations et marche du 5me corps jusqu'au 30 août* (Brussels, 1871).

FAIN, AGATHON JEAN FRANÇOIS (1778–1837), French historian, was born in Paris Under the Consulate he entered the office of the secretary of State, in the department of the archives In 1806 he was appointed secretary and archivist to the *cabinet particulier* of the emperor, whom he attended on his campaigns and journeys He was created a baron of the empire in 1809, and, on the fall of Napoleon, was first secretary of the cabinet and confidential secretary He published successively *Manuscrit de 1814, contenant l'histoire des six derniers mois du règne de Napoléon* (1823, new ed with illustrations, 1906); *Manuscrit de 1813, contenant le précis des événements de cette année pour servir à l'histoire de l'empereur Napoléon* (1824); *Manuscrit de 1812* (1827); and *Manuscrit de l'an iii. (1794–1795), contenant les premières transactions de l'Europe avec la république française et le tableau des derniers événements du régime conventionnel* (1828), which form a very valuable source for the history of Napoleon I Of still greater importance for the history of Napoleon are Fain's *Mémoires,* which were published posthumously in 1908 Immediately after the overthrow of Charles X , King Louis Philippe appointed Fain first secretary of his cabinet (Aug 1830) Fain was a member of the council of State and deputy from Montargis from 1834 until his death in Paris on Sept. 16, 1837.

FAIR. In popular speech markets and fairs are associated Coke says that every fair is a market, but not every market is a fair, and in terms that a fair is but a great sort of market Although this is not admitted by all as historically true, it has become true in English legal theory. The word "fair" is indeed rather loosely used. It may mean no more than a periodical market which attracts more custom than usual, as where a town has a weekly market and designates the first market of the month a fair. The word is also used in modern speech for various private auction marts, which have no characteristic of a true market, and for certain small periodical markets confined to one commodity. But its best use is that which Coke ascribes to it. Fairs, in this sense, are of immemorial antiquity. They appear early in the dark ages on the Continent Sidonius Apollinaris speaks of the fairs of Champagne and Brie in 427. They were common in the Low Countries by the 10th century. After the Conquest they multiplied in England, when foreign merchants were regularly passing to and fro under the protection of Norman and Angevin kings. The origin of some is lost, and few are modern; in modern times the machinery for establishing them on a legal footing is, in most European countries, similar to that for establishing a market (*see* MARKET). In England this is by charter or by act of parliament, but the general statutes under which any local authority may acquire (or, subject to its not infringing existing rights, may establish) a market do not extend to fairs, and therefore, where a fair is in the hands of a local authority in England it must be by charter or by special act. While a fair is thus more difficult (in England) than a market to establish on a legal footing, it is easier to abolish In fact, the Fairs Acts, 1868–71, provide machinery for the secretary of State to extinguish fairs which have outlived their utility. Owen's *Book of Fairs,* first published under George II. and again (after intermediate editions) in 1856, gives a list covering 62 pages of small print, but a number of these have passed into oblivion, even without formal abolition. This reflects the fact that, while markets have still a useful function, the commercial value of fairs has largely disappeared (in western Europe) with improved communications and the other changes wrought in modern trade. Thus, a fair held at Much Wenlock under a charter of Edward IV. was allowed to lapse in 1926, and a once important horse fair at Whittlesey attracted two entries only—the reason being that with improved methods of transport available at all times it is not worth while to collect a great assemblage once or twice a year. There are still commercial fairs of some local importance, noted in a recent report of the Ministry of Agriculture and Fisheries, but it may be doubted how long these will last, and it is certain that the day of the famous international fairs such as used to be held in Champagne, at Beaucaire and at Stourbridge (chartered by King John in 1211) is over in the west.

One important function which attached to many fairs—that of a "labour exchange," where servants, especially agricultural and domestic, were hired for a year—has disappeared in most countries, now that hirings are effected for shorter periods.

Pleasure Fairs.—The "pleasure fair" existed from early times side by side with the fair which was a "great market" Bartholomew Fair, held in London in August, had been granted by Henry II to Rahere as a fair of the old style, but by the 17th century had become almost entirely a pleasure fair—of which, indeed, it became recognized as the type. Often the business and the pleasure fair were mixed, but in the 19th century many of those which still survived tended to be solely for pleasure, and even these lost much of their prestige with the coming of other popular amusements. St. Giles' Fair at Oxford and the "Mop" at Stratford-on-Avon are among those known throughout the English-speaking world which have succeeded in surviving for generations after Bartholomew Fair was abolished in 1855.

In France and Belgium "pleasure fairs" are numerous. The French Revolution swept away a number which possessed a long history, and the commercial fair has suffered reduction in importance, as in England But even Paris retains numerous pleasure fairs, some of which last for weeks, and they are found on a smaller scale in most provincial towns and villages Often the fair is associated with a saint's day, the festival of the saint to whom the local church is dedicated In Brittany and Flanders the word is "kirmiss," or "Church mass," which, like the German use of "messen" in the same sense, keeps alive an association which has led some writers to believe that fairs as an institution had a religious origin. The true origin of the fair as known to-day is a moot point, but it is certain that the institution of periodical great markets is older than the Christian era; indeed, as markets have been shown to arise at a certain point in the development of human institutions, so it is natural that, yearly or half-yearly (or it may be every four years, as at the Olympic Games), some specially important gathering should be held, attracting merchants from a wider area. Such a gathering would, in primitive society, pagan or Christian as the case might be, inevitably be placed under protection of the gods or saints, whose prestige would secure safe conduct for those attending.

In eastern Europe and in Asia the causes which have led to the decline of fairs in the west have so far been less operative. Thus India preserves the fair at Hurdwar, where the Ganges leaves the mountains; a natural pilgrim centre which has in consequence acquired a fair, attracting many others than Hindus. It will be long before the "westernization" of India will have made such fairs unnecessary, and probably the same may be said of Russia, which has several fairs of international fame. The best known is that of Nijni Novgorod, founded in the 17th century. Before the World

ear it was calculated that more than 100,000 persons annually ttended it from Asia and from Europe, and it is of interest to find . described in an official Russian publication of 1923 as "an outtanding fact in the Soviet economic scheme," playing "a decisive ôle in the commercial transactions of the union" The total value f transactions registered as taking place in the fair in that year 'as 378 million gold roubles, and these registered transactions exluded all private sales and those of less value than 1,000 gold oubles. Baku, Kiev, Irbit (Siberia) and Kharkov (Ukrania) are ther fairs which, after being in abeyance—as was Nijni Novorod—during the Revolution, have been revived by the Soviet Government. *See* also MARKET, EXHIBITION AND TRADE FAIR

(A N. C. S)

United States.—In contrast with typical European fairs, where rade features predominate, American fairs have served chiefly he function of agricultural education. In the show ring, on the rack, and in crop and other exhibits, accepted standards of exellence have been gradually developed In 1927, more than ,000 agricultural fairs were held in the United States and Canada 'hese included national, regional, provincial, State, county and ther expositions The total attendance was over 40,000,000. 'he best available data, which, however, are quite incomplete, how premiums paid to the amount of $8,400,714 Each of 14 airs on the North American continent pays out annually $50,000 r more for prizes, exclusive of purses, and in five the prize ioney totals $100,000 or more each. Each of 16 fairs owns rounds and buildings worth more than $1,000,000 Almost all merican fairs continue for a week, though some last as long s two weeks. Exhibits are made by national, provincial and tate governments, as well as by organizations and individuals n recent years judging contests participated in by boys and girls id by college students have been important attractions Most urs have various entertainment features, and the last few years ave seen a marked and largely successful effort to improve these.

(R. T H)

FAIRBAIRN, ANDREW MARTIN (1838–1912), British Nonconformist divine, was born at Inverkeithing, Fife, on lov. 4, 1838 He was educated at Edinburgh and Berlin, and at ie Evangelical Union Theological Academy in Glasgow, and, ntering the Congregational ministry, held pastorates at Bathgate, Vest Lothian and Aberdeen From 1877 to 1886 he was principal of Airedale College, Bradford, a post which he gave up to ecome the first principal of Mansfield College, Oxford In 1883 e was chairman of the Congregational Union of England and Vales. He resigned his position at Mansfield College in the spring f 1909, and died in London on Feb 9, 1912

Among his more important works are:—*Studies in the Philosophy f Religion and History* (1876), *Philosophy of the Christian Religion* (1902); *Studies in Religion and Theology* (1909). *See* W. B. Selbie, *ife of Andrew Martin Fairbairn* (1914).

FAIRBAIRN, SIR WILLIAM, BART. (1789–1874), Scotsh engineer, was born on Feb. 19, 1789 at Kelso, Roxburghshire, here his father was a farm-bailiff. In 1803 he obtained work . three shillings a week as a mason's labourer on the bridge then eing built by John Rennie at Kelso; but within a few days he was capacitated by an accident. During his apprenticeship as a millright at Percy Main he made the acquaintance of George tephenson, who then had charge of an engine at a neighbouring olliery. In 1817 he entered into partnership with a shopmate, imes Lillie, with whose aid he hired an old shed in High street, lanchester, where he set up a lathe and began the business which ecame famous throughout the world. Fairbairn investigated the se of iron in shipbuilding, and made exhaustive experiments on s strength as a building material. In 1835 he established a shipuilding yard at Millwall, London, but his preoccupation with ientific investigation and other matters diverted his attention, id the business was sold at a loss.

In 1845 he was employed, with Robert Stephenson, in constructg the tubular railway bridges across the Conway and Menai raits. Fairbairn investigated the construction of steam boilers, which he effected many improvements. His fertility and readiess of invention greatly aided an inquiry carried out at his Manchester works (1851) by Sir William Thomson (Lord Kelvin) and J. P. Joule, at the instigation of William Hopkins, to determine the melting points of substances under great pressure; and from 1861 to 1865 he was employed to guide the experiments of the government committee appointed to inquire into the "application of iron to defensive purposes." He died at Moor Park, Surrey, on Aug 18, 1874 Fairbairn was a member of many learned societies, both British and foreign, and in 1861 served as president of the British Association He declined a knighthood in 1861, but accepted a baronetcy in 1869

His youngest brother, Sir PETER FAIRBAIRN (1799–1861), founded a large machine manufacturing business in Leeds Starting on a small scale with flax-spinning machinery, he subsequently extended his operations to the manufacture of textile machinery in general and finally to that of engineering tools. He was knighted in 1858

See *The Life of Sir William Fairbairn,* partly written by himself and edited and completed by Dr. William Pole (1877).

FAIRBANKS, DOUGLAS (1883–), motion picture actor and producer, was born at Denver (Colo), on May 23, 1883 He studied at the Colorado School of Mines, attended Harvard university, and entered a brokerage firm in Wall street In 1901 he took up the stage as a career, eventually starring in several plays, among them the *Man of the Hour* and *The Gentleman from Mississippi* Since 1915 he devoted himself to the screen, in 1917 becoming the head of his own producing company His pictures include *The Mark of Zorro, The Three Musketeers, Robin Hood, Don Q,* and the *Black Pirate* He married, on March 28, 1920, as his second wife, Mary Pickford

FAIRBANKS, ERASTUS (1792–1864), American manufacturer, was born in Brimfield (Mass.) on Oct. 28, 1792 In 1824 he formed a partnership with his brother Thaddeus for the manufacture of stoves and ploughs Erastus was a member of the State legislature in 1836–38, and governor of Vermont in 1852–53 and 1860–61.

His son HORACE FAIRBANKS (1820–88) became president of E and T Fairbanks and Co in 1874, and was governor of Vermont from 1876 to 1878.

His brother THADDEUS FAIRBANKS (1796–1886), inventor, was born at Brimfield (Mass) on Jan 17, 1796 He designed the models from which he and his brother manufactured stoves and ploughs at St Johnsbury (Vt) In 1826 he patented a cast-iron plough which was extensively used. In 1831 Fairbanks invented a hemp-dressing machine, and the famous compound-lever platform scale, which marked a great advance in the construction of machines for weighing bulky and heavy objects He, with his brothers, Erastus and Joseph P, founded the St. Johnsbury academy. He died at St Johnsbury on April 12, 1886

FAIRBANKS, a town of Alaska, situated in 64° 50′ N and 147° 44′ W, about 250 m up the Tanana river (by the windings of the stream) from its confluence with the Yukon The population had diminished from three or four thousand during the period of high gold production to 1,155 in 1920 The wagon road distance to Chitina, on the Copper river, is approximately 320 m., and to Valdez, 370 m.; by rail, 467 m. to Seward, the coast terminus The valley of the Tanana, in this section, consists of rolling hills and fertile soil, and offers inviting conditions for settlement It is scantily timbered and a large portion of that which once existed has been cut in the mining operations and for domestic use during the past 25 years. Coal is brought in from the Healy river mines along the Government railway. Fairbanks is headquarters of the 4th division of the district court.

FAIRBURY, a city of south-eastern Nebraska, U.S.A., on the Little Blue river, 10m. from the Kansas State line; the county seat of Jefferson county. It is served by the Burlington, the Rock Island, and the St Joseph and Grand Island railways. The population was 5,454 in 1920 (94% native white), and was estimated locally at 6,240 in 1928. It is in a farming and poultry-raising country, and there are large nurseries in the vicinity. The city has railroad shops and iron works; flour, planing and alfalfa mills; cement, tile and brick works; a creamery and a condensed-milk plant; and a windmill factory. Fairbury was settled about 1869

and incorporated in 1873.

FAIRFAX, EDWARD (*c* 1580–1635), English poet, translator of Tasso, was born at Leeds, the second son of Sir Thomas Fairfax of Denton. He is said to have been only about 20 years of age when he published his translation of the *Gerusalemme Liberata,* which appeared in 1600,—*Godfrey of Bulloigne, or the Recoverie of Ierusalem, done into English heroicall Verse by Edw. Fairefax, Gent*, and was dedicated to the queen In the same year extracts from it were printed in *England's Parnassus* It is said that it was King James's favourite English poem, and that Charles I read it in prison Fairfax employed the same number of lines and stanzas as his original, but within the limits of each stanza he allowed himself the greatest liberty He presented, says Mr. Courthope, "an idea of the chivalrous past of Europe, as seen through the medium of Catholic orthodoxy and classical humanism." The sweetness and melody of many passages are scarcely excelled even by Spenser. He wrote also 12 eclogues, the fourth of which was published in Mrs. Cooper's *Muses' Library* (1737). Another of the eclogues and a *Discourse on Witchcraft, as it was acted in the Family of Mr Edward Fairfax of Fuystone in the county of York in 1621,* edited from the original copy by Lord Houghton, appeared in the *Miscellanies* of the Philobiblon Society (1858–59). Fairfax died at Fewston on Jan. 27, 1635.

FAIRFAX OF CAMERON, FERDINANDO FAIRFAX, 2ND BARON (1584–1648), English parliamentary general, was born on March 29, 1584, son of Thomas Fairfax of Denton (1560–1640), first Baron Fairfax of Cameron (*c.* 1627). He was M P for Boroughbridge during the six parliaments which met between 1614 and 1629 and also during the Short Parliament of 1640. In May 1640 he succeeded his father as Baron Fairfax, but being a Scottish peer he sat in the English House of Commons as one of the representatives of Yorkshire during the Long Parliament from 1640 until his death, he took the side of the parliament, but held moderate views and desired to maintain the peace. In the first Scottish war Fairfax had commanded a regiment in the king's army; on the outbreak of the Civil War in 1642 he was made commander of the parliamentary forces in Yorkshire, with Newcastle as his opponent Hostilities began after the repudiation of a treaty of neutrality entered into by Fairfax with the royalists At first he met with no success He was driven from York, where he was besieging the royalists, to Selby; then in 1643 to Leeds, and after beating off an attack at that place he was totally defeated at Adwalton Moor (June 30). He escaped to Hull, which he defended against Newcastle (Sept 2–Oct 11), and by means of a brilliant sally caused the siege to be raised Fairfax was victorious at Selby (April 11, 1644), and joining the Scots besieged York, after which he was present at Marston Moor In July he was made governor of York, in December he took the town of Pontefract, but failed to secure the castle He resigned his command on the passing of the Self-denying Ordinance, but remained a member of the committee for the government of Yorkshire. He died from an accident on March 14, 1648, and was buried at Bolton Percy He was twice married, and by his first wife, Mary, daughter of Edmund Sheffield, 3rd Lord Sheffield (afterwards 1st earl of Mulgrave), he had six daughters and two sons, Thomas, who succeeded him as 3rd baron, and Charles, a colonel of horse, who was killed at Marston Moor.

FAIRFAX OF CAMERON, THOMAS FAIRFAX, 3RD BARON (1612–1671), parliamentary general and commander-in-chief during the English Civil War, the eldest son of the 2nd lord, was born at Denton, near Otley, Yorkshire, on Jan. 17, 1612. He studied at St. John's College, Cambridge (1626–29), and then served as a volunteer with the English army in the Low Countries under Sir Horace (Lord) Vere, whose daughter Anne he married in 1637. He was knighted in 1640

The Fairfaxes, father and son, though serving at first under Charles I., were opposed to the arbitrary prerogative of the crown. When Charles endeavoured to raise a guard for his own person at York, intending it to form the nucleus of an army, Fairfax presented a petition asking him to discontinue the raising of troops. This was at a meeting of the freeholders and farmers of Yorkshire convened by the king on Heworth Moor near York War broke out, Lord Fairfax was appointed general of the Parliamentary forces in the north, and his son, Sir Thomas, was made lieutenant-general of horse under him Both father and son distinguished themselves in the campaigns in Yorkshire (*see* GREAT REBELLION) Sometimes severely defeated, more often successful, and always energetic, prudent and resourceful, they maintained the struggle until the crisis of 1644, when York was held by the marquess of Newcastle against the combined forces of the English Parliamentarians and the Scots, and Prince Rupert hastened with all available forces to its relief. The battle of Marston Moor (*q v*) was decisive of the struggle in the north. The younger Fairfax bore himself with the greatest gallantry in the battle, and though severely wounded managed to join Cromwell and the victorious cavalry on the other wing One of his brothers, Colonel Charles Fairfax, was killed in the action.

After the passing of the Self-denying Ordinance Thomas Fairfax was selected to succeed Essex, the new lord general, with Cromwell as his lieutenant-general and cavalry commander, and after a short preliminary campaign the "New Model" justified its existence, and "the rebels' new brutish general," as the king called him, his capacity as commander-in-chief in the decisive victory of Naseby (*q v*) The king fled to Wales Fairfax besieged Leicester, and was successful at Taunton, Bridgwater and Bristol Oxford surrendered in 1646, and it is characteristic of the man that the general's first act was to set a strong guard on the Bodleian Library

In Jan 1647 Charles was delivered up by the Scots to the commissioners of parliament Fairfax met the king beyond Nottingham, and accompanied him during the journey to Holmby, treating him with the utmost consideration. In the confused negotiations between the various parties which followed, Fairfax was placed in the unpleasant position of intermediary between his own officers and parliament He was more at home in the field than at the head of a political committee, and, finding events too strong for him, he sought in vain to resign his commission as commander-in-chief He remained the titular chief of the army party, and with the greater part of its objects he was in complete, sometimes most active, sympathy. Shortly before the outbreak of the second Civil War, Fairfax succeeded his father in the barony and in the office of governor of Hull. In the field against the English Royalists in 1648 his operations culminated in the successful siege of Colchester, after the surrender of which place he approved the execution of the Royalist leaders Sir Charles Lucas and Sir George Lisle, holding that these officers had broken their parole. At the same time Cromwell's great victory of Preston crushed the Scots, and the Independents became practically all-powerful

Milton, in a sonnet written during the siege of Colchester, called upon the lord general to settle the kingdom, but the crisis was now at hand Fairfax approved, if he did not take an active part in, Pride's Purge (Dec. 6, 1648), but on the question of the fate of Charles he opposed the army officers He presided over the judges who were to try the king at the preliminary sitting Then, convinced that the king's death was intended, he refused to act. In calling over the court, when the crier pronounced the name of Fairfax, Lady Fairfax, from the gallery, cried out "that the Lord Fairfax was not there in person, that he would never sit among them, and that they did him wrong to name him as a commissioner." His last service as commander-in-chief was the suppression of the Leveller mutiny at Burford in May 1649 He had been reappointed lord general, but the council of state resolved to send an army against the Scots in 1650. Fairfax resigned his commission. Cromwell was appointed his successor. Fairfax received a pension of £5,000 a year, and lived in retirement at his Yorkshire home of Nunappleton till after the death of the Protector.

The troubles of the later Commonwealth recalled him to political activity, when Monk invited his co-operation against Lambert's army. When, in Dec. 1659, he appeared at the head of a body of Yorkshire gentlemen, 1,200 horse quitted Lambert's colours and joined him. That day secured the restoration of the

monarchy. Fairfax was elected member for Yorkshire in the "free" parliament, and led the commission appointed by the House of Commons to wait upon Charles II at The Hague and urge his speedy return.

The remaining eleven years of the life of Lord Fairfax were spent in retirement at his seat in Yorkshire. He died at Nunappleton on Nov 12, 1671, and was buried at Bilborough, near York. As a soldier he was exact and methodical in planning, in the heat of battle "so highly transported that scarce any one durst speak a word to him" (Whitelocke), chivalrous and punctilious in his dealings with his own men and the enemy. Honour and conscientiousness were equally the characteristics of his private and public character. But both in war and peace he was overshadowed by his associate Cromwell

Lord Fairfax translated some of the Psalms, and wrote poems on solitude, the Christian warfare, the shortness of life, etc During the last year or two of his life he wrote two *Memorials* which have been published—one on the northern actions in which he was engaged in 1642–44, and the other on some events in his tenure of the chief command. At York and at Oxford he endeavoured to save the libraries from pillage, and he enriched the Bodleian with some valuable mss His only daughter, Mary Fairfax, was married to George Villiers, the profligate duke of Buckingham of Charles II.'s court.

See the correspondence of Fairfax (2 vols. ed G. W. Johnson 1849, and 2 vols ed. R Bell, as *Memorials of the Civil War*, 1849); C R. Markham, *The Great Lord Fairfax* (1870); S. R. Gardiner, *History of the Great Civil War* (1893).

His descendant Thomas, 6th baron (1692–1782), inherited from his mother, the heiress of Thomas, 2nd Baron Culpepper, large estates in Virginia, U.S.A., and having sold Denton Hall and his Yorkshire estates he retired there about 1746, dying a bachelor. He was a friend of George Washington. Thomas found his cousin William Fairfax settled in Virginia, and made him his agent, and Bryan (1737–1802), the son of William Fairfax, eventually inherited the title, becoming 8th baron in 1793 His claim was admitted by the House of Lords in 1800 But it was practically dropped by the American family, until, shortly before the coronation of Edward VII., the successor in title was discovered in Albert Kirby Fairfax (b. 1870), a descendant of the 8th baron, who was an American citizen. In Nov. 1908 Albert's claim to the title as 12th baron was confirmed by the House of Lords.

FAIRFIELD, a city of Jefferson county, Alabama, U S A., 5m. W. of Birmingham; served by the Birmingham Southern and the Southern railways. The population was 5,003 in 1920 (46% negroes) and was estimated locally at 12,000 in 1928. It is an industrial suburb, with large steel plants, coke, freight-car, wire, brick and chemical works. The city was founded in 1910 to provide for the employés of the new plants of the United States Steel Corporation (which in 1907 had purchased the Tennessee Coal, Iron and Railroad company), and was laid out with a regard to beauty. It is the seat of the Employés' hospital of the Tennessee Coal, Iron and Railroad company. The city was incorporated in 1918.

FAIRFIELD, a town of Fairfield county, Connecticut, U.S.A., on Long Island sound, adjoining Bridgeport on the west. It is served by the New York, New Haven and Hartford railroad The population in 1920 was 11,475, and was estimated locally at over 17,000 in 1928. The town is a summer resort. Truck-gardening is an important occupation, and the principal village, Fairfield, has structural steel and boiler-plate plants, an aluminium factory, a gold and silver refinery, and other manufacturing industries. The town was settled in 1639 by Roger Ludlow, who in 1637 had been one of a band which defeated the Pequot Indians in the vicinity and was attracted by the region. During the colonial period it was a place of importance, but later was overshadowed by Bridgeport. On July 8, 1779, it was burned by the British and Hessians under Governor Tryon.

FAIRFIELD, a city of south-eastern Iowa, U.S.A., on Federal highway 34 and served by the Burlington and the Rock Island railways; the county seat of Jefferson county. The population (95% native white) was 6,333 in 1925 (State census). It is in a blue-grass country, where much live stock is raised, and is an important market for draft horses. The city has important manufactures, especially of dairy and farm equipment which goes to all parts of the country. The output in 1927 was valued at about $6,000,000. An annual Chautauqua assembly is held in a 30ac. park just east of the city, which has an auditorium seating 4,000. Fairfield was settled in 1839 and chartered as a city in 1847. It is the seat of Parsons college (Presbyterian), endowed by Lewis Baldwin Parsons, Sr (1793–1855), a merchant of Buffalo, N.Y., and established in 1875.

FAIRHAVEN, a town of Bristol county, Massachusetts, U S.A, on Buzzard's bay, opposite New Bedford; served by the New York, New Haven and Hartford railway. The population in 1925 was 10,827. It is a summer resort, and has a number of factories, making tacks, laundry machines, small yachts and boats and toilet powder From 1830 to 1857 whaling was the principal industry, but the fishing interests are now relatively unimportant Many of the public buildings were gifts from Henry H Rogers (1840–1909), long vice president of the Standard Oil Company, who was a native of the place. Fairhaven was separated from New Bedford and incorporated as a town in 1812. In Sept 1778, forces from the fleet under Lord Grey, sent to punish New Bedford for its privateering, dismantled the small fort which had been built early in the war on the east side of the harbour; and a day or two later they began to set fire to Fairhaven, but were driven off by 150 minute-men under Major Israel Fearing. The fort was rebuilt at once, and during the war of 1812 (under the name of Ft. Phoenix) was one of the strongest defences on the New England coast.

FAIR ISLAND. An isolated island situated between the Orkney and Shetland islands north-east of Scotland. It has an area of six sq m and is of rocky formation The principal industries are fishing, sheep farming and the knitting of multi-coloured garments for which the island is famous. It is noted among ornithologists for the numerous species of migrant birds observed there.

FAIRMONT, a city of southern Minnesota, U S A, 120m. S W. of Minneapolis; the county seat of Martin county It is on Federal highway 16, and is served by the Chicago and North Western and the Chicago, Milwaukee, St. Paul and Pacific railways. The population was 4,630 in 1920 (88% native white) and was estimated locally at 6,000 in 1928 It is the trade centre for a farming, dairying and poultry-raising region, is a summer resort, and has sundry manufacturing industries. The city was founded about 1866 and incorporated in 1886.

FAIRMONT, a city of northern West Virginia, U.S A., 75m. S by W. of Pittsburgh, at the head of navigation on the Monongahela river; the county seat of Marion county. It is on Federal highway 19, and is served by the Baltimore and Ohio and the Monongahela railways. The population was 17,851 in 1920 (88% native white). The city is built on hills, at an altitude of 800 to 900 feet. It is an important shipping point for coal, of which over 8,000,000 tons were mined in the county in 1926; it is the seat of a State normal school, and has various manufacturing industries (including powder and chemical plants, glass works and textile mills) with an output in 1925 valued at $9,885,902. A town was laid out here in 1819, which in 1842 became the county seat of the newly erected county. Until about 1844 it was called Middletown. The city was chartered in 1899. Since 1890, when the population was only 1,023, it has grown rapidly. In 1920 the population was 17,851.

FAIR OAKS, a station on a branch (formerly famous as the York river railway) of the Southern railway, 6m. east of Richmond, Virginia, U.S.A. It is noted as the site of one of the battles of the Civil War, fought on May 31 and June 1, 1862, between the Union (Army of the Potomac) under Gen. G. B. McClellan and the Confederate forces (Army of Northern Virginia) commanded by Gen. J. E. Johnston. The attack of the Confederates was made at a moment when the river Chickahominy divided the Federal army into two unequal parts—two corps on the south bank, three on the north—and was, moreover, swollen

to such a degree as to endanger the bridges. Gen. Johnston stationed part of his troops along the river to prevent the Federals sending aid to the smaller force south of it, upon which the Confederate attack, commanded by Gen Longstreet, was directed. Many accidents, due to the inexperience of the staff officers and to the difficulty of the ground, hindered the development of Longstreet's attack, but the Federals were gradually driven back with a loss of ten guns, though at the last moment reinforcements managed to cross the river and re-establish the line of defence At the close of the day Johnston was severely wounded, and Gen. G. W. Smith succeeded to the command The battle was renewed on June 1 but not fought out At the close of the action Gen. R. E Lee took over the command of the Confederates, which he held till the final surrender in April 1865 So far as the victory lay with either side, it was with the Union army, for the Confederates failed to achieve their purpose of destroying the almost isolated left wing of McClellan's army, and after the battle they withdrew into the lines of Richmond The Union losses were 5,031 in killed, wounded and missing; those of the Confederates were 6,134 The battle is alternatively known as the battle of Seven Pines.

FAIRPORT HARBOR, village, Lake county, Ohio, U S.A., on Lake Erie, 28m N N E of Cleveland. It is a port of entry, and is served by the Baltimore and Ohio railroad and lake steamers The population was 4,211 in 1926 (36% foreign-born white). It has one of the finest natural harbours, and one of the oldest lighthouses, on Lake Erie. The commerce of the port in 1925 amounted to 4,327,276 tons, valued at $41,941,156, and consisted largely (on the basis of tonnage) of incoming iron ore and limestone and shipments of coal A Finnish newspaper is published here The village was settled in 1812, by pioneers from Connecticut, and the first county court was held here It soon became an important commercial port In 1847 cargoes valued at $991,000 (chiefly farm wagons, furniture, cheese, flour and oil of peppermint) were carried by the 2,987 sailing vessels that entered the harbour

FAIR TRADE, the name given in 1881 in Great Britain to a movement to protect industry from foreign competition by means of import duties The term "fair trade" was coined to express the conception that free trade was unfair unless reciprocal, and that Great Britain should not admit duty free goods imported from countries which denied free trade to British exports. The boom in British trade of the decade before, having been followed by a period of depression culminating in great unemployment and distress, a fair trade league was formed in 1881 The league found many adherents and published a weekly journal called *Fair Trade,* the issue of which was continued until 1890, when with the revival of industry the agitation died down and was not renewed until the tariff reform movement of the end of the 19th century, led by Joseph Chamberlain (*See* PROTECTION, TARIFF REFORM)

FAIRŪZĀBĀDĪ (Abū-ṭ-Ṭāhir ibn Ibrahīm Majd ud-Dīn ul-Fairūzābādī) (1329–1414), Arabian lexicographer, was born at Kārazīn near Shiraz. His student days were spent in Shiraz, Wāsiṭ, Baghdad and Damascus He taught for ten years in Jerusalem, and afterwards travelled in western Asia and Egypt. In 1368 he settled in Mecca, where he remained for 15 years. He next visited India and spent some time in Delhi, then remained in Mecca another ten years The following three years were spent in Baghdad, in Shiraz (where he was received by Timur), and in Ta'iz. In 1395 he was appointed chief cadi (qadi) of Yemen, married a daughter of the sultan, and died at Zabīd in 1414 During this last period of his life he converted his house at Mecca into a school of Mālikite law and established three teachers in it. He wrote a huge lexicographical work of 60 or 100 volumes uniting the dictionaries of Ibn Sīda, a Spanish philologist (d. 1066), and of Sajānī (d. 1252). A digest of or an extract from this last work is his famous dictionary *al-Qāmūs* ("the Ocean"), which has been published in Egypt, Constantinople and India, has been translated into Turkish and Persian, and has itself been the basis of several later dictionaries.

FAIRWAY, the navigable channel of a river or other waterway. It is usually marked by buoys of distinctive shape, letter or colour. The maintenance of a fairway is often a matter of great care, calling for continuous dredging and clearance. (*See* RIVER ENGINEERING; DREDGERS AND DREDGING; BUOY) By derivation, the term is also used of the open passage on a golf course between the hazards, such as furze, water, bunkers. (*See* GOLF.)

FAIRY, the common term for a supposed race of supernatural beings who magically intermeddle in human affairs. (Fr. *fée, faerie;* Prov. *fada;* Sp *hada;* Ital. *fata;* med. Lat. *fatare,* to enchant, from Lat. *fatum,* fate, destiny.) They are not the immediate product of one country or of one time; they have a pedigree But mixture and connection of races have so changed the original folk-product that it is difficult to separate the different strains that have gone to the moulding of the result

It is not in literature that the early forms of the fairy belief must be sought Many of Homer's heroes have fairy lemans, called nymphs, but the fairy leman is familiar to the unpoetical Eskimo, and to the Red Indians, with their bird-bride and beaver-bride (*see* A Lang's *Custom and Myth,* "The Story of Cupid and Psyche"). The Gandharvas of Sanskrit poetry are also fairies.

One of the most interesting facts about fairies is the wide distribution and long persistence of the belief in them They are the chief factor in surviving Irish superstition. Here they dwell in the "raths," old earth-forts They are an organized people, and their life corresponds to human life in all particulars They carry off children and are generally the causes of all mysterious phenomena. Whirls of dust are caused by the fairy marching army, as by the beings called Kutchi in the Dieri tribe of Australia. The fairy changeling belief also exists in some districts of Argyll. In Ireland and the west Highlands neolithic arrow-heads and flint chips are still fairy weapons They are dipped in water, which is given to ailing cattle and human beings as a sovereign remedy for diseases In the Highlands there is much more interest in second sight than in fairies, while in Ireland the reverse is the case. The best book on Celtic fairy lore is still that of the minister of Aberfoyle, the Rev. Mr Kirk (*ob.* 1692). His work on *The Secret Commonwealth of Elves, Fauns, and Fairies,* left in ms. and incomplete (the remainder is in the Laing mss , Edinburgh University library), was published (100 copies) in 1815 by Sir Walter Scott, and in the *Bibliothèque de Carabas* (Lang) there is a French translation

It is clear that in many respects fairyland corresponds to the pre-Christian abode of the dead Like Persephone when carried to Hades, or Wainamoïnen in the Hades of the Finns (Manala), a living human being must not eat in fairyland; if he does, he dwells there for ever.

There is a theory that the fairies survive in legend from prehistoric memories of a pigmy people dwelling in the subterranean earth-houses, but the contents of these do not indicate an age prior to the close of the Roman occupation of Britain; nor are pigmy bones common in neolithic sepulchres. The "people of peace" (*Daoine Shie*) of Ireland and Scotland are usually of ordinary stature, only varying from mankind by their proceedings. (*See* J Curtin, *Irish Folk-tales.*)

The belief in a species of lady fairies, deathly to their human lovers, was found by R L Stevenson to be as common in Samoa (see *Island Nights' Entertainments*) as on the banks of Loch Awe. The Greek sirens of Homer are a form of these fairies, as the Nereids, Oreads and Naiads are fairies of wells, mountains and the sea. The fairy women who come to the births of children and foretell their fortunes (*Fata, Moerae,* ancient Egyptian *Hathors, Fées, Dominae Fatales*), with their spindles, are refractions of the human "spae-women" (in the Scots term) who derive omens of the child's future from various signs. These women, represented in the spiritual world by *Fata,* bequeath to us the French *fée,* in the sense of fairy. Perrault uses *fée* for anything that has magical quality.

The nearest analogy to the shape which fairy belief takes in Scotland and Ireland—the "pixies" of south-western England—is in *Jān* or *Jinnis* of the Arabs, Moors and people of Palestine. In stories which have passed through a literary medium, like *The Arabian Nights,* the *geni* or *Jān* do not so much resemble our fairies as they do in the popular superstitions of the East, orally

ed. They chiefly differ from our fairies in their greater ndency to wear animal forms; though when they choose to appear in human shape they are not to be distinguished from mortals. Like the fairies everywhere they have amours with mortals The herb rue is potent against them, as in British folk-lore. They, like the British brownies (a kind of domesticated fairy), are the causes of strange disappearances of things To preserve houses from their influences rue is kept, and the name of Allah is constantly invoked.

They often bear animal names Euphemistically they are addressed as *mubārakin*, "blessed ones" As our fairies give gold which changes into withered leaves, the *Jān* give onion peels which turn into gold Like our fairies the *Jān* can apply an ointment, kohl, to human eyes, after which the person so favoured can see *Jān*, which are invisible to other mortals, and can see treasure wherever it may be concealed. (See *Folk-lore of the Holy Land*, by J. E. Hanauer, 1907)

The enjoyment of love between a fairy and a mortal is generally qualified by some restriction or compact, the breaking of which is the cause of calamity to the lover and all his race, as in the notable tale of Melusine (*q v*, and *see* the chapter *De lamiis et nocturnis larvis* in *Otia Imperialia*, written early in the 13th century, by Gervaise of Tilbury) At the birth of Ogier le Danois six fairies attend, five of whom give good gifts, which the sixth overrides with a restriction There is little in these fairies of romance to distinguish them from human beings, except their supernatural knowledge and power To this class belong the fairies of Boiardo, Ariosto and Spenser.

There is no good modern book on the fairy belief in general Keightley's *Fairy Mythology* is interesting, Rhys's *Celtic Mythology* is copious about Welsh fairies, practically identical with those of Ireland and Scotland The works of Mr Jeremiah Curtin and Dr Douglas Hyde are useful for Ireland; for Scotland, Kirk's *Secret Commonwealth* has already been quoted Scott's dissertation on fairies in *The Border Minstrelsy* is rich in lore, though Scott had not the benefit of recent researches There is a full description of French fairies of the 15th century in the evidence of Jeanne d'Arc at her trial (1431) in Quicherat's *Procès de Jeanne d'Arc*, vol. i. pp. 67, 68, 187, 209, 212, vol. ii. pp 390, 404, 450 In another vein is Sir A Conan Doyle's *The Coming of the Fairies* (1922)

FAIRY RING, the popular name for the circular patches of a dark green colour seen occasionally on permanent grass-land, either lawn or meadow, on which the fairies were supposed to hold their midnight revels. They mark the area of growth of some fungus, starting from a centre of one or more plants The mycelium produced from the spores dropped by the fungus or from the "spawn" in the soil, radiates outwards, and each year's successive crop of fungi rises from the new growth round the circle. The rich colour of the grass is due to the fertilizing quality of the decaying fungi, which are peculiarly rich in nitrogenous substances For further details *see* FUNGI.

FAITH is an attitude of mind which, though not confined to religious experience, can best be examined by setting out from its manifestations within that sphere of experience. There we find in clearest form illustrations of the several shades of meaning which the word "faith" has borne A classic definition is that presented in the *Epistle to the Hebrews*, xi, 1. "faith is the substance of things hoped for, the evidence of things not seen." The word for "evidence" is, in the Revised version, rendered as "proving," and for "substance" are offered the alternative translations "assurance" and "the giving substance to." Assurance, certitude or convincedness, and giving substance to what we do not perceive and as to which we, therefore, only entertain an idea or a supposition, may at first seem somewhat disparate meanings for one word; but the connection between them is revealed by a common signification of the word "realize." We speak of realizing what some event is when we discern its import, and when what was, so to say, "nothing to us" is found to be something with which we have to reckon or which can influence our thought and action. Personal certitude or conviction as to what as yet is not matter of scientific knowledge or proven with logical certainty, is of the essence of faith; and action upon it *may* lead on to discovery of the actuality of the object, *i.e.*, to substantiation of the hoped-for or the unseen In the case of faith in God, whom "no man hath seen at any time," such certitude cannot issue in sight or sensibly verified knowledge; though it may develop into "proving" in the sense of establishing reasoned and reasonable belief, such as fact and experience corroborate. But in other spheres faith often issues in knowledge, such as can be characterized as seeing or perceiving what, without such exercise of faith, would have remained unseen or unknown. Thus the faith of Columbus "realized" America for the European; and an idea of Stephenson's led to the actual locomotive engine. In neither case did faith create the reality, but in both it substantiated the unseen, and brought men into actual touch with what had been but conceived or supposed Thus faith begins in creating or fashioning an idea; and it may issue in finding a real counterpart to the idea There is, however, no necessity that it shall so issue; and frequently it does not, no one, *e.g.*, has realized the idea of a machine capable of perpetual motion, though many have experimented with the notion The description of faith cited above from Heb xi. 1 is only lacking in psychological completeness, in that it contemplates successful ventures alone, and is silent as to such as may fail Otherwise it is of more general and exhaustive a nature than is any other conception met with in the New Testament. For instance, St Paul considers the efficacy of faith only in so far as it is faith in Christ or in God; one of his central doctrines is that we are justified by God through faith in Christ On the other hand the writer of *Hebrews* includes, among his illustrations of the faithful life, the case of Rahab who was one of "them that believed not" in the God of Israel; and the object of faith, with him, includes the whole region of the unseen, whatever it may contain His teaching is aptly expressed in the lines of Hartley Coleridge: faith

> " . is an affirmation and an act
> That binds eternal truth to present fact "

The long list of instances of the faithful given in Heb. xi. is made up of prophets, kings, etc, who achieved the heroic life and victories of various kinds, in virtue of their souls being possessed by faith; their faith was verified by their lives. They are all concrete embodiments of the principle "nothing venture, nothing have." And that principle is not only the essence of religious faith; it underlies the acquisition of all human knowledge, such as, for the conduct of life, is most worth having Thus the "father of the faithful" who obeyed his inward summons and went forward "not knowing whither" is an allegory of the intellectual progress of mankind Man did not begin with scientific knowledge or knowing, but with learning through doing. He learned by failure as well as by success, and in either case he ventured before he came to have. The uniformity of nature, *e g*, was not written so legibly on natural phenomena that, in the time of man's primitiveness, he who ran could read it off. On the other hand, if it had not been tentatively assumed, here a little and there a little, it could never have got "substance" for man's knowledge or relevance to his life; had it not been trusted while as yet unverified, no evidence of its actuality could have emerged And the most recent advance in logic consists in making clearer than ever before that this principle of uniformity, underlying all our inductive science, is, and must ever remain, a postulate incapable of logical proof Thus faith, in its primary sense, is not a word to be confined to the vocabulary of theology. Philosophy, or theory of knowledge, requires it and so does science, if it would understand its own logical structure and the presuppositions on which it rests Probability is not only "the guide of life"; it is also of the very texture of all "knowledge" as to the actual world as distinguished from pure mathematics or truth as to the relations between ideas; and probability in the last resort, *i.e.*, in the case of the fundamental postulates underlying induction—is not a matter of numerical calculability or of formal logic, but of human hope, sanguine expectation, faith in the unseen. Instead of being logically certified it is but pragmatically "verified." The old hard and fast line between knowledge and belief or faith has disappeared. The very rationality of the world, which science would read and expound, is at bottom an idea of faith. Reason, if it include the discovery of true premises as well as the logical

deduction of consequences from premises that may be either true or false, contains faith as well as logical linkage of sense-data

Besides the primary meaning that has been set forth "faith" has borne others Sometimes the word has been used as a synonym for "belief" or intellectual assent But whereas belief is more or less constrained by fact already known, and which convinces us independently of any striving on our part, "faith" is generally used to emphasize the active or volitional element of experience involved in venture reaching beyond the already known Faith, again, is to be distinguished from credulity, with which it is apt to be confounded The open mind and docility, personified in the New Testament as 'the little child' are requisite for reception of truth, but there is no beatitude on credulousness If faith, or the working to a lead or suggestion that experience suggests but does not warrant, is to issue in reasonable belief credulity must be restrained by resort to the method of doubt which is equally essential for acquisition of knowledge And faith proper is doubt-sifted credulity It proves all things before holding fast to them as true, and pursues no apparently open road after it has been shown to be closed, whereas credulity is interested belief, such as is often resorted to in order to escape the discomfort of uncertitude Faith or belief worth calling belief must often 'be purchased with the sweat of the brow" Another meaning of "faith" current in theological literature as well as in common speech is that of trust This resembles faith, as above described, and differs from belief in involving will and feeling but it is rather an attitude issuing out of and presupposing, the faith which creates its idea and then establishes belief in its actuality Before we can trust in God, we must first believe that He is, and that belief is acquired by a venture of faith Lastly, it is unnecessary to narrow down faith to *moral* postulation, or to the attitude of valuation exclusively Religious faith was forthcoming before advanced morality appeared, moreover, it is not concerned with what ought to be real or realized, but with what *is* realizable Theology founded on faith is dogma concerning ultimate reality, not pictorial recipes for pious conduct When religious faith is conceived as but a particular case of the faith that is involved in all knowledge and reason science and faith can be seen to be complementary, not mutually exclusive, they can lodge, without need of reconciliation in brotherly relation within one mind provided the mind is content with reasonableness, where logical rationality is unattainable

See W R Inge, *Faith* (1900), J Ward, *Essays in Philosophy* (1927), G Galloway, *Faith and Reason in Religion* (1927)
(F R T)

FAITHFULL, EMILY (1835–1895), English philanthropist, daughter of the Rev Ferdinand Fuithfull, was born at Headley rectory, Surrey in 1835 She took a great interest in the conditions of working-women, and in 1860 she set up in London a printing establishment for women She was shortly afterwards appointed printer and publisher in ordinary to Queen Victoria In *The Victoria Magazine* (est 1863) she continuously and earnestly advocated the claims of women to remunerative employment In 1868 she published a novel, *Change upon Change* She lectured widely and successfully both in England and the United States on feminist subjects Emily Faithfull died in Manchester on May 31, 1895

FAITH HEALING, a form of "mind cure," characterized by the doctrine that pain and disease really exist, but may be neutralized and dispelled by faith in Divine power, Christian Science (*q v*) holds that pain is an illusion and seeks to cure the patient by instilling into him this belief In the Christian Church the tradition of faith healing dates from the earliest days of Christianity, upon the miracles of the New Testament follow cases of healing first by the Apostles then by their successors After the 3rd century it became transformed into trust in relics, though faith cures still occur sporadically in later times With the Reformation faith healing proper reappears among the Moravians and Waldenses, who, like the peculiar people of our own day, put their trust in prayer and anointing with oil In the 16th century faith cures were recorded of Luther and other reformers, in the next century of the Baptists Quakers, and other Puritan sects and in the 18th century the faith healing of the Methodists in this country was paralleled by pietism in Germany In the 19th century Prince Hohenlohe-Waldenburg-Schillingsfurst, canon of Grosswardein, was a famous healer on the continent, the Mormons and Irvingites were prominent among English-speaking peoples, in the last quarter of the 19th century faith healing became popular in London, and Bethshan homes were opened in 1881, and since then it has found many adherents in England

Under faith healing in a wider sense may be included (1) the cures in the temples of Aesculapius and other deities in the ancient world, (2) the practice of touching for the king's evil, in vogue from the 11th to the 18th century, (3) the cures of Valentine Greatrakes, the "stroker" (1629–83), and (4) the miracles of Lourdes and other resorts of pilgrims including St Winifred's well in Flintshire, Trêves with its holy coat, the grave of the Jansenist Deacon de Paris in the 18th century the little town of Kevelier from 1041 onwards, the tombs of St Louis, Francis of Assisi, Catherine of Siena, and others

An animistic theory of disease was held by several European faith healers Used in this sense faith healing is indistinguishable from much of savage leech-craft, which seeks to cure disease by expelling the evil spirit in some portion of the body Although it is usually present, faith in the medicine man is not essential for the efficacy of the method The same may be said of the lineal descendant of savage medicine—the magical leech-craft of European folk-lore, cures for toothache warts, etc, act in spite of the disbelief of the sufferer, how far incredulity on the part of the healer would result in failure is an open question

From the psychological point of view all kinds of mind cure depend on suggestion (*q v*) In faith healing proper powerful direct suggestions are used, while the religious atmosphere and the auto-suggestions of the patient co-operate, especially where the cures take place during a period of religious revival when large assemblies and strong emotions are found

See A T Myers and F W H Myers in *Proc Soc Psychical Research*, IX 160–209 on the miracles of Lourdes, with bibliography A Feilding, *Faith Healing and Christian Science*, O Stoll, *Suggestion und Hypnotismus in der Volkerpsychologie*, article "Greatrakes" in *Dict Nat Biog* (N W F)

FAITHORNE, WILLIAM (1626 or 1627–1691), English painter and engraver, was born in London and was apprenticed to Robert Peake, a painter and printseller On the outbreak of the Civil War he accompanied his master into the king's service, and being made prisoner at Basinghouse, he was confined for some time to Aldersgate, where, however, he was permitted to follow his profession of engraver, and among other portraits did a small one of the first Villiers, duke of Buckingham He was soon released but only on condition of retiring to France There he received instruction from Robert Nanteuil He returned to England about 1650, and carried on his work as an engraver and printseller in a shop near Temple bar In 1680 he gave up his shop and retired to a house in Blackfriars, occupying himself chiefly in painting portraits from the life in crayons although still occasionally engaged in engraving Faithorne engraved the portraits of a large number of eminent persons, including Sir Henry Spelman, Oliver Cromwell, Henry Somerset, the marquis of Worcester, John Milton, Queen Catherine, Prince Rupert, Cardinal Richelieu, Sir Thomas Fairfax, Thomas Hobbes Richard Hooker Robert 2nd earl of Essex, and Charles I Faithorne wrote *The Art of Graving and Etching* (1662) He was the master of Wenceslaus Hollar He was buried at St Anne's, Blackfriars, on May 13, 1691

In addition to his engraved portraits, Faithorne executed many portrait-drawings in crayons, examples of which may be seen in the British Museum, the Bodleian and other collections Among the most famous of his engravings are two exceedingly rare maps "an exact delineation" of the cities of London, Westminster and suburbs (only impression known in *Bibl Nat*, Paris) in 12 sheets, measuring in all 72 by 39in, one of Virginia and Maryland (only known impression in Grenville library, Brit Mus, London) in 4 sheets, measuring altogether 36 by 31 inches In May 1857 Messrs Evans, London, and again in 1878, Stanford, London published facsimiles of the map in the *Bibliotheque Nationale*

His son WILLIAM (1656–1686), mezzotint engraver, engraved portraits of Charles II, Mary princess of Orange, Queen Anne when princess of Denmark, and Charles XII of Sweden

The best account of the Faithornes is that contained in Walpole's *Anecdotes of Painting* A life of Faithorne the elder is preserved in the British Museum among the papers of Bayford, librarian to Lord Oxford, and an intimate friend of Faithorne

FAIZABAD, a town of Afghanistan, capital of the province of Badakshan situated on the Kokcha river In 1821 it was destroyed by Murad Beg of Kunduz and the inhabitants removed to Kunduz But since Badakshan was annexed by Abdur Rahman, the town has recovered its former importance, and is now a considerable place of trade It is the chief cantonment for eastern Afghanistan and the Pamir region, and is protected by a fort built in 1904

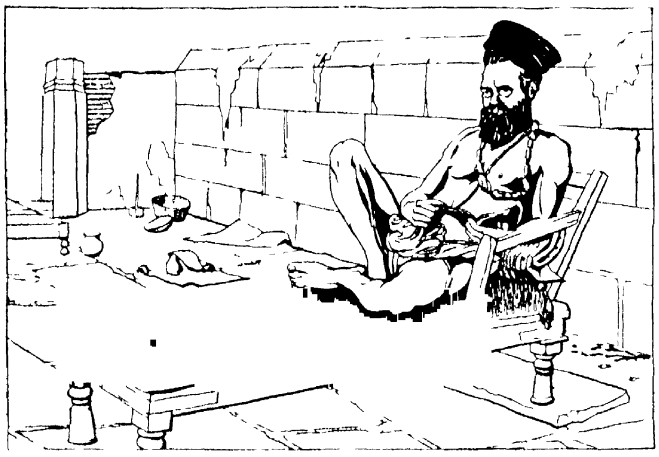
FAJARDO, the largest and most important town on the eastern coast of Porto Rico According to the census of 1920 the population was 6,571, which had increased to 7 833 in 1928 Fajardo is a prosperous town with considerable shipping and local trade The district is one of the richest sugar-producing parts of the island, in it is located the plant of the Fajardo Sugar Company It has good schools, churches, stores and shops, and is connected with the other towns by rail and highways Motor-bus service is available to all points, and the port has service both for freight and passenger transportation

FAJELU: *see* BARI

FAKHR UD-DĪN RĀZI (1149–1209) Arabian historian and theologian, was born at Rai (Rei, Rhagae), near Teheran Here and at Marāgha he studied philosophy and theology He was a Shafi'ite in law and a follower of Ash'arī (*q v*) in theology, and became renowned as a defender of orthodoxy During a journey in Khwarizm and Mawara'l-nahr he preached both in Persian and Arabic against the sects of Islam He settled later in Herat, where he died

His greatest work, the *Mafātih ul-Ghaib* ("The Keys of Mystery"), an extensive commentary on the Koran appeared at Cairo (8 vols, 1890) His dogmatic position may be seen from his work *Kitāb ul-Muhassal*, which is analysed by Schmolders in his *Essai sur les écoles philosophiques chez les Arabes* (Paris, 1842) Extracts from his *History of the Dynasties* were published by Jourdain in the *Fundgruben des Orients* (vol v), and by D R Heinzius (St Petersburg 1828)

See also F Wustenfeld, *Geschichte der arabischen Arzte,* No 200 (Gottingen, 1840), for a list of his works *cf* C Brockelmann's *Gesch der arabischen Literatur,* vol i (Weimar, 1898) and M Schreiner, *Zeitschr der deuts morgenlandischen Gesellsch* vol 52



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A NOMAD FAKĪR OF INDIA READING HIS PRAYERS ON A BED OF NAILS
This class of fakīr has little in common with the religious order of the same name, except a claim to sanctity The beggars that compose it wander about the country, living on alms and subjecting themselves to unbelievable tortures

FAKĪR (fah-kēr), a generic term, synonymous with Dervish, for a religious mendicant A Mohammedan word, it has come to be applied also to Hindus, replacing *bhikshu* and older words Fakīrs are common to all the creeds of India, and in theory mostly belong to a religious order But as a Muslim order does not usually profess celibacy and the Hindu and other orders do not always enforce it, the orders tend to form castes on the ordinary pattern Where strict monasticism has been maintained the influence of the orders has been on the whole good But when discipline has been relaxed, many evils have ensued Mendicancy has often become a pretext for extortion and occult powers a cloak for impudent swindling, sometimes assisted by murder While many fakīrs practise austerities of the severest kinds, others peregrinate the country with performing animals, selling love philtres, profess to transmute silver coin or other metals into gold, and batten on the credulity of the people The chief Hindu orders are the Sanıasis, Gosains, Jogis (who in theory profess *yoga*), bairāgis the Sikh Udāsīs, Nirmalas, Akālīs, the Mohammedan Chishtis, Qādirīs, Suharwardīs, Naqshbandīs, who owe much to Sufism (*q v*), and a host of minor fraternities Several orders have militant branches

FALAISE, a town of north-western France, capital of an arrondissement in the department of Calvados, on the right bank of the Ante, 19 m S by E of Caen by road Pop (1926) 5,263 The castle, now partly in ruins, was formerly the seat of the dukes of Normandy and the birthplace of William the Conqueror It stands on a high crag overlooking the town, and consists of a square mass defended by towers and flanked by a small donjon and a lofty tower added by the English in the 15th century, the rest of the castle dates chiefly from the 12th century Near the castle in the Place de la Trinite, is an equestrian statue in bronze of William the Conqueror, to whom the town owed its prosperity From 1417, when the town succumbed to Henry V of England till 1450, when it was retaken by the French Falaise was in the hands of the English Falaise has populous suburbs, one of which, Guibray, is celebrated for its annual fair for horses cattle and wool, which has been held in August since the 11th century The town is the seat of a subprefecture and has tribunals of first instance and commerce, a chamber of arts and manufacture and a board of trade-arbitrators Tanning (from at least the 11th cent) and some cotton manufactures are carried on

FALASHAS or "Jews of Abyssinia," a tribe of Hamitic stock akin to Galla who profess the Jewish religion and claim to be descended from the ten tribes banished from the Holy Land Another tradition assigns them, as ancestor, Menelek Solomon's alleged son by the queen of Sheba It is uncertain when they became Jews one account suggests in Solomon's time, another, at the Babylonian captivity, a third, during the 1st century of the Christian era One of the earlier dates is in all probability correct since the Falashas know nothing of either the Babylonian or Jerusalem Talmud, make no use of phylacteries (*tefillin*) and observe neither the feast of Purim nor the dedication of the temple They possess—not in Hebrew, of which they are altogether ignorant, but in Ethiopic (or Geez)—the canonical and apocryphal books of the Old Testament, a volume of extracts from the Pentateuch, with comments given to Moses by God on Mount Sinai, the Te-e-sa-sa Sanbat, or laws of the Sabbath, the Ardit, a book of secrets revealed to twelve saints, which is used as a charm against disease, lives of Abraham, Moses, etc, and a translation of Josephus called Sana Aihud A copy of the Orit or Mosaic law is kept in the holy of holies in every synagogue Every newly-built house is considered uninhabitable till the blood of a sheep or fowl has been spilt in it, a woman guilty of a breach of chastity has to undergo purification by leaping into a flaming fire, the Sabbath has been deified, and, as the goddess Sanbat, receives adoration and sacrifice and is said to have ten thousand times ten thousand angels to wait on her commands

Under the monastic system, founded it is said in the 4th century AD by Aba Zebra, a pious man who retired from the world and lived in the cave of Hoharewa, in the province of Armatshoho, the monks must prepare all their food with their own hands, and no lay person, male or female, may enter their houses Priests are allowed to marry once only, and no one is admitted into the order who has eaten bread with a Christian, or is the son or grandson of a man thus contaminated Belief in the evil eye or shadow is universal, and spirit-raisers, soothsayers and rain-doctors are in

repute. Education is in the hands of the monks and priests, and is confined to boys. Fasts, obligatory on all above seven years of age, are held on every Monday and Thursday, on every new moon and at the passover (April 21 or 22). The annual festivals are the passover, the harvest feast, the Baala Mazalat or feast of tabernacles (during which, however, no booths are built), the day of covenant or assembly and Abraham's day. It is believed that after death the soul remains in a place of darkness till the third day, when the first sacrifice for the dead is offered; prayers are read in the synagogue for the repose of the departed, and for seven days a formal lament takes place every morning in his house. No coffins are used, and a stone vault is built over the corpse so that it may not come into direct contact with the earth.

The Falashas live for the most part in villages of their own, or, if settled in a Christian or Mohammedan town, occupy a separate quarter. Their own kings, they pretend, were descended from David, but in 1800, the royal race became extinct, and they then became subject to the Abyssinian kingdom of Tigré They do not mix with the Abyssinians, and never marry women of alien religions They are even forbidden to enter the houses of Christians, and from such a pollution have to be purified before entering their own houses Polygamy is not practised; early marriages are rare and their morals are generally better than those of their Christian masters. They have no liking for trade, but are skilled in agriculture, in the manufacture of pottery, ironware and cloth and are good masons

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FALCÃO, CHRISTOVAM (?1512–?1553), Portuguese poet, born at Portalegre in the Alemtejo, is said to have fallen in love with an 11-year-old heiress, Maria Brandão, to have married her, and to have been separated from her by hostile parents. He then entered the diplomatic service, and died about 1553. The love story is told in some beautiful lyrics and in the charming eclogue *Chrisfal* Falcão was the friend of Bernardim Ribeiro, and the poems are very similar in style to Ribeiro's It is suggested by many critics that *Chrisfal* is really Ribeiro's work

For a discussion of the authorship of *Chrisfal see* A. F. G. Bell, *Portuguese Literature* (1922). There is a modern critical edition of *Chrisfal* and a *Carta* (letter) by A. Epiphanio da Silva Dias under the title *Obras de Christovão Falcão* (Oporto, 1893), and one of the *Cantigas* and *Esparsas* by the same scholar appeared in the *Revista Lusitana*, vol. iv., pp. 142–179 (1896), under the name *Fragmento de um Cancioneiro do Seculo XVI. See* Dr T. Braga, *Bernardim Ribeiro e o Bucolismo* (Oporto, 1897), and Delfim Guimarães, *Bernardim Ribeiro (O Poeta Crisfal)* (1908).

FALCK, ANTON REINHARD (1777–1843), Dutch statesman, was born at Utrecht on March 19, 1777. He studied at the University of Leiden, entered the diplomatic service, and became ambassador at Madrid. Under King Louis Napoleon he was secretary-general for foreign affairs, but resigned office on the annexation of the Batavian republic to France. He took part in the revolt of 1813 and in the organization of the new kingdom of the Netherlands. He was minister of education and of the colonies under William I., until the king tired of his counsels and sent him as ambassador to London. The disturbances of 1830 convinced him of the necessity of the separation of Belgium from Holland. He consequently resigned his post and lived in close retirement until 1839, when he became the first Dutch minister at the Belgian court. He died at Brussels on March 16, 1843. Besides some historical works he left *Brieven van A. R. Falck, 1795–1843* (2nd ed. The Hague, 1861), and *Ambtsbrieven van A. R. Falck* (*ibid.* 1878). His memoirs were edited by Colenbrander in 1913.

FALCÓN, the most northern State of Venezuela, with an extensive coast-line on the Caribbean sea and Gulf of Venezuela. Pop. (1926) 178,642. It lies between the Caribbean on the north and the State of Lara on the south, with Zulia and the Gulf of Venezuela on the west. Its surface is much broken by irregular ranges of low mountains, and extensive areas on the coast are sandy plains and tropical swamps. The climate is hot, but, being tempered by the trade winds, is not considered unhealthy except in the swampy districts. The State is sparsely settled and has no large towns, its capital, Coro (pop. 1926, 10,932), being important chiefly because of its history, and as the entrepôt for an extensive inland district. The only port in the State is La Vela de Coro, on a small bay of the same name, 7 m E. of the capital, with which it is connected by railway. In recent years petroleum has been discovered in the State and is being extracted.

FALCON, the name applied to the long-winged birds of prey which take their quarry as it moves. As in all the group of diurnal birds of prey, the female is larger than the male As type of the family *Falconidae* may be taken the peregrine falcon (*Falco peregrinus*), and the scarcely separable duck-hawk (*F. anatum*) of North America and *F. melanogenys* of Australia. The peregrine falcon inhabits practically every part of the world, except where it is replaced by its allies noticed above. For its size, it is perhaps the most powerful bird of prey that flies, and its courage is as great as its power Famous in the days of hawking (*see* FALCONRY), the plumage of this bird is blackish-blue above and white with a more or less deep cream-coloured tinge below, barred, except on the chin and throat, with black It nests on cliffs and trees, laying four or five eggs mottled with reddish-brown.



THE PEREGRINE FALCON, A COURAGEOUS AND POWERFUL BIRD OF PREY, TRAINED IN EUROPE FOR THE SPORT OF HAWKING

The gyrfalcon (*F. gyrfalco*) is larger and inhabits the Scandinavian mountains. The Iceland falcon (*F. islandus*), which also inhabits South Greenland, is paler, while the Greenland falcon (*F. candicans*) is white with dark streaks. The kindred *F labradorus* of North-east America is very dark both above and below

The "desert" falcons differ from the preceding in that they retain the longitudinal barring on the breast throughout life, instead of changing it after the first moult to transverse bars They include in the Old World the lanner (*F. biarmicus*), the saker (*F. cherrug*) and the lugger, or luggar (*F jugger*), of India; in the New, the prairie falcon (*F. mexicanus*) of the western plains of North America

The hobby falcons are characterized by their bold upstanding position and long wings. The beautiful little English hobby (*F. subbeto*) lives mainly on insects and is a summer visitor to most parts of Europe. Many other species are known. *See* MERLIN, KESTREL.

A falcon is also a primitive light gun, 2½in. bore, weighing about 6cwt, and firing a 2lb. shot. It takes its name from the bird of prey in accordance with an old fashion (*Cf.* FALCONET, MUSKET).

FALCONE, ANIELLO (1600–1656), Italian battle-painter, was born in Naples. He studied under Ribera (Lo Spagnoletto), was influenced by Domenichino and later by the Dutch school He introduced the new problems of lighting and colour into fresco-painting. There are three authentic works extant. He decorated the cupola of a chapel in San Paolo dei Padri Teatini at Naples. He painted a "Flight into Egypt" in the sacristy of Naples Cathedral (signed and dated 1641), and the frescoes in the sacristy of Gesú Nuovo, also at Naples. He was famous as a battle-painter, two of his battle-pieces being in the Naples museum and in the Prado, Madrid. Some engraved plates are attributed to him without sufficient evidence.

FALCONER, HUGH (1808–1865), British palaeontologist and botanist, was born at Forres on Feb. 29, 1808. He studied at Aberdeen and at Edinburgh, where he took his M.D. in 1829. Proceeding to Calcutta in 1830 as assistant-surgeon on the Bengal

establishment of the East India Company, he soon published his description of the fossil bones from Ava in the possession of the Asiatic Society of Bengal. In 1831 he was appointed superintendent of the botanic garden of Saharanpur. In 1834 he published a geological description of the Siwalik hills and subsequently brought to light a sub-tropical fossil fauna of unexampled extent and richness, including remains of *Mastodon*, the colossal ruminant *Sivatherium*, and the enormous tortoise *Colossochelys Atlas*. It was on his recommendation in 1834 that tea was introduced into India.

When illness required him to return to England in 1842, he began his *Fauna Antiqua Sivalensis*, of which Part I was issued in 1846, and 107 plates during the years 1846–49. He was elected F.R.S in 1845, and in 1847 was appointed superintendent of the Calcutta botanical garden, and professor of botany in the medical college

In 1850 he published an important report on the teak forests of Tenasserim, and through his recommendation the cultivation of the cinchona bark was introduced into India. From 1855, he spent the remainder of his life in examining fossil species in England and on the Continent corresponding to those found in India, notably the species of mastodon, elephant and rhinoceros; he also described some new mammalia from the Purbeck strata, and he reported on the bone-caves of Sicily, Gibraltar, Gower and Brixham. He died on Jan. 31, 1865.

Falconer's botanical notes, with 450 coloured drawings of Kashmir and Indian plants, were deposited in the library at Kew Gardens, and his *Palaeontological Memoirs and Notes* were edited, with a biographical sketch, by C Murchison (1868). *See* also *Essays, descriptive and biographical* (1901) by his niece Lady Prestwich

FALCONER, WILLIAM (1732–1769), British poet, was born in Edinburgh, the son of a wig-maker He went to sea, and at the age of 18 was second mate on the "Britannia" when she was wrecked off Cape Colonna. Falconer was one of the three saved. The voyage was the subject of his poem *The Shipwreck* (1762). On his return he published an elegy on Frederick, Prince of Wales, and some poems in the *Gentleman's Magazine* He dedicated *The Shipwreck* to the Duke of York, who advised him to enter the navy. After the peace of 1763 he became purser of the "Glory" frigate In 1764 he published a new edition of *The Shipwreck* and *The Demagogue*, an attack on Wilkes and Charles Churchill. In 1769 appeared his *Universal Marine Dictionary* He was then appointed purser of the "Aurora" frigate, sailing to India. She left Spithead on Sept. 20, 1769, reached the Cape, which she left on Dec. 27, and was never heard of again. *The Shipwreck* had a great reputation in its day, which it has not preserved.

See *Falconer's Poetical Works* (Aldwe Edition, 1836), with a life by J. Mitford. *The Shipwreck* (1887) has a life by W. H. D. Adams

FALCONET, ÉTIENNE MAURICE (1716–1791), French sculptor, was born at Vevey, and died in Paris on Jan. 4, 1791 He was at first apprenticed to a carpenter, but some of his clay-figures attracted the notice of the sculptor Lemoine, who made him his pupil. His statue of Milo of Crotona secured his admission to the Academy of Fine Arts in 1754. At St. Petersburg (Leningrad) he executed a colossal statue of Peter the Great in bronze (1766). In 1788 he became director of the French academy of painting Falconet's *"Nymphe descendant au bain"* is in the Louvre.

His writings were collected under the title of *Oeuvres littéraires* (6 vols., Lausanne, 1781–82; 3 vols., Paris, 1787).

FALCONIDAE: *see* FALCON; CARACARA.

FALCONRY. The art of employing falcons and hawks in the chase, often termed hawking (Fr. *fauconnerie*, from late Lat. *falco*, falcon) Falconry was a favourite recreation of the aristocracy during the middle ages, followed, as it seems, more as a sport than as a means of getting game for the table. The antiquity of falconry is very great. It appears to have been known in China some 2,000 years B.C. In Japan it appears to have been known at least 600 years B.C., and probably at an equally early date in India, Arabia, Persia and Syria. Sir A. H. Layard says that on a bas-relief found in the ruins of Khorsabad "there appeared to be a falconer bearing a hawk on his wrist," from which it would appear to have been known there some 1,700 years B.C. In all the above mentioned countries of Asia it is practised at the present day.

Persian and Arabic manuscripts attribute the origin of falconry to a pre-historic Persian king; certain it is that the Moguls gave a great impetus to hawking in India From ancient carvings and drawings it seems to have been known in Egypt many ages ago. The older writers on falconry, English and Continental, often mention Barbary and Tunisian falcons. It is still practised in Egypt. The oldest records of falconry in Europe are in the writings of Pliny, Aristotle and Martial. It was probably introduced into England from the Continent about A.D. 860, and from that time down to the middle of the 17th century, falconry was followed with an ardour that perhaps no English sport has ever evoked. Stringent laws and enactments were passed from time to time in its interest. About the middle of the 17th century its popularity began to decline in England, to revive somewhat at the Restoration; it never however recovered its former favour, a variety of causes operating against it, such as the enclosure of waste lands and the introduction of fire-arms into the sporting field. Yet it has never been even temporarily extinct, and it is practised at the present day

In Europe the "quarry" at which hawks are flown consists of grouse (confined to the British Isles), black-game, pheasants, partridges, quails, landrails, ducks, teal, woodcocks, snipe, herons, rooks, crows, gulls, magpies, jays, blackbirds, thrushes, larks, hares and rabbits, in former days geese, cranes, kites, ravens and bustards were also flown at. Old German works make much mention of the use of the Iceland falcon for taking the great bustard, a flight scarcely alluded to by English writers In Asia the list of "quarry" is longer, and in addition to all the foregoing, or their Asiatic representatives, various kinds of bustards, sand grouse, storks, ibises, spoonbills, stone plovers, grass owls, short eared owls, rollers, hoopoes, pea fowl, jungle fowl, kites, vultures and gazelles are captured by trained hawks. In Mongolia and Chinese Tartary, and among the nomad tribes of Central Asia the sport still flourishes; and a species of eagle known locally as the "berkute" is trained in those regions to take large game, such as antelopes and wolves In a letter from the Yarkand embassy, dated Nov. 27, 1873, the following passage occurs. "Hawking appears to be a favourite amusement, the golden eagle taking the place of the falcon or hawk" In Africa gazelles are taken and also partridges and wild fowl. The hawks used in England are the Greenland, Iceland and Norway falcons, the peregrine falcon, the hobby, the merlin, the goshawk and the sparrow-hawk. In former days the saker, the lanner and the Barbary or Tunisian falcon were also employed. The most efficient in the field are the peregrine falcon and the goshawk. In all species of hawk the female is larger and more powerful than the male.

Hawks are divided by falconers all over the world into two classes. The first class comprises "falcons," *i.e.*, "long winged hawks," or "hawks of the lure." Merlins come into this category; they are undoubtedly falcons. The goshawk was by courtesy sometimes styled a falcon. The second class is that of "hawks," *i.e.*, "short-winged hawks," or "hawks of the fist"; in these the wings are not pointed but rounded.

Training.—It is through the appetite principally that hawks are tamed; but to fit them for use in the field, much patience, gentleness and care are necessary. Slovenly taming necessitates starving, and low condition and weakness are the result. The aim of the falconer should be to have his hawk always keen, and the appetite, when it is brought into the field, should be such as would induce the bird in a state of nature to put forth its full powers to obtain its food, with, as near as possible, a corresponding bodily condition.

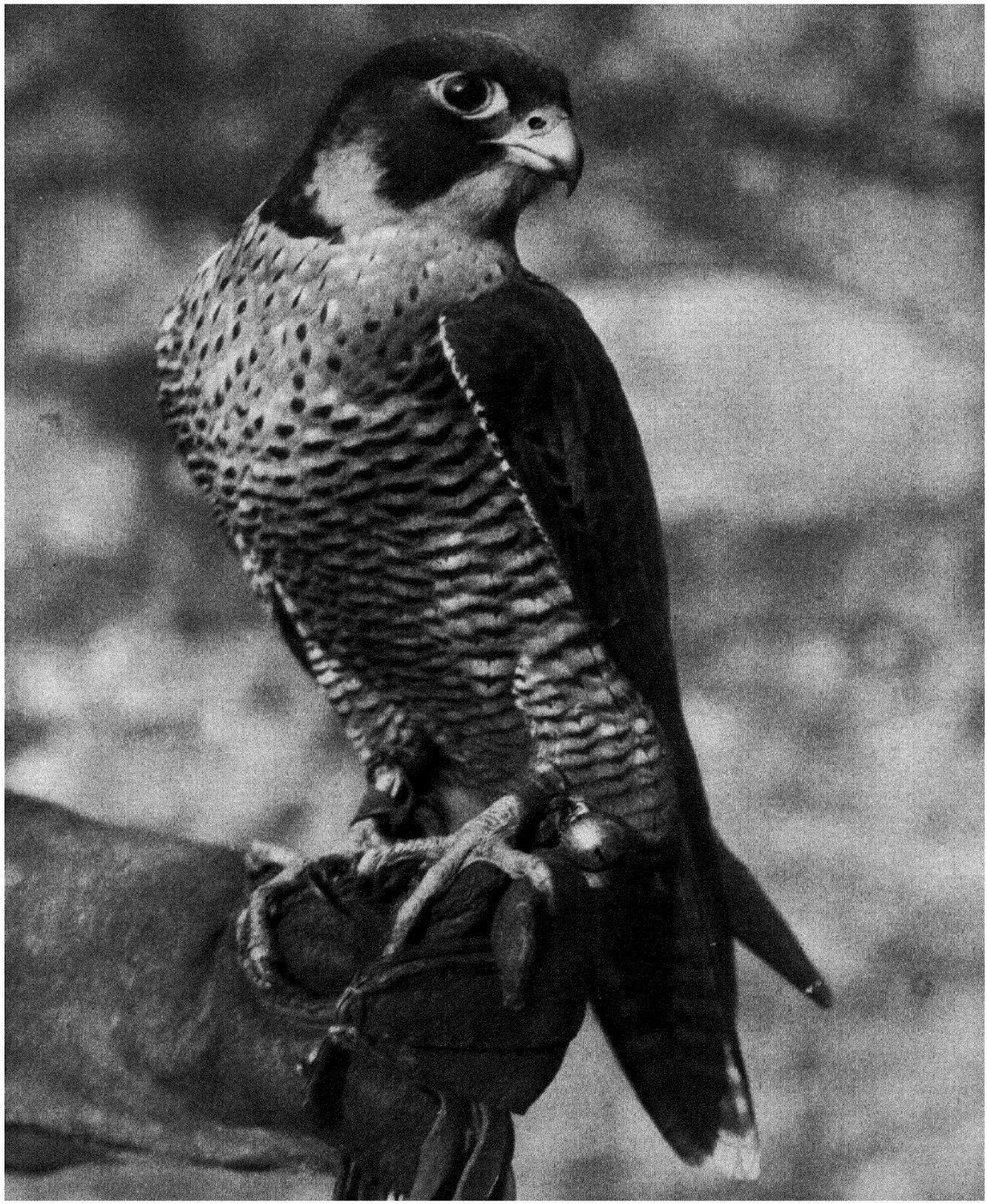
The following is a description of the process of training hawks. When first taken, a rufter or easy-fitting hood should be put on her head, and she must be furnished with jesses, swivel, leash and bell; jesses are strips of light leather for the legs. A thick glove or rather gauntlet should be worn on the left hand. (Eastern falconers always carry a hawk on the right.) She must be carried on the fist for several hours at a time, [illegible] night, at intervals being gently stroked with a [illegible] At



TRAINED EAGLE FLYING TO FIST

A golden eagle which has been trained to fly either to lure or to fist The falconer is protected against the bird's strong talons with a fencing mask, and with horsehide glove of double thickness and an extra leather sleeve for the left arm

FALCONRY



"INTERMEWED" FALCON

"Intermewed" peregrine falcon (*Falco peregrinus*) so called because it has moulted in the "mews," where hawks are kept The transverse markings indicate that the bird has moulted, before moulting they are perpendicular A moulting hawk is kept in very high condition and at liberty in a room within the "mews"; under these conditions it moults quickly and acquires strong and beautiful plumage

night she should be tied to a perch in a room with the windows darkened, so that no light can enter in the morning. The perch should be a padded one placed across the room about 4½ft. from the ground with a canvas screen underneath. She will be easily induced to feed, in most cases, by drawing a piece of beef-steak over her feet, brushing her legs at the time with a feather, and now and then, as she snaps at it, slipping a morsel into her mouth. Care must be taken to use a low whistle as she is in the act of swallowing; she will very soon learn to associate this sound with feeding, and it will be found that directly she hears it, she will gripe with her talons and bend down to feel for her food. When the falconer perceives this and other signs of her "coming to," that she no longer starts at the voice or touch, and steps quietly up from the perch when the hand is placed under her feet, it will be time to change her rufter hood for the ordinary hood This latter should be an easy fitting one, in which the braces draw closely and yet easily, and without jerking. An old one previously worn is to be recommended The hawk should be taken into an absolutely dark room, and the change should be made if possible in total darkness. After this she must be brought to feed with her hood off; at first she must be fed in a darkened room, more light being admitted as she is able to bear it. The first day, the hawk having seized the food, and begun to pull at it freely, the hood may be gently slipped off, and after she has eaten a moderate quantity, it must be replaced as slowly and gently as possible, and she should be allowed to finish her meal through the hood Next day the hood may be twice removed, and so on; day by day the practice should be continued, more light being gradually admitted, until the hawk will feed freely in broad daylight, and suffer the hood to be taken off and replaced without opposition. She must now be accustomed to see strangers, dogs, horses, etc , and to feed in their presence A good plan is to take her into the streets of a town at night, at first where the gas-light is not strong, unhooding and hooding her from time to time, but not letting her get frightened Up to this time she should be fed on lean beef-steak with no casting, but as soon as she is tolerably tame and submits well to the hood, she must occasionally be fed with pigeons and other birds This should be done not later than 3 or 4 P.M., and when she is placed on her perch for the night in the dark room, she must be unhooded and left so, of course, being carefully tied up. The falconer should enter the room about 7 or 8 A.M. next day, admitting as little light as possible, or using a candle He should first observe if she has thrown her casting; if so, he will at once take her to the fist, giving her a bite of food and rehooding her. If her casting has not been thrown up it is better for him to retire, leaving the room quite dark, and come in again later. He should leave her unhooded until such time as she has "cast."

She must now be taught to recognize the voice—the shout that is used to call her in the field—and to jump to the fist for food, the voice being used every time she is fed. When she comes freely to the fist she must be made acquainted with the lure. Kneeling down with the hawk on his fist, and gently unhooding her, the falconer casts out the lure, which may be either a dead pigeon, or an artificial lure garnished with beef-steak tied to a string, to a distance of a few feet in front of her. When she jumps down to it, she should be allowed to feed a little upon it—the voice being used—while occasionally receiving morsels from the falconer's hand; and before her meal is finished she must be taken up on to the hand, being induced to forsake the lure for the hand by offering her a piece of meat. This treatment will help to check her inclination hereafter to carry her quarry. This lesson is to be continued till the falcon feeds boldly on the lure on the ground in the falconer's presence—till she will allow him to walk round her while she is feeding. All this time she will have been held by the leash only, but in the next step a strong, but light creance—a line attached to the swivel—must be made fast to the leash, and an assistant holding the hawk should unhood her, as the falconer, standing at a little distance from her, calls her by shouting and casting out the lure.

Day by day the distance will be increased, until the hawk will [illegible] rooyds. and so on without hesitation: then she may be trusted to fly to the lure at liberty and by degrees from any distance, say 200 yards. This accomplished she should learn to stoop at the lure. Instead of allowing the hawk to seize upon it as she comes up the falconer will snatch the lure away and let her pass by, and immediately put it out that she may readily seize it when she turns round to look for it. This should be done at first only once, and then progressively, until she will stoop backwards and forwards at the lure as often as desired. Next she should be entered to her quarry Should she be intended for rooks or herons, two or three of these birds must be procured One should be given her from the hand, the next released close to her, and the third at a considerable distance. If she takes these keenly she may be flown at a wild bird, care must, however, be taken to let her have every possible advantage in her first flights—wind and weather, and the position of the quarry with regard to the surrounding country being an important consideration

Eyasses, on being received by the falconer before they can fly must be put into a sheltered place, such as an outhouse or shed. The basket or hamper should be filled with straw. A hamper is best, with the lid so placed as to form a platform upon which the young hawks can come out to feed. This should be fastened to a beam or prop a few feet from the ground The young hawks must be plentifully fed on the best fresh food obtainable—such as good lean beef and fresh killed birds and rabbits. The food should be securely tied in separate portions to a board, or better to wooden blocks, one for each hawk. At this stage the young hawk should be interfered with as little as possible. The falconer should place the food down for them and then retire as quickly as possible. The wilder and more independent they become during the period of "hack" the better. As they grow older they will come out and perch about the roof of their shed, by degrees extending their flights to neighbouring buildings or trees, never failing to come back at feeding time to the place where they are fed. Soon they will be continually on the wing, soaring up and playing with one another, and later the falconer will observe them chasing other birds, such as pigeons or rooks, which may be passing by. As soon as a young hawk fails to return to the hack for its meal a note should be made of its absence, and it should at once be caught in a bow net or snare the first time it comes back, or it may absent itself for good. It must be borne in mind that the longer hawks can be left out "at hack" the better they are likely to be in the field—those hawks being always the best which have preyed a few times for themselves when "at hack." There is, of course, a great risk of losing hawks altogether when they begin to prey for themselves, but this is a matter for the falconer's judgment. When a hawk is so caught she is said to be "taken up" from hack. Being an eyas, she will not require a rufter hood, but a good deal of the management as directed for the passage falcon will be necessary in her case also. She must be carefully tamed and broken to the hood in the same manner, and also taught to know the lure; but, as might be expected, very much less difficulty will be experienced. As soon as the eyas knows the lure sufficiently well to come to it sharp and straight from a distance, she must be taught to "wait on." This is effected by letting the hawk loose, choosing the most open space available. It will be found that she will circle round the falconer looking expectantly for the lure—perhaps mount a little in the air, and advantage must be taken of a favourable moment when the hawk is at a little height, her head being turned inwards towards the falconer, to loose a pigeon with shortened wings which she can easily catch. When the hawk has taken two or three pigeons in this way, and mounts into the air immediately in expectation, in short, begins to "wait on," she should be given no more pigeons, but be tried at game as soon as possible. The young hawk must be given every possible advantage when first flown at wild quarry, as, upon the success or failure of these early attempts, her subsequent career of usefulness chiefly depends.

The training of the great northern falcons, as well as that of merlins and hobbies, is conducted much on the above principles, but the jer-falcons will seldom "wait on" well, and merlins will

not do so at all.

The training of short-winged hawks is a simpler process. They must, like falcons, be provided with jesses, swivel, leash and bell. In these hawks the bell is sometimes fastened to the tail. Sparrow-hawks can, however, scarcely carry a bell big enough to be of any service The hood is seldom used for short-winged hawks—never in the field. They must be made as tame as possible by carriage on the fist and the society of man, and taught to come to the fist freely when required—at first to jump to it in a room, and then out of doors. When the goshawk comes freely and without hesitation from short distances, she would be called from longer distances from the hand of an assistant, but not oftener than twice in each meal, until she will come several hundred yards, on each occasion being well rewarded with some favourite food such as fresh killed birds When she does this freely, and endures the presence of strangers, dogs, etc., a few bagged rabbits may be given to her, and she will be ready to take the field. Some accustom the goshawk to the use of the lure, for the purpose of recovering her if she refuses to come to the fist in the field, when she has taken stand in a tree after being baulked of her quarry, but this is not a good practice

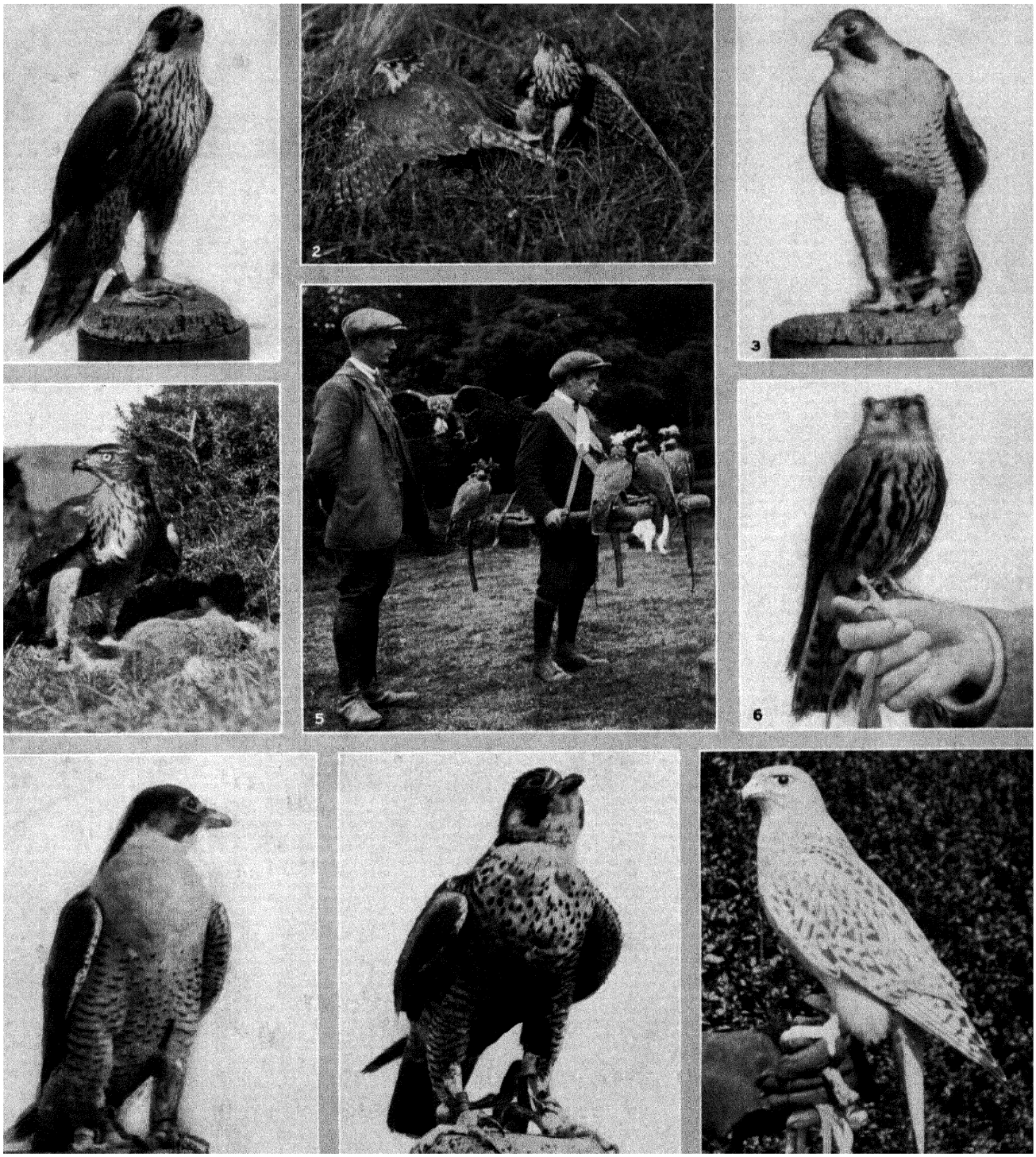
Methods of Hawking.—Falcons or long-winged hawks are either "flown out of the hood" (*i.e.*, unhooded and slipped when the quarry is in sight), or they are made to "wait on" till game is flushed. Herons and rooks are always taken by the former method. Passage hawks are generally employed for flying at these birds, though good eyasses are occasionally equal to the work.

For heron hawking a well stocked heronry is essential, adjoining an open country (with no adjacent water) over which the herons are in the constant habit of passing on their fishing excursions, or making their "passage." A heron found at his feeding place at a brook or pond affords no sport whatever. A goshawk can then take him as he rises, before he can get well on the wing. It is quite a different affair when he is sighted winging his way high in the air over an open tract of country free from water. Though he has no chance in competing against a falcon in straightforward flight, the heron has large concave wings, and a proportionately light body, and he can rise with astonishing rapidity, more perpendicularly or, in other words, in smaller rings than the falcon can and with less effort. As soon as he sees the approach of the falcon, he makes for the upper regions. The falcon then commences to climb to get above him, but in a very different style. She makes wider circles or rings, travelling at a higher rate of speed, due to her strength, weight and power of flying, till she rises above the heron. Then she makes her attack by stooping with great force at the quarry, sometimes falling so far below him that she cannot shoot up to a sufficient pitch for the next stoop, and has to make another ring to regain her lost command over the heron, which is ever rising, and so on —the "field" meanwhile galloping in the direction the flight is taking, till the falcon seizes the heron aloft, "binds" to him, and both come to the ground together. Absurd stories have been told, and pictures drawn, of the heron receiving the falcon on its beak in the air. It is, however, well known to all practical falconers that the heron has neither the power nor the inclination to use his beak in the air; so long as he is flying he relies solely on his wings for safety. When on the ground, however, the heron may use his dagger-like bill with dangerous effect, though it is very rare for a falcon to be injured. Old experienced hawks generally let go the heron on nearing the ground, "binding" to him again immediately he reaches it in his fall. Rooks are flown in the same manner as herons, but the flight is generally inferior. In Europe a cast of falcons was always flown at a heron. It was the practice to ride in and release the heron when he was taken, if uninjured the long plume of feathers at the back of his head being removed and kept as a trophy. The last establishment for heron hawking in Europe was maintained at the Loo in Holland, with H.R.H. Prince Alexander of the Netherlands as its president, between the years 1840 and 1850. This establishment was called the Loo Hawking Club and included several English members.

For game-hawking eyasses are generally used, though undoubtedly passage or wild caught hawks are to be preferred. The best game hawks we have seen have been passage hawks, but there are difficulties attending their use. It may perhaps be fairly said that passage hawks can be trained to "wait on" in grand style, but until they have got through their first season, they are more liable to be lost than eyasses. The advantages attending the use of eyasses may be summed up as follows: they are easier to obtain, to train and to keep; they moult more regularly than passage hawks, and if lost in the field they will often return home by themselves, or remain in the country where they are accustomed to be flown. Experience and, we must add, some good fortune also are requisite to make eyasses good for "waiting on" at game. Slight mistakes on the part of the falconer, false points from dogs, or bad luck in serving, will cause a young hawk to acquire bad habits, such as sitting down on the ground, taking stand in a tree, raking out wide, skimming the ground, or lazily flying round at an insufficient altitude. A good game hawk in proper flying order mounts rapidly to a high pitch until she appears no larger than a swallow in the sky, keeping well over the falconer and dogs, and ready to stoop when the quarry is sprung. Hawks that have been successfully trained and judiciously worked become wonderfully clever, and soon learn to regulate their flight by the movements of their master. Eyasses were not held in esteem by the old falconers, and it is evident from their writings that these hawks have been much better understood and managed in modern times than in the middle ages. It is probable that the old falconers procured the wild-caught hawks with greater facility than at the present day. There was a hawk mart held at Valkenswaard in Holland, where hawks were sold after the annual catch during the autumn migration. It was visited by falconers from all over Europe, large sums being often paid at auction for particularly choice birds

Here may be quoted a few lines from one of the best of the old writers, which may be taken as giving a fair account of the estimation in which eyasses were generally held, and from which it is evident that the old falconers did not understand flying hawks "at hack" Symon Latham, writing in 1633, says of eyasses: "They will be verie easily brought to familiaritie with the man, not in the house only, but also abroad, hooded and unhooded; nay, many of them will be more gentle and quiet when unhooded than when hooded, for if a man doe but stirre or speake in their hearing, they will crie and bate as though they did desire to see the man. Likewise some of them being unhooded, when they see the man will cowre and crie, showing thereby their exceeding fondness and fawning love towards him. . . . These kind of hawks which are (for the most part) taken out of the nest while verie young, even in the downe, from whence they are put into a close house, whereas they be alwaies fed and familiarly brought up by the man, untill they bee able to flie, when as the summer approaching verie suddenly they are continued and trained up in the same, the weather being alwaies warm and temperate; thus they are still inured to familiaritie with the man, not knowing from whence besides to fetch their relief or sustenance. When the summer is ended they bee commonly put up into a house again, or else kept in some warm place, for they cannot endure the cold wind to blow upon them. . . . But leaving to speak of these kind of scratching hawks and I never did love should come too neere my fingers, and to return unto the faire conditioned haggard faulcon. . . ."

The author here describes with accuracy the condition of unhacked eyasses which no modern falconer would trouble himself to keep. Many English falconers in modern times have owned eyasses which have killed grouse, ducks, and other quarry in a style almost equalling that of passage hawks. Moors, downs, open country where the hedges are low and weak, are best suited to game-hawking. Pointers or setters may be used to find the game, or the hawk may be loosed on reaching the ground where game is known to lie, and suffered, if an experienced one, to "wait on" till it is flushed. [illegible] ones especially, [illegible] when the dog points, [illegible] reached her pitch. The hawk should be well over the birds, and if



HAWKS AND FALCONS

1 Immature eyas tiercel, used for game hawking An eyas is a hawk which has been trained from the nest The male of any hawk, being a third smaller than the female, is called *tiercel* 2 A cast (male and female) of merlins, on a lark which they have killed Merlins are flown only at larks 3 An adult eyas tiercel A hawk is considered adult after the first moulting, when the marking of the plumage becomes horizontal instead of perpendicular Tiercels are best used for partridges, magpies and gulls. Only the largest can kill grouse 4 A female goshawk, flown at hares, rabbits or pheasants, shown sitting by a rabbit she has just caught 5 Hooded falcons on the cadge, a wooden frame on which hawks are transported to and from the field Their vision is cut off by leather hoods to ensure their sitting still 6 Jack merlin, or male The female is called the merlin 7 An eyas peregrine tiercel (*see* fig 3) This bird killed 504 head of game, principally partridge and grouse, in eight years 8 Haggard peregrine falcon, the bird most successfully used in falconry *Haggard* signifies a hawk caught wild in adult plumage 9 A gerfalcon of the Greenland variety, the largest of the falcons Modern falconers have not been successful in training this bird, having found it difficult to keep it in health and condition

FALCONRY



BY COURTESY OF CAPTAIN C W R KNIGHT

BUZZARD SUCCESSFULLY TRAINED FOR FALCONRY

A buzzard (*Buteo vulgaris*), from Exmoor, Devonshire, which was trained for falconry as an experiment and acquitted itself satisfactorily in the field This bird is generally considered useless for the practise of falconry, since in speed, courage and perseverance it is vastly inferior to other birds of prey

possible a little up-wind of them when they rise, she will then be better placed for a down-wind stoop, as the game will not dare to fly up-wind under the hawk The hawk will then turn over, and, flying headlong downwards with incredible speed, will, with the gathered impetus of her fall from the sky, rapidly overtake the bird she has from the first moment selected as her victim. As she reaches it, she strikes it a heavy blow with the hind talon of her foot, and the bird falls to the ground, often stone-dead, leaving a cloud of feathers in its track, or, just as she rushes up to it, the quarry may evade the stroke by a clever shift, and hurl itself into the nearest cover before the hawk has recovered from her stoop. The falconer will then come up as quickly as possible to "serve" the hawk by putting the bird out again while she "waits on" overhead. If this be successful, she is nearly certain to kill at the second attempt. Falcons, being larger and stronger, are to be preferred for grouse and tiercels for partridges. Woodcock afford capital sport where the country is sufficiently open; it will generally be found that after the first stoop at a woodcock, the cock will try to escape by taking the air, and will show a very fine flight. When beaten in the air it will try to get back to covert again, but when once a hawk has out-flown a woodcock, he is pretty sure to kill it. Snipe may be killed with first-class tiercels in favourable localities. Wild duck and teal are only to be flown at when they can be found in small pools or brooks at a distance from large sheets of water—where the fowl can be suddenly flushed by men or dogs, while the falcon is flying at her pitch overhead. For duck falcons should be used, tiercels will kill teal well The merlin is used for flying at larks, and there does not seem to be any other use to which this pretty little falcon may fairly be put. It is very active, but far from being, as some authors have stated, the swiftest of all hawks. Its flight is greatly inferior in speed to that of the peregrine. The hobby is swifter than the merlin, but cannot be said to be efficient in the field; it may be trained to "wait on" beautifully, and will take bagged larks· it is much addicted to the fault of "carrying"

The three great northern falcons are not easy to procure in proper condition for training. They are difficult to break to the hood and to manage in the field They can be flown, like the peregrine, at herons and rooks, and in former days were used for kites and hares. Their style of flight is magnificent; they are swifter than the peregrine, and are deadly "footers." They seem, however, to lack somewhat of the spirit and dash of the peregrine.

For the short-winged hawks an open country is not required; they may even be flown in a wood Goshawks are used for hares, rabbits, pheasants, partridges and wild-fowl Only very large and strong females are able to take hares; rabbits are easy quarry for any female goshawk and also for some males. For pheasants the male is to be preferred, and certainly for partridges, either sex will take duck, but the falconer must get close to them before they are flushed, or the goshawk will stand a poor chance of killing. Rabbits may be bolted with the ferret, and the hawk loosed as the rabbit bolts, but care must be taken that she does not kill the ferret. Where rabbits sit out in grass or in turnip fields, a goshawk may be used with success, or even in a wood where the burrows are not too near. For various reasons goshawks in England cannot be brought to the perfection to which they are brought in the East. In India, for instance, there is a far greater variety of quarry suited to them, and wild birds are much more approachable; moreover, there are advantages for training which do not exist in England. Unmolested, the Eastern falconer carries his hawk by day and night in the crowded bazaars, till the bird becomes perfectly indifferent to men, horses, carriages.

The management of sparrow-hawks is much the same as that of goshawks, but they are more delicate. They are flown in England at blackbirds, thrushes and other small birds; the best will take partridges well early in the season. In the East a large number of quail are taken with sparrow-hawks. In India falconry, until quite recently, has always been a flourishing art. Indian falconers far surpass Persians and Arabs. Eyasses are not used, and the system of flying "at hack" is unknown. Hawks are caught on the passage, manned and trained to the lure in a wonderfully short time, but very seldom is a falconer to be found who can maintain hawks in good flying condition In the Punjab, sakers are the falcons chiefly used; haggard and young passage hawks are flown at hares and hubara. Successful falconers get these sakers into good wind by daily exercise at the lure, giving them about 25 stoops in the morning, and about the same number in the evening. They are then kept fit by daily stooping to the lure Arab falconers omit this exercise altogether, and keep their hawks in such poor condition that they are unable to kill hubara on the wing. Their hawks follow the quarry in the open desert, and when it settles, kill after a rough and tumble on the ground. During the last 30 years falconry has nearly died out in India, though a fair number of goshawks are still kept. Between the hours of 11 A M and 3 P M. hawking in the desert is difficult on account of eagles, which interfere with the hawks, and rob them of their quarry. Pariah dogs too are liable to be a nuisance. Sakers, both haggard and young passage falcons, used also to be flown at kites. One flight each alternate day was usually considered sufficient, as this was a very tiring flight for the hawks. As kites are generally found in the vicinity of villages, and when pursued make for shelter in a village, kite-hawks generally come to an untimely end, being attacked by pariah dogs, or knocked in the head by the villagers themselves.

Hawks from which work in the field is expected should be kept in the highest health, and they must be carefully fed; no bad or tainted meat must be given to them. Peregrines and the great northern falcons are best kept on lean beef-steak with a frequent change in the shape of fresh killed pigeons and other birds. Freshly killed rabbits are a change to a lighter diet. The smaller falcons, the merlin and the hobby, require small birds to keep them in health. For goshawks a coarser diet, such as rats or rabbits, suffices. The sparrow-hawks, like the small falcons, require small birds. All hawks need to be given castings. Hawks will exist, and often appear to thrive, on good food without castings, but the seeds of future injury to their health are being sown If it is more convenient to feed the hawks on beef-steak, they should frequently be given the wings, heads and necks of game and poultry, with the blood carefully removed In addition to the castings which they swallow, tearing the pinion joint of a wing is good exercise for them, and biting the bones keeps their beaks in good trim Most hawks, peregrines especially, require a bath. The end of a cask sawn to give a depth of about 6in. makes a good bath. Peregrines which are used for "waiting on" require a bath at least twice a week. If this be neglected, they are when flown inclined to soar, and may even rake away in search of water, and so be lost.

The best way, where practicable, of keeping hawks, is to tether them to blocks on the lawn. Goshawks are generally placed on bow perches, which ought not to be more than 8 or 9in high at the centre of the arc. It will be several months before passage or wild-caught falcons can be kept out of doors; they must be fastened to a perch in a darkened room, hooded, and, by degrees, as they get tamer, they may be put out on the lawn. In England (especially in the south) peregrines, the northern falcons and goshawks may be kept out of doors all day and night in a sheltered situation. Merlins, being more delicate, should be given more protection. In wild boisterous weather, or in snow or sharp frost, it would be advisable to move them to the shelter of a shed, the floor of which should be laid with sand to a depth of 3 or 4 inches. An eastern aspect is best—all birds enjoy the morning sun and it is beneficial to them. The more hawks confined to blocks out of doors see of persons, dogs, horses, etc , moving about, the better. Those who have only seen wretched ill-fed hawks in cages, pining for exercise, with battered plumage, torn shoulders, and bleeding ceres, from dashing against their prison bars, and with overgrown beaks from never getting bones to break, can have little idea of the beautiful and noble-looking birds to be seen pluming their feathers and stretching their wings at their ease on their blocks on the lawn, watching with their large, bright, keen eyes everything that goes on in the sky, and everywhere else within their view.

Contrary to the prevailing notion, hawks that have been well handled show a good deal of attachment to their owners. It is

true that by hunger they are in great measure tamed and controlled, and the same may be said of many undomesticated and many domesticated animals Instinct prompts all wild creatures when away from man's control to return to their former shyness, but hawks certainly retain their tameness for a long time, and their memory is remarkably retentive. Wild-caught hawks have been retaken either by their coming to the lure, or upon quarry, from two to seven days after they have been lost, and eyasses from two to three weeks As an instance of retentiveness of memory displayed by a hawk we may mention the case of a wild-caught falcon which was recaptured after being at liberty more than three years, still bearing the jesses which she wore at the time she was released; in five days she was flying at the lure again at liberty, and was found to retain the peculiar ways and habits of a trained hawk It is useless to bring a hawk into the field unless she has a keen appetite, if she has not, she will neither hunt effectually nor follow her master Even wild-caught falcons, however, may sometimes become so attached to their owner that, when sitting on their blocks with food in their crops, they will, on seeing him, "bate" hard to get to reach him, till he either allows them to jump up to his hand, or withdraws from their sight Goshawks too evince great attachment to their owner. Another error is that hawks are lazy birds, requiring hunger to stir them to action. The reverse is the truth; they are birds of very active habits, and exceedingly restless. The wild falcon requires an immense amount of exercise to enable her to exert her speed and power of flight; instinct prompts her to spend hours daily on the wing, soaring and playing about in the air in all weathers, often chasing birds merely for play. When full gorged she takes a siesta; but unless she fills her crop late in the evening she is soon on the move again Goshawks and sparrow-hawks, too, habitually soar in the air at about 9 or 10 A.M., and remain aloft a considerable time, but these birds are not so active as the falcons. The frequent "bating" of tame hawks proves their restlessness and impatience of repose So does the wretched condition of the caged falcon, while the truly lazy buzzards and kites, which do not in the wild state depend upon their activity for their sustenance, maintain themselves for years even during confinement in good case and plumage The falconer, therefore, should endeavour to give his hawks as much flying as possible, and he should avoid the mistake of keeping too many hawks. In this case a favoured few are sure to get all the work, and the others, possibly equally good, were they given the chance, are spoilt for want of exercise

The larger hawks may be kept in health and working order for many years The writer has known peregrines, shaheens and goshawks to reach ages of 15 and 20 years. Goshawks, however, never fly well after four or five seasons, when they will no longer take difficult quarry; they may be used for rabbits as long as they live. Shaheens have been seen in the East at an advanced age, killing wild-fowl beautifully. The shaheen is a falcon of the peregrine type, but smaller, which does not travel, like the peregrine, all over the world It appears that the jerfalcons also may be worked to an advanced age. Old Symon Latham tells us of these birds—"I myself have known one of them an excellent hearnor (killer of herons) and to continue her goodnesse very neere twentie yeeres, or full out the time."

(E. D-RA.)

HAWKING IN MODERN ENGLAND

The Old Hawking Club.—The survival of falconry in England is due mainly to the influence of the Old Hawking Club. This club was formed by a few gentlemen in 1864 and continued in being until 1925; it came to an end for various causes, the first of which was the World War. The principal sport of this club was rook hawking on the Wiltshire downs during the spring, but every description of hawking has also been indulged in The hawks principally used were passage hawks, and a draft of from eight to ten freshly caught peregrines was annually brought over from Valkenswaard in Holland in the autumn, and trained for rook hawking in the following spring. Some of these, in conjunction with eyasses, were flown at partridges and grouse in the autumn. The objects of this club have ever been to promote falconry—first, by keeping up a first-class establishment of hawks; secondly, to train lads as falconers under an able man; and thirdly, by drafting out at the end of each season all but a few favourites, to maintain a supply of well trained hawks

In addition to the club a few private establishments have always been maintained, where the best traditions of the sport have been kept up. The place of the Old Hawking Club has now been taken by the British Falconers' Club. (D. C P.)

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FALDSTOOL, properly a folding seat for the use of a bishop when not occupying the throne in his own cathedral, or when officiating in a cathedral or church other than his own, hence any movable folding stool used for kneeling in divine service.

FALERII, one of the twelve chief cities of Etruria (mod *Cività Castellana* [*q v*]), situated about 2 m W. of the ancient Via Flaminia, 32 m. N of Rome Wars between Rome and the Falisci (*q v*) appear to have been frequent At the end of the First Punic War, they rose in rebellion, but were soon conquered (241 B.C) and lost half their territory The ancient city, built upon a precipitous hill, was destroyed and another built on a more accessible site in the plain Thus the original city occupied the site of the present Civita Castellana, and the Roman town was transferred 3 m. to the north-west. After this time Falerii hardly appears in history. There were bishops of Falerii up till 1033, when the desertion of the place in favour of the present site began, and the last mention of it dates from A D. 1064.

The site of the original Falerii is a plateau, about 1,100 yd by 400, not higher than the surrounding country (475 ft) but separated from it by gorges over 200 ft in depth, and only connected with it on the western side, which was strongly fortified with a mound and ditch; the rest of the city was defended by walls constructed of rectangular blocks of tufa, of which some remains still exist. Remains of at least four temples have been excavated These buildings were of wood, with fine decorations of coloured terra cotta (*see* Taylor and Bradshaw in *Papers of the British School at Rome* viii. 1 *sqq.*). Numerous tombs hewn in the rock are visible on all sides of the town; many objects, both from the temples and from the tombs, are in the Museo di Villa Giulia at Rome. The site of the Roman Falerii is now entirely abandoned. It lay upon a road which may have been the Via Annia, a by-road of the Via Cassia; this road approached it from the south passing through Nepet, while its prolongation to the north certainly bore the name Via Amerina. The circuit of the city is about 2,250 yd., its shape roughly triangular, and the walls are a remarkably fine and well-preserved specimen of Roman military architecture They are constructed of rectangular blocks of tufa and reach in places a height of 56 ft. and are 7 to 9 ft. thick. There were about 80 towers, some 50 of which are still preserved. Two of the gates also, of which there were eight, are noteworthy. Almost the only edifice now standing within the walls is the 12th-century abbey church of S. Maria.

See G. Dennis, *Cities and Cemeteries of Etruria* (London, 1883), i. 97; for philology and ethnology *see* FALISCI. (T. A.)

FALERIO (mod. *Falerone*), an ancient town of Picenum, Italy, about 10 m. S.E. of Urbs Salvia, which, from the remains

of its buildings, appears to have been of some importance. It was probably founded as a colony by Augustus after his victory at Actium. Considerable remains of a theatre in concrete faced with brickwork, erected, according to an inscription, in 43 B C, and 161 ft in diameter, were excavated in 1838 and are still visible; an amphitheatre, less well preserved, also exists, the arena of which measures about 180 by 150 ft Between the two is a water reservoir (called Bagno della Regina) connected with remains of baths.

FALGUIÈRE, JEAN ALEXANDRE JOSEPH (1831–1900), French sculptor and painter, was born at Toulouse on Sept 7, 1831. A pupil of the École des Beaux Arts he won the *Prix de Rome* in 1859; he became a member of the Institute in 1882 His "Victor of the Cock-Fight" (1864), and "Tarcisus the Christian Boy-Martyr" (1867) are now in the Luxembourg His more important monuments are those to Admiral Courbet (1890) at Abbeville and the famous "Joan of Arc" His "Triumph of the Republic" (1881–86), a vast quadriga for the Arc de Triomphe, Paris, is perhaps more amazingly full of life than others of his works, all of which reveal this quality of vitality in superlative degree To these works should be added his monuments to "Cardinal Lavigerie" and "General de La Fayette" (the latter in Washington), and his statues of "Lamartine" (1876) and "St Vincent de Paul" (1879), as well as the "Balzac," which he executed for the *Société des gens de lettres* on the rejection of that by Rodin; and the busts of "Carolus-Duran" and "Coquelin cadet" (1896) He died in Paris on April 19, 1900 Falguière was a painter as well as a sculptor Of his paintings "The Wrestlers" (1875) and "Fan and Dagger" (1882; a defiant Spanish woman) are in the Luxembourg

See Léonce Bénédite, *Alexandre Falguière* (1902)

FALIERI, MARINO (1279–1355), doge of Venice, belonged to one of the oldest and most illustrious Venetian families and had served the republic with distinction in various capacities In 1346 he commanded the Venetian land forces at the siege of Zara, where he was attacked by the Hungarians under King Louis the Great and totally defeated them; this victory led to the surrender of the city In Sept 1354, while absent on a mission to Pope Innocent IV at Avignon, Falieri was elected doge, an honour which apparently he had not sought. His reign began, as it was to end, in disaster, for very soon after his election the Venetian fleet was completely destroyed by the Genoese off the island of Sapienza, while plague and a declining commerce aggravated the situation Falieri fretted under the constitutional restrictions of the ducal power, and the discontent of the arsenal hands at their treatment by the nobles offered him his opportunity In concert with a sea-captain named Bertuccio Ixarella (who had received a blow from the noble Giovanni Dandolo), Filippo Calendario, a stonemason, and others, a plot was laid to murder the chief patricians on April 15 and proclaim Falieri prince of Venice. The Council of Ten arrested the ringleaders; several of the conspirators were condemned to death and others to various terms of imprisonment The doge was himself arrested; at the trial he confessed everything, and was condemned and executed on April 17, 1355

See Horatio Brown, *Studies in Venetian History* (1907, with bibliography).

FALISCI, a tribe of Sabine origin or connections, but speaking a dialect closely akin to Latin, who inhabited the town of Falerii (*q.v.*), as well as a considerable tract of the surrounding country, probably as far south as Capena. But at the beginning of the historical period (*i.e.*, from the beginning of the 5th century B C), and no doubt earlier, the dominant element in the town was Etruscan; and all through the wars of the following centuries the town was counted a member, and sometimes a leading member, of the Etruscan league (*cf.* Livy iv. 23, v. 17, vii 17).

The Faliscans show many traces of their Italic origin, above all in their language, which is preserved in some 36 short inscriptions, dating from the 3rd and 2nd centuries B.C., written from right to left in a peculiar alphabet derived from the Etruscan, with some traces of the influence of the Latin alphabet.

The phonetic characteristics of the Faliscan dialect are:—

1. The retention of medial *f* which in Latin became *b;*

2. The representation of an initial Ind.-Eur. *gh* by *f* (*foied,* contrast Latin *hodie*);

3. The palatalization of *d*+consonant *i* into some sound denoted merely by *i*—the central sound of *foied,* from *fo-diēd;*

4. The loss of final *s,* at all events before certain following sounds (*cra* beside Latin *crās*).

Other characteristics, appearing elsewhere, are:

5 The retention of the velars (Fal. *cuando*=Latin *quando;* contrast Umbrian *pan(n)u*);

6 The assimilation of some final consonants to the initial letter of the next word·

It seems probable that the dialect lasted on, though being gradually permeated with Latin, till at least 150 B C.

The remains found in the graves (*see* FALERII), which belong mainly to the period of Etruscan domination, give ample evidence of material prosperity and refinement. The earlier strata have yielded more primitive remains from the Italic epoch A large number of inscriptions consisting mainly of proper names may be regarded as Etruscan rather than Faliscan.

See W. Deecke, *Die Falisker;* E. Bormann, in *C.I.L.* xi pp 465 ff.; and R. S Conway, *Italic Dialects*

FALK, ADALBERT (1827–1900), German politician, was born at Matschkau, Silesia, on Aug. 10, 1827. In 1847 he entered the Prussian state service, and in 1853 became public prosecutor at Lyck. From 1872 to 1879 he was minister of education, and in connection with Bismarck's policy of the *Kultur-kampf* he was responsible for the famous May Laws against the Catholics (*see* GERMANY *History*) He retained his seat in the *Reichstag* till 1882, when he was made president of the supreme court of justice at Hamm He died on July 7, 1900

See H R. Fischer, *Adalbert Falk* (1901).

FALK, JOHANN DANIEL (1768–1826), German author and philanthropist, was born at Danzig on Oct. 28, 1768. In 1813 he established a philanthropic society (*Gesellschaft der Freunde in der Not*), one of the earliest of its kind, and about the same time founded an institute for the care and education of neglected and orphan children, which, in 1829, was taken over by the State and still exists as the *Falksches Institut* Falk lived at Weimar, and enjoyed the acquaintance and intimate friendship of Goethe, his account of their intercourse was posthumously published under the title *Goethe aus naherein persönlichen Umgange dargestellt* (1832) (English translation by S Austin) Falk died on Feb 14, 1826

Falk's *Satirische Werke* appeared in 7 vols. (1817 and 1826); his *Auserlesene Schriften* (3 vols., 1819). See *Johannes Falk: Erinnerungsblätter aus Briefen und Tagebuchern* edited by his daughter, (1868); Heinzelmann, *Johannes Falk und die Gesellschaft der Freunde in der Not* (1879); S. Schultze, *Falk und Goethe* (1900).

FALKE, JOHANN FRIEDRICH GOTTLIEB (1823–1876), German historian, was born at Ratzeburg on April 10, 1823 In 1856 he was appointed secretary of the German museum at Nuremberg, and in 1859 keeper of the manuscripts. With the aid of the manuscript collections in the museum he studied economic history, and, with Johann H Müller, established an historical journal, *Zeitschrift fur deutsche Kulturgeschichte* (4 vols , Nuremberg, 1856–59). To this journal he contributed a history of German taxation and commerce In 1862 he became secretary and, later, keeper of the State archives at Dresden. His works include. *Geschichte des deutschen Handels* (2 vols., 1859–60); *Die Hansa als deutsche See- und Handels-macht* (1862), and *Geschichte des deutschen Zollwesens* (1869) He died at Dresden on March 2, 1876

FALKENHAYN, ERICH VON (1861–1922), Prussian general, was born on Nov 11, 1861 at Burg Belchau (Thorn) He took part in the China expedition of 1900 and remained in China with a brigade of occupation until 1903. In 1907 he was appointed chief of staff of the XVI., and in 1912 of the IV Army Corps. In 1911 he was appointed commander of the 4th Guards (infantry) regiment. In 1913 he was made general, and from July 7, 1913 to Jan 20, 1915 was Prussian war minister He succeeded General von Moltke on Nov. 3, 1914 as chief of the general staff of the army. Although Falkenhayn did not accept the principle that a decision could be obtained in the East, the

abandonment of the plan for a break-through on the Albert-Arras front, and the increasing evidence of shortage of material and weakening efficiency on the Russian side made him regard a very heavy blow on the Russian front as necessary and desirable Eight divisions were brought from the Western front, and Mackensen was made chief of this army (XI), which succeeded in breaking through the Russian lines (Gorlice–Tarnow) on May 2–3, 1915 (*see* WORLD WAR) Falkenhayn later helped to plan the summer offensive of 1915 against Russia At the end of 1915 he became convinced of the necessity of opening a road to Turkey for the transit of munitions and expert personnel, and organized the operations by which, with the co-operation of the Bulgarian army, Serbia was over-run in the winter of 1915–16 At the end of Dec 1915, Falkenhayn sent the Kaiser a memorandum setting forth his reasons for advocating an attack on Verdun (*see* VERDUN, BATTLES OF), and he was severely blamed when the attack eventually failed

In July 1916, Falkenhayn, submitting to public opinion, proposed that Field-Marshal von Hindenburg should be made supreme commander from Pripet to the Dniester, and a few days later he offered him the command of the whole eastern front from the Baltic to the Carpathians The desire for the creation of a general supreme command was rapidly growing even in Austria, and on Sept 16, 1916 the *Oberste Kriegsleitung* was signed by German and Austrian plenipotentiaries, under this agreement the German Kaiser became responsible for the higher leading of operations in general It was signed on the part of the Germans by von Hindenburg, who had succeeded Falkenhayn as new chief of the General Staff on Aug 29, 1916, the immediate cause of Falkenhayn's dismissal being the Rumanian declaration of war (Aug 27, 1916) Falkenhayn was then assigned the leadership of the IX Army against Rumania and commanded in the fighting at Hermannstadt and on the Targu Jin (*see* RUMANIA. *Defence*) In 1917 he took command of the so-called Asiatic Corps, for operations in the Caucasus, and in 1918 and 1919 was at the head of the X Army in Lithuania

He wrote an interesting account of the German conduct of the war during its first two years, entitled *Die oberste Heeresleitung in ihren wichtigsten Entschliessungen 1914–16* (1919), and *Der Feldzug der IX Armee gegen die Rumanen und Russen 1916–17* (2 vols 1921). He died on April 8, 1922, at the castle of Lindstet, near Wildpark.

See A Alberte, *General Falkenhayn, die Beziehungen zwischen den Generalstabschefs des Dreibunds* (1924)

FALKIRK, municipal and police burgh and parish, Stirlingshire, Scotland Pop. (1921) 33,308 It is on high ground overlooking the fertile Carse of Falkirk, 11 m S.E. of Stirling, and about midway between Edinburgh and Glasgow Grangemouth, its port, lies 3 m to the N.E , and the Forth and Clyde canal passes to the north, and the Union canal to the south of the town The town is under the control of a council with provost and bailies, and combines with Stirling and Grangemouth (the Stirling group of burghs) to return a member to parliament The district is rich in coal and iron, which supply the predominant industries, Falkirk being the chief seat of the light-casting trade in Scotland, but tanning, flour-milling, brewing, distilling and the manufacture of explosives and chemicals are also carried on The long important trysts or sales of cattle, sheep and horses were transferred hither from Crieff in 1770, and have been replaced by local weekly auction marts Carron, 2 m. N.N.W , is famous for iron-works established in 1760 by Dr John Roebuck (1718–1794), whose advising engineers were successively John Smeaton and James Watt The original name of Falkirk was the Gaelic *Eaglais breac*, "church of speckled or mottled stone," which Simeon of Durham (*fl.* 1130) transliterated as Egglesbreth By the end of the 13th century appears the form Faukirke (the present local pronunciation), a translation of the Gaelic *fau* or *faw*, meaning "dun," "pale red " The first church was built by Malcolm Canmore (d. 1093) Falkirk was made a burgh of barony in 1600 and a burgh of regality in 1646, but on the forfeiture of the earl of Linlithgow in 1715, its superiority was vested in the crown. Callender House, immediately to the south, was the seat of the earl and his ancestors. The wall of Antoninus ran through the grounds, and the district is rich in Roman remains, Camelon, about 2 m. W , being the site of a Roman settlement. The eastern suburb of Laurieston was first called Langtoune, then Merchistown, and received its present name after Sir Lawrence Dundas of Kerse, who had promoted its welfare

Battles of Falkirk.—The battle of July 22, 1298, was fought between the forces of King Edward I of England and those of the Scottish national party under Sir William Wallace The latter after long baffling the king's attempts to bring him to battle, had taken up a strong position south of the town behind a morass The Scots formed in four deep and close masses ("schiltrons") of pikemen, the light troops screening the front and flanks and a small body of mounted men-at-arms in reserve It was probably hoped that the English cavalry—overwhelmingly superior in strength—would plunge into the morass, for no serious precautions were taken as to the flanks, but in any case Wallace desired no more than to receive an attack at the halt, trusting wholly to his massed pikes The English "vaward" or right wing first appeared, tried the morass in vain, and then set out to turn it by a long détour, the main battle under the king halted in front of it, while the "rereward" or left wing, under Antony Bec, bishop of Durham, wheeled off and rode round the flank of the marsh Once on the enemy's side of the obstacle, the bishop halted to wait for Edward, who was now following him, but his undisciplined barons, shouting " 'Tis not for thee, bishop, to teach us war Go say mass!" drove off the Scottish archers and men-at-arms and charged the nearest square of pikes, which repulsed them with heavy losses On the other flank the right wing, its flank march completed, charged with the same result But Edward, who had now joined the bishop with the centre or "main battle," peremptorily ordered the cavalry to stand fast, and, taught by his experience in the Welsh wars, brought up his archers The longbow here scored its first victory in a pitched battle Before long, gaps appeared in the close ranks of pike heads, and after sufficient preparation Edward again launched his men-at-arms to the charge The shaken masses then gave way one after the other, and the Scots fled in all directions The English cavalry as a whole forgot the lesson and remembered only the effect of the final charge. But Robert Bruce, who here served in the English left wing, turned Wallace's experience to profit and at Bannockburn (*q.v.*), 16 years later, not only took care to secure his flanks but used his cavalry promptly to disperse the English archers

The second battle of Falkirk, fought on January 17, 1746, between the Highlanders under Prince Charles and the British forces under General Hawley, resulted in the defeat of the latter It is remarkable only for the bad conduct of the British dragoons and the steadiness of the infantry. Hawley, with whom served James Wolfe (*q.v*), retreated to Linlithgow, leaving all his baggage, 700 prisoners, and seven guns in the enemy's hands

FALKLAND, LUCIUS CARY, 2nd VISCOUNT (*c* 1610–1643), son of Sir Henry Cary, afterwards 1st Viscount Falkland (d 1633), lord deputy of Ireland from 1622 to 1629, was born either in 1609 or 1610, and was educated at Trinity College, Dublin In 1625 he inherited from his grandfather the manors of Great Tew and Burford in Oxfordshire; he married Lettice, daughter of Sir Richard Morrison. In 1633 he succeeded his father as Viscount Falkland. He assembled round him at Great Tew many learned men He was the friend of Hales and Chillingworth, was celebrated by Jonson, Suckling, Cowley and Waller in verse, and in prose by Clarendon, who is eloquent in describing the virtues and genius of the "incomparable" Falkland, and draws a delightful picture of his society and hospitality.

Falkland served on the king's side as a volunteer under Essex in the campaign of 1639 against the Scots. In 1640 he was returned for Newport in the Isle of Wight to the Short and Long Parliaments, and took an active part on the side of the opposition. He spoke against the exaction of shipmoney on Dec. 7, 1640, denouncing the servile conduct of Lord Keeper Finch and the judges He supported the prosecution of Strafford and voted for the third reading of the attainder. On the church question he deprecated clerical encroachment in secular matters; on the other hand, though he denied that episcopacy existed

iure divino, he was opposed to its abolition, fearing the establishment of the Presbyterian system, which in Scotland had proved equally tyrannical. In fact Falkland sought compromise but a bill simply excluding the clergy from secular offices failed, and on May 27, 1641 the Root and Branch Bill, for the total abolition of episcopacy, was introduced in the House of Commons This measure Falkland opposed, as well as the second bill for excluding the bishops, introduced on Oct. 21. In the discussion on the Grand Remonstrance he took the part of the bishops and the Arminians He was now definitely ranged against the policy of the parliament, and on Jan 1, 1642, was persuaded by Hyde to accept the secretaryship of state, though he had little influence in the king's councils

He signed the protestation against making war, at York on June 15, 1642 On Sept. 5 he carried Charles's overtures for peace to the parliament, when he informed the leaders of the opposition that the king consented to a thorough reformation of religion. The secret correspondence connected with the Waller plot passed through his hands He was present with the king at Edgehill and at the siege of Gloucester By this time the hopelessness of the situation had completely overwhelmed him, and he welcomed death on the battlefield as an escape from the catastrophe which he foresaw but saw no means of avoiding Riding alone at a gap in a hedge commanded by the enemy's fire in the battle of Newbury (Sept 20, 1643), he was immediately killed He was succeeded in the title by his eldest son, Lucius, 3rd Viscount Falkland, his male descent becoming extinct in the person of Anthony, 5th viscount, in 1694, when the viscounty passed to Lucius Henry (1687–1730), a descendant of the first viscount

Falkland wrote a *Discourse of Infallibility* (1646); *A Letter 30 Sept. 1642 concerning the late conflict before Worcester* (1642); and *Poems* (ed A B Grosart, 1871, in Fuller's Worthies Library) in which he shows himself a follower of Ben Jonson

See Lady M T Lewis, "Life of Falkland" in *Lives of the Friends . . . of Lord Chancellor Clarendon,* vol 1 p 3 (1852); J. A R. Marriott, *Life and Times of Lucius Cary, Viscount Falkland* (1907).

FALKLAND, a royal burgh and parish, Fifeshire, Scotland Pop (1921) 781 It is at the northern base of the hill of East Lomond (1,471 ft high), 2½ m from Falkland Road station on the L N E R main line to Dundee, 21 m N of Edinburgh as the crow flies Many ancient houses still stand. Most of the inhabitants are engaged in the manufacture of linen and linoleum The place is famed for the ancient palace of the Stuarts An older building that occupied this site was a hunting-tower of the Macduffs, earls of Fife, and was transferred with the earldom in 1371 to Robert Stewart, earl of Fife and Menteith, afterwards duke of Albany, second son of Robert II. Because of his father's long illness and the incapacity of Robert III, his brother Albany was during many years virtual ruler of Scotland, and, in the hope of securing the crown, caused the heir-apparent—David, duke of Rothesay—to be conveyed to the castle by force and there starved to death, in 1402 The conversion of the Thane's tower into the existing palace was begun by James III. and completed in 1538 The western part had two round towers, similar to those at Holyrood, which were also built by James V., and the southern elevation was ornamented with niches and statues From the palace James V when a boy fled to Stirling by night from the custody of the earl of Angus, and in it he died in 1542. Here, too, Queen Mary spent some of her happiest days. James VI. upset the schemes of the Gowrie conspirators by escaping from Falkland to St Andrews, and it was while he was residing in the palace that the fifth earl of Bothwell, in 1592, attempted to kidnap him In September 1596 a dramatic interview took place in the palace between the king and Andrew Melville and other Presbyterian ministers sent by the General Assembly at Cupar to remonstrate with him on allowing the Roman Catholic lords to return to Scotland. In 1654 the eastern wing was accidentally destroyed by fire, during its tenancy by the soldiers of Cromwell, by whose orders the fine old oaks in the park were cut down for the building of a fort at Perth. In 1715 Rob Roy garrisoned the palace and levied dues on the burgh and neighbourhood. The third marquess of Bute acquired the estate and buildings in 1888, and undertook the restoration of the palace

Falkland became a royal burgh in 1458 and its charter was renewed in 1595, before the earlier date it had been a seat of the Templars. It gives the title of viscount to the English family of Cary, the patent having been granted in 1620 by James VI The town's most distinguished native was Richard Cameron, the Covenanter. His house—a three-storeyed structure with yellow harled front and thatched roof—still stands on the south side of the square in the main street

FALKLAND ISLANDS, a group of islands in the South Atlantic ocean, belonging to Great Britain, and lying about 250 m. E of the nearest point in the mainland of South America, between 51° and 53° S, and 57° 40′ and 61° 25′ W With South Georgia island, the South Shetlands, South Orkneys, and other dependencies, they form the most southerly colony of the British empire. The islands, inclusive of rocks and reefs, exceed 100 in number and have a total area of 6,500 sq m; but only two are of considerable size The area of East Falkland is about 3,000 sq m., and that of West Falkland 2,300, while most of the others are mere islets, the largest 16 m long by 8 m. wide. The two principal islands are separated by Falkland sound, a narrow strait from 18 to 2½ m. in width, running north-east and south-west The general appearance of the islands is not unlike that of one of the outer Hebrides, dreary and monotonous inland, with much upland bog, but with fine coastal scenery The coast-line of both main islands is deeply indented and many of the bays and inlets form secure and sheltered harbours, some of which, however, are difficult of access to sailing ships.

East Falkland is, except for a narrow peninsula of 1½ miles wide, bisected by two deep fjords, Choiseul and Brenton sounds The northern portion is hilly, and is crossed by a rugged and difficult range, the Wickham Heights, running east and west, and rising in Mt Usborne to 2,245 ft The remainder of the island consists chiefly of low undulating ground, mostly pasture and morass, with many shallow freshwater tarns, and small streams running in the valleys There are two fine inlets, Berkeley sound and Port William, at the north-eastern extremity of the island Port Louis, formerly the seat of government, is at the head of Berkeley sound, but the anchorage there having been found rather too exposed, about the year 1844 a town was laid out, and the necessary public buildings were erected on Stanley harbour, a land-locked harbour within Port William West Falkland is more hilly near the east island; the principal mountain range, the Hornby hills, runs north and south parallel with Falkland sound. Mount Adam, the highest hill in the islands, is 2,315 ft high

The little town of Stanley is built along the south shore of Stanley harbour and stretches a short way up the slope, it has a population of about 900 Government house, grey, stone-built and slated, calls to mind a manse in Shetland or Orkney. Next to Stanley the most important place on East Falkland is Darwin on Choiseul sound—a village of Scottish shepherds and a station of the Falkland Islands Company

The Falkland islands consist entirely, with the exception of the southern part of East Falkland, which is Permo-Carboniferous, of the older Palaeozoic rocks, Lower Devonian or Upper Silurian, slightly metamorphosed and a good deal crumpled and distorted, in the low grounds clay slate and soft sandstone, and on the ridges hardened sandstone passing into the conspicuous white quartzites. There are no minerals of value, but galena is found in small quantity, and in some places it contains a large percentage of silver. There is also a quantity of fine white sand reported suitable for glass-making, and there are small and sporadic occurrences of high-grade iron ores

Many of the valleys in the Falklands are occupied by pale glistening masses which at a little distance much resemble small glaciers Examined more closely these are found to be vast accumulations of blocks of quartzite, irregular in form, but having a tendency to a rude diamond shape, from 2 to 20 ft in length, and half as much in width, and of a thickness corresponding with that of the quartzite ridges on the hills above. The blocks are angular, and rest irregularly one upon another. The whole mass

looks as if it were, as it is, slowly sliding down the valley to the sea These "stone runs" are looked upon with great wonder by the shifting population of the Falklands, and they are shown to visitors with many strange speculations as to their mode of formation. One of many theories is that the hard beds of quartzite were denuded by the disintegration of the softer layers in an interglacial period, slid down the slopes by their own weight and have since been completely denuded by the action of water.

CONDITIONS ON THE ISLANDS

The Falkland islands correspond very nearly in latitude in the southern hemisphere with London in the northern The temperature is equable, the average of the two midsummer months being about 47° Fahr., and that of the two midwinter months 37° Fahr. The climate is not unlike that of the Outer Hebrides, but is somewhat colder. occasional heavy snow-falls occur, and the sea in shallow inlets is covered with a thin coating of ice The sky is almost constantly overcast, and rain falls, mostly in a drizzle and in frequent showers, on about 250 days in the year The rainfall is not great, only about 26 in , but the mean humidity for the year is high. November is considered the only dry month. The prevalent winds from the west, south-west and south blow continuously, at times approaching the force of a hurricane. "A region more exposed to storms both in summer and winter it would be difficult to mention" (Fitzroy, *Voyages of "Adventure" and "Beagle,"* ii. 228). The fragments of many wrecks emphasize the dangers of navigation, which are increased by the absence of beacons, the only lighthouse being the one maintained by the Board of Trade on Cape Pembroke near the principal settlement

Of aboriginal human inhabitants there is no trace in the Falklands, and the land fauna is very scanty A small wolf or dog, the *loup-renard* of de Bougainville, is extinct, the last having been seen about 1875 on the West Falkland Some herds of cattle and horses ran wild until recently, but these were, of course, introduced, the first having been brought by de Bougainville. Horses and cattle have declined in numbers, being profitably replaced by sheep of which there were over 600,000 in 1926 Except for about 80,000 acres, all available land is used for sheep-farming, which started in East Falkland in 1835. Land-birds are few in kind, and are mostly migrants from South America They include, however, the snipe and military starling, which on account of its scarlet breast is locally known as the robin. Sea-birds are abundant, and, probably from the islands having been comparatively lately peopled, they are singularly tame Gulls and amphibious birds abound in large variety; three kinds of penguin have their rookeries and breed here, migrating yearly for some months to the South American mainland. Stray specimens of the great king penguin have been observed, and there are also mollymauks (a kind of albatross), black-crested grebe, Cape pigeons and many carrion birds Kelp and upland geese abound, the latter being edible, and their shooting affords some sport.

The Falkland islands form essentially a part of Patagonia, with which they are connected by an elevated submarine plateau, and their flora is much the same as that of Antarctic South America. The trees which form dense forest and scrub in southern Patagonia and in Fuegia are absent, owing to the strong gales and salt-spray, and attempts at planting trees have not met with great success. The greater part of the "camp" (the open country) is formed of peat, which in some places is of great age and depth, and at the bottom of the bed very dense and bituminous. The peat is different in character from that of northern Europe: the lower plants enter but little into its composition, and it is formed almost entirely of the roots and stems of *Empetrum rubrum,* a variety of the common crowberry of the Scottish hills with red berries, called by the Falklanders the "diddle-dee" berry; of *Myrtus nummularia,* a little creeping myrtle whose leaves are used by the shepherds as a substitute for tea; and of sedges and sedge-like plants, such as *Astelia pumila, Gaimardia australis* and *Bostkovia grandiflora.* Peat is largely used as fuel, coal being obtained only at a high price.

Two vegetable products, the "balsam bog" (*Azorella caespitosa*) and the "tussock grass" (*Poa flabellata*) have been objects of curiosity and interest ever since the first accounts of the islands were given. The first is a huge mass of a bright green colour, living to a great age, and when dead becoming of a grey and stony appearance. When cut open, it displays an infinity of tiny leaf-buds and stems, and at intervals there exudes from it an aromatic resin. The "tussock grass" is a wonderful and most valuable natural production, which, owing to the introduction of stock, has become extinct in the two main islands, but still flourishes elsewhere in the group. It is a reed-like grass, which grows in dense tufts from 6 to 10 ft. high from stool-like root-crowns. It forms excellent fodder for cattle, and is regularly gathered for that purpose

The population was estimated at 2,197 in 1924 The large majority of the inhabitants live in the East island, and the predominating element is Scottish—Scottish shepherds having superseded the South American Gauchos. In 1867 there were no settlers on the West island, and the government issued a proclamation offering leases of grazing stations on very moderate terms In 1868 all the available land was occupied. These lands are fairly healthy, the principal drawback being the virulent form assumed by simple epidemic maladies The occupation of the inhabitants is almost entirely pastoral, and the principal industry is sheep-farming Wool forms by far the largest export, and tallow, hides, bones and frozen mutton are also exported Trade is carried on almost entirely with the United Kingdom, the value of exports in 1926 was nearly £240,000, most of which was in wool, and of imports nearly £180,000 The Falkland Islands Company, having its headquarters at Stanley and an important station in the camp at Darwin, carries on an extensive business in sheep-farming and the dependent industries, and in the general import trade The development of this undertaking necessitated the establishment of stores and workshops at Stanley, and ships can be repaired and provided in every way; a matter of importance in such stormy seas. A former trade in oil and sealskin has decayed, owing to the smaller number of whales and seals remaining about the islands and the headquarters of the whaling industry has been moved to South Georgia. Communications are maintained on horseback and by water, and there are no roads except at Stanley Mail leaves for England monthly, passage being about four weeks

The Falkland Islands were first seen by Davis in the year 1592, and Sir Richard Hawkins sailed along their north shore in 1594 The claims of Amerigo Vespucci to a previous discovery are doubtful In 1598 Sebald de Wert, a Dutchman, visited them, and called them the Sebald Islands, a name which they bear on some Dutch maps Captain Strong sailed through between the two principal islands in 1690, landed upon one of them, and called the passage Falkland Sound, and from this the group afterwards took its English name In 1764 the French explorer de Bougainville took possession of the islands on behalf of his country, and established a colony at Port Louis on Berkeley Sound. But in 1767 France ceded the islands to Spain, de Bougainville being employed as intermediary. Meanwhile in 1765 Commodore Byron had taken possession on the part of England on the ground of prior discovery, and had formed a settlement at Port Egmont on the small island of Saunders The Spanish and English settlers remained in ignorance, real or assumed, of each other's presence until 1769–1770, when Byron's action was nearly the cause of a war between England and Spain, both countries having armed fleets to contest the barren sovereignty. In 1771, however, Spain yielded the islands to Great Britain by convention.

The Falkland islands are a crown colony, with a governor and executive and legislative councils. The colony is self-supporting, the revenue being largely derived from the drink duties, and there is no public debt. The Falklands are the seat of a colonial bishop. Education is compulsory. The government maintains schools and travelling teachers; the Falkland Islands Company also maintains a school at Darwin. Stanley was for some years a naval station, but ceased to be so in 1904. It is now a wireless station.

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FALKLAND ISLANDS, BATTLE OF. One of the principal actions of the World War, known as the Battle of the Falklands, was fought on Dec 8, 1914, to the south-eastward of the Falkland Islands, between a British squadron under Vice-Admiral Sir Doveton Sturdee and a German squadron under Vice-Admiral Graf von Spee This battle was a counter-stroke to the battle of Coronel (*q v*)

With the utmost secrecy the two battle-cruisers "Invincible" and "Inflexible" had been detached from the Grand Fleet in the North Sea and sent, with all despatch, to reinforce the British squadron in the South Atlantic Admiral Sturdee's orders, on leaving England in the "Invincible," were to "Seek out and destroy the enemy" The following table shows the details of the rival forces.—

British.			
Type	Ships	Guns.	Nominal speed.
Battle cruisers	"Invincible"	8 12-in.	26 Knots
	"Inflexible"	8 12-in.	26 "
Armoured cruisers	"Carnarvon"	4 7 5-in, 6 6-in.	22 "
	"Cornwall"	14 6-in.	23·5 "
	"Kent"	14 6-in.	23·5 "
Light cruisers	"Glasgow"	2 6-in, 10 4-in	25 "
	"Bristol"	2 6-in, 10 4-in	24 "
Armed merchant cruiser	"Macedonia"		
German.			
Armoured cruisers	"Scharnhorst"	8 8·2-in. 6 5·9-in	23 Knots
	"Gneisenau"	8 8·2-in. 6 5·9-in	23 "
Light cruisers.	"Leipzig"	10 4·1-in.	23 "
	"Nürnberg"	10 4·1-in.	23·5 "
	"Dresden"	10 4·1-in.	24 "
Supply ships.	"Seydlitz"		
	"Baden"		
	"Santa Isabel"		

Fleet at Port William.—After the defeat of Admiral Cradock's squadron at Coronel, the old battleship "Canopus" had returned to the Falklands and was berthed on the mud in Port Stanley, the inner harbour. Her light guns had been erected on shore and the entrance to the harbour mined with electric mines constructed out of old oil drums A signal station had been erected and the local volunteers organized as a defence force. Thus being sturdily prepared for eventualities, the little colony had waited.

On his arrival at Port William on December 7, Admiral Sturdee ordered the "Macedonia" to patrol outside the harbour; the "Inflexible" and "Kent" to be ready for 14 knots at half-an-hour's notice and the other ships of his squadron to keep steam for 12 knots at two hours' notice Only three colliers were available, so all ships could not coal at once By 6 A M on December 8, the "Carnarvon" and "Glasgow" had finished coaling. The "Invincible" and "Inflexible" then began The "Bristol" had her fires out to remedy defects and the "Cornwall" had one engine opened up at six hours' notice; the "Glasgow" was also repairing machinery and could not be ready for two hours Such was the situation when, at 7 50 A M, the observation post on Sapper's Hill reported two strange ships in sight. At 7 56 A M the "Glasgow" fired a gun to draw attention to a signal flying in the "Canopus," making known this report

German Squadron in Sight.—A scene of activity ensued; colliers were cast off and preparations made for leaving harbour The "Kent," having just taken over guard duty, was ordered to weigh and observe the enemy The general signal to weigh was

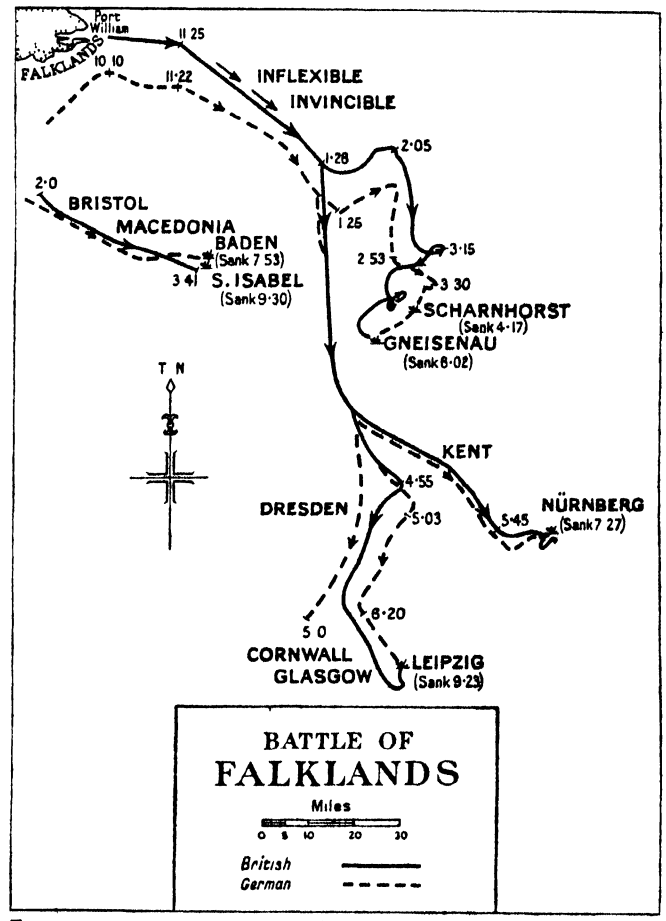

FIG. 1.—GENERAL PLAN OF THE BATTLE OF THE FALKLAND ISLANDS, 1914 The plan shows the course of the engagement from the morning of Dec. 8, 1914, when the British ships, under Admiral Sturdee, left Port William, until the sinking of the last German ship, the "Leipzig," at 9.23 p.m. The "Dresden," the only German ship to escape, is shown bearing away to the south-west at 5.00 p.m.

made at 8 14 A M; at 8 30 "Action" was sounded off and all ships were striving to raise steam at the earliest possible moment

The two ships which had been sighted were the "Gneisenau" and "Nürnberg," which von Spee had sent on ahead to reconnoitre; they were not visible from the "Canopus" but, with the aid of an extemporized observation hut which had been established on the hill, she opened fire on them at 9 15 A.M with her 12in. guns The range, however, was too great and the shots fell short; nevertheless, the firing made the two German ships turn away to the south-east.

Von Spee, in the "Scharnhorst" was some 15 miles distant from the harbour, but the clouds of smoke visible over the intervening land made him suspicious. The "Gneisenau" was near enough to make out the masts and funnels of six ships in the harbour. and, worse still, some observers thought they could distinguish the tripod masts of battle-cruisers The report from the "Gneisenau" confirmed von Spee in his misgivings and he immediately ordered the advanced ships not to accept action. This order was followed by a general signal to his squadron to raise steam in all boilers and steer east

Von Spee's Intentions.—It is impossible to be sure with what intention Admiral von Spee made for the Falkland Islands By one account he expected to find there a British squadron weaker than his own, he hoped to draw them to sea, destroy them, and then occupy the Islands. Some colour is lent to this by the report of British officers at the observation post on shore that they could distinguish, through telescopes, men on board the "Gneisenau" dressed and equipped ready for landing. Von Spee was certainly unaware that the Admiralty had despatched two battle-cruisers to these waters. Their arrival just in time was a stroke of luck which the latter fully deserved, but Admiral Sturdee was momentarily at a distinct disadvantage owing to his ships being at anchor with colliers alongside

Von Spee's position if the British squadron brought him to action in the open was hopeless; but if the Germans had pressed home an attack at the entrance to the harbour, the prospects would have been far from pleasant for the British forces within

Pursuit of the German Squadron.—By 10 15 A M all ships, excepting the "Bristol," had steam up, and 15 minutes later they had cleared the harbour; the enemy was hull-down to the south-east, some 12 or 13 miles distant, so Admiral Sturdee made the signal for "general chase," an order for each ship to steam at her utmost speed in pursuit The sea was calm, the sky clear, and a light north-westerly breeze was blowing At 10 50 A M it became evident that the British ships were gaining and Sturdee ordered the "Glasgow" to keep three miles ahead, and the "Inflexible" to keep on the port quarter, of the "Invincible" This annulled the "general chase" By 11 A M the German ships were clearly visible and the battle-cruisers reduced speed to 24 knots The "Carnarvon" and "Cornwall" were now lagging behind, their best speed being 20 knots and 22 knots respectively, and, to avoid his ships becoming too widely scattered, Sturdee reduced the speed of the squadron to 19 knots and ordered the crews to be piped to dinner The German squadron was then doing little more than 15 knots.

Meanwhile, the German auxiliaries had been sighted from the Islands, and the "Bristol," which by extraordinary exertions had managed to raise steam and was just leaving harbour, was ordered to take "Macedonia" under her orders and "destroy the transports" Unfortunately, it was not known then that these ships were colliers.

At 12 20 P M Sturdee decided to press the chase and speed was increased to 22 knots; by 12.50 P M the British battle-cruisers were steaming 25 knots and were rapidly overhauling the enemy At 12 55 P M fire was opened by the "Inflexible" on the "Leipzig" at a range of 16,000 yards To save his light cruisers, von Spee ordered them to scatter and make for the South American coast; they turned away to the southward at about 1 20 P M. Such a contingency had been provided for, and, without further orders, the British cruisers turned off in pursuit (*see* fig 1).

The Battle-cruiser Action.—As his light cruisers left him, von Spee turned to the eastward to accept action; and Sturdee's battle-cruisers turned into line ahead on a nearly parallel course to the enemy. Fire was now opened on both sides, but the range —about 14,000yd.—was too great, and the shots from the German ships fell short The range closed to 12,500yd. and about 1 45 P M "Invincible" was hit; whereupon Sturdee turned away to open the range and obtain full advantage from his heavier armament. His object was to annihilate the enemy, but in doing so to receive as little damage as possible. By 2 P.M. the range had increased to 16,000yd. and firing ceased for a time (*see* fig. 2).

In order to renew the action, the British battle-cruisers altered course to starboard, and gradually reduced the range to 15,000yd. Fire was then reopened and von Spee again accepted action, manoeuvring his ships to reduce the range sufficiently for his secondary armament to be brought into action. Sturdee allowed the range to fall to about 12,500yd and then, as the Germans began to fire with their 5 9-in guns, he sheered off again With

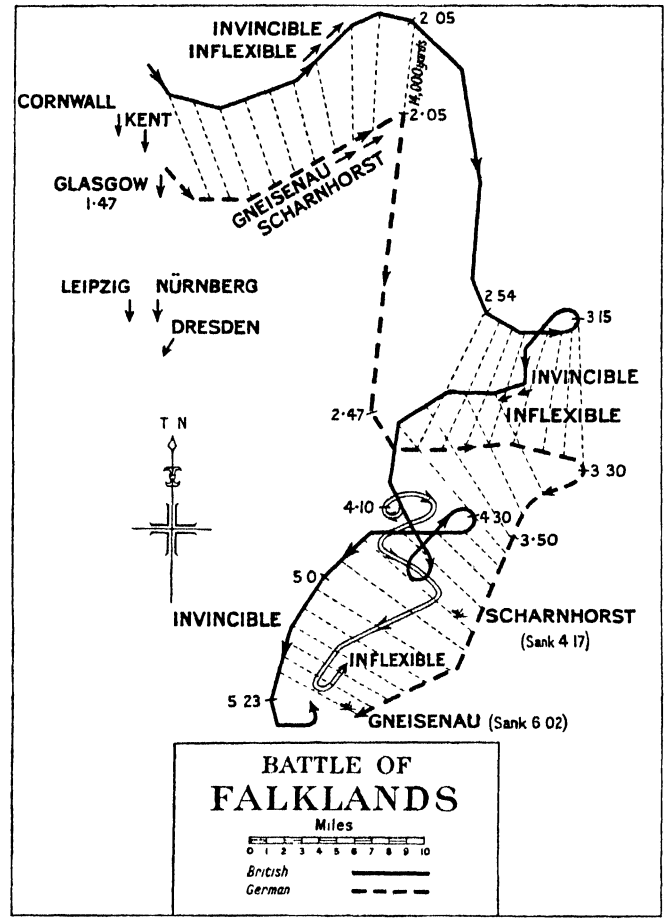

FIG 2 —DETAILS OF THE FIGHT BETWEEN THE CAPITAL SHIPS
The engagement between "Invincible" (Admiral Sturdee) and "Inflexible," and "Scharnhorst" (Admiral von Spee) and "Gneisenau" is shown in greater detail. Both German ships went down with flags flying, and 187 of the crew of the "Gneisenau" were saved. The result of the battle was that Great Britain regained control of the ocean trade routes until the submarine campaign began

his superior speed Sturdee was able to keep the range as he wished and the British guns now began to inflict severe damage on the enemy ships

By 3 10 P M. the Germans showed signs of damage, the "Scharnhorst" being on fire The smother of smoke made spotting the fall of shot a matter of some difficulty, so, at 3 15 P M, Sturdee turned the battle-cruisers round to port; von Spee replied by also turning his ships, and the action now ran to the south-westward

End of the "Scharnhorst."—By 4 P M. the "Scharnhorst" was suffering terribly; she was on fire from stem to stern; her superstructure was in ruins and she had a heavy list to port, but she continued to fire gamely with her remaining guns Her end came at 4 17 P.M., when she turned completely over and sank with flag flying. No one was saved.

The "Gneisenau" Sunk.—After the "Scharnhorst" sank, both battle-cruisers engaged the "Gneisenau," and, to prevent being blinded by smoke, steered on independent courses. The "Carnarvon" had now been able to close sufficiently to open fire, and the doomed German cruiser became a target for a concentrated fire from three directions. Her fire slackened; she was on fire fore and aft and her speed rapidly dropped Her one remaining gun continued to fire at intervals; but at 5.40 P.M. her splendid fight

against hopeless odds was at an end and she heeled slowly over and sank at about 6 P M The British ships closed, lowered their boats and succeeded in rescuing 187 survivors from the icy water.

The Light Cruisers.—When the German light cruisers broke away, they had about 11 miles' start on their pursuers The British ships had nominally no superiority in speed, but, owing to their recent continuous cruising, the boilers in the German ships were in no condition to withstand severe pressure At first the enemy kept together (*see* fig 1). The "Glasgow" was the fastest of the pursuers and soon forged ahead of her consorts, the "Kent" and "Cornwall," and, having crossed ahead of them, she headed for the "Dresden," the fastest of the pursued. It was, however, soon evident that the only chance of bringing the enemy to action before the light failed, was to attack the rearmost ship, in the hopes that this would bring the others back to her assistance

"Glasgow" and "Cornwall" versus "Leipzig."—At 2 53 P M the "Glasgow" opened fire on the "Leipzig" and by 4 15 P M the "Cornwall" had closed the range sufficiently to bring her guns into action The "Leipzig" suffered considerably under the cross-fire from the two British cruisers; her speed too was falling so rapidly that her attackers were in the fortunate position of being able to keep the range as they desired By 7 P M the "Leipzig's" stern was enveloped in flames and she was in sorry plight, but she made no sign of surrender At about 8 10 P M she made signals of distress and the British ships closed and lowered boats to rescue survivors At 9 23 P M there was an explosion and the "Leipzig" disappeared

"Kent" versus "Nürnberg."—The "Kent" meanwhile had been pursuing the "Nurnberg" and, by extraordinary efforts on the part of her engine-room department, succeeded in exceeding her designed speed At 5 P M the "Nurnberg" opened fire, but the 6-in guns of the "Kent" were not yet within range The weather was becoming thick, owing to a fine drizzle having set in, when fortune favoured the pursuer, the "Nurnberg's" boiler tubes gave out and her speed sank rapidly, which enabled the "Kent" to close to effective range By 6 25 P M the "Nurnberg" was a blazing wreck and about 7 30 P M she turned over and sank The boats from the "Kent" searched the sea until 9 P M but rescued only seven survivors

Casualties.—The following table shows the casualties of the British and German forces.—

Ship.	Hits received.	Casualties	Rounds fired.
British.			
"Invincible"	22	0 k, 1 w	573 12-in
"Inflexible"	3	1 k, 2 w	661 12-in.
"Glasgow"	2	1 k, 4 w	316 6-in
"Cornwall"	18	0 k, 0 w.	1000 6-in.
"Kent"	36	4 k, 12 w.	646 6-in.
"Carnarvon"	0	0 k, 0 w	
German:			
"Scharnhorst"	Sunk	All	..
"Gneisenau"	Sunk	187 saved	.
"Leipzig"	Sunk	18 "	
"Nurnberg"	Sunk	7 "	.
"Dresden"	Escaped		..

k = killed w = wounded.

German Colliers Destroyed.—Meanwhile two of the German colliers had been overhauled by the "Bristol" and "Macedonia." They were captured at about 4 P M The signalled order to the "Bristol" to "destroy the transports" was literally obeyed in spite of these ships not being transports, but ships full of valuable coal The "Dresden" escaped and was not hunted down and destroyed until March 14, 1915

Conclusion.—The Battle of the Falklands was a very decisive victory for the British, inasmuch as it marked the end of a definite phase of the war at sea. As a result, German cruiser warfare collapsed and England held, outside the narrow seas, undisputed control of the ocean trade routes of the world.

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(J. E. T H)

FALLACY, the term given generally to any mistaken statement used in argument; in logic, technically, any violation of the conditions of valid inference (Lat *fall-ax*, apt to mislead) An argument may be fallacious in *matter* (*i.e*, misstatement of facts), in *wording* (*i.e*, wrong use of words), or in the *process of inference* Fallacies have, therefore, been classified as: I Material, II Verbal, III Logical or Formal; II and III. are often included under the general description *Logical*, and in scholastic phraseology, following Aristotle, are called fallacies *in dictione* or *in voce*, as opposed to material fallacies *in re* or *extra dictionem*

I **Material.**—The classification widely adopted by modern logicians and based on that of Aristotle, *Organon* (*Sophistici elenchi*), is as follows.—(1) *Fallacy of Accident, i e*, confusing what is accidental with what is essential. (2) *Secundum Quid, i e*, arguing erroneously from a general rule to a particular case, without proper regard to special circumstances which vitiate the application of the general rule, *e g*, if manhood suffrage be the law, arguing that a criminal or a lunatic must, therefore, have a vote; or the converse fallacy of arguing from a special case to a general rule, (3) *Irrelevant Conclusion*, or *Ignoratio Elenchi*, wherein, instead of proving the fact in dispute, the arguer seeks to gain his point by diverting attention to some extraneous fact (as in the legal story of "No case Abuse the plaintiff's attorney"). Under this head come the so-called *argumentum* (*a*) *ad hominem*, (*b*) *ad populum*, (*c*) *ad baculum*, (*d*) *ad verecundiam*, common in platform oratory, in which the speaker obscures the real issue by appealing to his audience on the grounds of (*a*) purely personal considerations, (*b*) popular sentiment, (*c*) fear, (*d*) conventional propriety This fallacy has been illustrated by ethical or theological arguments wherein the fear of punishment is subtly substituted for abstract right as the sanction of moral obligation. (4) *Petitio principii* (begging the question) or *Circulus in probando* (arguing in a circle), which consists in demonstrating a conclusion by means of premises which presuppose that conclusion Jeremy Bentham points out that this fallacy may lurk in a single word, especially in an epithet, *e g*, if a measure were condemned simply on the ground that it is alleged to be "un-English"; (5) *Fallacy of the Consequent*, arguing from a consequent to its condition, *e g*, if a man is a drunkard he becomes destitute Therefore if he is destitute, he is a drunkard (6) *Fallacy of False Cause*, or *Non Sequitur* ("it does not follow"), bases a conclusion on an insufficient or erroneous *reason* This is often confused with (7) *Post hoc* (after this, therefore, because of this), wherein one thing is incorrectly assumed as the *cause* of another, as when the ancients attributed a public calamity to a meteorological phenomenon; (8) *Fallacy of Many Questions* (*Plurium Interrogationum*), wherein several questions are improperly grouped in the form of one, and a direct categorical answer is demanded, *e g*, if a prosecuting counsel asked the prisoner "What time was it when you met this man?" with the intention of eliciting the tacit admission that such a meeting had taken place.

II. **Verbal Fallacies** are those in which a false conclusion is obtained by improper or ambiguous use of words. They are generally classified as follows: (1) *Equivocation* consists in employing the same word in two or more senses, *e g*, in a syllogism, the middle term being used in one sense in the major and another in the minor premise, so that in fact there are *four* not *three* terms ("All fair things are honourable, This woman is fair; therefore this woman is honourable," the second "fair" being in reference to complexion). (2) *Amphibology* is the result of ambiguity of grammatical structure, *e.g.*, of the position of the adverb "only" in careless writers ("He only said that," in which sentence, as experience shows, the adverb has been intended to qualify any one of the other three words). (3) *Composition*, a species of (1), which results from the confused use of collective terms ("The angles of a triangle are less than two right angles"

might refer to the angles separately or added together). (4) *Division*, the converse of the preceding, which consists in employing the middle term distributively in the minor and collectively in the major premise (5) *Accent*, which occurs only in speaking and consists of emphasizing the wrong word in a sentence ("He is a fairly good pianist," according to the emphasis on the words, may imply praise of a beginner's progress, or an expert's depreciation of a popular hero, or it may imply that the person in question is a deplorable violinist) (6) *Figure of Speech*, misinterpretation of a form of expression or an inflexion; *e g*, taking "desirable" to mean what *can be desired* (instead of what ought to be desired) because "visible" means what can be seen.

III. The purely **Logical** or **Formal** fallacies consist in the violation of the formal rules of the syllogism (*q.v.*). They are (*a*) fallacy of four terms (*Quaternio terminorum*); (*b*) of undistributed middle, (*c*) of illicit process of the major or the minor term, (*d*) of negative premises

Of other classifications of fallacies in general the most famous are those of Francis Bacon and J S Mill. Bacon (*Novum organum*, Aph 1 33, 38 *sqq*) divided fallacies into four *Idola* (Idols, *i.e*, false appearances), which summarize the various kinds of mistakes to which the human intellect is prone (*see* BACON, FRANCIS). With these should be compared the *Offendicula* of Roger Bacon, contained in the *Opus maius*, pt 1 (*see* BACON, ROGER) J S Mill discussed the subject in book v of his *Logic*, and Jeremy Bentham's *Book of Fallacies* (1824) contains valuable remarks.

See A. Sidgwick, *Fallacies* (1883), H W B Joseph, *An Introduction to Logic* (1916)

FALLIÈRES, CLÉMENT ARMAND (1841–), president of the French republic, was born on Nov. 6, 1841, at Mézin (Lot-et-Garonne), where his father was clerk of the peace. He studied law and became an advocate at Nérac, beginning his public career there as municipal councillor (1868), afterwards mayor (1871), and as councillor-general of the department of Lot-et-Garonne (1871). He lost his position in May 1873 upon the fall of Thiers, but in Feb 1876 was elected deputy for Nérac. In the chamber he sat with the Republican Left, signed the protestation of May 18, 1877, and was re-elected in October by his constituency He held at first a minor part (1880–81) in the Jules Ferry ministry, was then minister of the interior (1882–83), and for a month (Feb. 1883) premier. His ministry had to face the question of the expulsion of the pretenders to the throne of France, owing to the proclamation by Prince Jérome Napoleon (Jan 1883), and Fallières, who was ill at the time, resigned when the senate rejected his project He became minister of public instruction (Nov. 1883–March 1885), then minister of the interior in the Rouvier cabinet in May 1887, and exchanged his portfolio in December for that of justice He returned to the ministry of the interior in Feb. 1889, and was minister of justice from 1890 to 1892 In June 1890 his department (Lot-et-Garonne) elected him to the senate by 417 votes to 23. In March 1899 he was elected president of the senate, and retained that position until Jan 1906, when he was chosen by a union of the groups of the Left in both chambers as candidate for the presidency of the republic He was elected on the first ballot by 449 votes against 371 for his opponent, Paul Doumer He held office until Jan 7, 1913, when he was succeeded by Poincaré. For the events of his presidency *see* FRANCE. *History*.

FALLING STARS: *see* METEOR

FALL-LINE, in American geology, a line marking the junction between the hard rocks of the Appalachians and the softer deposits of the coastal plain The pre-Cambrian and metamorphic rocks of the mountain mass form a continuous ledge parallel to the east coast, where they form a series of "falls" and rapids in the river courses all along this line The relief of the land below the falls is very slight, and this low country rarely rises to a height of 200ft, so that the rivers are navigable up to the falls, while the falls themselves are a valuable source of power. A line of cities may be traced upon the map whose position will thus be readily understood in relation to the economic importance of the fall-line. They are Trenton on the Delaware, Philadelphia on the Schuylkill, Georgetown on the Potomac, Richmond on the James, and Augusta on the Savannah It will be readily understood that the softer and more recent rocks of the coastal plain have been more easily washed away, while the harder rocks of the mountains, owing to differential denudation, are left standing high above them, and that the trend of the edge of this great lenticular mass of ancient rock is roughly parallel to that of the Appalachian system.

FALLMERAYER, JAKOB PHILIPP (1790–1861), German scholar, son of a peasant, was born at Tschotsch, near Brixen in Tirol, on Dec. 10, 1790. In 1809 he ran away from the cathedral choir school at Brixen, and then studied philology first at Salzburg and then at Landshut. After two years' service in the Napoleonic wars (1813–15) and two years of garrison life after the peace, he became a schoolmaster at Augsburg and later at Landshut In 1827 he won the gold medal offered by the university of Copenhagen with his most important work *Geschichte des Kaisertums von Trapezunt* (Trebizond), based on patient investigation of Greek and oriental mss at Venice and Vienna Prior to his discovery of the chronicle of Michael Panaretos, covering the dominion of Alexius Comnenus and his successors from 1204 to 1426, the history of this mediaeval empire was practically unknown During 1831–47, he travelled widely in the East with intervals spent in Munich, and after the revolution of 1848 became professor of history at Munich university and member of the national congress at Frankfort-on-Main There he joined the left, or opposition party, and in 1849 accompanied the rump-parliament to Stuttgart, and was expelled from his chair at the university. The amnesty of April 1850 enabled him to return to Munich. He died on April 26, 1861.

Fallmerayer's contributions to the mediaeval history of Greece are of great value, and his theory that the modern Greeks are of Albanian and Slav descent, with hardly a drop of true Greek blood in their veins has served to modify the opinions of even his greatest opponents. A criticism of his views will be found in Hopf's *Geschichte Griechenlands* (from Ersch and Gruber's *Encykl*) and in Finlay's *History of Greece in the Middle Ages*

His other works include *Über die Entstehung der Neugriechen* (Stuttgart, 1835), "Originalfragmente, Chroniken, usw, zur Geschichte des K Trapezunts" (Munich, 1843), in *Abhandl der hist Classe der K Bayerisch Akad v Wiss*; *Das albanesische Element in Griechenland*, in parts, in the *Abhandl.* for 1860–66 *See* his *Gesammelte Werke* (3 vols, 1861) containing *Studien und Erinnerungen aus meinem Leben* and a sketch of his life by the editor, G M Thomas

FALLOPIUS or **FALLOPIO, GABRIELLO** (1523–1562), Italian anatomist, was born at Modena, where he became a canon of the cathedral He studied medicine at Ferrara and became teacher of anatomy in that city, and later at Pisa and Padua, where he worked with Vesalius He died on Oct 9, 1562. Fallopius discovered and described the chorda tympani, the sphenoid sinus, the opening of the ovarian tubes of the human female into the abdominal cavity, the trigeminal, auditory and glossopharyngeal nerves He named the ovarian tubes, the vagina, the placenta, the muscles of the forehead, occiput and tongue Only one treatise by Fallopius appeared during his lifetime, namely the *Observationes anatomicae* (Venice, 1561). His collected works, *Opera genuina omnia*, were published at Venice in 1584

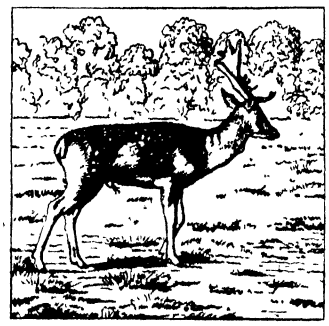
FALLOUX, FRÉDÉRIC ALFRED PIERRE, COMTE DE (1811–1886), French politician and author, was born at Angers on May 11, 1811 His father had been ennobled by Charles X., and Falloux began his career as a Legitimist and clerical journalist under the influence of Mme. Swetchine. In 1846 he entered the legislature as deputy for Maine-et-Loire, and with many other ultra-Catholics he gave real or pretended support to the revolution of 1848. Louis Napoleon made him minister of education in 1849, but disagreements with the president led to his resignation within a year. He had nevertheless secured the passage of the Loi Falloux (March 15, 1850) for the organization of primary and secondary education. This law provided that the clergy and members of ecclesiastical orders, male and female, might exercise the profession of teaching without producing any further qualification. This exemption was extended even to priests who taught in secondary schools, where a university degree was exacted from

lay teachers. The primary schools were put under the management of the curés Falloux was elected to the French Academy in 1856. His failure to secure re-election to the legislature in 1866, 1869, 1870 and 1871 was due to the opposition of the stricter Legitimists, who viewed with suspicion his attempts to reconcile the Orleans princes with Henri, comte de Chambord. In spite of his failure to enter the National Assembly his influence was very great, and was increased by the intimacy of his personal relations with Thiers. But in 1872 he offended both sections of the monarchical party at a conference arranged in the hope of effecting a fusion between the partisans of the comte de Chambord and of the Orleans princes, divided on the vexed question of the flag. He suggested that the comte de Chambord might recede from his position with dignity at the desire of the National Assembly, and he insinuated the possibility of a transitional stage with the duc d'Aumale as president of the republic. His disgrace with the Catholic party was so complete that he was excommunicated by the bishop of Angers in 1876 He died on Jan 16, 1886

Of his numerous works the best known are his *Histoire de Louis XVI* (1840), *Histoire de Saint Pie* (1845), *De la contre-révolution* (1876); and the posthumous *Mémoires d'un royaliste* (2 vols., 1888).

FALLOW, land ploughed and tilled, but left unsown usually for a year, in order, on the one hand, to disintegrate, aerate and free it from weeds, and, on the other, to allow it to recuperate The "Sabbath rest" ordered to be given every seventh year to the land by Mosaic law is a classical instance of the "fallow" Improvements in crop rotations and manuring have diminished the necessity of the "bare fallow," which is uneconomical because the land is left unproductive, and because the nitrates in the soil unintercepted by the roots of plants are washed away in the drainage waters At the present time bare fallowing is, in general, only advisable on stiff soils and in dry climates A "green fallow" is land planted with turnips, potatoes or some similar crop in rows, the space between which may be cleared of weeds by hoeing. The "bastard fallow" is a modification of the bare fallow, effected by the growth of rye, vetches, or some other rapidly growing crop, sown in autumn and fed off in spring, the land then undergoing the processes of ploughing, grubbing and harrowing usual in the bare fallow (*See* CULTIVATION, ROTATION OF CROPS; DRY FARMING)

FALLOW-DEER (*Dama dama*), a medium-sized representative of the family *Cervidae,* characterized by its palmated antlers, which generally have no bez-tine, rather long tail (black above and white below), and a coat spotted with white in summer but uniformly coloured in winter. The shoulder height is about 3ft The species is semi-domesticated in British parks and occurs wild in western Asia, north Africa, south Europe, and Sardinia In prehistoric times it occurred throughout northern and central Europe Bucks and does live apart except during the pairing-season; and the doe produces one or two, and sometimes three fawns at a birth. The Persian fallow-deer (*D mesopotamicus*), is larger and has a brighter coat, differing in some details of colouring Here may be mentioned the gigantic fossil deer commonly known as the Irish elk (*Megaceros giganteus*), whose horns are of the fallow-deer type. This deer inhabited Ireland, Great Britain, central and northern Europe, and western Asia in Pleistocene and prehistoric times; and stood 6ft. high at the shoulder. The antlers were greatly palmated and of enormous size, fine specimens measuring 11 ft between the tips



THE FALLOW-DEER (DAMA DAMA) SEMI-DOMESTICATED IN BRITAIN AND CHARACTERIZED BY PALMATED ANTLERS SOME 25 INCHES LONG

FALL RIVER, a city of Bristol county, Massachusetts, U.S.A., on the east shore of Mount Hope bay, at the mouth of the Taunton river, 50 m. S. of Boston; a port of entry and one of the principal cotton-manufacturing centres of the country. It is served by the New York, New Haven and Hartford railroad and by the famous Fall River Line of the New England Steamship Company and cargo steamers operating to Pacific and Atlantic ports. The population was 120,485 in 1920, of whom 42,331 were foreign-born white (including 10,734 French-Canadians, 7,971 British, 6,428 from the Atlantic islands, and 5,675 from Portugal); and was estimated locally at 125,000 in 1928

The city faces west, stretching for 9m along a granite ledge rising steeply from the river About 200ft above the city, and 2m. east, are the Watuppa Lakes, from which the little Quequechan (or Fall) river tumbles down It runs through the city, flowing under the city hall, and its banks are lined with long rows of the great cotton-mills, many of them built of gray granite from the city's foundation A city plan was adopted in 1923, which will correct the defects in the haphazard lay-out of the streets, utilize the natural advantages of the site, and transform Fall River into a beautiful and conveniently arranged city On the banks of the Taunton river is the first unit of a hydro-electric plant which eventually will furnish 275,000 h p The harbour is large, deep, and easy of access. Its traffic in 1927 amounted to 4,140,000 tons, and included large receipts of coal and oil, and considerable commerce (100,000 tons) through the Panama canal The aggregate output of the city's factories in 1925 was valued at $142,884,764, of which over half ($79,363,623) represented cotton goods The cotton-mills (over 100) have about 4,000,000 spindles, one-ninth of the total number in the United States, and have an annual capacity of 400,000 bales of cotton There are large hat factories; an oil refinery (built in 1922) with a capacity of 1,000,000 barrels a month; silk mills, shirt and curtain factories. The assessed valuation of property in 1927 was $188,935,750 Bank debits in 1926 amounted to $355,068,000 From the character of the dominating industry and of the population it results that Fall River has a considerable preponderance of women (92 6 males to 100 females, 1920); and a high percentage of boys and girls employed in occupations (18 5% in 1920 of the total population between 10 and 15 years of age) Fall River was incorporated as a town in 1803 and as a city in 1854 In 1860 the population was 14,026 Between 1865 and 1900 the number of spindles increased from 265,328 to 3,000,000, and the population grew to 48,961 in 1880 and 104,863 in 1900. Since 1900 there have been periods of great fluctuation, and the net increase has been relatively slow In 1904–05 occurred a strike of the textile workers (for higher wages) lasting seven months, and thousands of operatives moved away. It was ended by arbitration by the governor, and resulted in the adoption of a plan for semi-annual conferences at which the wage-scale is adjusted. The industry, and consequently the city as a whole, was seriously affected by the depression of 1920–21, and by the growing competition of the southern cotton-mills. A disastrous fire occurred in 1843; and in Feb 1928, 12 blocks in the heart of the business district were destroyed by fire It was at Mount Hope, across the bay, that the Indian chieftain, king Philip, was captured and slain (1676).

FALLS CITY, the county seat of Richardson county, Nebraska, U.S.A., in the south-east corner of the State, on Federal highway 73, and served by the Burlington and the Missouri Pacific railways. The population was 4,930 in 1920 (94% native white), and was estimated locally at 7,000 in 1928. It is in a fine apple-growing country, and ships also large quantities of poultry and poultry products, cattle, hogs and grain The manufacturing industries include railroad shops, a flour mill and a creamery. Falls City was founded and incorporated in 1857. It was named from falls in the Nemaha river, which disappeared when the river was straightened

FALMOUTH, a seaport, market town and municipal borough in the Penryn and Falmouth parliamentary division of Cornwall, England, 291¼ m W S.W. of London on a branch from Truro of the G W railway Pop (1921) 13,322. Falmouth is finely situated on the west shore of Carrick roads, the largest of the many estuaries which open on the south coast of Cornwall. Several streams empty into the estuary, opening to inland navigation by river steamer; the largest is the Fal, near the head of the estuary on the east shore, by which Truro is reached; while the Penryn river and creek joins Falmouth with Penryn on

the west, and the picturesque inlet of the Porthcuel river opens out from St Mawes near the entrance opposite Falmouth. Carrick roads form one of the best refuges for shipping on the south coast, being accessible at all times by the largest vessels The shores are beautifully wooded, and slope sharply up to about 250 ft The entrance from the more open Falmouth bay is 1 m. across between St. Anthony Head (with its powerful light) and Zoze point, on the east, and Pendennis point, the promontory of Falmouth, on the west. Pendennis and St. Mawes' castles are Tudor fortresses, the former is celebrated for its gallant defence in the Civil War, when Cornwall was a centre of the royalist cause—another memorial being the church of King Charles the Martyr, built in 1662–63 during the Restoration Arwenack house is the ancient seat of the Killigrews, who were lords of the manor. Owing to its situation on the neck of a peninsula, Falmouth faces the water on both sides, and considerable improvements have been effected by the corporation in laying out a marine drive and pleasure grounds, etc. Among the principal buildings and institutions are the town-hall and market-house, the Royal Cornwall Sailors' home and hospital, a meteorological and magnetic observatory, and a submarine mining establishment. The Royal Cornwall Yacht club has its headquarters here; the principal prize in the annual regatta is a cup given by the prince of Wales as duke of Cornwall Engineering, shipbuilding, brewing and the manufacture of manure are carried on, and there are oyster and mussel fisheries controlled by the corporation, and trawl fisheries, especially for pilchard The growing importance of Falmouth as a ship repairing centre has been met by increased wharfage and the installation of modern workshops, as well as the addition of two new graving docks in 1926 and 1928, respectively 750 ft. and 611 ft long, the latter being especially intended for the convenience of oil tank steamers The area of the tidal harbour within the docks is *c* 42 ac. Grain, timber, coal and manures are imported, and granite, china clay, copper ore, ropes and fish exported. Falmouth is also in favour as a watering-place. The municipal borough is under a mayor, four aldermen and 12 councillors, and has a separate commission of the peace Area, 791 ac

Falmouth (Falemuth) as a haven and port has had a place in the maritime history of Cornwall from early times The site of the town, formerly known as Smithick and Pennycomequick, formed part of the manor of Arwenack held by the family of Killigrew, the last of whom died in the 18th century. In 1652 the Commonwealth parliament granted a market to Smithick This market was confirmed to Sir Peter Killigrew in 1660 together with two fairs and a ferry between Smithick and Flushing, on the opposite shore of Penryn creek By the charter of incorporation granted in the following year the name was changed to Falmouth In 1664, an act creating the borough a separate ecclesiastical parish empowered the mayor and aldermen to assess all buildings within the town for the support of the rector This rector's rate occasioned much ill-feeling in modern times, and by act of parliament in 1896 was taken over by the corporation, and provision made for its eventual amortization. In 1832 Penryn was united with Falmouth for parliamentary purposes, two members being assigned to the united boroughs. By the Redistribution act 1885, the number of members was reduced to one. In 1918 the borough was merged in the present county division.

FALSE IMPRISONMENT is the total restraint upon the liberty of another person for however short a time without legal justification. Partial restraint, such as preventing a person from walking in a particular direction, is not sufficient, but actual locking up is not necessary, and the restraint may be either physical or exercised on a show of authority (*Bird* v. *Jones*, 1845, 7 Q.B 742) Imprisonment may be justified either at common law or under statute, but justification for interference with the liberty of the subject must be strictly proved. False imprisonment gives the right of a civil action for damages, but, in addition, where the detention is physical and continued a writ of *habeas corpus ad subjiciendum* may be obtained. (*See* also ARREST and HABEAS CORPUS.)

FALSE PRETENCES, in English law, the obtaining from any other person by any false pretence any chattel, money or valuable security, with intent to defraud It is an indictable misdemeanour by statute The broad distinction between this offence and larceny is that in the former the owner intends to part with his property, in the latter he does not. This offence dates as a statutory crime practically from 1757 At common law the only remedy originally available for an owner who had been deprived of his goods by fraud was an indictment for the crime of cheating These remedies were insufficient to cover all cases where money or other properties had been obtained by false pretences, and the offence was first partially created by a statute of Henry VIII (1541) The scope of the offence was enlarged to include practically all false pretences by an act of George IV passed in 1757

The law is now governed by the Larceny Act 1916, which by s. 32 enacts that every person who by any false pretence (1) with intent to defraud, obtains from any other person any chattel, money or valuable security, or (2) with intent to defraud or injure any other person, fraudulently causes or induces any other person to execute, make, accept, endorse or destroy the whole or any part of any valuable security, is guilty of a misdemeanour and liable to penal servitude for five years Also by s 40 of the same act, it is not necessary to prove an intent to defraud any particular person, but it is sufficient to prove that the person accused did the act charged with intent to defraud And on a trial for larceny, if the facts so warrant, a verdict of false pretences may be returned, and if on a trial for obtaining by false pretences it is proved that the defendant stole the property in question, he is not by reason thereof entitled to be acquitted of obtaining such property by false pretences

The principal points to notice are that the pretence must be a false pretence of some past or existing fact, made for the purpose of inducing the prosecutor to part with his property, and a pretence of future action is not sufficient. This rule was recognized in the Summary Jurisdiction Act 1899, for where justices propose to deal with a case summarily they must explain to the accused "that a false pretence means a false representation by words, writing or conduct that some fact exists or existed, and that a promise as to future conduct not intended to be kept is not by itself a false pretence" The property, too, must have been actually obtained by the false pretence The owner must be induced by the pretence to make over the absolute and immediate ownership of the goods, for where temporary possession only is given it is "larceny by means of a trick" It is not always easy, however, to draw a distinction between the various classes of offences. In the case where a man goes into a restaurant and orders a meal, and, after consuming it, says that he has no means of paying for it, it was decided by the court for Crown cases reserved in *R.* v. *Jones*, 1898, L R 1 Q B. 119, that it is neither larceny nor false pretences, but an offence under the Debtors Act 1869, of obtaining credit by fraud (*See* also CHEATING; FRAUD; LARCENY)

In the United States, false pretences in the various States is a crime by statutes, based largely upon the English statutes passed prior to the American Revolution While the statutes are broad, they do not include every case of fraud and dishonesty whereby one person gains advantage over another.

FALSETTO, a forced form of sound production employed to obtain notes above the natural range of the voice The notes of this register are of poor and peculiar quality owing to the vocal cords being only partially set in vibration.

FALSTAFF, SIR JOHN, a character in Shakespeare's *Henry IV.* and *Merry Wives.* In the original draft of *Henry IV. Part I.* he bore the name of the Lollard martyr, Oldcastle, which was changed in deference, it would seem, to protests from the family. Shakespeare substituted the name of Sir John Fastolf (*q.v.*).

FALTICENI, the capital of the department of Suceava, Rumania, on a tributary of the Sereth, on the fall line between the Transylvanian Alps and the Bessarabian plain. Pop. about 10,000, over half of which is Jewish. A branch railway runs for 15 m. to join the main line between Czernowitz (Cernauti) and Galatz

(Galati). The Suceava department (named after Suceava or Suciava, its former capital) is densely forested; its considerable timber trade centres in Falticeni It has a summer fair

FALUN, a town of Sweden, capital of the district (*lan*) of Kopparberg, 153 m. N.W. of Stockholm by rail. Pop. (1928) 13,611 It is situated in difficult country near the western shore of lake Runn. Its famous copper mines have been worked since the 13th century Their produce has gradually decreased since the 17th century, and is now unimportant, but various secondary products are still obtained The mines belong to the Kopparberg Mining company, the oldest industrial corporation in Sweden, established before 1347 At present it has various industrial interests besides copper mining Falun has railway rolling-stock factories and there are museums of mineralogy and geology and a school of mining.

FAMA, in classical mythology, the personification of Rumour (Gr. Φήμη, Ὄσσα). The Homeric equivalent *Ossa* (*Iliad,* ii 93) is represented as the messenger of Zeus, who spreads reports with the rapidity of a conflagration. Homer does not personify *Pheme,* which is merely a presage drawn from human utterances, whereas *Ossa* (until later times) is associated with the idea of divine origin A more definite character is given to Pheme by Hesiod (*Works and Days,* 764), who calls her a goddess, in Sophocles (*Oed Tyr,* 158) she is the daughter of Hope According to Aeschines the orator (*c. Timarch,* 128, *de falsa leg* 145) and Pausanias (i 17. I) there was a temple of Pheme at Athens, but apart from this, she is a figure of mythical and poetical imagination rather than cult

In Rome, Fama is purely a poetical figure (*e g,* Virgil, *Aen,* IV., 173) The Φήμη καὶ κληδὼν of Plutarch (*Camillus,* 30, *de fert. Roman,* 319 A) is simply *Aius Locutius,* misunderstood, *cp.* Livy, V, 50, 5

FAMAGUSTA, a town and harbour on the east coast of Cyprus (Gr. *Ammochostos*), 2½ m S. of the ruins of Salamis (*q v*) The population in 1901 was 818, nearly all being Muslims who live within the walls of the fortress; the Christian population has migrated to a suburb, Varosia (pop 2,948) When Salamis (*q v.* = Roman *Constantia*) was destroyed by the Arabs in AD 647, its Christian inhabitants settled at the neighbouring Arsinoe (*Ammochostos* "choked with sand") which had been built by Ptolemy Philadelphus in 274 BC, and now became the seat of the orthodox archbishopric Famagusta received many refugees at the fall of Acre in 1291, was annexed by the Genoese in 1376, reunited to the throne of Cyprus in 1464; and surrendered to the Turks in 1571 after a year's siege The fortifications, remodelled by the Venetians after 1489, the castle, the grand Gothic cathedral of St Nicolas (now a mosque) and the remains of the palace and many other churches testify to the mediaeval splendour of Famagusta Acts ii and v of Shakespeare's *Othello* pass there, and the "Moor's Tower" is still shown Since 1903 much has been done to develop the natural harbour and a light railway connects it with Nicosia (*q v.*)

FAMILIAR, properly meaning belonging to the family or household, but in this sense the word is rare. The more usual meanings are: friendly, intimate, well-known "Familiar" is also used as a substantive, especially of the spirit or demon which attended on a wizard or magician. The idea underlies the notion of the Christian guardian angel and of the Roman *genius natalis* (*see* DEMONOLOGY; WITCHCRAFT) In the Roman Church the term is applied to persons attached to the household of the pope or of bishops.

FAMILIARITY, in psychology, is defined as a feeling upon which follows closely recognition, so immediate, that its complex nature is hidden This recognition is based upon subliminal association and there is consequently no need for the presence of mental images Familiarity is therefore a developed "new" process of the mind, resulting from a fusion or combination of mental processes no longer individually felt *See* ASSOCIATION OF IDEAS.

FAMILISTS, a term of English origin (later adopted in other languages) to denote the members of the "Family of Love," founded by Hendrik Niclaes who died probably in 1580. His calling was that of a merchant, in which he and his son Franz prospered, becoming ultimately wealthy. Not till 1540 did he appear in the character of one divinely endowed with "the spirit of the true love of Jesus Christ." For twenty years (1540–1560) Emden was the headquarters at once of his merchandise and of his propaganda; but he travelled in both interests to various countries, visiting England in 1552 or 1553 Niclaes claimed to hold an impartial attitude towards all existing religious parties, and his mysticism, derived from David Joris, was undogmatic. Yet he admitted his followers by the rite of adult baptism, and set up a hierarchy among them on the Roman model (*see* his *Evangelium Regni,* in English *A Joyfull Message of the Kingdom,* 1574?, reprinted, 1652) His pantheism had an antinomian drift; for himself and his officials he claimed impeccability, but whatever truth there may be in the charge that among his followers were those who interpreted "love" as licence, no such charge can be sustained against the morals of Niclaes and the other leaders of the sect The society spread in the eastern counties, in spite of repressive measures, it revived under the Commonwealth, and lingered into the early years of the 18th century, the leading idea of its "service of love" was a reliance on sympathy and tenderness for the moral and spiritual edification of its members. Thus, in an age of strife and polemics, it seemed to afford a refuge for quiet, gentle spirits and meditative temperaments.

See W T. Whitley, article "Enthusiasts, religious" in Hastings, *Encyclopaedia of Religion and Ethics,* F Loofs, article "Familisten" in Herzog-Hauck, *Realencyklopaedie,* F Nippold, "H. Niclaes und das Haus der Liebe" in *Zeitschrift fur die hist Theol.,* 1862.

FAMILY. The family is a social unit based on the biological facts of procreation and the lengthy period of helplessness of offspring Since it occurs as a purely instinctive grouping amongst many animals, it was in all probability the first group in the evolution of human culture to acquire a traditional form, out of which developed those more complex groups, such as the clan, common amongst primitive peoples at the present day.

Most speculation on the beginnings of human culture assume a sort of family, instinctively produced, as a basis According to one view, this earliest form of family is a group led by a mature male, who dominated a number of females and children Out of this "cyclopean family" developed all the later forms of the family, dependent on a variety of marriage-rules and differences in the mode of determining descent. Others have supposed the monogamous family, consisting of a man and his mate and their children, to be the earliest form One school, as a reaction against the patriarchal theory, through the discovery of the widespread occurrence of matrilineal descent, denies the family in favour of original promiscuity

Whether or not there has ever been a social organization lacking the institution of the family, the family can be detected as a fundamental unit in all societies, primitive or otherwise, that have so far been observed

The family is here defined as a social group, consisting of one or more men living normally in the same habitation with one or more women, and the children, at least during their youth, that have resulted, or appear to be connected with their union. There are no clear instances of families in which several men cohabit with several women, though group-marriage (*q v.*) has been postulated by several writers to explain certain features of relationship terminology, and certain customs of widespread occurrence. (*See* MARRIAGE and RELATIONSHIP TERMS) Of the other three types of family, two at least have a wide distribution, the monogamous, in which one man is mated to one woman, and polygynous families, in which one man is mated to several women, while the polyandrous family, in which several men cohabit with one woman, is comparatively rare. (*See* POLYGYNY and POLYANDRY.)

The monogamous family is the usual type of family in every known society, though usually the polygynous family, confined to an upper class of the society, occurs alongside it. It is rare amongst primitives for the polygynous family to be entirely absent Where, as a result of the development of great social differences within a society, polygynous families of great size occur, some of the more usual characteristics of the family group are lost.

Joint Family.—Although the family is typically a social group of great cohesiveness, consisting of a man and his wife or wives, and their children, it is often a wider group, containing, perhaps, husbands and wives of the children, as well as the children of these, and other relatives as well. The term "joint family" has been used when such family-groups are of normal occurrence in a society. The test of the occurrence of such family groups may be taken to be the common occupation of a habitation, though family groups of this kind can sometimes be detected in the absence of joint habitation

The joint family may be either bilateral or unilateral, and the unilateral joint family may be either matrilineal or patrilineal. By bilateral is meant comprising relatives of both husband and wife, by unilateral, relatives of one side only by descent, which is matrilineal or patrilineal as the case may be. The patrilineal joint family is common in India, where a distinct family group is common, consisting of a man and his wives and children, together with his sons' children, and perhaps his father, or even grandfather. India also provides an example of the matrilineal joint family in the Nayars of Malabar, where the relations included are those of the wife instead of the husband.

Although the family as a definite social group, usually constituting a household, is always to be found in any society, the distribution and type of family groups occurring in any society depend on that part of the social organization which we may conveniently call the family grouping The family grouping is something which is different for every member of a society; it is an orientation of individuals about himself, based on relationship, and is somewhat different for every member of even one and the same family group It is, in connection with the family grouping, as distinct from family groups, that the terms matrilineal and patrilineal family have special significance, particularly in those cases where we do not have joint families, for the single family, as a group, obviously cannot be either matrilineal or patrilineal Where the family grouping is matrilineal, the nearest members of a person's family will consist of many of the next relatives by direct matrilineal descent of his mother, and very few, if any, relatives of his father. Where the family grouping is patrilineal, the converse is the case. It is obvious that the possible variations in the nature of the family grouping are considerable, even under the same family groups of man and wife with their children.

Matrilocal and Patrilocal Marriage.—Where the grouping is strongly matrilineal, it is commonly found that the husband has come from his own village to take up residence with his wife in her village (matrilocal marriage), and the wife's brothers may have more significance to the children than the father himself, there are numerous instances of this in regions so far apart as Melanesia, Africa and North America. Conversely, where the grouping is strongly patrilineal, the relatives of the mother may count for nothing in the lives of the children—a state of affairs not rare amongst pastoral peoples and others who buy their wives. An intermediate type of grouping, with no more than a slight emphasis of the matrilineal or patrilineal side, is perhaps the commoner state of affairs; in south-east New Guinea, for example, we find a people with matrilineal descent, in which the family grouping could hardly be described as either matrilineal or patrilineal. This is well shown by the absence of any rule of residence, a family frequently dividing its time between residence in the village of the husband and residence in that of the wife

Finally, it should be noted that, although family-groups may be small, a person's family may embody a very large number of persons, even if we confine the term to persons with whom genealogical relationship can be traced; and if we do not confine the term to genealogical relations—and there is no very good reason why we should—then, owing to the classificatory system of relationships (*q.v.*), which frequently occurs in primitive society, family relationships will be found to penetrate the whole tribe.

BIBLIOGRAPHY.—The family is treated in W. H. R. Rivers's *Social Organization* (1924), and R. H. Lowie's *Primitive Society* (1921), amongst other general works on sociology. A more special treatment of the family occurs in E. Westermarck's *History of Human Marriage*, 3 vols. (1921). An interesting detailed study of the family in one particular area will be found in B. Malinowski's *The Family among the Australian Aborigines* (1913); *see* also *Sex and Repression in Savage Society*, 1927 The family is part of the subject-matter of a recent voluminous work, R. Briffault, *The Mothers*, 3 vols (1927)

(W E A)

FAMILY PSYCHOLOGY. The psychology of the family is concerned with the problems that arise from the interactions and adjustments of human beings living in intimate association The very nature of the family organization is dependent upon the limit of elasticity in such adjustments on the part of individual members of the group. Like other social institutions, the family is an outcome of mankind's efforts to find satisfaction for a multiplicity of desires. The history of the family is a record of collective learning, carried out by persons through untold time

Fundamental, therefore, to an understanding of familial organization is knowledge of human nature, and particularly of the processes by which men learn. Much has been discovered about these processes during the present century Observation of living creatures, experimentally caged and puzzled, has taught psychologists that learning proceeds only in dissatisfied organisms. A fundamental principle underlying all social institutions is derived from experimental study of the learning process· *a puzzled creature tends to learn as fixed habit whatever mode of action happens to bring relief from persistent cravings* Social change occurs because some group of persons is unsatisfied (E L. Thorndike, *The Learning Process*, 1913.)

To what puzzle is the family, then, a solution? For purposes of ordinary reference, the human family consists typically of children and their parents, though it may include adopted persons, or more remote relatives such as grandparents Briefly, the puzzle of the family has been how to win satisfaction of the appetites for food, sex, security, self-assertion, play and other urgent needs, and at the same time to carry the burden of involuntary reproduction The manifold and often conflicting desires of men, of women and of children are involved, so that this puzzle has been and still is extremely complicated and difficult In striving for a solution that will yield the maximum of satisfaction with the minimum of thwarting to all concerned, mankind has tried almost every possible form of familial organization. Like a caged kitten, mankind has done nearly everything that it can do The form of the family obviously depends largely on the form of mating, and the history of human endeavour shows us (1) group marriage, scarcely different from promiscuity, in which all the men of a community live with all the women of that community and with the children produced by mating at will; (2) polyandry, in which one wife mates with several husbands, living simultaneously with all of them and with their children borne by her; (3) polygyny, in which one husband lives in a household with several wives, and forms a family with them and his and their children; (4) successive polygamy, as when a man or woman takes various mates in succession, after divorce; (5) monogamy, in which one man and one woman marry with the sanctioned formalities and live together with their offspring, as life-long mates (G. E. Howard, *The History of Matrimonial Institutions*, 1904.)

The times and places in which these various forms of the family occur reveal certain characteristic features of food supply, depopulation, over-population, etc, which are thought by students of the subject to exert decisive influence. Whatever form is established in any given time or place is regarded by the folk as "right" and "the way." We find every kind of organization receiving sanction sometime, somewhere. (W. G. Sumner, *Folkways*, 1911) Pair marriage, with monogamy as its ideal, seems most nearly in universal favour to-day as the best solution of the relationship between men and women in the family—best, that is, in the sense that it involves more satisfaction and less annoyance within the family than other forms, under conditions of human nature and of the environment as now existing. Powerful forces thus favour the unity of the family based on monogamy, but forces nearly as powerful work constantly for its disruption. (E. C. Parsons, *The Family*, 1906.) It is of interest to notice what these forces are.

FACTORS IN FAMILY LIFE

Considering first the forces which favour monogamous mating

and the familial organization resulting therefrom, we note that the sexes are numerically equal. It is true that more boys than girls are born, in a ratio of about 100 girls to 106 boys. However, mortality is slightly greater among males, so that in adulthood the sexes exist in numbers practically equal, taken the world over. This biological fact in itself favours pair marriage, since under polyandry or polygyny many are necessarily left mateless. Moreover, group marriage renders the paternity of children impossible of determination, and is so disfavoured by possessiveness and jealousy that after centuries of trial and error it is sanctioned scarcely anywhere at the present time, even among savages Furthermore, it has long been known to be a biological fact that two and only two persons are required to co-operate for the perpetuation of the species. The rearing of offspring falls most naturally, perhaps, to the two who have produced them. Also mutual possessiveness, already mentioned, favours the family based on pair marriage, for man is constituted to resist encroachment upon property or privilege. Thus a man fights those who would possess "his woman," and a woman fights those who would possess "her man." These struggles to exclude competitors for favour would seem in the long run to work for pair marriage, as against other forms

On the other hand, pair marriage with the monogamic ideal assumes that since there are enough mates for everybody, everyone can and will find a suitable mate This assumption is not warranted by facts. There is not and never has been provided any adequate social machinery whereby young people might be enabled to make genuine choice, and to find each a suitable life-long mate. Moreover, the standard of living, by constantly rising, works to postpone marriage later and later. Thus a fairly large proportion of adults are at any given time unmarried, and the dissatisfactions and maladjustments arising from this situation affect society as a whole, and to the extent to which they are felt, work against monogamous marriage. Sexual instinct in human beings is not such that each person experiences a unique attraction during life. On the contrary, sexual impulse is in both sexes arousable by a variety of stimuli, regardless of ceremonial and legal restrictions Mankind seems typically polygamous rather than monogamous by momentary impulse, however unfortunate for other aspects of life the satisfaction of such impulse may be This fact perpetually threatens the family which is based on the ideal of life-long pair marriage Furthermore, the desire for mastery over each other, individual differences in endowment, and a host of egoistic impulses, constitutionally latent in every person, work toward hostility and disruption, as the divorce courts prove.

However important the form of relationship between men and women may be for familial structure, it is really the child who chiefly determines how men and women shall live together Except for reproduction, men and women might live in a great variety of social patterns, prompted only by individual differences in impulse and resources. The civilized family, founded upon pair marriage, with the husband as the head, and with the wife and children dependent upon his ability and bounty, was arrived at through struggling with the great sex difference in reproductive function. It must be remembered that until recently women were typically engaged throughout youth and maturity in conceiving, bearing, feeding, nursing, transporting and burying infants. From girlhood, women were physically attached to infants. The period of gestation for a human infant is long. Once born it must be carried upon the back and fed from the breast for a long time, under primitive conditions. Its birth constitutes an ordeal for the mother, in the course of which she may be crippled, at least for enough days to suffice for starvation unless ministered to by others. Human infants are conceived and borne in the course of nature at the rate of one each year or two, at any season, in the cold as well as in the warm, and they become quite heavy while still too immature to walk far or to run. (B. T. Baldwin, *Physical Growth from Birth to Maturity*, 1921) How to master the uncertain food supply, ravenous wild beasts, hostile tribes, storms and cold is a hard puzzle for a creature carrying heavy children within and upon her body, year in and year out.

There is, nevertheless, a way to open this hard cage, that will lead to sustenance and shelter without sacrifice of the child. This way is to get the protection of those who are not cumbered with burdensome generative systems. Thus if men could be induced to supply subsistence, women could live without killing or abandoning their infants. At the same time, men were motivated by sex attraction, by the luxury of having routine labours performed for them, and doubtless by pity, to undertake the protection of women and of the helpless offspring to which they were mysteriously subject. Thus men, women and children came to be arranged in family groups, in which men were inevitably lords and masters, because they needed the arrangement least. The satisfaction of the mutual need for sex leaves men unhampered, while it leaves women weighted with the burden of gestation, child-birth and child care (A. B Parsons, *Woman's Dilemma*, 1926)

It must be remembered that at the beginning of this long learning process, men knew no direct responsibility for the child. We have said that women were *mysteriously* subject to child-bearing. Knowledge of the true cause of child-birth had to be worked out by accumulation of records, comparison of observations and verification of inferences, just as in the case of any other scientific fact It would almost certainly be a long time before human experience would establish the fact that sexual union is the invariable cause of procreation. Child-birth was originally ascribed to the influence upon mothers of the sun, the rain, the rivers and the trees (E. S Hartland, *Primitive Paternity*, 1910)

The discovery of paternity undoubtedly modified woman's previously existing familial status in various ways. Men learning that they too were creators of children, realized also that in order to identify "his own flesh and blood" a man must ensure the strict fidelity of the mother to himself alone, in matters of sexual union Special restrictions were thus imposed upon women, and a double standard of morals arose. In the earliest formulations of law, we find that "If the finger have been pointed at the wife of a man because of another man—for her husband's sake she shall throw herself into the river " No similar law required the husband to drown himself in like circumstances. (Code of Hammurabi, 2250 B C.) With sound knowledge of the true source of infants, women could take steps toward limiting the number of births The first step in the exercise of this new power was voluntary celibacy Celibate women had time and energy to examine closely the family situation, to appraise woman's status therein, and to formulate diverse suggestions for mitigating some of the misfortunes due to her subordination. (K. Anthony, *Feminism in Germany and Scandinavia*, 1914.)

However, the almost sudden modification of woman's status, which the present generation witnesses, has come to pass not through feminist propaganda primarily, but through the works of persons who as a group were indifferent to the woman question Inventors, men of science and philosophers created what is known as "the new woman," with a changing position in the family During the 19th century, invention based on physics and chemistry harnessed power a thousandfold greater than the power of women's hands Biologists studied the processes of reproduction, and devised scientific methods of birth-control other than celibacy They wrought upon the origin of species and carried the conviction to high places that human beings had in the past undergone evolution, and therefore might in future continue to change. Philosophers in the meantime had developed naturalism, humanitarianism and pragmatism—all points of view favourable to the liberation of women as individuals, which science had been rendering practicable. (L. S. Hollingworth, "The New Woman in the Making," *Current History*, 1927)

By the opening of the 20th century a "new woman" was trying to find place in the family Freed at the same time from routine hand labour for the family and from incessant, involuntary maternity, married women in large numbers began to attempt differentiated occupation and economic independence. As a result of this breaking up of its formerly undifferentiated matrix, the family has begun to undergo internal modification and reflective scrutiny. Two chief problems now emerge as a result of woman's shift in power and attitude, *i e.*, the serving of food and the care

of young children In cities the apartment hotel, the restaurant, the nursery school, the managing housekeeper and the trained nurse afford solutions more or less suggestive of ultimate satisfaction In small towns and in the country these facilities are lacking as yet, and women still occupy the place which was traditional in the centuries immediately preceding ours.

The same influences that gave women increased power are also giving the child a modified status in the family. Psychology has developed scientific method during the half-century just elapsed Child-study is one of the conspicuous concerns of modern psychology, offering new insight into child life, and a new respect for the child and for his right to be set free from the family at maturity. However, the increased value of the child, affording him increased dignity of status in the family, arises chiefly from new power over procreation, which renders the child less cheap and less to be taken for granted As time goes on and all intelligent people gain the power of voluntary parenthood, the value of the child may well become such as to modify social attitudes in ways which we can at present but vaguely foresee (*The Child. His Nature and His Needs,* The Children's Foundation, 1924.)

To summarize briefly the changes which are in progress in the modern family, we may say that parenthood is becoming a voluntary matter, wives are achieving economic independence in differentiated work, the double standard of morals is being condemned, and children are becoming less frequent and more valued Our times bear witness to the living of many avowedly experimental lives, in the attempt to revise the family on the basis of new powers over nature Studies are being compiled of families in which the wife and mother earns an independent salary (V. M Collier, *Marriage and Careers,* 1926) From these studies it appears that men and women of intelligence and good will are consciously searching for a form of familial procedure in which the interests of men, women and children may all receive equal consideration. The outcome of the search is still uncertain

Since the child is the core of the puzzle, since changes along the lines attempted depend upon voluntary maternity, and since methods of birth-control at present developed require intelligence and character for successful application, it follows that such changes will be confined at first and possibly for a long time to the unusually able Whether the future will witness two kinds of familial pattern, one for the reflective, the other for the unreflective, or whether the unreflective will eventually change their "ways" through force of example, remains to be seen.

(L. S. H.)

FAMILY ALLOWANCES. The custom of paying, in addition to wages, allowances for children and sometimes for wives, grew up out of the economic conditions during and after the World War, though before that vestiges of it existed here and there in a few occupations, notably in agriculture, where payments in kind varying with the size of the labourer's family have long been general in most countries. During the war all the belligerent States paid allowances for the wives and children of the men in the fighting services, and in the public services of most European countries the war bonuses made necessary by the rise in prices were proportioned in some way to the size of the worker's family, or at least differed for married and unmarried. Probably these two war customs prepared the way for the rapid development which has followed in some countries.

In the services of the State and of local authorities the payment of allowances for children has become established in all European countries except Great Britain, Portugal, Spain and Russia The Federal Government of Australia gives the children of its employees an allowance of 5s. a week until the age of 14 In several of these countries (*e.g.,* Switzerland and Italy) attempts have been made, so far unsuccessfully, to drop the payment as conditions became more normal.

The allowances do not vary with the remuneration of the worker, except in Holland, where they are expressed as a percentage of his salary, with a minimum and a maximum. Everywhere the allowances represent only a small part of the cost of a child; being on a flat rate they are more important to the lower paid than to the higher paid officials. They are paid up to the age of 18 (in Germany 16), later, if education is continued.

In America, there is a growing interest in the subject of family allowances A movement is on foot in Canada urging upon the Federal Government of that country the advisability of passing, as soon as possible, a family allowance law applicable to the whole Dominion

In the United States, an investigation of "Family Allowances in Foreign Countries" has been carried on by the Federal Bureau of Labor Statistics, and the results published in its *Bulletin 401* (Washington, 1926).

Next to the public services, mining is the occupation where the system is most widely established. It is practically universal in the mining industry of France and Belgium, and is in operation in some of the mining districts of Germany, Holland, Czechoslovakia, Poland and Sweden Here, as elsewhere, the allowance represents only a contribution towards child maintenance In most countries the married workers' privileges include coal and in some a house free or at a low rate

The System at Work.—In other industries, the family allowance system is widely extended only in France and Belgium, though there are instances of it in other countries.

In France its development has been greatly helped by the device of the equalization fund (*Caisse de Compensation pour allocations familiales*), which guards successfully against the danger that family allowances paid for by employers might prejudice men with families in obtaining employment Such funds were first proposed in 1918 by M Romanet, a benevolent Roman Catholic employer of the metallurgic industry of Grenoble The idea spread rapidly, and in May 1927 there were 210 equalization funds in France, covering over 16,200 firms and 1,420,000 workers Twenty-seven of the funds were agricultural The method is simple —The fund may be either "professional," *i.e.,* confined to a single industry or kind of occupation, or "regional and interprofessional," *i.e.,* open to all employers who desire to join within a given area The scale of allowances (which varies considerably in different funds) having been fixed, the number of children covered is ascertained at fixed periods, and each adherent employer is assessed for his share of the cost, the assessment being based either on the amount of his wage-bill, the number of his workers, or the number of hours worked When the number of workers is the basis, some funds fix a lower scale for women and youths than for adult male workers Some funds actually pay the allowances to the parents, in others the employer pays and subsequently claims from the fund the excess, or pays into the fund the deficiency of his payment over the sum due from him

The allowances are usually paid monthly and, in an increasing proportion of funds, not to the workman but to the children's mother It is found that this method is not only more certain to benefit the children, but less apt to arouse the jealousy of the single man, who is thus led to regard the allowances, not as an addition to wages, and thus an infraction of the principle of equal pay for equal work, but as a recognition of the separate service of parenthood The desire for an increased population is shown by the grading of the allowances upwards, *e.g.,* in May 1927 the rates of allowances averaged 27 francs per month for one child, 67 for two children, 115 for three, and 181 for four In the leading funds the rates rise to 60 francs for one, 150 for two, and 240 for three children. Figures for the metal and allied industries fund in the Paris district, covering 200,000 workers, showed that the allowance for one child amounted to about 4% of wages, for two children to 10%, and for five to 40% Many funds also pay bonuses at childbirth (*primes de naissance*) and during the period of lactation (*primes d'allaitement*). Many maintain subsidiary health services, such as health visitors, day nurseries, convalescent homes, etc.

The cost of the allowances to employers varies from 1 to 7% of the wage-bill. Including the public services, mines, railways and other large enterprises, which pay allowances directly, the number of workers covered in May 1927 was reckoned at 3,700,000, and the annual cost of the allowances at 1,318 million francs

The system is increasingly popular with employers, who find their reward in the increased well-being and contentment of their

workers The attitude of the trade unions has changed from one of suspicion to a definite and cordial acceptance of the principle, coupled with resentment of employers' control and demand that it shall be made universal, compulsory and collectively controlled

In Belgium, the methods adopted are modelled closely on those of France Progress began several years later, but has been rapid, and the system appears equally destined to become a permanent part of industrial life, welcomed both by employer and employed In his report for 1925, the British commercial secretary attributed the freedom of the country from industrial strife partly to this cause and said.—"It is almost generally admitted now that the family bonus system is of real economic value, and that by improving the present and future conditions of the working class it is capable of exerting a direct and beneficial influence on the prosperity and producing capacity of the country"

In Germany, during the five years following the World War the payment of family allowances was probably as common as in France but much less generally popular Employers tended to regard the allowances as a temporary addition to wages which could be dropped when conditions became more normal Hence few equalization funds were started, and the allowance being paid to the worker with his wage was apt to excite the single man's jealousy, while the married man feared to be prejudiced in seeking work In 1925 the number of collective agreements containing family allowances showed a falling off It is not yet certain whether the tendency will be permanent

Scattered instances of equalization funds and of allowances paid by individual firms are to be found in Holland, Poland, Austria and Palestine, and to a minor extent in Czechoslovakia, Greece, Rumania and Switzerland

In New Zealand a Family Allowance Act was passed by a Conservative Government in 1926 and came into force in April 1927 The allowance amounts to 2s per week per child under 15 in excess of two children per family, up to income limit of £4 per week plus any sum payable under the act The cost has been estimated at £200,000 per annum

In Australia, since 1907, wages have been subject to a legal minimum, settled by the courts and supposed to be roughly based on the needs of the "normal" family of five persons (four persons in New South Wales) In 1919, owing to the discontent caused by rising prices, a Royal Commission on the basic wage, composed of equal numbers of representatives of employers and employed with an impartial chairman, was set up to determine what was the actual cost of maintenance of a five-member family at a standard of reasonable comfort The sum fixed for each of the five states averaged £5 16s., the existing basic wage being then £4 The Commonwealth statistician promptly reported that the whole produced wealth of the country would not yield the amount that was necessary The chairman of the commission, A D. Piddington, then submitted the proposal that the basic wage should be based on the needs of man and wife and supplemented by an allowance of 12s. per week for each child, paid out of a State fund to which each employer should contribute 10s. 9d a week per employee. He pointed out that the ordinary conception of the basic wage postulated 2,100,000 non-existent children, the total number of actual children (under 14) of employees being 900,000. The only actual fruit of this proposal, up to 1926, was the aforesaid 5s allowance paid for each child of a Commonwealth employee In June 1927 a Conference of State Premiers referred the question to a Royal Commission Meanwhile a Child Endowment Act was passed in New South Wales in March, 1927, providing for allowances of 5s per week per child under 14 (up to 16 if incapacitated from earning) Allowances are not payable when the previous year's income exceeds the basic wage plus £13 for each child. The basic wage, assessed on the requirements of man and wife, amounted to £4 5s. per week in Oct. 1927. It is estimated that the endowment will cover 396,000 children at a cost of approximately five millions This cost is met by a levy on employers amounting to 3% of wages-bill.

Although Great Britain possesses the earliest equalization fund in existence (in fact though not in name) in that established about a century ago by the Wesleyan community for children of ministers, and although allowances for children are also paid in the United and Primitive Methodist Churches and in a few dioceses of the Church of England, the family allowance system has so far not taken much root in the country, except in the fighting service The subject, however, has been widely discussed since the development of the foreign schemes It is significant of its growing hold on public opinion that during 1925 the London School of Economics introduced substantial educational allowances for the children of its professorial staff, the Independent Labour Party adopted as part of its programme a state scheme of children's allowances, and the Coal Commission report recommended such allowances as "one of the most valuable measures that could be adopted for increasing the well-being and contentment of the mining population."

The Case for Family Allowances.—Advocates of the principle contend that as the national income or dividend is an uncomfortably tight fit, it will be impossible to satisfy the general demand for a reasonably high standard of life so long as the needs of the family during the years of its greatest dependency are only met through a wage paid equally to the childless man They further argue that the value of children to the community, as its future citizens and workers, is not adequately recognized by a system which assigns to the family unit an income no larger than that enjoyed by the single individual, that as a result the more thoughtful and ambitious workers are tending drastically to restrict their families, while the less thoughtful and less ambitious practice no such restriction To this is added the plea that the maximum production of wealth will only be achieved when competition between men and women workers is at once free and fair, and that this is impossible without "equal pay for equal work," and that this again is impracticable until family responsibilities are met by family allowances

There is a division of opinion among advocates of family allowances in Great Britain between those who prefer the foreign system of equalization funds paid for by employers, those who would like to see family allowances provided through contributory insurance, and those who believe that the whole cost should be met by the State

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FAMINE, extreme and general scarcity of food, causing distress and deaths from starvation among the population of a district or country (Lat *fames,* hunger) The causes of famine are partly natural and partly artificial Among the natural causes may be classed all failures of crops due to excess or defect of rainfall and other meteorological phenomena, or to the ravages of insects and vermin. Among the artificial causes may be classed war, and economic errors in the production, transport and sale of foodstuffs, etc.

The natural causes of famine are still mainly outside our control, though science enables agriculturists to combat them more successfully, and the improvement in means of transport allows a rich harvest in one land to supplement the defective crops in another. In tropical countries drought is the commonest cause of a failure in the harvest, and where great droughts are not uncommon—as in parts of India and Australia—the hydraulic engineer comes to the rescue by devising systems of water-storage and irrigation It is less easy to provide against the evils of excessive rainfall and of frost, hail, and the like The experience of the French in Algiers shows that it is possible to stamp out a plague of locusts, such as is the greatest danger to the farmer in many parts of Argentina But the ease with which food can nowadays be transported from one part of the world to another minimizes the danger of famine from natural causes, as we can hardly conceive that the whole food-producing area of the world should be thus affected at once (*See* GRAIN PRODUCTION AND TRADE; TROPICAL AGRICULTURE; IRRIGATION.)

Great Famines.—Amongst the great famines of history may be named the following.—

BC 436	Famine at Rome, when thousands of starving people threw themselves into the Tiber.
AD 42	Great famine in Egypt.
650	Famine throughout India.
879	Universal famine.
941, 1022 and 1033	Great famines in India, in which entire provinces were depopulated and man was driven to cannibalism.
1005	Famine in England.
1016	Famine throughout Europe
1064–1072	Seven years' famine in Egypt
1148–1159	Eleven years' famine in India.
1162	Universal famine.
1344–1345	Great famine in India, when the Mogul emperor was unable to obtain the necessaries for his household The famine continued for years and thousands upon thousands of people perished of want
1396–1407	The Durga Devi famine in India, lasting 12 years.
1580	Famine in England which gave rise to the Poor Law system
1661	Famine in India, when not a drop of rain fell for two years
1769–1770	Great famine in Bengal, when a third of the population (10,000,000 persons) perished
1783	The Chalisa famine in India, which extended from the eastern edge of the Benares province to Lahore and Jammu
1790–1792	The Doji Bara, or skull famine, in India, so called because the people died in such numbers that they could not be buried. According to tradition this was one of the severest famines ever known It extended over the whole of Bombay into Hyderabad and affected the northern districts of Madras Relief works were first opened during this famine in Madras.
1838	Intense famine in North-West Provinces (United Provinces) of India, 800,000 perished
1846–1847	Famine in Ireland, due to the failure of the potato-crop Grants were made by parliament amounting to £10,000,000
1861	Famine in North-West India
1866	Famine in Bengal and Orissa, 1,000,000 perished
1869	Intense famine in Rajputana, 1,500,000 perished The government initiated the policy of saving life
1874	Famine in Behar, India Government relief in excess of the needs of the people
1876–1878	Famine in Bombay, Madras, and Mysore, 5,000,000 perished Relief insufficient
1877–1878	Severe famine in north China, 9,500,000 said to have perished.
1887–1889	Famine in China
1891–1892	Famine in Russia
1897	Famine in India Government policy of saving life successful Mansion House fund £550,000.
1899–1901	Famine in India, 1,000,000 people perished Estimated loss to India £50,000,000 The government spent £10,000,000 on relief, and at one time there were 4,500,000 people on the relief works
1905	Famine in Russia
1916	Famine in China.
1921	Famine in Russia.

Famines in India.—Owing to its tropical situation and its almost entire dependence upon the monsoon rains, India is more liable than any other country in the world to crop failures, which upon occasion deepen into famine. Every year sufficient rain falls in India to secure an abundant harvest if it were evenly distributed over the whole country; but as a matter of fact the distribution is so uneven and so uncertain that every year some district suffers from insufficient rainfall. In fact, famine is, to all intents and purposes, endemic in India, and is a problem to reckon with every year in some portion of that vast area. The people depend so entirely upon agriculture, and the harvest is so entirely destroyed by a single monsoon failure, that wherever a total failure occurs the landless labourer is immediately thrown out of work, and remains out of work for the whole year. The question is thus one of lack of employment, rather than lack of food. The food is there, perhaps at a slightly enhanced price, but the unemployed labourer has no money to buy it. The problem is very much the same as that met by the British Poor Law system.

Famines seem to recur in India at periodical intervals, which have been held to be in some way dependent on the sun-spot period. Every five or ten years the annual scarcity widens its area and becomes a recognized famine; every 50 or 100 years whole provinces are involved, loss of life becomes widespread In the famine of 1901, the worst of recent years, the loss of life in British districts was 3% of the population affected, as against 33% in the Bengal famine of 1770.

The native rulers of India seem to have made no effort to relieve the sufferings of their subjects in times of famine; and even down to 1866 the British government had no settled famine policy. In that year the Orissa famine awakened the public conscience, and the commission presided over by Sir George Campbell laid down the lines upon which subsequent famine-relief was organized In the Rajputana famine of 1869 the humane principle of saving every possible life was first enunciated

Fighting Indian Famine.—The measures by which the government of India chiefly endeavours to reduce the liability of the country to famine are the promotion of railways, the extension of canal and well irrigation; the reclamation of waste lands, with the establishment of fuel and fodder reserves; the introduction of agricultural improvements; the multiplication of industries; emigration, and finally the improvement where necessary of the revenue and rent systems. In times of famine the function of the railways in distributing the grain is just as important as the function of the irrigation-canals in increasing the amount grown There is always enough grain within the boundaries of India for the needs of the people; the only difficulty is to transport it to the tract where it is required at a particular moment. Owing to the extension of railways, in the famines of 1898 and 1901 there was never any dearth of food in any famine-stricken tract, and the only difficulty was to find enough rolling-stock to cope with the demand Irrigation protects large tracts against famine, and has immensely increased the wheat output of the Punjab; the Irrigation Commission of 1903 recommended the addition of 6½ million acres to the irrigated area of India, and that recommendation was carried out

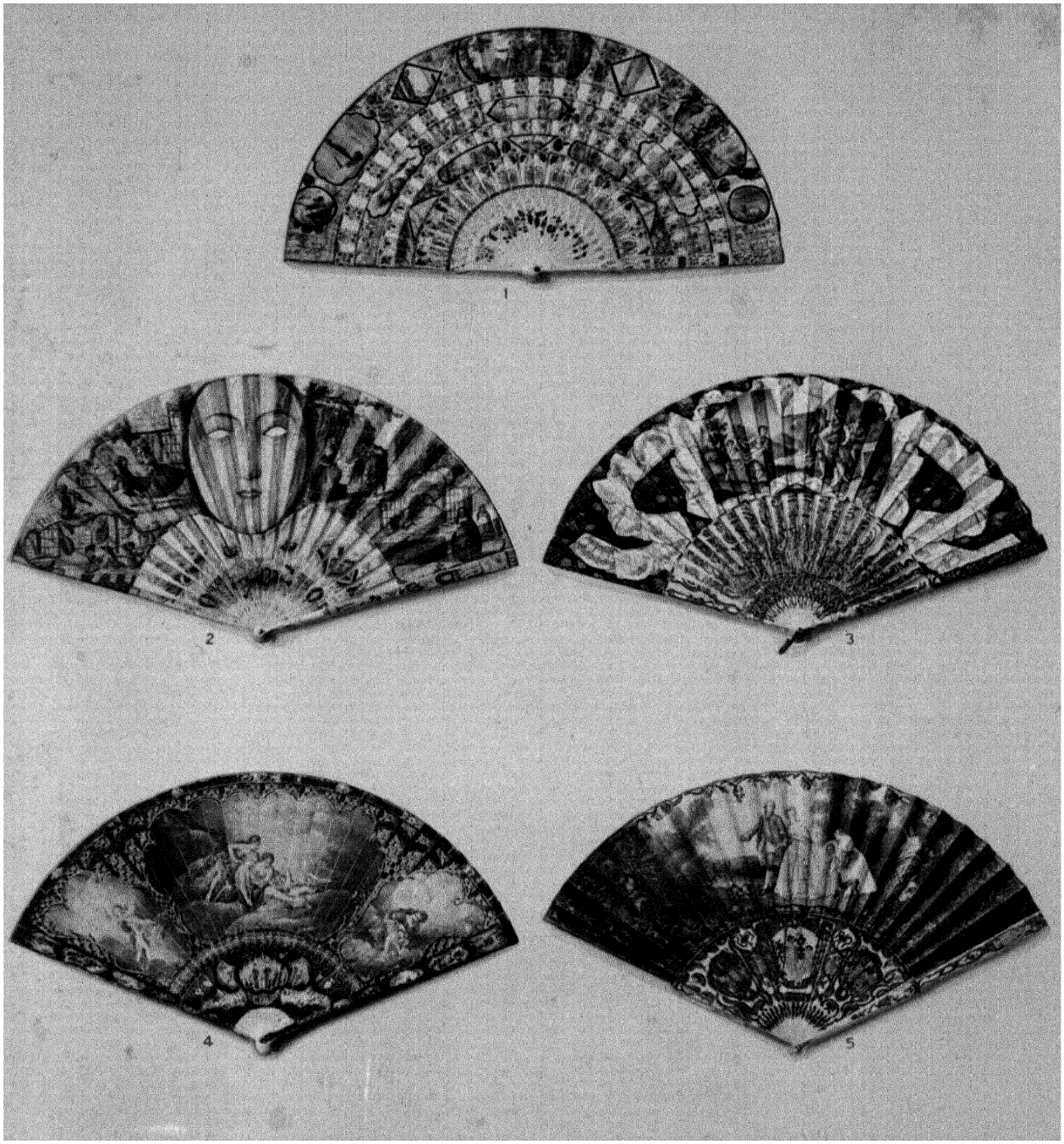
As five-sixths of the whole population of India are dependent upon the land, any failure of agriculture becomes a national calamity If there were more industries and manufactures in India, the dependence on the land would not be so great and the liability to lack of occupation would not be so uniform in any particular district. The remedy for this is the extension of factories and home industries which is a work of time

On the question of a possible famine in the world's natural resources, *see* NATURAL RESOURCES, CONSERVATION OF

See Cornelius Walford, "On the Famines of the World, Past and Present" (*Journal of the Statistical Society*, 1878–1879), Romesh C Dutt, *Famines in India* (1900), Robert Wallace, *Famine in India* (1900), George Campbell, *Famines in India* (1769–1788), *Chronological List of Famines for all India* (Madras Administration Report, 1885); J C. Geddes, *Administrative Experience in Former Famines* (1874), *Statistical Atlas of India* (1895), F H S Merewether, *Through the Famine Districts of India* (1898), G. W. Forrest, *The Famine in India* (1898), E. A. B Hodgetts, *In the Track of the Russian Famine* (1892); W B Steveni, *Through Famine-Stricken Russia* (1892); Vaughan Nash, *The Great Famine* (1900); Lady Hope, *Sir Arthur Cotton* (1900); *Lord Curzon in India* (1905), T W. Holderness, *Narrative of the Famine of 1896–97* (c. 8812 of 1898), the Indian Famine Commission reports of 1880, 1898, and 1900; report of the Indian Irrigation Commission (1901–1903); C. W. McMinn, *Famine Truths, Half-Truths, Untruths* (1902); Theodore Morison, *Indian Industrial Organization* (1906); W. B Steveni, *Europe's Great Calamity* (1922); *Die Hungersnot in der Ukraine*, Veröffentlicht vom Zentral-komitee der Ukrainischen sozialdemokratischen Arbeiterpartee (Berlin, 1923); W H Mallory, *China · Land of Famine* (1926), A Daudé-Bancel, *La réforme agraire en Russie* (1926); H. H. Fisher, *The Famine in Soviet Russia* (1927); F. A. Golder, *On the Trail of the Russian Famine* (1927).

FAN, in its usually restricted sense denotes a light instrument held in the hand and used for raising a current of air to cool the face. Among the ancients the fan was also known as a winnower, as a bellows for fire and as a fly whisk. Modern usage also applies the word to an instrument for winnowing grain (winnowing fan) and to various appliances in systems of ventilation. (*See* FANS.)

In the more familiar sense the forms of the fan may be divided into two main groups—the screen fan and the folding fan. In gen-



(1, 2, 3, 4) FROM THE COLLECTION OF DE WITT CLINTON COHEN, NEW YORK (5) BY COURTESY OF THE METROPOLITAN MUSEUM OF ART, NEW YORK

FANS OF THE 18TH CENTURY

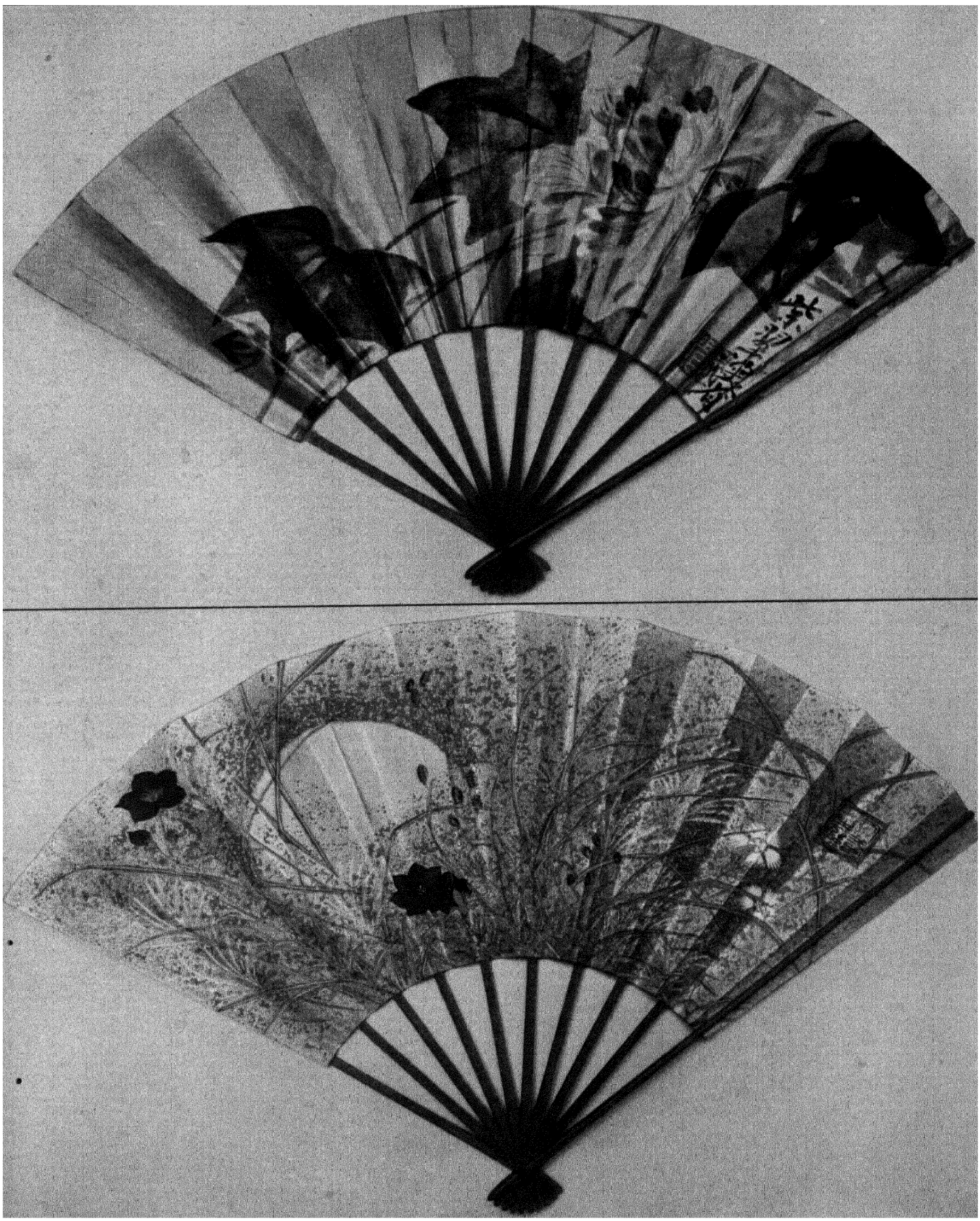
1 Cabriolet fan, with mounts of painted skin, sticks and guards of painted ivory. This type of folding fan was in vogue about the middle of the reign of Louis XV. It was named after the light two-wheeled carriage, popular in France at that time, which is often represented in the scenes painted or engraved on the mounts.

2 Mask fan, popular in Spain during the middle of the 18th century. The leaf is of painted skin and the guards and stick are carved and painted.

3 Fan of painted skin with ivory sticks and guards, used in France during the third quarter of the 18th century.

4 Vernis-Martin fan. This variety is one of the rarest and most sought after by collectors. The name is derived from the translucent varnish accidentally discovered by the brothers Martin, French coach painters, while they were attempting to imitate Japanese lacquer. The painting on the fan reproduced is attributed to Boucher.

5 Elaborate French fan of the 18th century. On the parchment leaf are painted the figures of Louis XVI, Marie Antoinette, the princess royal and the dauphin. This fan, a product of the period when the most extravagant and luxurious ornament was in vogue, has sticks and guards made of carved and gilded mother-of-pearl.



BY COURTESY OF THE IMPERIAL HOUSEHOLD MUSEUM OF TOKYO

JAPANESE FOLDING FANS

Top Fan painted by Obata Kenzan Illustrating a type of folding fan widely used in Japan, having ten sticks and a decorated mount of thick paper

Bottom Japanese folding fan, painted by Sakai Hoitsu Fans are often regarded in Japan as an emblem of life, widening and expanding as the sticks radiate from the rivet

eral the former consists of a handle to which is attached a rigid mount; except feather fans, which may be included in this class, the usual mount is made of straw, cane, silk, parchment, etc, and is square, circular, pear or leaf shaped. In some cases the mount is placed at one side, producing a flag-like form, such as the Venetian type of the 16th century, which was also known to the Copts of the early Christian era. The so-called cockade fan, which, as its name implies, has a circular pleated mount that may be folded flat, also belongs to this group. Types of the screen fan are to be found throughout the world in all periods, among both primitive and highly civilized peoples The folding fan, although the better-known form, has a more circumscribed history It is said to have been invented in Japan about A D. 670 It was introduced into China in the 10th century and thence into Europe in the late 15th or early 16th century, probably at the time when the Portuguese under Vasco da Gama established themselves as the supreme trading power in the East. The folding fan is composed of sticks and a mount. The sticks are a number of blades, the one at each end being a guard, they may be ivory, mother-of-pearl or various woods, pierced, carved and often ornamented with inlay and gilding; all are fastened at the handle-end by a pin or rivet. The mount (or leaf), is pleated and stretched over the blades at the top, it may be made of paper, parchment, silk, lace and "chicken-skin" (an especially prepared kid-skin) or other materials, and is usually decorated with painting. A variant of the folding fan, popular in France in the 18th century, is the cabriolet, which will be described later. The distinguishing feature of the *brisé* fan is that it has no mount but is composed of a number of blades fastened at the handle-end by a rivet and radiating toward the top where they are connected by a ribbon; the delicately carved ivory fans of China are exquisite examples of this type

China.—The fan of the Far East is the most ancient known to us and is a separate chapter in the history of the instrument. Some authorities testify that in China fans have been known since about 3000 B C The earliest form was of dyed pheasant or peacock feathers mounted on a handle Cockade fans and large ceremonial screens are also of ancient origin while the small hand-screens of various shapes, made of palm, bamboo and silk stretched on a frame, have been in use from ancient to modern times Ivory fans seem to have come into being shortly after the folding fan was introduced into China The Imperial ivory works within the palace at Pekin were founded in the 17th century and became the centre of the best productions. The delicacy of carving in ivory *brisé* fans can hardly be overestimated. Sometimes the decoration is made up of pierced, flat, open work, sometimes of elaborately carved figure or floral subjects with a background formed by ribbing of exquisite quality. Tortoise-shell was used in a similar way, also sandalwood and mother-of-pearl Filigree fans of silver or silver gilt frequently inlaid with enamel form another variation. A class of Chinese folding fan often seen is the mandarin fan with sticks of carved ivory and the leaf painted with innumerable minute figures with ivory heads and silk costumes applied Almost every city or district in China has its characteristic fan distinguishable by its colour and ornament and made to suit every class from mandarin to peasant

Japan.—In Japan also the use of the fan is very closely linked with the life and customs of the people. In Rhead's *History of the Fan* the author says that it is regarded as an emblem of life, widening and expanding as the sticks radiate from the rivet. It plays a part in almost every aspect of their existence: it is presented to the youth on the attainment of his majority; it is used by jugglers in feats of skill; the condemned man marches to the scaffold fan in hand. The earliest examples were made of palm leaves or feathers while the rigid screen fans were introduced from China in the 6th century A.D. Large screens were used for religious and civil ceremonial and as war standards. Most interesting of all the rigid fans is the Gumbai Uchuia, a type of battle fan of iron first known in the 11th century. It is, however, the folding fan, invented by the Japanese in the 7th century, that has played such an important role in their history and art. There are innumerable variations of its form each designed for a particular use and possessing individual characteristics The Akomé Ogi is the earliest form of court fan having come into use in the 7th century; it is composed of 38 blades fastened with a rivet, formed of a bird or butterfly, and ornamented at the corners with artificial flowers and 12 long streamers of coloured silks, it was the type used by court ladies until 1868 The Gun Sen is the folding battle fan with sticks of wrought iron and the mount of thick paper painted with the sun, moon or star in red or gold on a black or coloured ground; its initial purpose in battle was as a signal The Mai-Ogi or dancing fan dates from the 17th century; it has 10 sticks and a mount of thick paper usually decorated with a family crest. The Rikin-Ogi or tea fan, used in tea ceremonies celebrated in each province on the first day of every month, has only three sticks and the paper mount is simply decorated, the fan itself being used for handing around little cakes, fanning being prohibited during this dignified ceremony Many early fans were designed with the infinite artistry of the great painters of Japan but these are rarely seen to-day Those most often found in collections are the modern *brisé* of ivory or tortoise-shell decorated with lacquer and inlay and often made for exportation to Europe (*See* DRESS: *Eastern.*)

Ancient.—In the cultures of ancient Egypt, Assyria and India, the fan achieved considerable importance both as a civil and religious emblem Especially in Egypt fans played an important part in royal ceremony; the office of fan-bearer to the king was a highly prized honour; their fans, made of feathers arranged in a half-circle and mounted on long handles, may be seen in Egyptian wall paintings and reliefs. Two actual examples now in the museum at Cairo, were found in the tomb of Tut-ankh-amen (14th century B.C); the gold mounts with embossed and incised decorations were fitted with brown and white ostrich plumes and the handles were made in one case of gold and in the other of ebony overlaid with gold and lapis-lazuli In India both the fan and umbrella were held in reverence; the punkah or large screen fans are still hung in rooms and manipulated by servants detailed for the purpose In Greece peacock feather hand fans were known about 500 B C and may be seen in contemporary vase paintings while the rigid palm leaf shaped fan is frequently depicted in the terra-cotta figurines from Tanagra As for ancient Italy, an Etruscan cinerary urn in the Metropolitan Museum of Art shows the deceased in the customary reclining posture holding in her hand a feather fan; and in Rome tablet fans of precious woods or finely cut ivory were carried by the exquisites on the Via Sacra for their ladies, while another type was always part of the bridal outfit of a Roman woman.

Mediaeval.—In the Middle Ages the Christian Church perceived the usefulness of the fan in religious ceremonials The *flabellum*, as it was called, a disc sometimes of silver or silver gilt mounted on a long handle, was held by deacons and used to drive away flies and insects from the sacramental vessels. Accounts of the *flabellum* occur repeatedly in the old inventories of church and abbey property but except for two, whose use was probably secular, no fans of the period exist to-day. With the exception of the large leather fan carried in state processions for the pope, the fan is no longer used in the Western Church, but it still appears in the rites of the Eastern Church. The two famous specimens mentioned above, of the mediaeval period, are of the cockade type with mount of vellum and handle of carved bone One of these dating from the 11th century from the abbey church of Tournus is now in the National museum at Florence while the other, said to be the oldest existing Christian fan and identified with Theodolinda, queen of the Lombards, is now preserved as a sacred relic in the cathedral of Monza near Milan, where superstition has invested it with magic powers.

Modern European.—The vogue of the folding fan in Europe dates from its introduction through Portuguese trade connections with India and the Far East in the 16th century. Although it may have been known earlier, the impetus supplied by oriental importations produced a new era in its evolution. In popularity it soon supplanted the feather fan mounted on a carved ivory handle and the Venetian flag-like instrument. The type of folding fan found in late 16th century portraits is about a quarter circle in shape with sticks of ivory and a mount composed of alternate strips

of vellum and mica, or of vellum cut out in a geometrical pattern of circles and lozenges similar to the designs of reticello lace of the period Of this kind, called *découpé* from the perforated vellum mount, there is a beautiful example in the Cluny museum and one almost identical in a private collection in New York. It was at this time that the vogue for fans, already general in Italy and Spain, spread to France and England. Although not then confined to the use of ladies, special conventions were developed and gestures in handling them grew into code signals of amorous import.

In the 17th century Paris became the centre for the manufacture of fans. Louis XIV issued edicts at various times for the regulation of the industry and in 1678 the Fanmakers' Guild was formed. The revocation of the Edict of Nantes (1685) drove many fanmakers to England and Holland In consequence a fan trade was established in England where, after the formation of the Fanmakers' Company (1709), the importation of foreign fans, especially from India and China, was for a time prohibited During this period the shape of the fan gradually grew to a full semi-circle with sticks of ivory or mother-of-pearl pierced or carved. The mounts of paper, vellum, parchment and specially prepared kidskin were painted or engraved, often from designs of such artists as Lebrun, Romanelli, Abraham Bosse and Callot.

It was, however, in the 18th century that the most extravagant and luxurious ornament was expended upon the decoration of the fan. The delicately carved sticks of ivory and mother-of-pearl, sometimes the product of Chinese workmen in Europe, were further enriched with incrustations of gold, silver, enamel and jewels The mounts were made not only of skin but of silk, lace and paper perforated in imitation of lace, while the suave and gracious designs with which they were painted followed the fashion set by the chief artists and decorators of the day As it was an age of considerable decorative invention, it is not surprising that new forms of the folding fan should appear One of the rarest and most sought after by collectors is the so-called Vernis Martin. In form this type of fan is an ivory *brisé*, the blades of which are painted in thin oils and then varnished It is from the particular translucent varnish that the name is derived, for in attempting to imitate Japanese lacquer, the brothers Martin, coach painters by trade, accidentally developed a method suitable for this decoration Vernis Martin fans are smaller in size than the usual type of the period and because of their interest to collectors many imitations have been made. About the middle of the reign of Louis XV another type of folding fan, the *cabriolet*, became the vogue This was a reflection of the immense popularity achieved by a light two-wheeled carriage introduced to Paris by Josiah Child in 1755. For such fans, the mount instead of being one broad strip, was composed of two or sometimes three narrow strips with an intervening space between them. The strips were then painted or engraved with small scenes which usually included representations of people driving about in the fantastically popular carriage itself.

Toward the end of the reign of Louis XV. the fan industry suffered from a vogue for cheap printed fans. The sticks were thin and often undecorated, the printed paper mounts frequently depicted incidents and personages connected with contemporary political events Some of the most interesting of these fans commemorate the balloon ascensions of 1784 and 1785 and the meeting of the Estates General in 1789. Other more pretentious fans of the period were much ornamented with spangles and tinsel, often with cheap effect In England at this time there developed a particular type of ivory *brisé* fan—the ivory pierced and decorated with medallions painted in miniature in the style of Cosway or Angelica Kaufman.

During the period of the First Empire fans retrieved very little of their past elegance. They were small, delicate instruments often with mounts of spangled gauze and sticks of pierced ivory. The lorgnette fan, a variant of the cockade form, was made of pierced horn or ivory and had a little glass inserted at the rivet. As the century advanced the romantic and antiquarian tastes of the Victorian era were reflected in the style and decoration of fans. There was much lifeless imitation of the Louis XV. types, and there were many large fans with mounts of lace or, frequently, paper with coloured lithographic prints of romantic scenes. The sticks of mother-of-pearl were pierced and gilded and, except in rare cases, were coarse in both design and execution. The invention of Alphonse Baude in 1859 for carving sticks by machinery reveals the lack of taste and discriminating quality of the time, for no mechanical contrivance can duplicate the verve of hand-carving Somewhat later, however, certain fan-makers attempted to revive the old distinction of design and workmanship. Exhibitions were held in Paris and at South Kensington (1870) and painters of repute made designs for fan mounts, among whom may be cited Gavarni, Diaz, Couture, Solde, Jacquemart and Charles Condor (1868–1900) (*q v*)

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FANCY, display, showing forth, as a philosophical term, the representative power of the mind. "Fancy" is a shortened form of the older "phantasy" and dates from the 15th century (Derivation is through the O Fr. *fantasie*, mod. *fantaisie*, from the Latinized form of the Greek *φαντασία*, *φαντάζειν*, *φαίνειν*, to show). The older form "fantasy," which is now chiefly used poetically, was in its early application synonymous with imagination, the mental ability to form representations or images of things not present to the senses; it is more usually, in this sense, applied to the lighter forms of the imagination. "Fancy" also commonly means inclination, whim, caprice The more learned form, "phantasy," as also such words as "phantom" and "phantasm," are chiefly confined to visionary imaginings.

FANFARE, in music, a short phrase or passage of a bold and rousing character played unaccompanied by a brass instrument or instruments, usually the trumpet, more especially on festive or ceremonial occasions

FANG, an African tribe occupying the Gabun district north of the Ogowé river in French Congo The name means "men" They call themselves *Pa^{n}we*, *Fa^{n}we* and *Fa^{n}* with highly nasalized *n*. They are a finely-made race of chocolate colour; some few are very dark, but these are of slave origin They have bright expressive oval faces with prominent cheek-bones. Many of them file their teeth to points. Their hair, which is woolly, is worn by the women long, reaching below the nape of the neck The men wear it in a variety of shapes, often building it up over a wooden base The growth of the hair appears abundant, but that on the face is usually removed Little clothing is worn; the men wear a bark waist-cloth, the women a plantain girdle, sometimes with a bustle of dried grass. A chief wears a leopard's skin around the shoulders Both sexes tattoo and paint the body, and delight in ornaments of every kind. The men fight and hunt, carry muskets, spears for throwing and stabbing and throwing-knives with blades broader than they are long. They use crossbows made of ebony to hunt apes and birds. In battle the Fang used elephant hide shields; now apparently discarded.

In 1815 the Fang were an inland people inhabiting the hilly plateaus north of the Ogowé affluents, now south of the Gabun they have reached the sea at several points. Their language is of the Bantu family. The Fang were noted cannibals. Among certain tribes the aged alone were permitted to eat human flesh, which was tabu for all others. The Fang are skilful workers in iron and have a curious coinage called *bikĕi*, little iron imitation axeheads tied up in bundles called *ntet*, ten to a bundle; these are used chiefly in the purchase of wives. They are energetic traders and are skilled in pottery and in gardening. Their religion appears to be a combination of primitive animism and ancestor worship, with a belief in sympathetic magic.

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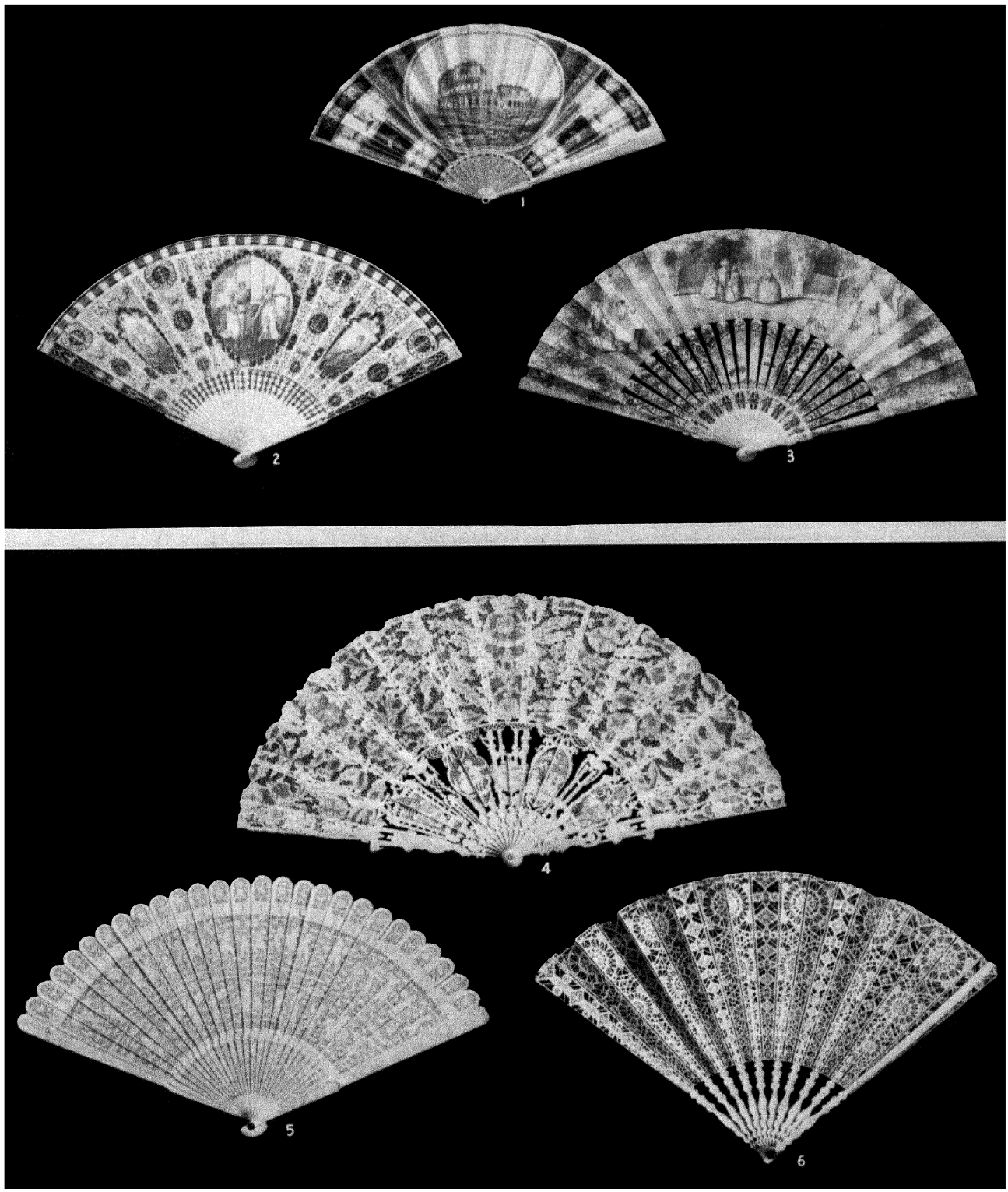

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FANS OF THE SIXTEENTH, EIGHTEENTH AND NINETEENTH CENTURIES

1 Italian fan, early 19th century Leaf of skin painted in *gouache* with view of the Colosseum, sticks and guards of pierced mother-of-pearl 2 Ivory brise fan with painted medallion in style of Cosway English, late 18th century 3 Fan with mount of painted skin, sticks and guards of carved and painted ivory English, middle of the 18th century 4 French fan, mount of Argentan lace, sticks and guards of carved ivory Third quarter of the 18th century 5 Carved ivory brisé fan Chinese, 18th century 6 Late 16th century Italian fan with mount of parchment cut out in a geometric design The sticks are of ivory

FAN

JAPANESE AND INDIAN FANS OF THE NINETEENTH CENTURY

1. Japanese fan with a paper mount painted by Hokusai The sticks and guards are of wood
2 Japanese brise fan of ivory sticks decorated on both sides with lacquer
3 Indian brise fan of lacquered ivory sticks

FANO, a coast town and episcopal see of the Marches, Italy (anc. *Fanum Fortunae, q.v.*) province of Pesaro and Urbino, 8 m. S E of Pesaro by rail, and 46 ft above sea-level Pop. town, 11,689, commune 28,538. S Croce and S. Maria Nuova contain pictures by Giovanni Santi, the father of Raphael. S. Agostino contains a painting of the Angelo Custode ("the Guardian Angel") by Guercino which is the subject of a poem by Robert Browning The fine Gothic Palazzo della Ragione (1299) has been converted into a theatre The palace of the Malatesta has fine porticos and Gothic windows, and there is also an imposing citadel built by them. S Michele, built against the arch of Augustus, is an early Renaissance building (1475–1490), probably by Matteo Nuzio of Fano, with an ornate portal

Mediaeval Fano had a chequered story and in the 14th century became subject to the Malatesta In 1463 Pius II added it to the states of the Church Julius II established here in 1514 the first printing press with movable Arabic type The harbour was restored by Paul V , Fano is a favourite sea bathing resort

FANS are devices for setting air or gases in motion Mechanical contrivances for this purpose are a necessity in a great number of manufacturing processes For ventilating, warming or cooling buildings, ships and mines, air must also be propelled in large volumes In cases where a blower or blowing engine (*q v*) is not required to give pressures above the range of a fan, the latter is employed, reaching in capacity from the tiny table fans to the huge mine fans requiring over one thousand horse-power to drive. The hand fans and the punkahs do not actually bring fresh volumes of air but only keep in motion the air in the neighbourhood A rotary fan transfers air or gases completely from one location to another It may be a blowing fan or an exhausting one, according to the purpose desired, and it may move solid matter along with the air, as dust, wood and other shavings, and powders and woolly substances

Fans are divisible into two classes, the *screw* or *propeller* type and the *centrifugal* or *impeller* type The former acts on the principle of the inclined plane, the latter by centrifugal force created in the air which revolves with the impeller wheel. Propeller fans will move large volumes of air, but they are mostly used with "free air," that is, little or no resistance must be caused by piping, flues, etc , or the efficiency of the fan rapidly drops

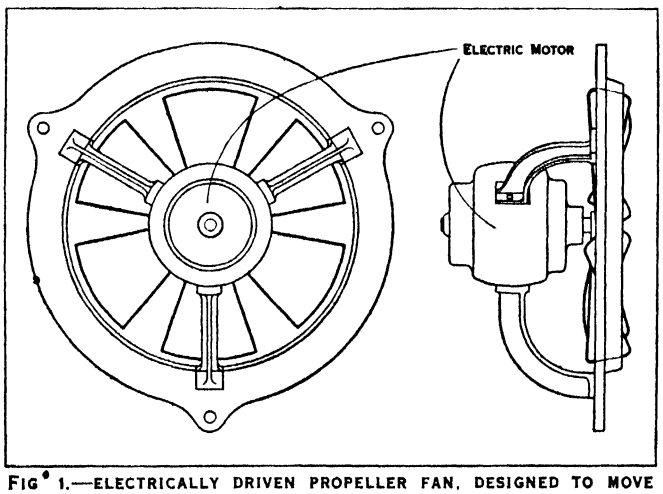

FIG 1.—ELECTRICALLY DRIVEN PROPELLER FAN, DESIGNED TO MOVE LARGE VOLUMES OF AIR AGAINST LITTLE RESISTANCE WHERE PIPING PREVENTS FREE FLOW THE CENTRIFUGAL FAN MUST BE USED

Hence it is often called a *volume fan* The simplest design is that of the ceiling fan, depending from a vertical hanger, carrying at the bottom end the electric motor and the fan blades, two, three or four in number. The motor may be pivoted so as to vary the direction of the flow of air. Desk or bracket fans are on a pillar, and the blades are protected with a wire guard; automatic oscillation is often included to increase the area of influence. Types for affixing to a wall or window or partition or for placing in a duct comprise a frame with lugs for the attaching screws, and bearings for the spindle, which is belt driven or by direct motor, fig. 1. Protection against weather is frequently given by means of a hood, and against back draught when the fan is stopped by an automatic shutter; this has two light doors which close by gravity but fly open easily when the fan commences to run The quantity of air moved in a given time depends on the speed, but the following table affords an idea of output with Sturtevant fans —

Diameter of fan in inches	Revolutions per minute	Cubic ft of air per minute, with "free" inlet and outlet
12	1,300	1,300
15	1,000	2,000
18	850	3,000
24	630	6,000
36	425	12,000
48	320	19,000
60	255	30,000

The blades in fig 1 are of *open* sort, while another kind, the *box* blade, has the tips encircled by a binding ring, affording greater rigidity, and permitting of higher speeds Very large propeller fans are built up to about 10 ft diameter, one of this size giving 246,000 cubic ft at 250 revolutions per minute, and consuming 42 h p The small pressures produced by fans are measured against a column of water in a *water-gauge,* and stated in inches and parts of the inch

The centrifugal fan takes in air at the *eye* or side opening of the casing, and the numerous blades of the impeller seize it and throw it off tangentially from their tips The casing is built of such shape that its opening provides the tangential discharge, fig 2, which may be arranged horizontally, or upwards, downwards or at an angle Steel plate is employed to make the casing, but in the large-mine fans there is a good deal of masonry enclosure Shapes of blades differ considerably, in some fans they are relatively few in number and of large area, in others numerous and narrow The Sirocco fan made by Davidson & Co Ltd of Belfast in the eastern hemisphere and by the American Fan Blower Corporation in the western hemisphere led a practice in the latter direction, the wheel possessing a lot of narrow, long blades (fig 3) with their outer edges curved forward in the direction of rotation. The eye or intake is of equal diameter to the wheel When the fan runs, centrifugal force is created upon the body of air within the wheel This causes a partial vacuum in the central space between the blades, to be immediately filled by air entering the inlet. As the air moves outwards over the blades its speed increases The greater the wheel speed the higher the velocity Double-inlet fans comprise two wheels on the same shaft, each drawing from the side, large duty can be obtained in this way in limited space. Many large fans are driven at each end of the shaft, the steam engine being in duplicate for this The surface fans of mines are capable of being used either to exhaust air from the mine, or to blow fresh air down This is done by means of an arrangement of doors and dampers in the fan Fig 4 illustrates the arrangement as applied to a steam-driven outfit by The Waddle Patent Fan and Engineering Co Ltd , Llanelly (Wales) The door A closes the by-pass drift when the fan is exhausting. When it is required to blow fresh air down the upcast pit, A is swung on its hinges, thus shutting off the main drift from the fan inlet Then door B is lifted to admit fresh air to the fan, and flap-doors C dropped shut, the fresh air being consequently dis-

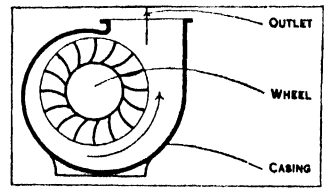

FIG. 2 —THE CENTRIFUGAL FAN
This type is able to work against resistances which would render the propeller fan ineffective

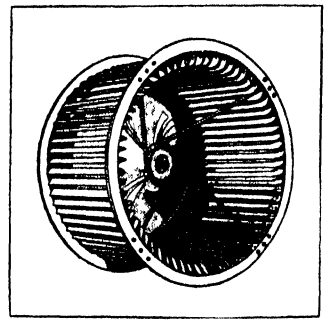

FIG 3 —THE WHEEL OF SIROCCO CENTRIFUGAL FAN
The blades are numerous and narrow, and the centrifugal effect created within the wheel is very marked

charged along the by-pass drift (uncovered by door A) and along the main drift to the upcast shaft The ordinary air-lock doors for getting into the fan drift are at D, and serve as an additional inlet for fresh air

For supplying the blast to cupolas, forge fires, furnaces and other services requiring high pressures a narrow kind of fan is utilized, having the blast wheel enclosed in a cast-iron casing

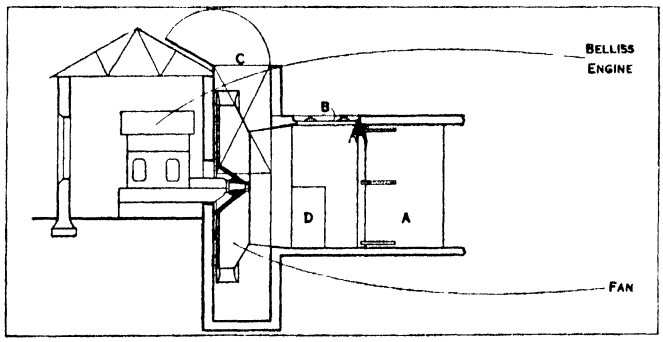

FIG 4 —DIAGRAM OF THE WADDLE MINE FAN INSTALLATION SHOWING ARRANGEMENT OF DOORS BY WHICH THE FAN CAN BE USED EITHER FOR EXHAUSTING, OR FOR BLOWING FRESH AIR DOWN THE PIT

Another special construction is the dust fan wheel, which is built very strongly to withstand the impact of materials sucked in (such as chips and small pieces of wood from the machines) and the flow of air is such that the blades do not become choked with the material

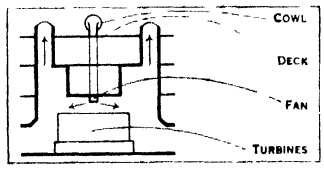

FIG 5 —VENTILATION OF A SHIP S ENGINE ROOM
Fans in duplicate suck fresh air down through cowls, and, heated air rises through the shafts

Applications of Fans.—Air supply for ventilating purposes is necessary in cases where natural ventilation does not suffice, not only for people but for the ventilation of various kinds of rooms carrying on processes, or cargo holds, engine-rooms, fig 5, as well as individual machines, notably electric generators (*see* COOLING SYSTEMS) A big liner will have more than one hundred fans on board For warming the air in heating systems steam or direct-fired heaters are installed, the former utilizing live or exhaust steam, the latter wood, coal, coke or oil fuel. Air-washers are also used in conjunction with fans when it is essential to avoid the carrying in of dirt into a building or amongst machines, or goods in process of manufacture; sprays of water break up the air and cause the dust and grit to fall by gravity into a tank The cooling of the air is obviously beneficial, for certain purposes Warm air for drying purposes is applied either in rooms, cabinets or tunnels in which the goods to be dried are placed. Substances include various foodstuffs, as bacon, tea, fruit, vegetables, grain, milk, sweetmeats and so on, also glass, starch, rubber, leather, paint, various paper goods, chemicals, and some things in course of manufacture, as tins and boxes

Timber seasoning is effected by a fan sending warm air through the kilns; a certain degree of humidity has to be maintained, either by mixing steam with the air, or re-circulating part of the air which has already extracted moisture from the timber. Recording instruments have to be installed to take readings of temperature and humidity, so that control may be exercised

In addition to the supply of air to forges, cupolas and furnaces, fans are also employed to create draught for steam-boiler furnaces, giving increased steaming power, and economy of fuel Low-grade fuels can be burned satisfactorily, because of the extra volume of air forced through the fire, and there is incidentally reduction of smoke, while chimney height may be considerably less than for natural draught Another type of pressure application is that of pneumatic elevating and conveying, transporting through tubing such light materials as sawdust, wool, bark, chaff, cotton, cork, etc , and carriers for messages, coins, etc.

Great value is obtained from fans in industries which create dust, grit, cuttings, fibres, steam and fumes, the extraction and complete removal of these being effected through ducts Many reasons may be mentioned why this is necessary, some having to do with the workers' health, others non-interference with the machines or processes by the waste products, and in many cases safety from fire or explosion The general principle is that of placing a hood about the spot where the products come off, the fan suction whisking them away instantaneously. But for this some machines would be unworkable, some wood-working machines would bury themselves in their cuttings in a few minutes, brushing away being impracticable as well as dangerous A big sheet-metal casing termed cyclone separator receives the refuse and in its conical body a whirling motion causes the refuse to fall to the bottom and thence to boilers to act as fuel Refuse which reaches the floor of a factory is brushed along to a *sweep-up,* fig 6 (Sturtevant), which sucks everything away similarly to the hoods on the machines Industries requiring dust removal plants include principally wood-working, metal-grinding, polishing, cleaning by tumbling barrel, sand-blasting, leather and textile processes, brush factories, paint works, paper mills, potteries, linoleum works, granaries, cement works, collieries and quarries Prevention of atmospheric pollution is another field for the fan collection system, dust particles which are carried up the chimney in power plants, especially when cheap and small fuels are burned The dust nuisance has often compelled power stations to buy more expensive fuel on this account An extreme case is quoted at a Scotch colliery, where coal-dust and slack is fed to the boilers, being a fine and dirty mixture When a Davidson collector was installed no less than 450 lb of dust per hour were trapped, from two boilers, using 5,500 lb of fuel per hour (F H)

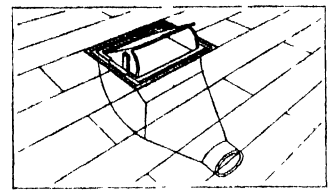

FIG 6 —STURTEVANT "SWEEP-UP" Set in the floor of a factory and connected to a fan, this device sucks away shavings, sawdust and bits of wood brushed to the opening

FANSHAWE, SIR RICHARD, BART , cr 1650 (1608–1666), English poet and ambassador, translator of Camoens, son of Sir Henry Fanshawe, remembrancer of the exchequer, of Ware park, Hertfordshire, and of Elizabeth, daughter of Thomas Smith or Smythe, was educated in Cripplegate by the famous schoolmaster, Thomas Farnaby, and at Jesus college, Cambridge In 1635 he was appointed secretary to the English embassy at Madrid under Lord Aston At the outbreak of the Civil War he joined the king He was appointed secretary for war to the prince of Wales, with whom he set out in 1645 for the western counties, Scilly, and afterwards Jersey He compounded in 1646 with the parliamentary authorities, and was allowed to live in London till Oct 1647 In 1647 he published his translation of the *Pastor Fido* of Guarini (*q.v*) which he reissued in 1648 with the addition of several other poems, original and translated In 1648 he was appointed treasurer to the navy under Prince Rupert In November of that year he was in Ireland, where he actively engaged in the Royalist cause till the spring of 1650, when he was despatched by Charles II. on a mission to obtain help from Spain This was refused, and he joined Charles in Scotland as secretary He was taken prisoner at the battle of Worcester After a brief confinement he was allowed to choose his own place of residence His works include. *Selected Parts of Horace* (1652), *Querer por solo querer To Love only for Love's Sake* (pr 1670) and *Fiestas de Aranjuez* (pr. 1671) from the Spanish of Antonio de Mendoza But the great labour of his retirement was the translation (1655) of the *Lusiad,* by Camoens It is in ottava rima, with the translation prefixed to it of the Latin poem *Furor Petroniensis.* In 1658 he published a Latin version of the *Faithful Shepherdess* of Fletcher.

In April 1659 Fanshawe re-entered Charles's service in Paris. After the Restoration he was engaged in diplomatic missions in Spain and Portugal He died at Madrid, on June 26, 1666 He had a family of 14 children, of whom five only survived him, Richard, the youngest, succeeding as second baronet and dying unmarried in 1694.

Fanshawe's translations of *Pastor Fido* and his *Lusiad* have

not been superseded by later scholars, and his own poems are of real merit

BIBLIOGRAPHY.—*Memoirs of Lady Fanshawe* (née Anne Harrison), written in 1676 and published in 1829 (from an inaccurate transcript), these were reprinted from the original manuscript and edited by H. C. Fanshawe (1907), article in the *Dict. of Nat. Biography* and authorities there quoted; J. W. Mackail, "Sir Richard Fanshawe" in *Trans. Roy. Soc.* vol. 28. *Add. mss. British Museum*, 15,228 (poems), *Harl. mss. Brit. Mus.* 7,010 (letters).

FANTAN, a form of gambling highly popular among the Chinese and extensively played in the United States. It is a very simple game. A square is marked in the centre of an ordinary table, or a square piece of metal is laid on it, the sides being marked 1, 2, 3 and 4. The banker puts on the table a double handful of small coins—in China "cash"—or similar articles, which he covers with a metal bowl. The players bet on the numbers, setting their stakes on the side of the square which bears the number selected. When all have staked, the bowl is removed, and the banker or croupier with a small stick removes coins from the heap, four at a time, till the final batch is reached. If it contains four coins, the backer of No. 4 wins; if three, the backer of No. 3 wins, and so on. Twenty-five per cent. is deducted from the stake by the banker, and the winner receives five times the amount of his stake thus reduced. In Macao, the Monte Carlo of China, play goes on day and night, every day of the week, and bets can be made from 5 cents to 500 dollars, which are the limits.

Fantan is also the name of a card game, played with an ordinary pack, by any number of players up to eight. The deal decided, the cards are dealt singly, any that are left over forming a stock, and being placed face downwards on the table. Each player contributes a fixed stake or "ante." The first player can enter if he has an ace, if not he pays an "ante" and takes a card from the stock; the second player is then called upon and acts similarly till an ace is played. This (and the other aces when played) is put face upwards on the table, and the piles are built up from the ace to the king. The pool goes to the player who first gets rid of all his cards. If a player fails to play, having a playable card, he is fined the amount of the ante for every card in the other players' hands.

FANTASIA, a name in music for a composition possessing little structural form, and having the general style of an improvisation, also for a combination or medley of familiar airs connected together with original passages of more or less brilliance. The word, however, was originally applied to more formal compositions, based on the madrigal, for several instruments. Fantasias appear as compositions of a distinctive type in Bach's works, in the case of which they frequently serve as preludes to fugues, *e.g.*, the "Chromatic Fantasia and Fugue." Brahms used the term for some of his shorter piano pieces, and it has also been applied on occasion to much larger and more elaborately organized works, alike for the piano and for the orchestra, such as Schubert's "Wanderer" fantasia, Schumann's Op. 17 and Tchaikovski's symphonic fantasia *Francesca da Rimini*.

The Italian word is still used in Tunis, Algeria and Morocco with the meaning of "showing off" for an acrobatic exhibition of horsemanship by the Arabs.

FANTI, MANFREDO (1806–1865), Italian general, was born at Carpi on Feb. 24, 1806, and educated at the military college of Modena. In 1831 he was implicated in the revolutionary movement organized by Ciro Menotti (*see* FRANCIS IV., of Modena), and was condemned to death and hanged in effigy, but escaped to France, where he was given an appointment in the French corps of engineers. In 1833 he took part in Mazzini's abortive attempt to invade Savoy, and in 1835 he went to Spain to serve in Queen Christina's army against the Carlists. There he remained for thirteen years, rising to a high staff appointment. But on the outbreak of the war between Piedmont and Austria in 1848 he hurried back to Italy, and although at first his services were rejected both by the Piedmontese government and the Lombard provisional government, he was afterwards given the command of a Lombard brigade. In the general confusion following on Charles Albert's defeat on the Mincio and his retreat to Milan, where the people rose against the unhappy king, Fanti's courage and tact saved the situation. He was elected member of the Piedmontese chamber in 1849, and on the renewal of the campaign he again commanded a Lombard brigade under General Ramorino. After the Piedmontese defeat at Novara (March 23) peace was made, but a rising broke out at Genoa, and Fanti with great difficulty restrained his Lombards from taking part in it. But he was suspected as a Mazzinian and a soldier of fortune by the higher Piedmontese officers. He was court-martialled, and, though acquitted, he was not employed again until the Crimean expedition of 1855. In the second Austrian war in 1859 Fanti commanded the second division, and contributed to the victories of Palestro, Magenta and San Martino. After the peace of Villafranca he converted the army of the Central Italian League (composed of the provisional governments of Tuscany, Modena, Parma and Romagna), into a well-drilled body of 45,000 men. He steered a clear course between the exaggerated prudence of Baron Ricasoli, who wished to recall the troops from the frontier, and the impetuosity of Garibaldi, his second-in-command, who was anxious to invade Romagna prematurely, even at the risk of Austrian intervention. Fanti's firmness led to Garibaldi's resignation. In Jan. 1860 Fanti became minister of war and marine under Cavour, and incorporated the League's army in that of Piedmont. In the meanwhile Garibaldi had invaded Sicily with his Thousand, and the king of Sardinia, Victor Emmanuel, decided at last that he too must intervene, Fanti was given the chief command of a strong Italian force which invaded the papal states, seized Ancona and other fortresses, and defeated the papal army at Castelfidardo, where the enemy's commander, General Lamoricière, was captured. In three weeks Fanti had conquered the Marche and Umbria and taken 28,000 prisoners. When the army entered Neapolitan territory the king took the chief command, with Fanti as chief of the staff. After defeating a large Neapolitan force at Mola and organizing the siege operations round Gaeta, Fanti returned to the war office at Turin to carry out important army reforms. His attitude in opposing the admission of Garibaldi's 7,000 officers into the regular army with their own grades made him unpopular, and led to a severe reprimand from Cavour. In 1861 he resigned office and took command of the VII. army corps. He died in Florence on April 5, 1865. His loss was greatly felt in the war of 1866.

See A. Di Giorgio, *Il Generale M. Fanti* (Florence, 1906).

(L. V.; X.)

FANTI, a Gold Coast people living on the Cape Coast—Elmina-Secondi littoral and hinterland, and speaking a language closely related to Ashanti (*q.v.*). They have an organization similar to that of the Ashanti, and though less warlike in temperament, probably derive from the same stock.

See Sarbah, *Fanti Customary Law* (1904).

FANTIN-LATOUR, IGNACE HENRI JEAN THÉODORE (1836–1904), French artist, was born at Grenoble on Jan. 14, 1836. He studied first with his father, a pastel painter, and then at the drawing school of Lecoq de Boisbaudran. He was the friend of Ingres, Delacroix, Corot, Courbet and others. He exhibited in the Salon of 1861 and many of his more important canvases appeared on its walls in later years, though 1863 found him with Harpignies, Manet, Legros and Whistler in the Salon des Refusés. Whistler introduced him to English artistic circles in London. He died on Aug. 28, 1904. His portrait groups, arranged somewhat after the manner of the Dutch masters, are as interesting from their subjects as they are from the artistic point of view. *"Hommage à Delacroix"* showed portraits of Whistler and Legros, Baudelaire, Champfleury and himself; *"Un Atelier à Batignolles"* gave portraits of Monet, Manet, Zola and Renoir, and is now in the Luxembourg; *"Un Coin de table"* presented Verlaine, Rimbaud, Camille Peladan and others; and *"Autour du Piano"* contained portraits of Chabrier, D'Indy and other musicians. His paintings of flowers are perfect examples of the art. In his later years he devoted much attention to lithography. After *"L'Anniversaire"* in honour of Berlioz in the Salon of 1876, he regularly exhibited lithographs, some of which were examples of delicate portraiture, others being elusive and imaginative drawings illustrative of the music of Wagner (whose cause he cham-

pioned in Paris as early as 1864), Berlioz, Brahms and other composers He illustrated Adolphe Jullien's *Wagner* (1886) and *Berlioz* (1888) There are excellent collections of his lithographic work at Dresden, the British Museum and the Louvre

See Germain Hédiard, *Les Maitres de la lithographie* (1892–99), Loys Delteil, *L'Oeuvre lithographique de Fantin-Latour* (1907), A Jullien, *Fantin-Latour, sa vie et ses amitiés* (1909)

FANUM FORTUNAE (mod *Fano*), an ancient town of Umbria, Italy, at the point where the Via Flaminia reaches the north-east coast of Italy As its name (the temple of Fortune) shows it was of Roman origin It is first mentioned, with Pisaurum and Ancona, as held by Julius Caesar in 49 B C Augustus planted a colony there, and round it constructed a wall (of which some remains exist), as is recorded in the inscription on the triple arch erected in his honour at the entrance to the town (A D 9–10), which is still standing Vitruvius tells us that there was, during Augustus's lifetime, a temple in his honour and a temple of Jupiter, and describes a basilica of which he himself was the architect The arch of Augustus bears a subsequent inscription in honour of Constantine, added after his death A colonnade was built above the arch but was removed in 1463 (shown in a relief on the façade of the church of S Michele)

FAN VAULT, in architecture, a type of English late Gothic vaulting, in which many equidistant non-structural, decorative ribs of similar curvature rise from each support in a generally conoidal form These conoids either intersect at the ridges or leave small, flat areas between the circles which are their top and outside circumferences The entire surfaces thus formed are usually covered with a network of tracery The earliest example is in the cloisters of Gloucester cathedral (1351–1412) Other notable examples are that at King's college chapel, Cambridge (*c* 1512), and that of the chapel of Henry VII, Westminster Abbey, of about the same date, notable for the fact that the conoids are supported on pendants from great cross arches and not directly on the piers (*See* VAULT, GOTHIC ARCHITECTURE)

FĀRĀBĪ or **ALFARABI** (Abū Nasr Muhammad ibn Tarkhān ul-Fārābī) (*c* 870–950), Arabian philosopher, was born of Turkish stock at Fārāb, Turkistan At Baghdad, he learned Arabic and studied mathematics, medicine and philosophy Later he went to the court of the Hamdānid Saif addaula, where he lived a quiet life He died in Damascus

Alfarabi's philosophy, which greatly influenced Avicenna and Averroes, is coloured by Neoplatonism God, the unmoved mover possessing necessary existence and absolute perfection, produces the world by the intermediary of the active intellect As far as man is concerned this active intellect is the final form and the only immortal part Alfarabi's epistemology is a naive realism By his commentaries and interpretations especially on the *Organon, Nich Eths* and the *Physics,* Alfarabi introduced Aristotle to the Arabs His *De Scientus* and *De Intellectu* appeared in *Alpharabu Opera Omnia* (Paris, 1638) Dieterici has published *Alfarabi's philosophische Abhandlungen* (Leyden, 1890, Ger trans 1892), *Alfarabi's Abhandlung des Musterstaats* (1895, Ger trans 1900) and *Die Statsleitung von Alfarabi* in German (1904) C Baumker has edited *De ortu scientiarum* (1919), and M Horten has translated and explained *The Book of Gems* with the commentary of Ismâ' îl (1906)

See Steinschneider's article in *Mémoires de l'Académie* (St. Petersburg [Leningrad], 1869), Brockelmann, *Gesch der arab Literatur,* vol 1 (Weimar, 1898), Duhem, *Le Système du Monde,* t 4 (1916)

FARAD. A unit of electric capacity The capacity of a conductor or condenser is one farad when a quantity of electricity, equal to one coulomb increases its potential by one volt. (*See* ELECTRICITY and CONDENSER)

FARADAY, MICHAEL (1791–1867), English chemist and physicist, was born at Newington, Surrey, on Sept 22, 1791 His parents had migrated from Yorkshire to London, where his father worked as a blacksmith Faraday himself was apprenticed to a bookbinder He continued to work as a journeyman bookbinder till March 1813, when he was appointed assistant in the laboratory of the Royal Institution of Great Britain on the recommendation of Sir Humphry Davy, whom he accompanied on a tour through France, Italy and Switzerland from Oct 1813 to April 1815 He was appointed director of the laboratory in 1825, and in 1833 he was appointed Fullerian professor of chemistry in the institution for life, without the obligation to deliver lectures He died at Hampton Court on Aug 25, 1867

The parents of Faraday belonged to the very small and isolated Christian sect which is commonly called after Robert Sandeman Faraday himself attended the meetings from childhood, and at the age of 30 he made public profession of his faith

Faraday's earliest chemical work was in the paths opened by Davy, to whom he acted as assistant He made a special study of chlorine, and discovered two new chlorides of carbon He also made the first rough experiments on the diffusion of gases, a phenomenon first pointed out by John Dalton (*q v*) He succeeded in liquefying several gases, he investigated the alloys of steel, and produced several new kinds of optical glass A specimen of one of these heavy glasses afterwards became historically important as the substance in which Faraday detected the rotation of the plane of polarization of light when the glass was placed in a magnetic field, and also as the substance which was first repelled by the poles of the magnet He also improved laboratory methods *See* his work on *Chemical Manipulation,* and the articles LIQUEFACTION OF GASES

FIRST PERIOD OF ELECTRICAL DISCOVERIES

But Faraday's chemical work was soon overshadowed by his electrical discoveries The first experiment which he has recorded was the construction of a voltaic pile with seven halfpence, seven disks of sheet zinc, and six pieces of paper moistened with salt water With this pile he decomposed magnesium sulphate (first letter to Abbott, July 12, 1812) His first notable discovery was the production of the continuous rotation of magnets and of wires conducting the electric current round each other The consequences deducible from the great discovery of H C Oersted (July 21 1820) were still imperfectly understood In the summer of 1821 Faraday wrote for the *Annals of Philosophy* an historical sketch of electro-magnetism, and he repeated the experiments he described This led him in the beginning of September to discover the method of producing the continuous rotation of the wire round the magnet, and of the magnet round the wire He did not succeed in making the wire or the magnet revolve on its own axis

Although the fact of the tangential force between an electric current and a magnetic pole was clearly stated by Oersted, and clearly apprehended by Ampère, Wollaston and others, the realization of the continuous rotation of the wire and the magnet round each other was a scientific puzzle requiring no mean ingenuity for its original solution For on the one hand the electric current always forms a closed circuit, and on the other the two poles of the magnet have equal but opposite properties, and are inseparably connected, so that whatever tendency there is for one pole to circulate round the current in one direction is opposed by the equal tendency of the other pole to go round the other way, and thus the one pole can neither drag the other round and round the wire nor leave it behind Faraday solved the problem by causing the current, in some part of its course, to run in parallel in two channels, one on each side of the magnet, in such a way that during the revolution of the magnet the current is transferred from the channel in front of the magnet to the channel behind it, so that the middle of the magnet can pass across the current without stopping it, just as Cyrus caused his army to pass dryshod over the Gyndes by diverting the river into a channel cut for it in his rear

Faraday's crowning discovery was the induction of electric currents In Dec 1824 he had attempted to obtain an electric current by means of a magnet, and on three occasions he had attempted to produce a current in one wire by means of a current in another wire or by a magnet On Aug 29, 1831, he obtained the first evidence that an electric current can induce another in a different circuit. In nine more days of experimenting he had arrived at the results described in his first series of "Experimental Researches" read to the Royal Society on Nov 24, 1841

During his first period of discovery, besides the induction of electric currents, Faraday established the identity of electrifi-

cation produced in different ways, the law of the definite electrolytic action of a current; and the fact, upon which he laid great stress, that every unit of positive electrification is related in a definite manner to a unit of negative electrification, so that it is impossible to produce what Faraday called "an absolute charge of electricity" of one kind not related to an equal charge of the opposite kind He also discovered the difference of the capacities of different substances for taking part in electric induction Henry Cavendish had before 1773 discovered that glass, wax, rosin and shellac have higher specific inductive capacities than air, and had actually determined the numerical ratios of these capacities, but this was unknown both to Faraday and to all other electricians of his time, since Cavendish's *Electrical Researches* remained unpublished till 1879

SECOND PERIOD OF ELECTRICAL DISCOVERIES

The first period of Faraday's electrical discoveries lasted ten years In 1841 he found that he required rest, and it was not till 1845 that he entered on his second great period of research, in which he discovered the effect of magnetism on polarized light, and the phenomena of diamagnetism

Faraday had for a long time kept in view the possibility of using a ray of polarized light as a means of investigating the condition of transparent bodies when acted on by electric and magnetic forces He began to work on this problem in 1822, and returned to it repeatedly during the next 13 years The first evidence which he obtained of the rotation of the plane of polarization of light under the action of magnetism was in 1845, the transparent substance being his own heavy glass He began to work on Aug 30, 1845, on polarized light passing through electrolytes After three days he worked with common electricity, trying glass, heavy optical glass, quartz, Iceland spar, all without effect, as on former trials On Sept 13 he worked with lines of magnetic force Air, flint, glass, rock-crystal, calcareous spar were examined, but without effect

Heavy glass was experimented with It gave no effects when the *same magnetic poles* or the *contrary poles* were on opposite sides (as respects the course of the polarized ray), nor when the same poles were on the same side either with the constant or intermitting current But when contrary magnetic poles were on the same side there was an effect produced on the polarized ray, and thus magnetic force and light were proved to have relations to each other This fact will most likely prove exceedingly fertile, and of great value in the investigation of the conditions of natural force

On Nov 6 he sent in to the Royal Society the 19th series of his "Experimental Researches," in which the whole conditions of the phenomena are fully specified The negative rotation in ferromagnetic media is the only fact of importance which remained to be discovered afterwards (by M E Verdet in 1856)

But his work for the year was not yet over On Nov. 3 a new horseshoe magnet came home, and Faraday immediately began to experiment on the action in the polarized ray through gases, but with no effect The following day he repeated an experiment which had given no result on Oct 6 A bar of heavy glass was suspended by silk between the poles of the new magnet "When it was arranged, and had come to rest, I found I *could* affect it by the magnetic forces and give it position" By Dec 6 he had sent in to the Royal Society the 20th, and on Dec. 24 the 21st series of his 'Researches," in which the properties of diamagnetic bodies are fully described Thus these two great discoveries were elaborated, like his earlier one, in about three months The discovery of the magnetic rotation of the plane of polarized light, though it did not lead to such important practical applications as some of Faraday's earlier discoveries, has been of the highest value to science, as furnishing complete dynamical evidence that wherever magnetic force exists there is matter, portions of which are rotating about axes parallel to the direction of that force

(*See* ELECTRICITY. *Historical Introduction* and MAGNETISM)

His published works were *Chemical Manipulation, being Instructions to Students in Chemistry* (1st ed. 1827, 2nd 1830, 3rd 1842); *Experimental Researches in Electricity,* vols i. and ii (1844 and 1847), vol iii (1844), vol iii Richard Taylor and William Francis (1855), *Experimental Researches in Chemistry and Physics* (1859), *Lectures on the Chemical History of a Candle* (edit by W Crookes, 1861); *On the Various Forces in Nature* (edit by W Crookes, no date)

See J Tyndall, *Faraday as a Discoverer* (1st ed 1868, 2nd ed 1870), Bence Jones, *The Life and Letters of Faraday* (2 vols, 1870), J H Gladstone, *Michael Faraday* (1872), S P Thompson, *Michael Faraday, his Life and Work* (1898) (J C MA, X)

FARAH, a town of Afghanistan, on the river that bears its name on the main road between Herat and Kandahar, 160 m S of Herat and 225 m W of Kandahar It commands the approaches to India and Seistan from Herat The town (2,460 ft above sea-level) is a square walled enclosure in the middle of the plain Owing to its unhealthiness it is only occupied by the Afghan regiment quartered there It is probably the Phra mentioned by Isidore of Charax in the 1st century AD

FARAH, a river of Afghanistan It rises in the southern slopes of Siah-Koh, which forms the southern wall of the valley of Herat, and after a south-westerly course of about 200 m falls into the Seistan Hamun At the town of Farah it has a width of 150 yd in the dry season with 2 ft of water and a clear, swift stream It is liable to floods, when it becomes impassable for weeks The lower valley of the Farah Rud is fertile and well cultivated

FARAZDAQ (Hammām ibn Ghālib ibn Sa'sa', known as al-Farazdaq) (*c* 641–*c* 728), Arabian poet, was born at Basra At the age of fifteen Farazdaq was known as a poet He devoted his talent largely to satire and attacked the bani Nahshal and the ban' Fuqaim When Ziyād, a member of the latter tribe, became governor of Basra, the poet fled, first to Kufa, and then, as he was still too near Ziyād, to Medina, where he was well received by Sa'īd ibn ul-Āsī Here he remained about ten years, writing satires on Bedouin tribes, but avoiding city politics But he lived a prodigal life, and his amorous verses led to his expulsion by the caliph Merwan I On the death of Ziyād he returned to Basra, where he secured the favour of Ziyād's successor 'Obaidallāh ibn Ziyād Much of his verse at this period is concerned with his dispute with his wife, his cousin Nawār, whom he had married against her will. Another subject occasioned a long series of verses, namely his feud with his rival Jarīr (*q v*) and his tribe the bani Kulaib These poems are published as the *Naka'id of Jarir and al-Farazdaq* (ed A A Bevan, Leiden, 1906 ff) In political life Farazdaq was prevented by fear from taking a large part He seems, however, to have been attached to the house of Ali During the reign of Moawiya I he avoided politics, but later gave his allegiance to 'Abdallah ibn Zobair

The fullest account of his life is contained in J Hell's *Das Leben Farazdaq nach seinen Gedichten* (Leipzig, 1903), Arabian stories of him in the *Kitab ul-Aghāni* and in Ibn Khallikān A portion of his poems was edited with French translation by R Boucher (Paris, 1870), the remainder have been published by J Hell (Munich, 1900)

FARCE, a form of comedy in dramatic art, the object of which is to excite laughter by ridiculous situations and incidents It originated from the Latin *farcire,* to stuff, and with the meaning of "stuffing" or forcemeat it appears in old cookery books in English The French *farce,* the form to which we owe our word, was originally the "gag" that the actors in the mediaeval drama inserted into their parts, generally to meet the popular demand for a lightening of humour or buffoonery It has thus been used for the lighter form of comic drama (*see* DRAMA), and also figuratively for a piece of idle buffoonery, sham or mockery

FAR EASTERN AREA, an administrative unit of Asiatic Russia, created in 1922, upon the fall of the independent Far Eastern People's Republic. it occupies 2,846,323 sq km, but its population in 1926 was only about 1,843,000 Eastward from Chaun bay the Arctic ocean forms its northern boundary, and the Bering sea, the Okhotsk sea and the Gulf of Tartary wash its eastern shores The Yakutsk and Buriat-Mongol Soviet Republics lie to the west, the boundary running for the most part along the crests of the Anadyr, Stanovoi and Yablonoi mountains Mongolia, Manchuria and Korea lie to the south, the Peking Convention of 1860 defined the boundary between Russia and

Manchuria as following the Argun, Amur, Ussuri and Sungacha rivers to Lake Khanka, thence crossing the lake westwards to the Pai-ling river, thence along a mountain range to the junction of the Hu-pu-tu (Khubtu) with the Suifen river, and thence along the Hunchun river, and along the range of mountains between that river and the sea, up to the Tumen river 6 m inland from its mouth However, most maps show the boundary as running along the whole course of the Hu-pu-tu river The ocean boundary lies along the Bering strait, separating Russia from Alaska and Lawrence island, and passes south of Cape Lopatka separating the Kurile isles from Kamchatka The Commander islands, off the east of Kamchatka peninsula, and the part of Sakhalin island north of lat 50°, form part of the Far Eastern Area A commission is at present (1928) considering the following alterations of the boundary between the Yakutsk Republic and the Far Eastern Area (1) the provision of an outlet to the sea for the Yakutsk Republic through Ayan, a port on the sea of Okhotsk, (2) the creation of an autonomous Tungus area, formed partly from the south-eastern Yakutsk Republic and partly from the Uda river territory of the Far Eastern Area, with Chumukan as its administrative centre, (3) the union of the Aldan-Amur goldfield under one administration, (4) the union of the Kolyma river district with the Okhotsk river district It should be noted that an isolated portion of the Trans-Baikal province belongs to the Buriat Mongol Republic (*q v*) Much of the area is unproductive, and difficulties of position, structure and climate combine to retard its development A great part of Kamchatka has not yet been topographically or geologically surveyed, and uncertainty exists as to the continuity of the Yablonoi and Stanovoi mountains, and as to the north-eastern termination of the latter The relation of the Great Khingan to the Stanovoi is also not yet worked out Much of Kamchatka, both peninsular and continental, is occupied by mountains, and in the Amur province a range of granitic and schistose mountains, called the Little Khingan, or Bureya or Dousse Alin, runs parallel to the Great Khingan from the north bank of the Amur river, while still further east is the Sikhota Alin range, occupying most of the Maritime Province The only volcanic activity is in Kamchatka peninsula, where a series of partly active and partly extinct volcanoes runs along the east coast Kluchevskaya, 16,130 ft , is probably the highest active volcano in Asia The Trans-Baikal region, with the Selenga, Vitim and Aldan plateaux, forms part of a terrace rising 3,000 to 5,000 ft above the general 1,200 to 1,500 ft level of the high eastern plateau of Asia Tundra occupies one-third of the Far Eastern Area, and in addition part of north Sakhalin is tundra If these tundra regions are excluded, 64% of the remaining land is forest clad The forests may be divided roughly into three groups, (1) the Daurian type stretching from the west of Transbaikal to the Zeya river, consisting mainly of larch and birch, with open prairies which in spring become grassy seas, where the peony, aconite and similar blooms reach a height of 4 to 5 ft ; (2) the Manchurian type, extending eastward from the Bureya river and southward along the western slopes of the Sikhota Alin range The prevailing trees are fir, silver fir and Manchurian cedar, amongst which are sprinkled broad-leaved Manchurian varieties, *e g*, velvet tree, Greek nut, Manchurian ash, Mongolian oak and a few species of maple; (3) the Okhotsk-Kamchatka flora occupying Okhotsk and Kamchatka, the eastern slopes of the Sikhota Alin, the northern parts of the Amur and Maritime provinces and the island of Sakhalin It consists mainly of the Siberian fir and cedar, with a few birch, aspen, alder and poplar trees In spite of this wealth, the timber industry is little developed, partly because of the lack of road communication and sea tonnage and partly because of the lack of suitable port facilities, the capital to provide these is lacking The Amur river forms an excellent summer waterway for timber, but Nikolaevsk at its mouth has no facilities for timber haulage and embarkation The river is frozen from November to May and at Nikolaevsk to June. At present, therefore, Vladivostok is the main timber port, but the fact that timber must be carried by rail to it increases the cost and hence puts Russian timber at a disadvantage on the world market Vladivostok also is the natural outlet for Manchurian timber, and with better dock facilities could double its trade Oak, cedar, fir and planks of aspen for match manufacture are chiefly exported, while Imperatorskaya bay (now Soviet bay) exports soft woods to Australia, and Olga bay exports pit props Attempts are being made to replace the export of raw timber by local industries dependent on timber, and match, veneer and plywood factories have been established in the Ussuri valley, while in Transbaikalia, the Amur province and Primorsk there are now more than 30 timber mills, those round Vladivostok manufacturing barrels for the fishing industry At Spasskaya (Yevgenevka) on the Ussuri railway, is a factory producing turpentine, tar, wood alcohol, vinegar, resin and potash

In spite of destructive exploitation in the past, hunting and trapping still form the chief occupation of the native tribes, and a supplementary source of income for the Russian settlers The Arctic fox and white bear are found only north of lat 60°, and the former is not so abundant as in western Siberia The blue, the red and the black or silver fox are trapped in quantity, especially by the Koryaks The raccoon dog, a native of China and Japan, is found in the Amur basin and valued for its skin in winter and its flesh in summer The polar bear is found where there are seals, but the brown or Kamchatkan bear is common in the forests and yields both fur and food, the black or Tibetan bear is found in the south The Gilyak tribes are specially skilled in bear hunting, and the bear has religious significance for many native tribes The marten and sable are decreasing, the best sable comes from the Nerchinsk, Amgun and Zeya districts and the poorest quality from Sakhalin Ermine, glutton, skunk and otter are also decreasing The hare is trapped for local use, though many tribes will not eat its flesh Squirrels are not found in Kamchatka, but in the south they are common, and their skin is in great demand for gloves, hoods and carriage aprons The reindeer is widespread in the tundra region, the Koryaks and Chukchee often owning herds of two to five thousand head, which provide them with meat, leather and means of locomotion War conditions of 1914–22 had a disastrous effect, and it has been calculated that of 1,622,000 reindeer, only 687,000 survived The elk is also found, and the wapiti and maral deer are valued for their horns From the horns of the maral deer a powder called *panty* is obtained which is in great request amongst Chinese physicians The musk deer is hunted in the Amur region and Sakhalin, its flesh is eaten, its skin used for clothing and its thin leg bones made into arrowheads The roebuck, stag, rock-deer and spotted deer are found, and in the island of Askold near Vladivostok, the siku The musk ox is extinct, except possibly in Sakhalin

The Commander islands were at one time famous for the fur seal, but promiscuous killing has greatly diminished its numbers Near Chita and in the jungles of the Primorsk area, tigers are much dreaded; the snow leopard, lynx and two varieties of wild cat are also found Fish is abundant and varied, both in the rivers and the sea, many native tribes rely on fish for food in much the same way as we rely on bread It is salted or frozen for winter use, and towards the end of winter is often eaten in an advanced state of decomposition The best market for exported fish is Japan Attempts are being made to foster a tinned fish industry, and Kamchatkan tinned salmon, mainly put up under Japanese direction, finds an increasing market The scarcity of salt greatly hampers the fish preserving industry, and the government is (1928) financing the Yakutsk salt mines on Vilyui river, a tributary of the Lena, to meet the need Herrings are abundant in Peter the Great gulf and could find a ready market in Siberia if better transport and refrigerator facilities were provided The Keta or dog-salmon is common except in south Kamchatka, and from its skin the natives make sails, clothes and boots For a detailed account of the numerous kinds of fish see *A Handbook of Siberia and Arctic Russia*, I D 1207 London 1920, in which there is also a detailed account of the various native tribes

Climate.—The climate varies much, since the region extends from 70° N. to 42° N The north-east corner, including the

Anadyr mountains, lies within the frozen Arctic tundra zone, where summer is very short, with a temperature never rising above 60° F, and winter is long and cold, with a January mean of −10° F to −40° F Precipitation is slight Three factors influence the climate of the remaining area, (1) the cold current of the Okhotsk sea considerably lowers the temperature, thus the centre of the frozen Kamchatka desert lies in about the same latitude as Moscow; (2) the south-east monsoon brings rain, especially in July and August, to all the Pacific coastal areas, thus making summer stormy, wet and cool and unfavourable to agriculture, (3) the continental situation and high elevation of Transbaikalia and part of the Amur province cause severe winters, often lasting seven months, though in the remaining five summer months the heat is sufficient to allow sub-tropical plants, *e g*, rice, to be grown The slight snowfall exposes the ground to the severe winter frosts and prevents the cultivation of winter wheat The range of temperature here may be 70° F, and even at Vladivostok is 64 6° F The annual rainfall in Transbaikal and the west of the Amur province is 300 to 500 mm , in the eastern Amur and the Maritime area 500 to 700 mm and towards the south 700 mm Dense fogs are common on the coast in summer Sakhalin and Kamchatka have less severe extremes of climate and heavier rainfall all the year round, in east Kamchatka precipitation is about 1,000 mm per annum. Ayan, on the south coast of the Okhotsk sea, gets the same heavy rainfall, but the north coast of this sea is completely dry

Agriculture and Industry.—Rumours of rich black earths in the southern parts attracted the first settlers, but black earth exists only in the Transbaikal, where it is of poor quality and rapidly degenerates, climatic conditions here are unfavourable for agriculture The soils in the Amur and Maritime provinces, formerly accepted as black earths, prove to be dark coloured bog, semi-bog and ash coloured soils, when capital for draining them becomes available, they should prove productive On the narrow coastal fringe, the impenetrable clayey and stony rocks led to bogging and flooding during the semi-tropical summer rains Agriculture is therefore most favourably carried on in the light, easily worked, muddy alluvial soils of the Amur, Ussuri, Zeya and Bureya valleys The most densely sown area is round Blagovyeschensk, from which district sown land thins out in every direction, the chief crops are wheat 52 2%, oats 39 3%, grasses 2 2%, potatoes 1 4%, rye 1 3%, other crops being buckwheat, millet, sunflower seed, barley, flax and hemp Melons are also grown The Ussuri valley and the district near Vladivostok, especially from Lake Khanka to the Suifen river are well cultivated Of late years rice has been introduced so successfully that its northern limit is now 49° N , instead of 42° N Experiments are being carried out with a view to establishing the cultivation of tobacco, sugar-beet and silk, the chief crops at present are oats, wheat and buckwheat Soya beans are increasingly grown and carrots, potatoes, tomatoes, cabbages and fruits, especially the apple, ripen well in the short summer Hay in this district is so rank and coarse that cattle sometimes refuse it Wild grapes are found in the southern Ussuri district Beekeeping, since its introduction in 1871, forms a valuable supplement to agriculture, except where the opium poppy is grown The only other cultivated region is in Transbaikal, along the valleys of the Ingoda, Onon and Argun rivers, where irrigation of a primitive kind is practised, rye, oats, wheat and buckwheat forming 92·4% of the harvest The northern limit of agriculture in the Maritime province is 43° N , as against 65° N in the Yakutsk Republic, but a small patch of land near the Tym and Poronaya rivers in Sakhalin, another near the mouth of the Uda river, and a third in the Kamchatka peninsula form tiny islands of possible cultivation much to the north of the general limit War and civil war diminished the size of the sown area, and the quality of the harvest, which is still (1928) much below the 1913 level Even then, however, sufficient grain for the needs of the population was not grown Most imported grain is floated down the Sungari river from Manchuria; the remainder either comes from North America via Vladivostok or from western Russia via the Siberian railway The home meat supply is also deficient, and fat cattle from Mongolia form a staple import. Dairying and cattle breeding of a fairly intensive type are carried on in the Ussuri district to supply the towns of Khabarovsk and Vladivostok, but are much hampered by insect pests In Transbaikal an extensive nomad form of cattle-breeding is carried on, the herdsmen often taking their flocks into Manchuria for the winter Horses are bred and used as working animals in the summer and for posting routes in the winter The rearing of sheep and goats wherever possible was emphasized by war conditions, which cut off the supply of imported cloth and made the country dependent on homespun Strong and hardy camels are bred in Transbaikal Pigs in this region are of poor quality, but in the Ussuri district they are better bred and a bacon industry is developing

The mineral wealth is as yet not completely surveyed Gold output has diminished markedly since 1917 and will probably need to be put on a machine using basis in place of the old hand methods, it is mainly obtained from alluvial washings The rich quartz deposits could not be profitably exploited under present conditions. Climatic conditions make work possible only in summer, and most of the gold is found in places where the ground never really thaws, if the summer is dry, water for washing is deficient; if wet, flooding is troublesome Population is scanty, roads almost non-existent and the cost of bringing machinery and food supplies is exceedingly heavy The chief regions are the Nerchinsk, the Zeya and its tributaries, the Bureya, and especially its tributary, the Niman, Blagovyeschensk and Zeya-Pristan have government gold laboratories The Amgun mines near Kerbinski have proved too costly to exploit, but the Orsk mines on Lake Chlya, near Nikolaevsk, are more successful The more accessible mines in the Ussuri district are worked out, but a new source has been opened on the Iman river Quartz gold was extracted formerly from Askold island near Vladivostok The silver mines of Nerchinsk, in Transbaikal, which were worked as early as 1704 and reached their maximum output in 1774, are no longer worked, since the easily reached layers are exhausted and the Kirghiz silver mines are more productive Zinc and silver-lead mines are worked near Tyutikha bay and Soviet bay Wolfram, bismuth, asbestos, platinum, molybdenum, osmiridium and tin are found and many precious stones, unworked for lack of demand Antimony occurs in quantity in the Amur province Brown coal of a low calorific value has been mined in the Transbaikal and Amur province since the coming of the railway In the Maritime province both brown coal and a better variety are mined for the Ussuri railway, but the best coal is obtained from Sakhalin, the Japanese markedly developed the mines during their occupation The eastern shores of Sakhalin also produce good quality naphtha, and this and the coal are worked by a Japanese concession Iron was worked in the Transbaikal in the 18th century and an iron foundry existed at Petrovsk on the Balaga river; it declined after the opening of the trans-Siberian railway, but revived temporarily in 1914–22 Chinese competition, with better fuel and ore conditions, is now reducing its prosperity The Olga bay iron industry is more prosperous North-east Kamchatka has undeveloped resources of gold, platinum, silver-lead ore, iron, coal, granite, marble and naphtha In 1925 concessions were granted to the following British firms, (1) "Lena Goldfields" for 30 years (2) "The Priamur Mines" for 36 years to develop the iron, zinc, lead and silver at present unworked in the Olga bay district (3) "The Tetukhe Mining Corporation" for 36 years to develop the zinc, silver, lead and sulphate near the Tetukhe river (4) "The Ayan Corporation" for 36 years to work the gold mines in Kamchatka The industries of the Far Eastern Area are at present mainly restricted to peasant products for local needs, homespun, sewn leather footwear, flour-milling, etc Leather is distinctly a peasant industry, except in Vladivostok and the Transbaikal Vladivostok and Blagovyeschensk are important flour-milling centres, and a macaroni industry was established at the former town in 1923 Both towns have shipbuilding and repairing industries, the latter for the Amur river fleet. The former Khabarovsk arsenal now produces agricultural implements The damage to the railway bridges and rolling stock and to the river fleet during 1914–1922 is still

felt Roads are lacking in many places and are often impassable in the rainy season The opening of the final railway link between Khabarovsk and the Transbaikal in 1914–15, has not yet had time to make its influence felt Coastal transport is difficult owing to the uncharted seas and the summer fogs and winter ice The Far Eastern Area thus presents itself as an area of potential wealth as yet undeveloped Its present exports of timber, fish, furs, coal, oats, beans, rice, hempseed and bran hardly cover its imports of grain, fats, tea, sugar, meat, cattle, agricultural and other implements, machinery and small necessities such as paper, soap and chemicals The seasonal nature of its industries and the difficulties of agriculture, combined with transport difficulties are a check on colonization, and yet intensive colonization is the only means of creating a demand for manufactures of a non-seasonal character Its chief towns (*q v*) are Vladivostok, Blagovyeschensk, Khabarovsk, Chita and Nerchinsk

Native Tribes.—Many native tribes still survive Until recently the Palaeo-Siberian races, akin to the North American Indians, occupied all eastern Siberia and some Japanese islands They have been pressed out by invaders towards the north-east, and of the present 35,000 population of Kamchatka, about 30,000 are natives The Chukchee are the most important Their original territory was mainly from east of Chaun bay to the north of the Anadyr region, but the increase of their reindeer herds has caused them to expand, at the expense of the Yukaghirs They inhabit the tundra and its taiga fringe, seeking the latter for shelter in the autumn and camping in summer near a glacier or in the open tundra They were probably originally a maritime people who later developed reindeer breeding and they are today divided into the Reindeer and the Maritime Chukchee The latter live mainly by seal and walrus hunting and their boats are made from walrus hide The Reindeer Chukchee hunt wild reindeer, wolves, bears and foxes to supplement their reindeer breeding The Koryak tribe, closely related to the Chukchee, extends from the Stanovoi mountains to the sea, and along the west coast of Kamchatka to lat 55° N They are also divided into a Maritime and a Reindeer section, the latter intermarrying with the Chukchee and the former with the Kamchadals They fish, hunt and breed reindeer, and have developed much artistic skill in carving wood, ivory, whalebone and horn and in basketwork and rug-making Kamchadal is a name applied to the principal tribe of the Kamchatkan peninsula, pure aborigines are rare, much intermixture between them and escaped convicts having occurred Their chief occupation is salmon fishing, though some are hunters and trappers They train sledge dogs and are expert sledge drivers The Gilyaks of the coastal region on either side of the Amur present an ethnological problem, one type approximating to the Ainu, another to the Tungus and a third being distinct from either Hunting, fishing and trading are their chief occupations and till recently they carried on a slave trade with the Ainu and Goldi The bear is their sacred animal, and there is a bear cage near each of their villages A few Eskimo are found in the north and a few Aleuts in the Commander islands

Of the Neo-Siberian tribes, sometimes called the Ural-Altaic, the Tungus are the most important in this region, they are a branch of the same Mongolic tribe as the Manchu They stretch from the Taimir peninsula along the Yenisei valley across the Vitim plateau to the sea coast almost from Korea to Kamchatka, the Amur and Ussuri are Tungus streams The Lamuts and Olennye of the Chukchee peninsula are a branch of the Tungus The southern Tungus fall into two linguistic groups, one including the Orochon, Manegir, Birar and Kile, the other the Olcha, Oroke, Negda and Samagir Physical and linguistic divisions do not, however, correspond, *e g*, the Olcha resemble the Gilyaks physically, and the Samagir resemble the Goldi of the Amur, Ussuri and Sungari region In Transbaikal many Tungus have become sedentary and intermingled with the Russian settlers, but the nomadic cattle-breeding Tungus, forming about 45% of the whole, have preserved their nationality and language and are demanding recognition of an autonomous area The Buriats of Transbaikal are the principal Mongol tribe in Siberia, the eastern branch is known as the Aga-Buriat, as distinct from the Buriat Mongol (*q v*) In 1925 the first congress of native peoples of the Transbaikal, Amur and Primorsk regions was held. It laid down a broad basis for preserving native cultures and suggested plans, (1) for combating shamanism (*q v*), the sale of women, and the spread of such diseases as syphilis, leprosy, etc, (2) for establishing co-operation among the natives to prevent their exploitation, (3) for enabling the natives to adapt themselves gradually to timber and other industries, in view of the fall in the value of hunting and fishing Though as yet it is early to expect results, the congress is significant of a new outlook on problems of the relations of native tribes and incoming settlers and traders In 1926 a station providing veterinary aid to native reindeer breeders and medical help for the natives was established in St Lawrence bay near Bering strait

Colonization.—The history of the opening up of the Far Eastern region is full of romantic interest, and the hardships suffered in its wild country and inhospitable climate were perhaps greater than in opening up any other region The wealth of fur attracted traders from early times The Cossack Dezhnev in 1648, after whom East Cape has been re-christened Dezhneva, sailed through Bering strait eighty years before Bering, and discovered the Anadyr, where he was joined by other Cossacks who had come by land from the Kolyma river along the Anyui and over the watershed In 1647 Okhotsk fortress was built and by 1697 Kamchatka was explored and a fortress built at Verkhne-Kamchatsk In 1643 Poyarkov sailed down the Zeya and the Amur to the Pacific and returned via Okhotsk In 1649–50 Khabarov, a merchant of Olekminsk sailed down the Amur and wintered at the place which now bears his name He also selected the future Blagovyeschensk as a suitable site About this time Verkhne-Udinsk and Nerchinsk were founded, but the Amur was ceded to China in 1689 The final occupation of the Amur is mainly due to Count Muraviev-Amurski, who, in 1849, sent Nevelski to explore the mouth of the river, and Nikolaevsk was founded by him Two years later de Castries bay and Marinsk were occupied and outposts established in Sakhalin The journeys of Middendorf, 1844–45, Akhte and Schwarz, 1852, and in 1854–57 of the Siberian expedition increased the knowledge of and interest in the district At the same time the Siberian branch of the Russian Geographical Society was formed in Irkutsk as a centre for Siberian research During the Crimean War, Petropavlovsk in Kamchatka was successfully held against the English and French, and later a flotilla was sent down the Amur to help the Pacific fleet The settlement of peasants along the left bank began in 1856 with colonies at the mouth of the Kumara, the Zeya and the Sungari, and at the entrance to the Little Khingan gorge In 1858, by the treaty of Aigun, China ceded to Russia the left bank of the Amur from the Argun to the sea, and the Peking Convention of 1860 confirmed the cession to Russia of the Ussuri region For some years a zone of free trade existed along the frontier, but this was discontinued in 1912 and much smuggling now goes on In 1872 Vladivostok was made the Russian Pacific Naval base In 1896 Russia abandoned the longer and more difficult railway route along the Amur in Russian territory in favour of a joint Chinese-Russian railway through Manchuria to link the Transbaikalia railway with Vladivostok, and in 1898 obtained the lease of Port Arthur, and after the Boxer rebellion of 1900 established herself in Manchuria and Korea But by the Treaty of Portsmouth 1905, at the end of the Russo-Japanese war, Russia recognized Japan's right to Korea, ceded her rights to Port Arthur and retired from Manchuria Sakhalin was divided between Russia and Japan at lat. 50° and Japan gained fishing rights in the Bering and Okhotsk seas Russia was then compelled to build the Amur railway which was completed in 1915. Following on the 1917 revolution, a rising took place in Vladivostok in 1918, and Japanese and British naval forces occupied the town Much confused fighting took place, Semenov's troops, the retreating Czecho-Slovak army, the White Guards, Allied troops and especially Japanese troops and Bolshevist forces all taking part From 1920 to 1922 an independent Far Eastern Republic existed, but in November 1922 the Soviet power finally established itself and the Far Eastern Area was incorporated in

the R S F S R, though the Japanese did not evacuate northern Sakhalin until May 1925 Colonization in the area was attended in early days with great difficulties and casualties were heavy The region of oldest settlement is the Transbaikalia, where Cossacks were established in the middle of the 17th century, thence they were progressively moved eastwards, settling on the Amur river in 1857 In 1869 peasant colonization of the Amur district began and the opening of the Odessa to Vladivostok sea route in 1878, which lessened the transit time from two years of difficult land travel to a few weeks' sea voyage, gave a great impetus to the settlement of the Maritime and Ussuri districts Besides Cossacks and peasants political and religious refugees and exiles also settled in the district and have formed a valuable element in the population Some, notably Bogoras in his studies of the peoples of the Chukchee region, have added considerably to the scientific exploration of the district Criminal exiles, on the other hand, have been a great source of disorder; many convicts escaped and they and the ex-convicts whose term of imprisonment was completed, frequently terrorized the native tribes and settlers In 1907 the custom of sending criminals to Sakhalin island was discontinued Since 1925 the Soviet government has been offering special facilities to settlers in the Far East, especially to those intending to work in the lumbering and fishing industries, and arrangements are being made for the settlement in 1928–29 of about 150,000 men, with their wives and families, in the Primorsk region Schemes are also being worked out to bring settlers from the Caspian fishery district and to encourage them to combine cattle breeding and fishing There is much infiltration of Koreans, Chinese and Japanese into the district, the two latter as traders and craftsmen, the Koreans, with their frugal and industrious habits and their familiarity with difficult local conditions, are specially fitted to become agricultural settlers It is estimated that in 1923, 90% of Koreans in this area were cultivators, some even settling in Kamchatka, while only 23% of Chinese were landworkers So far all attempts to settle Russians in Kamchatka have proved unsuccessful A striking feature of the colonization of the area has been the rapid growth of the towns Blagovyeschensk increased from 32,834 in 1897 to 57,500 in 1926, Vladivostok from 28,896 to 102,454, Khabarovsk from 14,971 to 43,567, Nikolaevsk-Ussuri from 10,868 to 32,121, Chita from 11,511 to 57,731 and even Petropavlovsk in Kamchatka has increased from 398 to 1,670 This growth in spite of the troubled conditions and lack of development of the surrounding districts is an indication of the probable future importance of the region

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FAREHAM, a market town and seaport in the Fareham parliamentary division of Hampshire, England, 84¼ m S W. from London by the S R, is a junction station on the line from Portsmouth to Southampton, with branch to Gosport and Stokes Bay on the south, and north-west to Eastleigh Pop of urban district (1921) 10,063 It lies at the head of a creek opening into the north-western corner of Portsmouth harbour The principal industries are the manufacture of sackings, ropes, bricks, coarse earthenware, terra-cotta, tobacco-pipes and leather. Fareham has a considerable trade in corn, timber and coal, the creek being accessible to vessels of 300 tons Three miles E of Fareham, on Portsmouth harbour, are the interesting ruins of Porchester castle, an extensive walled enclosure retaining its Norman keep, and exhibiting in its outer walls considerable evidence of Roman workmanship St Mary's parish church (rebuilt and restored in the last century) retains some fine Norman portions, it belonged to an Augustinian priory founded by Henry I At Titchfield, 3 m W. of Fareham, are ruins of the beautiful Tudor mansion, Place house, on the site of a Premonstratensian abbey of the 13th century, of which there are also fragments At Knowle, 3 m N.N.W of Fareham, is the large county asylum, where in 1927 there were over 1,000 patients Fareham became an urban district in 1894. The council owns the water and electricity supplies

The fact that Fareham (Fernham, Ferham) formed part of the original endowment of the see of Winchester fixes its existence certainly as early as the 9th century It is mentioned in the Domesday Survey as subject to a reduced assessment on account of its exposed position and liability to Danish attacks There is evidence to show that Fareham had become a borough before 1264, but no charter can be found It was a mesne borough held of the bishop of Winchester, but it is probable that during the 18th century the privileges of the burgesses were allowed to lapse, as by 1835 it has ceased to be a borough Fareham was represented in the parliament of 1306, but two years later it petitioned against representation on the ground of expense A fair was held under grant of Henry III, and in the 18th century was mainly important for the sale of toys, it was abolished in 1871 Fareham in mediaeval times was a free port and had a considerable trade in wool and wine

FAREL, GUILLAUME (1489–1565), French reformer, was born of a noble family near Gap, Dauphiné He studied in Paris under Jacobus Faber (Stapulensis), on whose recommendation he was appointed professor in the college of Cardinal Lemoine In 1521, on the invitation of Bishop Briçonnet, he went to Meaux, and took part in efforts of reform within the Roman communion The persecuting measures of 1523, from which Faber found a refuge at Meaux, determined Farel to leave France Oecolampadius welcomed him to Basel, where in 1524 he put forth thirteen theses sharply antagonizing Roman doctrine, and defended them with so much heat that Erasmus joined in demanding his expulsion from the city He thought of going to Wittenberg, but his first halt was at Strassburg, where, Bucer and Capito received him kindly At the call of Duke Ulrich of Wurttemberg he went as preacher to Montbéliard, but was forced to leave early in 1525

Retracing his steps to Strassburg and Basel, at the end of 1526 he obtained a preacher's post at Aigle, then a dependency of Bern, and, with reference to his protection by that city, adopted the pseudonym Ursinus He obtained in 1528 a licence from the authorities to preach anywhere within the canton of Bern, but extended his labours to the cantons of Neuchâtel and Vaud, in Oct 1530 breaking into the church of Neuchâtel with an iconoclastic mob In 1532 he visited the Waldenses and on the return journey halted at Geneva, then at a crisis of political and religious strife On June 30, 1532, the Council of Two Hundred had ordained that in every church and cloister of the city "the pure Gospel" should be preached, against this order the bishop's vicar led the opposition Reaching Geneva in Oct 1532, Farel at once began to preach at his lodging, and soon attracted crowds Summoned before the bishop's vicar, he was violently thrust from the court and bidden to leave the city within three hours He escaped with difficulty to Orbe by boat Through the intervention of the government of Bern, liberty of worship was granted on March 28, 1533 to the Reformation party in Geneva Farel, returning, achieved in a couple of years a complete supremacy for his followers On New Year's Day 1534 the bishop interdicted all preaching unauthorized by himself, and ordered the burning of all Protestant Bibles This was the signal for public disputations in which Farel took the leading part on the Reformation side, with the result that by decree of Aug 27, 1535 the mass was suppressed and the reformed religion established. Calvin, on his way to Basel for a life of study, touched at Geneva, and by the importunity of Farel was there detained to become the leader of the Genevan Reformation The severity of the disciplinary measures which followed procured a reaction under which Farel and Calvin were banished the city in 1538 Farel was called to Neuchâtel in July 1538, but his position there was made untenable, though he remained at his post during a visitation of the plague When (1541) Calvin was recalled to Geneva, Farel also returned; but in 1542 he went to Metz to support the Reformation there In 1544 he returned to Neuchâtel. No one was more frequently and confidentially consulted by Calvin When the trial of Serve-

tus was in progress (1553), Calvin was anxious for Farel's presence, but he did not arrive till sentence had been passed He accompanied Servetus to the stake, vainly urging him to a recantation at the last moment Calvin's death, in 1564, affected Farel deeply He died at Metz on Sept 13, 1565

See C Ancillon, *Vie de G Farel* (1691), the article in Bayle, M Kirchhofer, *Das Leben W Farels* (1831–1833); Ch Schmidt, *Études sur Farel* (1834), F Bevan, *W Farel* (1893), J J Herzog, in Herzog-Hauck's *Realencyklopadie* (1898)

FARGO, WILLIAM GEORGE (1818–1881), pioneer American expressman, was born in Pompey (N Y), on May 20, 1818 He became a freight agent for the Auburn and Syracuse Railway Co in 1841, and express messenger between Albany and Buffalo a year later, and in 1843 a resident agent in Buffalo In 1844 he organized, with Henry Wells (1805–78) and Daniel Dunning, the first express company to engage in the carrying business west of Buffalo The lines of this company were rapidly extended to Chicago, St Louis, and other western points In March 1850, when the American Express Co was organized, Fargo became secretary, and in 1851 he organized the firm of Wells, Fargo and Co to conduct an express business between New York and San Francisco by way of the Isthmus of Panama In 1861 Wells, Fargo and Co bought the Overland Mail Co , of which Fargo had been one of the original promoters From 1862–66 he was mayor of Buffalo, and from 1868 to his death, in Buffalo, on Aug 3, 1881, he was president of the American Express Co He was a director of the New York Central and of the Northern Pacific railways

FARGO, the largest city of North Dakota, U S A , on the eastern boundary of the State, on the Red river, opposite Moorhead, Minn , and 252m N W of St Paul, the county seat of Cass county It is on Federal highways 10 and 81 , has a municipal air port , and is served by the Chicago, Milwaukee, St Paul and Pacific, the Great Northern and the Northern Pacific railways The population in 1925 (State census) was 24,921, and was estimated locally at over 30,000 in 1928 About 15% are of foreign birth, chiefly Scandinavian and Canadian Fargo is the most important city in the Red river valley ("the granary of the world") It is an important market for farm-machinery and has a large general wholesale trade Wholesale transactions in 1926 amounted to $37,745,500, retail trade to $19,652,600 The factory output in 1925 was valued at $4,944,003 The assessed valuation of property in 1927 was $32,177,435 Bank debits to individual accounts in 1926 amounted to $186,238,000 Fargo is the seat of several private schools, and of the North Dakota agricultural college, which was provided for by the State Constitution, and established in 1890 by the first legislative assembly It owns 1 5 sections of land in the north-western part of the city and extending beyond the city limits, of which 100ac is used for the campus The biennial appropriation for maintenance in 1925 was $543,000 Resident enrolment (exclusive of correspondence courses) is over 1,400 The agricultural experiment station maintains branches at Langdon, Edgeley, Dickinson, Hettinger, McLeod and Williston A tent colony was established here when the Northern Pacific crossed the river in 1871, and permanent settlement began in 1873, after the Indian title to the land had been extinguished The city was chartered in 1875, and was named after W G Fargo, of Wells, Fargo and Company It has a commission form of government The population was 5,664 in 1890, 9,589 in 1900, 14,331 in 1910; and 21,961 in 1920

FARIA Y SOUSA, MANUEL DE (1590–1649), Spanish and Portuguese historian and scholar, commentator of *Os Lusiadas* and author of a history of the Portuguese in all parts of the world This work appeared in portions after his death under the titles. *Europa Portugueza* (1667), *Asia Portugueza* (1666–75); *Africa Portugueza* (1681).

FARIBAULT (fâr'ĭ-bō), a city of Minnesota, U S A , situated on the Cannon river, about 50m. S. of St Paul; the county seat of Rice county It is on Federal highway 65, and is served by the Chicago Great Western, the Chicago, Milwaukee, St Paul and Pacific, the Minneapolis, Northfield and Southern, and the Rock Island railways The population was 11,089 in 1920 (88% native white) and was estimated locally at 12,500 in 1928. It is in a farming and dairying country, and on the eastern edge of the beautiful lake region of southern Minnesota Its diversified manufacturing industries had an output in 1925 valued at $6,922,190, and there are five nurseries within the city The largest peony farm in the country is here Faribault is the seat of the State schools for the deaf (established 1863), for the blind (1874), and for the feeble-minded (1879); of the Seabury Divinity school (Protestant Episcopal, incorporated 1860) and several private academies, and of the cathedral of Our Merciful Saviour (1868–69), the first Protestant Episcopal church in the United States built and used from the outset as a cathedral Jean Baptiste Faribault, a French fur-trader and pioneer, made his headquarters in this region in the latter part of the 18th century Permanent settlement dates from 1848, and the city was incorporated in 1872 A French millwright, Le Croix, introduced here, about 1860, a process of making flour which revolutionized the industry in the United States His mill was soon destroyed by flood, and he moved to Minneapolis, where the process was adopted on a large scale Faribault was the home for a time of Gen. James Shields (1810–79); and for many years of Bishop Henry Benjamin Whipple (1859–1901), the pioneer bishop of the Protestant Episcopal church in Minnesota, famous for his missionary work among the Indians

FARIDKOT, an Indian State in the Punjab One of the Cis-Sutlej States, under British influence since 1809 Area 638sq m , and population in 1921, 150,661 The chief, Raja Pahar Singh was rewarded with increase of territory for service to the British in the first Sikh war In the mutiny of 1857, too, his son and successor, Wazir Singh, did good service Estimated gross revenue £138,000 Faridkot is irrigated by a branch of the Sirhind canal The State contributed large sums and the services of sappers and other troops for the World War

FARIDPUR, a town and district of British India, in the Dacca division of Bengal The town, which has a railway station, stands on an old channel of the Ganges Pop (1921), 14,503 There are a Baptist mission and a college The district has an area of 2,371 sq m and a population of 2,249,858 In the north the land is comparatively high, with a light sandy soil, covered with water during the rainy season, but dry during the cold and hot weather From the town of Faridpur the ground slopes, until in the south, on the confines of Bakarganj, it becomes one immense swamp, never entirely dry The villages are built on artificially raised sites or the high banks of the deltaic streams Along many of the larger rivers the line of hamlets is unbroken for miles together, so that it is difficult to say where one ends and another begins The plains between the rivers are almost invariably more or less depressed towards the centre, where usually a marsh or lagoon is found These marshes, however, are gradually filling up by the silt deposited from the rivers, in the north of the district there now only remain two or three large swamps, and in them the process may be seen going on.

The principal rivers are the Ganges, the Arial Khan and the Haringhata The Ganges, or Padma as it is locally called, flows along its northern boundary as far as Goalundo, where it receives the waters of the Jamuna or main stream of the Brahmaputra, thence the united stream turns southwards and forms the eastern boundary of the district Rice is the great crop of the district.

The north of the district is crossed by the line of the Eastern Bengal State railway to Goalundo, an important place of call for the Ganges and Brahmaputra steamers, and a branch runs to Faridpur town. Most of the trade is conducted by river. The subdivisional town of Madaripur (pop 25,297) in the south of the district, is a centre of steamer traffic and also of the jute-baling industry of eastern Bengal

See J. C. Jack, *The Economic Life of a Bengal District* (1916).

FARĪD UD-DĪN 'ATTĀR (1119–1229), Persian poet and mystic, was born at Nishapur, *c* 513 A H. (A D 1119), and was put to death *c* 627 A H (A.D. 1229) His real name was Abu Talib (or Abu Ḥamid) Mohammed ben Ibrahim, and Farīd ud-dīn was simply an honourable title equivalent to Pearl of Religion He followed for a time his father's profession of druggist or per-

fumer, and hence the name 'Attar (one who sold *'itr*, otto of roses; hence, simply, dealer in drugs), which he afterwards employed as his poetical designation Farīd soon gave up his shop and began to study the mystic theosophy of the Sufis under Sheik Rukneddin, and before long was recognized as one of its principal representatives He travelled extensively, visited Mecca, Egypt, Damascus and India, and was invested with the Sufi mantle by Sheik Majd-ud-din of Baghdad. The greater portion of his life was spent in the town of Shadyakh, but he is not unfrequently named Nishapuri, after the city of his boyhood and youth Farīd was a voluminous writer, and left no fewer than 120,000 couplets of poetry, though in his later years he carried his asceticism so far as to deny himself the pleasures of poetical composition His most famous work is the *Mantik uttair*, or language of birds, an allegorical poem containing a complete survey of the life and doctrine of the Sufis It is extremely popular among Mohammedans both of the Sunnite and Shiite sects, and the manuscript copies are consequently very numerous The birds, according to the poet, were tired of a republican constitution, and longed for a king As the lapwing, having guided Solomon through the desert, best knew what a king should be, he was asked whom they should choose The Simorg in the Caucasus, was his reply But the way to the Caucasus was long and dangerous, and most of the birds excused themselves from the enterprise. A few, however, set out, but by the time they reached the great king's court, their number was reduced to thirty The thirty birds (*sī morg*), wing-weary and hunger-stricken, at length gained access to their chosen monarch the Simorg, but only to find that they strangely lost their identity in his presence—that they are he, and he is they In such strange fashion does the poet image forth the search of the human soul after absorption into the divine

The text of the *Mantik uttair* was published by Garcin de Tassy in 1857, a summary of its contents having already appeared as *La Poésie philosophique et religieuse chez les Persans* in 1856, this was succeeded by a complete translation in 1863 Among Farīd ud-dīn's other works may be mentioned his *Pandnāma* (Book of Counsel), of which a translation by Silvestre de Sacy appeared in 1819, *Bulbul Nama* (Book of the Nightingale), *Wasalet Nama* (Book of Conjunctions), *Khusru va Gul* (The King and the Rose); and *Tadhkiratu 'l Awliyā* (Memoirs of the Saints) (ed R A Nicholson in *Persian Historical Texts*)

See Sir Gore Ouseley, *Biographical Notices of Persian Poets* (1846), p 236, Von Hammer Purgstall, *Geschichte der schonen Redekunste Persiens* (Vienna, 1818), p 140, the Oriental Collections, II (London, 1798), pp 84, 124, containing translations of part of the *Pandnāma*, E H Palmer, *Oriental Mysticism* (1867), E G Browne, *Literary History of Persia* (1906).

FARINA, SALVATORE (1846–1918), Italian novelist, was born at Sorso, Sardinia, on Jan 10, 1846, and after studying law at Turin and Pavia settled in Milan Farina has often been compared with Dickens His masterpiece is *Il Signor Io* (1880), a portrait of an egoist, *Il Tesoro di Donnina* (1873), *Amore a cent' occhi* (1883), are other volumes He died Dec 15, 1918

See his own *Ricordi* (1910–13); also V. Dendi, *Uno romanziere dimenticato Salvatore Farina* (Pisa, 1921).

FARINACCI, ROBERTO (1892–), Italian politician, was born Oct 16, 1892, at Isernia, in the province of Campobasso Educated at Cremona, he entered the railway administration, becoming station-master at Cremona While still a very young man he took to politics, and on the outbreak of the World War conducted an active interventionist propaganda As soon as Italy went to war he volunteered for active service, but 18 months later was ordered to resume his civilian duties After the Armistice he was one of the first to join Mussolini's Fasci di Combattimento and he organized the movement in Cremona In 1921 he was returned to the Legislature as member for Mantova-Cremona, but was unable to take his seat in the Chamber, being under age He had now become the leading figure in Cremona, and through the daily paper founded by him, *Cremona Nuova*, acquired an increasing influence in the Fascist party He also found time to complete his studies and secured a university degree in law When Mussolini came into power, although not given office, Farinacci continued to be one of the Premier's most trusted advisers. In 1924 he was again returned to the Legislature and in March 1925 he became, on Mussolini's nomination, general secretary of the Fascist party He was superseded (March 31, 1926), being succeeded by Augusto Turati (not to be confused with the Socialist deputy) The real reasons for the change were not divulged In any case Farinacci remained a force in the party

FARINATO PAOLO (1524–1606), Italian painter, architect and engraver of the Veronese school He was born at Verona and probably studied first under his father, Giovanni Battista, and then under Nicolo Giolfino He was the head of a family of artists who were active in Verona for half a century as painters of façades and as decorators of walls in churches and palaces. Paolo's name first occurs in 1549, when Philip II of Spain is said to have admired one of his pictures at Villafranca and expressed the desire to acquire it His reputation was well established in 1552 when Ercole Gonzaga invited him to co-operate with Paolo Caliari, Domenico Brusasorci and Battista dal Moro in the decoration of Mantua cathedral, where his painting of St Martin is still to be seen There are numerous works by him in the churches of Verona (S Maria Organo, San Nazaro e Celso, San Giovanni in Fonte) and in the neighbourhood Among his last pictures, dated 1603, are the "Betrothal of St Catherine" in the museum of Verona, and the "Miracle of the Loaves and Fishes," in the church of San Giorgio, a very large painting replete with figures, of which the master recorded with pride that he painted it in his 79th year His style is characterized by marked peculiarities—by the overlong proportions of his figures, by their sometimes contorted poses, and by a feeling for space, pageant and movement His colour scheme is low and silvery in tone, Vasari praises his compositions "with large number of figures, executed in good design" Though Paolo Farinato's paintings are rarely met with out of Verona, his drawings, easily recognizable by their pronounced style, are to be found in most of the great European collections Among his first engravings are "Venus and Cupid" (1566) and "St John the Evangelist" (1567) He often signed his engravings and paintings with the figure of a snail From the year 1573 onward he kept a careful chronological register of his works with details of his contracts There are, moreover, numerous architectural designs in the diary, and his activities as an architect in connection with the fortress of Palma and the Castello S Felice at Verona are mentioned by Ridolfi His death must have occurred soon after July 23, 1606, the date of his last will He was buried in S Paolo in Campo Marzo, having made arrangements for his tomb twelve years previously He then, in 1594, adopted the surname of the distinguished Florentine family "Farinati degli Uberti," and used this name henceforth in his signatures, and inscribed it on his epitaph, although his ancestors were not connected with the Florentine patricians, but were probably sellers of bread—"farinati" Paolo's two sons, Orazio and Giovanni Battista, and his daughter Vittoria, were also painters As the Farinati were among the most important artists in Verona at the time when Paolo Veronese was forming his style, they doubtless contributed to the local influences which moulded the early work of the greatest of Verona's painters, thus young Caliari worked in conjunction with a nephew of Paolo Farinato, Battista Farinato, called "Zelotti" (*c* 1532–92) So similar was the work of these two young men that it is very difficult now to apportion it on stylistic evidence

See Vasari Milanesi and Ridolfi, *Le Maraviglie* (1648), L Simeoni published the artist's register of his works in *Madonne Verona I to V*; Bartsch enumerates 10, and Passavant 11, engravings by the artist. (I A R)

FARINELLI (1705–1782), whose real name was Carlo Broschi, one of the most extraordinary male soprano singers that ever lived, was born on Jan 24, 1705, at Naples He was the nephew of Cristiano Farinelli, the composer and violinist, whose name he took He studied under N A Porpora, and, to the possession of a marvellous voice, added a brilliant technique In 1722 he made his first appearance at Rome in his master's *Eumene*, arousing the greatest enthusiasm Porpora had written an obbligato for a popular German trumpet player to one of the boy's songs, and the singer surpassed the trumpet, holding and swelling a note

of prodigious length, purity and power, and in the variations, roulades and trills which he introduced into the air In 1724 he appeared at Vienna, and at Venice in the following year, returning to Naples shortly afterwards He sang at Milan in 1726, and at Bologna in 1727, where he first met and acknowledged himself vanquished by the singer Antonio Bernacchi (b. 1700), to whose instruction he was much indebted With ever-increasing success and fame Farinelli appeared in nearly all the great cities of Italy, and returned a third time to Vienna in 1731 He now modified his style, it is said on the advice of Charles VI, from mere *bravura* of the Porpora school to one of pathos and simplicity He visited London in 1734, arriving in time to lend his powerful support to the faction which in opposition to Handel had set up a rival opera with Porpora as composer and Senesino as principal singer But not even his aid could make the undertaking successful His first appearance at the Lincoln's Inn Fields theatre was in *Artaserse*, much of the music of which was by his brother, Riccardo Broschi His success was instantaneous, and the prince of Wales and the court loaded him with favours and presents Having spent three years in England, Farinelli set out for Spain, staying a few months on the way in France, where he sang before Louis XV In Spain, where he had only meant to stay a few months, he ended by passing nearly twenty-five years His voice, employed by the queen to cure Philip V of his melancholy madness, acquired for him an influence with that prince which gave him eventually the power, if not the name, of prime minister This power he was wise and modest enough to use discreetly For ten years, night after night, he had to sing to the king the same four songs, and never anything else Under Ferdinand VI he held a similar position, and was decorated (1750) with the cross of Calatrava He utilized his ascendancy over this king by persuading him to establish an Italian opera After the accession of Charles III Farinelli was asked to leave Spain, but was allowed to retain his salary on condition that he lived at Bologna and not at Naples, the reservation being imposed for political reasons He died at Bologna on July 15, 1782

See G Sacchi, *Vita del Cav Don Carlo Broschi* (1784), C Ricci, *Burney, Casanova et Farinelli in Bologna* (1890), J Desastre, *Carlo Broschi* (1903), Franz Habock, *Die Gesangkunst der Kastraten* . (1923)

FARINGDON, properly GREAT FARINGDON, a market town in the Abingdon parliamentary division of Berkshire, England, 10 m N W of London on a branch of the G W R from Uffington Pop of civil parish (1921) 2,758 It lies on the slope of a low range of hills which borders the valley of the Thames on the south The old church of All Saints, with low central tower, is mainly Transitional Norman and Early English, and contains many monuments and brasses, including those of the Unton family (16th century) and a chapel of the Pye family, to whom Faringdon house was restored after being held by the Royalists in the Civil War The present mansion was rebuilt by Henry James Pye (1745–1813), poet laureate from 1790 to 1813, who also caused to be planted the conspicuous group of fir-trees on the hill east of the town called Faringdon Clump, or the Folly. Edward the Elder is reputed to have died at Faringdon in a palace of the Saxon kings.

FARINI, LUIGI CARLO (1812–1866), Italian statesman and historian, was born at Russi, near Ravenna, on Oct 22, 1812. After completing a brilliant university course at Bologna, which he interrupted to take part in the revolution of 1831 (*see* CARBONARI), he practised as a physician at Russi and at Ravenna. In 1843 he was expelled from the Papal States He resided successively in Florence and Paris, and travelled about Europe as private physician to Prince Jerome Bonaparte, but when Pius IX was elected to the holy see and began his reign with apparently Liberal and nationalist tendencies, Farini returned to Italy and was appointed secretary-general to G Recchi, the minister of the interior (March 1848) But he resigned with the rest of the ministry on April 29 Pius now sent Farini to Charles Albert, king of Sardinia, to hand over the command of the papal contingent to him He was again secretary to the ministry of the interior in the Mamiani cabinet, and later director-general of the public health department He resigned office on the proclamation of the republic after the flight of the pope to Gaeta in 1849, resumed it for a while when Pius returned to Rome with the protection of French arms, but when a reactionary and priestly policy was instituted, he went into exile at Turin There he contributed to Cavour's paper *Il Risorgimento,* in *La Frusta* and *Il Piemonte,* of which latter he was at one time editor He also wrote his chief historical work, *Lo Stato Romano dal 1815 al 1850,* in four volumes (Turin, 1850) In 1851 he was appointed minister of public instruction in the D'Azeglio cabinet, an office which he held till May 1852 In the Sardinian parliament and in the press Farini was a staunch supporter of Cavour (*q v*), and urged that Piedmont should participate in the Crimean War, if indeed he was not actually the first to suggest that policy (*see* G B Ercolani's letter in E Parri's memoir of Farini) In 1856 and 1857 he published two letters to Gladstone on Italian affairs, which created a sensation When on the outbreak of the war of 1859 Francis V, duke of Modena, was expelled and a provisional government set up, Farini was sent as Piedmontese commissioner to that city, but although recalled after the peace of Villafranca he was determined on the annexation of central Italy to Piedmont and remained behind, becoming a Modenese citizen and dictator of the state He negotiated an alliance with Parma, Romagna and Tuscany, when other provisional governments had been established, and entrusted the task of organizing an army for this central Italian league to General Fanti (*q v*) Annexation to Piedmont having been voted by *plebiscite* and the opposition of Napoleon III having been overcome, Farini returned to Turin, when the king conferred on him the order of the Annunziata and Cavour appointed him minister of the interior (June 1860), and subsequently viceroy of Naples, but he soon resigned on the score of ill-health Cavour died in 1861, and the following year Farini succeeded Rattazzi as premier, in which office he endeavoured to carry out Cavour's policy Ill health compelled his resignation in 1863, and he died on Aug 1, 1866

His son Domenico Farini had a distinguished political career and was at one time president of the chamber

BIBLIOGRAPHY—Several letters from Farini to Mr Gladstone and Lord John Russell were reprinted in a *Mémoire sur les affaires d'Italie* (1859), and a collection of his political correspondence was published under the title of *Lettres sur les affaires d'Italie* (Paris, 1860) His historical work was translated into English in part by Mr Gladstone and in part under his superintendence *See* E Parri, *Luigi Carlo Farini* (Rome, 1878), L Carpi in *Il Risorgimento Italiano,* vol iv (Milan, 1888), and G Finali's article, "Il 27 Aprile 1859," in the *Nuova Antologia* for May 16, 1903

FARM, in the most generally used sense, a portion of land leased or held for the purpose of agriculture, hence "farming" is equivalent to the pursuit of agriculture, and "farmer" to an agriculturist (*See* AGRICULTURE, DAIRY; FARM MANAGEMENT, etc)

FARM ACCOUNTS: *see* FARM MANAGEMENT

FARMAN, HENRI, French airman, the son of an English journalist, born in Paris, May 26, 1874, was first a bicycle racer, then a painter, later a racing motorist With his brother Maurice he made a successful biplane, in 1908 he made the first aerial voyage from Bouy to Reims, won the *grand prix d'aviation* and in 1909 the Michelin cup He founded the Farman works at Boulogne-sur-Seine, making many aeroplanes, including the *Goliath,* which made a voyage to Dakar in 1919 In 1920 he flew to Constantinople, establishing a world record for flight duration and the world height record He obtained a prize for establishing a record by remaining in the air for 34 hours

So successful were the efforts of the brothers Farman to produce a practical flying machine that a special type of aeroplane soon became known as the Farman machine The first trials of the Farman aeroplane were conducted at Issy-les-Moulineaux, during the period November 1907–January 1908 Henri Farman was the first aviator to fly 100 miles (1909) As early as 1908 he established a school of aviation and construction works at Buc, near Versailles.

His brother, Maurice, established works for aeroplane construction at a later date, but in 1912 the two brothers united their resources in merging their mutual interests. They supplied

machines not only to the French military authorities but to other countries and the Farman aeroplane was well tried and approved during the World War Other aeroplanes have improved considerably on some of the earlier Farman models, but to the Farman brothers belongs the credit of the early biplane successes

FARM BUILDINGS. There is such variety in the character and management of agricultural holdings that there must needs be equally great variety possible in the designs of the farm buildings The farmhouse and labourers' cottages could be included under this heading, but they are omitted in this reference which will be restricted to the outbuildings

Farms may be divided roughly into the following classes, pastoral farms, arable farms, mixed farms and dairy farms, but there are a great number of modifications of these systems Local customs and climatic variations also have important effects upon the design of homesteads, but the chief aim in all cases is to have just those buildings which will satisfy the primary object of the farm, the suitability of each building for its purpose and its convenience for economic work being very important to ensure success in farming

The usual homestead consists of several units bearing no relation to one another as a result of additions and alterations which have been made from time to time This lack of proper arrangement costs the farmer much time and labour which should be and can be saved if the buildings are in a compact group and well arranged

They may be advantageously planned in one rectangular block because this form lends itself to their best arrangement for economy in the working of the farm Such a plan results also in the saving of floor and roof areas, external walls and length of drainage and, in consequence, of erection and expense in maintenance

The primary points which demand most careful thought and consideration are situation, water supply and drainage. As to situation, the best aspect is generally south or south-east because it admits of an arrangement by means of which the rays of the sun are able to visit every part of the steading at some time during the course of the day With a view to easy disposal of drainage, the steading should be built on a slope and on, or within easy distance of, a public road in order to minimise the expense of the upkeep of private roads It should be as near as possible to the centre of the farm, but this desideratum should not be allowed to outweigh the other considerations Physical difficulties may be present to affect the question and in the case of some types of mixed farms it might be conveniently placed in or near to the centre of the arable portion, because the carting in such instances is a big item Again, if a river or stream is available and capable of affording a constant supply of water throughout the year it might be placed next to it even if it were not in or near the centre of the farm by so doing

The water supply, by whatever means provided, should be laid on at different and suitable points or, at any rate, the central source of supply should be in the most accessible and convenient places as regards the stable, cowsheds and yards.

The drainage requires two separate systems, one to deal with the roof and surface water and the other to carry off liquid manure If the water is not collected for use from roofs the surface drains may empty into the nearest field, ditch or pond. The liquid manure should be drained off on approved methods to a liquid manure tank which if possible should be placed in a central position so as to save expense The liquid voided by live stock has a very high manurial value and should be properly conserved

After these initial considerations attention should be given to the grouping of the buildings, and here the main principles are the same in nearly all classes of homesteads The food department should be adjacent to the cattle sheds and communicate with them by means of internal passages; the disposal of the manure should be convenient and the yards should be of economic size and accessible, so that the stock may be conveniently watered and fed.

For small holdings the number of buildings is reduced to a minimum and will consist of the barn to the north with cattle sheds adjoining to the south, thus keeping the food department close to the stock and satisfying the first principle of economic grouping

From this nucleus extension may be made to any size of holding Taking as an example a mixed farm of from three to four hundred acres, the block plan will consist usually of from three to four ranges of buildings The north range is comprised of the taller buildings of two stories and provides the food department On the ground floor of this range are, from left to right, the implement shed, the root shed, the mixing room in which all the food for the stock is prepared, the roots sliced or pulped and the chaff, corn and cake collected, the fodder store and the cart shed On the floor above and over the root store extending to the cart shed are the cake room, chaff cutting room and granary The chaff, cake and corn are delivered into the mixing room by means of traps or shoots A feeding passage runs the whole length of this range on the ground floor and communicates with the cattle sheds which are generally placed at right angles to it and in the middle of the block, the yards being on either side of them On a dairy farm, however, the cowsheds should be further away from the yards and may occupy the south range

Covered yards, well ventilated, are best as they afford shelter both to stock and manure and for that reason are an improvement on the old open yards; the manure made in them is often as much as 50% better than that produced in open yards

Lighting and ventilation of all the animal sheds, as well as their drainage, should be of the most efficient kind Light should be admitted through walls, roof or both where possible and ventilation should be introduced by means of inlets at a low level and outlets at the highest points of the buildings A free circulation of cold, fresh air goes a long way to promote the health of the stock and give them a sound constitution but it is important that the backs of the animals should not be exposed to draughts The floors of the cowsheds should be constructed of such material and in such a manner as to render it practicable to remove all liquid matter which may fall on them and the channels should be made of an impervious material

A double cowhouse is proportionately less costly than a single one for a large number of cows The cows may be planned to stand back to back or facing one another with a feeding passage down the middle of the building; if sufficient width is given to the feeding passage the latter is probably the better arrangement but on the other hand it entails the keeping clean of two dunging passages.

The cattle sheds and yards are bounded by the east, west and in some instances a south range which comprise the remaining structures needed to make the set of buildings complete for the object of the farm These may include boxes, nag stall, trap house, tool-shed, workshop, etc. Stables should be sheltered, situated on a hard road and close to the cart shed They should have an entrance from the road for the horses to enter and if possible an entrance into the yard for the manure to be thrown out

The cart and implement sheds should not face a position where the sun and driving rain will damage the paint and warp and crack the shafts From east through north to north-west is the best range of aspect

Where a silo is to be included as a permanent structure it should be an adjunct to the food department and be placed on the north range On dairy farms the piggeries should be kept separate and apart from the main block of buildings

On hill farms where the main stock is sheep, there will be several field houses and beyond these the main consideration will be the farm house and stables

Space does not permit a description of the lay-out of the other types of farm buildings but the general arrangement is the same except in the case of purely dairy farms If the dairy is not part of the farm house it should be placed beyond the reach of any sort of contamination

BIBLIOGRAPHY.—For a more detailed treatment of the subject reference may be made to the following works —A D Clarke, *Modern Farm Buildings* (1899); S. Taylor, *Modern Homesteads* (1905), C P Lawrence, *Economic Farm Buildings* (1919), W. A. Foster and D G

Carter, *Farm Buildings* (1922); J C Morton, *A cyclopaedia of agriculture*, vol 1, and articles in the *Journal of the Ministry of Agriculture*, vols 29, 30, and in the *Cyclopaedia of American Agriculture*, vol. 1. (A. H H)

United States.—Owing to the variety of types of farming, kind and quantity of stock or crops raised, economic conditions, topography, climate and other local influences there exists a considerable variation in the design, equipment and grouping of buildings, even within a single State For this reason only very general principles can be applied to the grouping of farm buildings; each farm constitutes a specific problem that must be worked out in the light of the existing conditions and particular requirements

The cost of farm buildings, particularly dairy barns, is such that the farmer has difficulty in obtaining an adequate return on his investment This has led to efforts to simplify and standardize farm building design The ultimate aims in farm structures are economic durability; economy of materials and labour in construction; arrangement and equipment to conserve time and labour in the performance of operations; and the maintenance of conditions, such as temperature, humidity, light and ventilation, which may be most conducive to the welfare of stock and the preservation of stored crops

For comprehensive discussion of the various structures and their grouping reference should be made to the publications of the U S Department of Agriculture and to *Agricultural Engineering* published by the American Society of Agricultural Engineers

FARM COLONY. An artificial settlement of unemployed persons on the land Farm colonies are relatively little known in Great Britain, but they have been in existence in Germany for 45 years and in Holland for over 90 years It was the Unemployed Workman's Act of 1905 which created the possibility of such an experiment in Great Britain A feeling had grown up amongst social and land reformers that the question of the land and the question of the unemployed were closely bound together, and therefore to several classes of the unemployed, especially the unskilled, almost the only resource was work on the land offering at least a chance of productive and useful employment

There can be no doubt about the numbers of the unemployed or the need for better cultivation of the soil, but the problem is not so easy of solution even though we have waste labour and waste land, for often the waste labour is the wrong kind of labour for agricultural purposes and very frequently the waste land costs too much to bring into cultivation There are various types of farm and labour colonies some of which are really outside the scope of this article, such as penal colonies for the unemployable There is for example the colony of Merxplas near Antwerp and two other colonies in Belgium designed to stamp out mendicity Merxplas alone has 4,500 men, and with the other two colonies at Wortel and Hoogstraten possesses about 3,000 acres of land There is a similar system in Holland, where there are three Government colonies which may be described as penal settlements for beggars and tramps

A farm colony is really designed for the unskilled unemployed As long ago as 1894 an experiment was made at a farm at Laindon in Essex by the Poplar Board of Guardians assisted by the late Joseph Fels This followed the experiment in 1893 in connection with the Salvation Army colony at Hadleigh, Essex, which is still in existence, but is now more a training farm for boys who are sent abroad to the overseas Dominions About 200 boys at a time between the ages of 14 and 19 were in 1928 being trained in this farm colony and at times there were in addition some 70 or 80 unemployed men who are being trained for agricultural work and for emigration Another farm colony was purchased in 1928 by the Salvation Army in the vicinity of St Albans. The Hadleigh colony has an area of 3,000 acres It is four miles from Southend The land is a stiff clay, rather cold and poor in character. It has however immensely improved in value About a hundred acres are planted with fruit trees and with it are pasture land, market gardens and chicken farms Hadleigh is not a very great loss to the Salvation Army and indirectly it is of immense value in the training of boys for overseas work.

In Germany there are something like 30 colonies which were founded under the auspices of the German Labour colony central board for the unskilled unemployed. These colonies were and are run by philanthropy, but subsidised by the provincial governments. The first was started in Oct. 1888 on the initiative of Pastor von Bodelschwingh. These farm colonies are run on religious lines but all unemployed men able to work are admitted without distinction of character or religion so long as there is room The only form of punishment is dismissal; colonists dismissed for bad behaviour cannot be admitted into another colony without the consent of the colony which discharged them About 50% are men of good character but in need of training Perhaps the best German farm colony is that at Lulerheim which has created out of somewhat unpromising material in the shape both of waste land and waste labour a very successful labour colony The buildings themselves have been constructed in the main by the colonists with a little paid assistance

Perhaps it is to Holland that we ought to look for the best type of farm colony for the unemployed The most famous example is that at Frederiksoord situated in Vriesland, north-east of the Zuyder Zee and about 9m from Steenwyck It is one of three, the other two being Willemsoord and Wilhelminasoord These colonies consist of 10,000 acres of heath and sand which have been brought under cultivation by townbred unemployed men, many of them over 40 years of age They are sent from the town by the Society of Beneficence Frederiksoord has a population of between 1,000 and 2,000 and the work is chiefly agricultural although it does include dairying, brick making and other trades These colonies receive married men with their families as well as unmarried men and if the man has a wife and children and is accepted in one of these colonies he is usually housed in a separate cottage with a garden and the younger children are sent to a Government school on the colony A specialty is made of horticulture in which there is excellent tuition and the gardens are a good illustration of what can be done by unskilled labour even on poor soil There are large farms in connection with the colonies and men serve a probation upon the farms, but where a colonist has demonstrated his ability to learn the industry of agriculture he is given after a probation of two years a free farm of about 7½ acres Two years is the shortest possible period of probation

It seems safe to say that farm colonies in England will not succeed without Government assistance and that side by side with such colonies there should be set up market gardens and rural industries developed upon co-operative lines In the main, however, these colonies should serve as training schools for men who wish to become agriculturalists in such countries as Canada or New Zealand In that case a loss per head is expected but the reward comes in the creation of the right kind of emigrant for the overseas Dominions (P A)

In the United States this phrase is used to indicate a group of farmers living in the same region and co-operating in some manner The best examples of such colonies are the groups of settlers on the arid and semi-arid lands of Western States who are banded together for the irrigation of otherwise unproductive land Individual settlers, with the limited means at their disposal, were unable to build the large canals and irrigation structures necessary This led to organizations of more or less compact units as water users associations or irrigation districts for financing the construction and operation of irrigation works Under the costlier Federal and irrigation district developments colonization methods have become more important The larger the number of people grouped together, the more necessary it is to have arrangements for marketing and programmes of cultivation. The 24 operating projects under the Bureau of Reclamation, Department of the Interior, have a population of more than 140,000 on 38,100 irrigated farms, and the 204 project cities and towns have an additional population of 390,200.

FARMER, JOHN (*fl* 1591–1601), English madrigalist, of whose life little is known. He was living in London in 1599 when he published his *First Set of English Madrigals to Foure Voices*, "newly composed by John Farmer," and for four years before that time he was organist at Dublin cathedral. He also set to music the thirteen canticles and hymns prefixed to the psalms

(and five of the psalms themselves) in *The Whole Book of Psalms* (Thomas East, 1592)

FARMER, RICHARD (1735–1797), Shakespearian commentator, the son of a maltster, was born at Leicester and educated at the local grammar school and at Emmanuel college, Cambridge. He graduated in 1757, became classical tutor, and in 1775 master of his college. In 1788 he became a canon at St. Paul's. In 1766 he published his famous *Essay on the Learning of Shakespeare,* maintaining that the poet's acquaintance with ancient and modern Continental literature was exclusively derived from translations, of which he copied even the blunders "Shakespeare," he said, "wanted not the stilts of language to raise him above all other men" Farmer was immensely popular in his own college, and loved, it was said, above all other things, old port, old clothes and old books.

FARMERS' CLUBS. One of the effects of the general outbreak of agricultural enthusiasm in England at the end of the 18th century was the formation of associations throughout the country for the promotion of improvements in farming For the most part these were societies which made the holding of an annual show of livestock their primary object Later on, in the early part of the 19th century, another form of association became popular. Farmers' clubs were established, their main object being to hold meetings for the discussion of questions of agricultural interest, chiefly those relating to the practice of farming. In those days no gathering of farmers—or indeed of any class—for any purpose involving prolonged attendance was conceivable unless a substantial meal formed part of the proceedings It is indeed probable that the idea of Farmers' clubs originated in the "market ordinary." In the old leisurely times the farmers of a district who met week after week round the dinner table of the favoured inn would naturally discuss farming and these discussions might in some cases take a more or less orderly and formal course.

That Farmers' clubs may have originated in some such way is suggested by the Faversham Farmers' club which was started in 1727 and still survives. This is frankly a dining club with a very limited membership and there does not appear to have been at any time any provision for discussion in its rules which were concerned only with the regulation of the dinner The meal started at 2 o'clock and members were directed by the rules not to stay later than 8 o'clock in winter or 9 o'clock in summer It may be assumed that during this 6 or 7 hours the members discussed, informally, farming questions It was during the second quarter of the 19th century that the formation of Farmers' clubs became general One of the earliest was the West Herefordshire club formed in 1839. Others were formed about the same date at Harlesden (Norfolk), Ipswich and Probus (Cornwall). In 1847 it was stated that there were then 170 Farmers' clubs in the country

The London Farmers' club was founded in 1842. It was intended to provide a club house in London where members might meet to discuss agricultural questions and where also farmers visiting the metropolis might find the ordinary facilities and amenities of a social club. It first had quarters in the York hotel, Bridge street, Blackfriars, but in 1863 these had to be somewhat suddenly vacated as the hotel was acquired and pulled down to make a site for Ludgate Hill station. At that time the Salisbury Square hotel was about to be built and many members of the club took shares, it being hoped to secure a controlling interest. The intention was expressed in the name of the Company which built the hotel, it being called "The Agricultural Hotel Company, Ltd" The club never acquired control but accommodation for it was provided and in 1865 it took up its quarters there, remaining however then only ten years, but returning in 1886. In May 1903, the club removed to its present rooms at Whitehall court.

Whether as the result of these repeated removals or for other reasons the club for many years led a somewhat precarious existence with only a limited membership. In recent years it has steadily grown in membership and influence and has now nearly 1,500 members. But throughout its career the Farmers' club has maintained a high reputation for the papers read at its meetings. They included subjects of timely interest dealing mainly with the practice, science and economics of farming. Among the subjects recently discussed have been "Intensified Grazing," "Open air Dairying," "Three times Milking," "Consumers' requirements for meat and how Farmers can supply them," "Modern Swine husbandry," "Farm Valuations," "The Liming of land," etc In its earlier days questions coming within the scope of agricultural politics were more often considered by the club. The subject of tenant right frequently engaged its attention, being discussed about a score of times in the first half century of its existence As long ago as 1847 a deputation from the club waited on Lord John Russell to urge "the necessity of some legislative enactment for the establishment of a general system of tenant right" When, 30 years later, the first legislation was passed on the subject the club strongly protested against its permissive character. On the disastrous outbreak of cattle plague in 1865–66 the club took vigorous action to impress on the Government the urgency of taking effective measures to suppress it

Local Farmers' clubs differed widely in size and importance. In some cases their activities were confined to holding periodical meetings, usually once a month during the winter, but in many cases a room was engaged at an inn in the market town for the exclusive use of members on market days Comparatively few attempted, like the London Farmers' Club, to provide a room or rooms for the use of members at all times. This type of club was practicable only when its centre was in a large town and it drew a part of its membership at least from the town and its immediate vicinity. (R. H. R.)

United States.—Numerous local or State agricultural societies were founded in the United States in the late 18th and early 19th centuries, established, largely, by city professional men to improve farming practices Such of those as survived came under the control of actual farmers In the latter half of the 19th century various national farmers' societies were formed and attained a large membership (*see* AGRICULTURAL SOCIETIES AND SHOWS).

Chiefly since 1900, many local farmers' clubs have been formed. Some of these exist for local co-operative action in purchasing, cow testing, and other activities, but most of them are social and educational Some conduct programmes with discussions of agriculture The wide circulation of farm periodicals, the extension work conducted by the Government, and the existence of numerous organizations dealing with production matters cause most of these clubs, however, to lay stress rather on marketing problems, on current events of special agricultural interest, and, most extensively of all, on community improvement. Dramatic, musical, motion picture and literary programmes are given There are occasional lectures by visiting speakers. A number of such community clubs have carried out successful movements for the erection of clubhouses for community purposes Local branches of various farm organizations, especially the Grange, perform in some communities many of the functions of local farmers' clubs

Among clubs covering a wider territory the Saddle and Sirloin Club is most conspicuous Founded in 1903, it comprises in its membership leaders in various branches of the livestock industry Membership is by invitation The club has quarters in the Stock Yard Inn, Chicago, where it maintains a livestock library and a portrait gallery of leaders in the industry It conducts essay contests for students in agricultural colleges and has stimulated the formation of clubs composed of students interested in animal husbandry

Many organizations devoted to various breeds of livestock are known as clubs, such as the American Jersey Cattle, the American Yorkshire, and the American Plymouth Rock clubs These, however, are essentially societies or associations, rather than clubs in the sense in which the word is commonly used

A number of farm women's clubs also exist Some of these are affiliated with the National Federation of Women's Clubs, while in some States they have federations of their own In Ohio more than 100 are thus federated. The programmes of farm women's clubs differ little from those of women's clubs generally In many rural villages membership of the women's clubs is made up in part of farm women, in part of women residing in town

Farm boys' and girls' clubs exist chiefly for recreation or for carrying out specific projects such as crop growing, livestock raising, canning and garden making The development of the latter type of club, partly under private auspices, partly under government encouragement, constitutes a striking phenomenon. The number of farm boys and girls enrolled in such organizations is (1928) more than 600,000 In many instances these clubs have stimulated their communities to improved agricultural and domestic practices (N A C)

FARMERS' EDUCATIONAL AND CO-OPERATIVE UNION OF AMERICA, commonly known simply as the Farmers' Union, a society of farmers founded in 1902 by Newt Gresham of Emory, Texas It was at first confined to Rains county, Texas Its success there in collective bargaining in connection with cotton led to rapid expansion, especially in the South, the Middle West and the Far West It never reached New England or the Middle States Many of the local unions were formed from still existing community branches of the defunct Farmers' Alliance, which had wielded considerable political and other power from 1879 to 1892 Co-operative enterprises of great number and variety were started Many of these soon disappeared, but others were and still are successful The States in which the Union is strongest—Arkansas, Iowa, Kansas and Nebraska—are those in which its co-operative programme is most effectively carried out The Union advocates liberal political and economic policies, including direct election of the president and of Federal judges, occupational representation in Congress, opposition to militarism and prohibition of speculation in farm products It has co-operated to some extent with organized labour The organization is democratic, endeavouring to reach chiefly the mass of farmers rather than the leaders The national side of the Union's work has been moulded largely by C S Barrett, a farmer and former teacher, who has been president of the society since 1906

See Charles S Barrett, *Mission, History and Times of the Farmers' Union* (1909), C B Fisher, *The Farmers' Union* (1920)

(N A. C)

FARMERS' ORGANIZATIONS. In the United States these organizations have grown to greater dimensions than in any other country, although they do not as yet occupy the place of supreme importance in agriculture that co-operation occupies in some other countries, for instance, Denmark For similar organizations in other agricultural countries the articles thereon should be consulted *See* also AGRICULTURE, AGRICULTURAL ARTICLES, AGRICULTURAL CO-OPERATION, AGRICULTURAL SOCIETIES AND SHOWS, MARKETING

The organizations in the United States may be grouped roughly as educational organizations, improvement associations and co-operative business enterprises In the first of these groups are the organizations which are engaged chiefly in educational work or in carrying out programmes for the betterment of the farmers' social or economic conditions or both. The second group of organizations includes those which the farmer has evolved to aid him in producing better crops and animals, such as seed-improvement associations and organizations for the exchange of information regarding cultural practices for crops, associations for improving the various strains of animals and for keeping registration records; cow-testing associations; and the calf and pig clubs The largest of the groups consists of associations which the farmer has set up to assist him in handling his business transactions This group includes more than 10,000 co-operative marketing associations, about 1,000 collective purchasing associations, about 2,000 mutual-insurance companies of various kinds and a large number of associations that furnish on a co-operative basis telephone service, electric current for light and power, water for irrigation purposes and transportation at cost.

Principal Organizations.—General farmers' organizations include the Grange, or Patrons of Husbandry, the Farmers' Educational and Co-operative Union of America, the American Farm Bureau Federation, the National Board of Farm Organizations and many others formed on practically a country-wide basis. For details of these organizations, *see* the articles dealing with them.

Marketing.—The organization of farmers for business purposes has been mainly in the field of co-operative marketing The most reliable estimates place the total annual business of co-operative marketing associations at about $2,500,000,000 This business is conducted by approximately 12,000 associations

The first nation-wide survey of the extent of co-operation among farmers was begun in 1913 Data for the years 1912, 1913, 1914 and 1915 were collected and tabulated The most complete information was secured for the year 1915. Reports were received from 5,424 co-operative associations with an estimated membership of 651,186 and an estimated volume of business amounting to $635,838,684 The largest volume of business, $289,689,200, was credited to the farmers' grain elevators Fruit and vegetable associations with $201,542,600 were second, and associations marketing dairy products were third with $89,061,300 The second survey was made in connection with the taking of the 1919 census Sales through farmers' marketing organizations at this time were reported as $721,983,639, and 511,383 farms reported sales through such organizations At the same time 329,449 farms reported purchases totalling $84,615,669 through farmers' buying associations The third survey was undertaken by the U S department of agriculture in 1921 Reports had been received from 10,500 associations up to 1925, and it is on these reports that the estimate of total business, already given, is based The interesting feature of these figures as compared with those given for 1915 is the increase in the amount of business done by cotton and livestock marketing associations In fact, large-scale co-operation in the South has developed entirely since 1920

Local Associations.—In January, 1926, there were approximately 11,500 active local co-operative associations—independent organizations and units of federations—whose members were for the most part limited to farmers using the same shipping point The local association is the earliest form of co-operation among farmers in the United States It performs, as a rule, the services of a country dealer Fruit and vegetables are assembled, packed and stored by local associations, milk is manufactured into butter and cheese, grain is bought; live stock is assembled and shipped and supplies are purchased and distributed by this type of organization In most instances such an association handles only one commodity or a group of related commodities, such as several vegetables, or butter and eggs Approximately 9,500 of the local associations operate independently They sell their products to local dealers or through commission merchants in the terminal markets In some cases they employ the services of private distributing firms, or more rarely sell direct to wholesalers

Large-scale Associations.—About 2,000 local organizations, however, are member units of federations formed for the purpose of performing the selling services which the small independent local associations cannot handle to the best advantage The federation is an organization in which the local units are the members and own the stock of the organization, if it is incorporated with capital stock. More than 450 creameries in Minnesota, for example, have affiliated to form a federation to sell the butter manufactured by them Two hundred local citrus-packing associations in California sell their products through a co-operative central agency which they own and control. In this manner the group of local units is adequately represented in the markets at a reasonable cost Approximately 50 federations were in operation in 1925 The annual sales aggregated $400,000,000, and more than 220,000 farmers were members of the local units that affiliated to form these federations.

A third type of co-operative organization is the centralized regional association The first co-operative organization of this type was formed in 1912 Since 1920, associations for the marketing of tobacco, cotton, fluid milk and dried fruit have been formed according to the centralized plan A centralized regional association usually extends over a large area, frequently an entire State, or a producing region including portions of several States It combines the functions of the independent local association and the federation All members affiliate directly with the organization It owns the local warehouses and other necessary local facilities, and performs the local functions of assem-

bling, storing, grading or processing the product in addition to the marketing functions of distributing and selling. About 75 associations of this kind have been formed Their total sales in 1925 were approximately $600,000,000 It will be noted, therefore, that approximately one-third of the co-operative marketing business was carried on in 1925 by 125 centralized regional and federated regional organizations Sales agencies for the co-operative handling of live stock have been established at 19 of the terminal markets During 1927 these agencies received live stock which sold for more than $267,000,000 Co-operative terminal market agencies have also been formed in a few markets for the sale of grain.

Capper-Volstead Act.—The rapid growth of large-scale co-operative organizations, which began in 1920, created a demand for State laws providing for the incorporation of the co-operative associations In 1927, 47 of the States had laws permitting co-operative organizations to incorporate, with or without capital stock, and to incorporate in their articles of incorporation and by-laws provisions that would ensure the co-operative nature of the enterprises Many of these laws also define the status of co-operative associations with reference to State anti-trust laws In 1922 Congress enacted the Capper-Volstead Act which, in effect, sets forth the right of producers of agricultural products to act together in associations, and prescribes certain conditions which organizations of agricultural producers must meet in order to be considered co-operative for the purposes of the act The second section of the Capper-Volstead Act provides that the secretary of agriculture may take steps to prevent the undue enhancement of prices of agricultural products by co-operative organizations

Co-operative Marketing Act.—Research, educational and service work with farmers' co-operative associations became a specific Government activity through the Co-operative Marketing Act, approved July 2, 1926 The act provided for the establishment of the division of co-operative marketing in the bureau of agricultural economics, department of agriculture, and for enlargement of the department's research, educational and service work relating to co-operative marketing of agricultural products, co-operative purchasing of farm supplies, and other co-operative activities among farmers

The steady growth of co-operative marketing among farmers in the United States indicates that it has become established as a permanent method of marketing farm products Since 1924 the development of new co-operative enterprises has been comparatively slow More effort is being directed toward strengthening existing organizations and introducing more efficient methods of marketing farm products

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FARM (STATIONARY) MACHINERY. The machines to be described here are installed in buildings on the farm and are used mainly in connection with the preparation of foodstuffs for livestock They may be operated by hand or power In the latter case some form of *transmission machinery* must be employed to enable the power unit (steam or oil engine, agricultural tractor or electric motor) to drive the machinery Where only one machine is used this is driven direct by a belt from the engine, but where a number of machines are installed it is usual to employ shafting and secondary pulleys (*i e*, belt wheels) for driving each machine When several machines are to be operated simultaneously, the drive from the engine is taken by a belt to the shafting which carries the pulleys and belts for operating the various machines. Fast and loose pulleys are usually employed side by side so that by moving the belt from one to the other on the shaft a particular machine may be started or stopped without interfering with the operation of other machines In some cases clutches may be used instead of fast and loose pulley Stationary machines must be driven at the correct speed as specified by the makers, if efficient service is to be secured, and care must be taken to see that pulleys of the correct size are used

Chaff Cutters.—The chaffing or chopping of hay and straw into short lengths is done to facilitate mixing with other food-

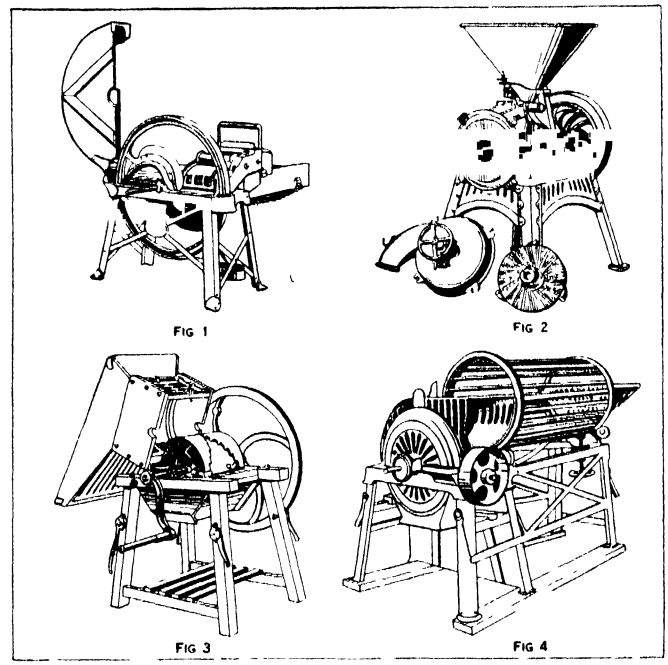


FIG 1 FIG 2

FIG 3 FIG 4

BY COURTESY OF (1) JOHN WALLACE AND SONS (2) R HUNT & CO, (3) J B EDLINGTON & CO, (4) HARRISON MCGREGOR & CO

TYPES OF STATIONARY FARM MACHINERY

Fig 1 —Chaff cutter with safety cover raised
Fig 2 —Grinding mill showing discs
Fig 3 —Rotary turnip cutter with hopper raised
Fig 4 —Root cleaner and cutter

stuffs and to assist the feeding of livestock In a modern chaff-cutter the hay or straw is fed into a trough, at the bottom of which is a moving belt for conveying the uncut fodder to toothed rollers these rollers hold the long stalks while the knives descend and cut the fodder into the required lengths The knives which may be convex, concave or straight are usually attached to the spokes of the flywheel (which is connected to the driving mechanism by a spindle or shaft), and so set that they cut the fodder against the mouth of the machine as it is pushed forward by the feeding rollers, which are driven by gearing from the driving shaft of the machine The length of cut is varied by adjusting the feeding-trough the speed of the knives can be varied to suit the cut, and some machines have three-speed gearing for this purpose The upper feeding roller is usually kept in position by a spring so that it can adjust itself to deal with uneven thicknesses of fodder Power-driven chaff cutters are required in Great Britain to have a cover over the knives and to have a device to prevent the hand or arm of the operator being drawn into the machine In hand-fed machines there is usually a device for reversing the direction of rotation of the feeding rollers in the event of the operator's arm being drawn along with the fodder As an additional safeguard, idle rollers may be placed on the outside of the feeding rollers Large machines may have dust-extractors and bagging attachments or blowers for conveying the cut fodder to a store

Mills (Crushing, Grinding, Kibbling).—These machines are used principally for milling cereals, maize, pulse, etc, before feeding to livestock, so as to aid digestion, as, for example, in the case of crushed oats, or to facilitate mixing with other fodder, *e g*, ground corn or chaffed hay or straw The degree of grinding is very coarse compared with flour, though some mills used by farmers can grind wheat sufficiently fine for making whole-meal bread In America the machines described below are known as "feed-grinders" or "feed-mills" and may have attachments for cutting

pea-vines, peanut-hay and other roughage which is afterwards ground Such machines are often fitted with bagging or blowing devices *Crushers* or *kibblers* are used mainly for oats, maize and linseed, which are bruised, broken or flattened without being ground into a meal The essential components are two roughened or fluted rollers which crush the corn as it passes between them. One roller is fixed and the other adjustable so that different grain can be crushed or the fineness of crushing varied In some machines the fixed roller has a much larger diameter than the other and serves as a flywheel The grain is fed from a hopper by gravity and the machine may be either hand- or power-driven *Grist* or *grinding mills* are invariably power-driven and utilise small disks (smooth, rough or fluted) revolving at a high speed in a vertical plane for grinding the corn which is fed from a hopper The mill is placed on a suitable stand and must be firmly fixed to a solid foundation. Stone was originally used for the grinding disks, but chilled metal and artificial or composition stones are now commonly employed The disks may be flat or conical in shape and provision is made for adjusting them to vary the fineness of grinding Where a farmer desires to grind whole-meal flour the mill may be provided with a meal-sifter Combined crushing and grinding mills are also made the essential components resemble those described above, but the hopper is usually divided into two compartments so that both operations may be carried on simultaneously

Cake Breakers.—These machines are made for hand and power operation They consist of a feeding slot and one or two pairs of toothed or spiked metal rollers which break the cake as it passes between them The distance between the rollers can be varied to alter the size of the broken pieces these are passed over a riddle in order to separate the meal and fine particles from the nuts The breaking rollers should be securely protected or covered so that there is no possibility of the man feeding the machine being trapped by them, and any cog wheels used for driving the rollers should be encased by a metal covering

Root Cleaners, Cutters and Pulpers.—These machines are used mainly for swede turnips which are hard Mangolds and white or soft turnips are usually fed whole, though they may occasionally be sliced *Cleaners* consist of a number of iron bars joined together in the form of an open cylinder which can rotate in an inclined plane The roots are fed into a hopper at one end and pass by gravitation along the cleaner as it rotates into the cutter or pulper, any loose soil falling through the iron bars in the process The rate of cleaning is regulated by altering the inclination of the cylinder to the horizontal *Cutters* or *pulpers* are of various types and may be operated by hand or power The simplest hand machine is the *stamp* or *lever* cutter which slices the roots by means of a receptacle with knives set in echelon at the sides and a hinged handle with a block of wood for pressing the roots between the knives The commonest types work on the rotary principle and have a hollow barrel or drum carrying cutting devices of various shapes on the periphery The roots are fed from a hopper and the barrel, which is mounted on a frame, can rotate in both directions so that the roots can be sliced by one set of knives and cut into fingers by the other It is usual to slice roots for cattle and cut them into fingers for sheep. For *pulping* roots, rotating disks with cutting projections are used, but these machines appear to be going out of use Power root-cutters may have an elevator for feeding the roots or for disposing of the roots after cutting.

Fencing of Machinery.—There are no general statutory requirements for the protection of farm-workers as there are for the protection of factory-workers Manufacturers make it a rule to provide guards for dangerous machinery, but many precautions must, of necessity, be left to the user. All flywheels, pulleys, belts, shafting, cog wheels, etc , which are within reach of the workers should be securely fenced or protected in order to prevent accidents Many accidents can be prevented by laying out the shafting and machinery in such a way as to remove the belting and moving-parts as far as possible from the workmen.

See also AGRICULTURAL MACHINERY

See *Safeguarding of machinery and other dangerous plant used on farms,* Ministry of Agriculture and Fisheries, London

(B. J. O ; H G. R.)

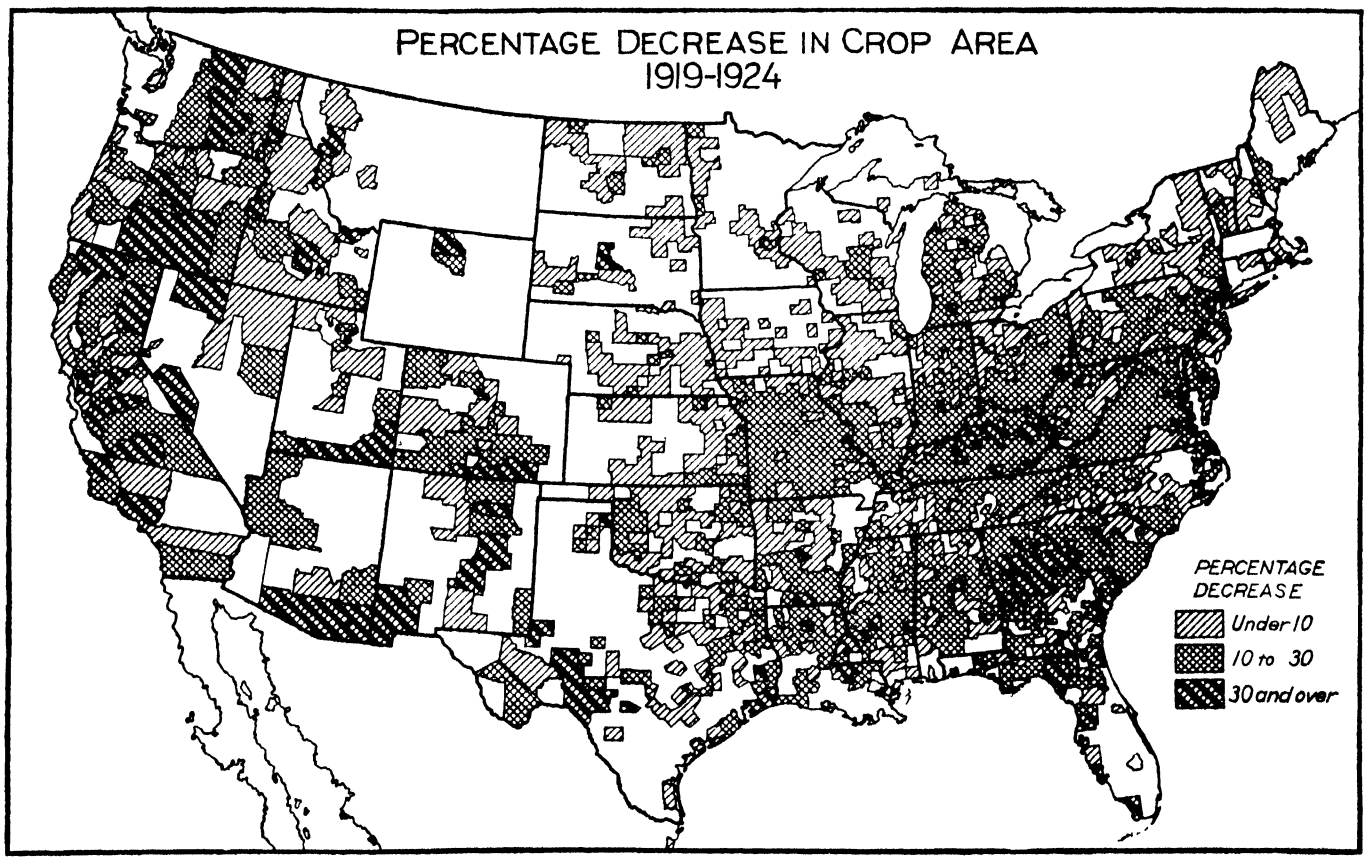
FARM MANAGEMENT. This subject is considered in this article solely in its relation to the farmer as a business man The scientific production of crops and livestock products is considered elsewhere in these pages

Farming is a one-man business in the sense that it is carried on entirely by relatively small capitalists; there is no joint-stock enterprise in British agriculture In this respect the farmer as a business man has lagged behind his brother in urban industry. The village craft has given place to the factory or the foundry with all the opportunities presented by large scale organization for mass production, specialization of labour and scientific management of every kind The farm regarded as a unit of production remains practically what it has always been, with only such modifications as have been introduced by the partial change from self-sufficing agriculture to production in a greater degree for the market This failure on the part of the farmer to participate in what has come to be regarded as progress in industry can hardly be charged against him as evidence of want of imagination or organizing ability There is probably something inherent in agriculture, as practised in this country, which makes it a one-man business. Production from the land is carried on under conditions which change from day to day and from season to season, so that departmentalization of production and specialization of labour, which are characteristic features of large scale enterprise, are impossible A man cannot be set to drill wheat all the year in the way that a man can be set to fit tyres to the wheels of motor-cars, for wheat sowing lasts for but a short time in the year Even during that period the work may be interrupted by conditions of the weather, and though the contrast is less sharply marked in the case of workmen engaged entirely in the care of livestock, it is true to say that owing to the dovetailing and interdependence of the various departments of the farm and the rapid decisions as to the work of the employees which is called for, specialization of management may be as difficult as specialization of labour, and the size of the farming unit must be determined by the limitations of the individual manager

It should be noted that these conclusions are drawn from the study of farming as it is and as it always must be in many parts of Great Britain It is not impossible to visualize conditions under which, by a completely new conception of farming, large-scale production, with its attendant advantages and difficulties, might even find its way into agriculture If it were possible to eliminate much of the "mixed" nature of farming and to limit production over large areas to one or two commodities, on the analogy of the tea and coffee and rubber estates of tropical countries, the joint-stock system might find its place This is a large question, outside the scope of the present article

Farm Capital.—As regards the provision of capital for his industry the farmer's position is almost unique Under the system of land tenure which has prevailed for the last century and a half it has been the practice for his landlord to supply the capital for what would be regarded as the factory of the industrialist, and to maintain it in tenantable condition for him in return for a small annual rent Whereas the urban manufacturer has to allocate a certain portion of his capital to the purchase of land and to the erection of the buildings necessary to his trade thereon, the farmer is provided with a factory more or less completely equipped and ready for use This is a condition which is really essential to the one-man organization of the farming industry The amount of capital required to buy and build the average agricultural holding and to stock it with the live and dead stock necessary would be far beyond the means of the individual capitalist, and any extensive upheaval in the old arrangement of this partnership between landlord and tenant will require either that the landlord's functions should be assumed by some other party, or that the size of holdings be reduced to the point at which the money now employed as working capital upon larger units will be sufficient to cover what we may term the fixed capital, represented by the land and buildings, in addition.

As regards working capital, the farmer is cut off from some of the sources available to other people by the relative insignificance of his business. He cannot appeal direct to the investing public.



BY COURTESY OF THE U S DEPT OF AGRICULTURE

FIG 1.—GRAPH SHOWING DECREASE IN PERCENTAGE OF LAND DEVOTED TO CROPS FOR THE VARIOUS COUNTIES OF THE UNITED STATES DURING THE PERIOD 1919 TO 1924

Thus he is limited to his own resources and to the estimate of his credit-worthiness which the bankers and traders with whom he deals are prepared to make This operates against him in two ways The joint-stock banking institutions lend large sums to their agricultural customers, but farming suffers from a slow turnover (the wheat crop, for example, may require financing for two years from the date of the first ploughing until the date of delivery to market) and long-term credit makes no great appeal to the banks This drives the farmer to the merchant from whom he buys his requisites, or to the cattle-dealer or the auctioneer from whom he buys his livestock, for the further credit he may require, and although many farmers owe much to their friends engaged in these occupations, the loss of independence which the practice entails is open to many abuses, which need hardly be enumerated. Thus in these two ways, the unsuitability of bank credit for a slow turnover, and the tying of the farmer to his merchant where merchant credit is sought, the farmer is at a disadvantage in securing access to adequate capital resources It is true that in this respect his case is no different from that of other small manufacturers, but there is no other industry of the magnitude of farming which is comprised so exclusively of little capitalists No satisfactory system of agricultural credit adapted to the needs of farmers in Great Britain has been devised In the peasant countries of Europe and elsewhere credit has been organised on a co-operative basis, the members of the society assuming unlimited liability for each other This works well enough in peasant communities, where every man's business and character is known. In England, where the small cultivator of fifty acres may have as his neighbour the tenant of a thousand-acre farm, co-operative credit on this analogy is obviously unworkable The most promising proposal is that which contemplates the linking up of credit with farmers' co-operative trading societies. Societies for the sale of farmers' requisites on the co-operative principle are common throughout Great Britain, but both their membership and the volume of trade they do are restricted by their rules of business These are modelled on those of the industrial co-operative societies, under which transactions with members must be for cash only It is obvious that there can be no advantage, and even certain danger, in extending credit to the industrial co-operator purchasing goods for consumption out of a weekly wage, it is equally obvious that there is every reason for extending credit to the agricultural co-operator purchasing the requisites and raw materials for the manufacture of his commodities, the process of which will occupy many months. So long as the agricultural co-operative supply societies insist upon cash payments, so long will their membership be a restricted one and the opportunity for solving the farmers' credit problem will not be attained

Farm Labour.—In its relations with labour, British agriculture is in the same position as those other industries which are regulated by the decisions of a trade board Even in the days of prosperity before the great agricultural depression of the 'eighties and 'nineties of the last century, the farming industry can only be regarded as a sweated industry, and all attempts to organize the rural worker on trade union lines failed, partly owing to the general diffusion of the agricultural population, as opposed to the concentration of the workers in urban industry, and partly owing to the decline in the demand for labour under modern systems of farming In these circumstances, and having regard to the trend of public opinion, the setting up of an agricultural wages board sooner or later was inevitable, and wages are now regulated in every county by the decision of the impartial members of a tribunal, where the representative members are unable to agree. It is unfortunate for the farmer that the standard by which these wages are regulated must be inevitably those of the great mass of the community engaged in urban industry, whereas the competitors of the English farmer in many parts of the world are living at a lower standard In these circumstances it is essential that everything be done to increase the efficiency of the English agricultural worker as measured by the value of his output, and it is here that some criticism of his employer may be justified Complaints of the inefficiency of the farm labourer are general, but

there is no apprenticeship of boys, nor any organized instruction for them in farm work They pick up what they can As adults there is no study of their work on the lines made familiar through scientific management of industry, and too little consideration of the point at which the expense of manual labour under present day conditions becomes prohibitive and at which it is an economic necessity to multiply its efficiency by mechanical power For a century the labourer was the farmer's cheapest machine and he has not yet fully adapted himself to new conditions

Distribution of Farm Produce.—Thus far the British farmer has been considered as a business man solely in relation to production The question of the distribution of his product is probably even more important at the present time With the remuneration of his workers controlled by a wages board, and with the raw materials of his industry in the hands, for the most part, of powerful combines, there is perhaps little scope for the farmer

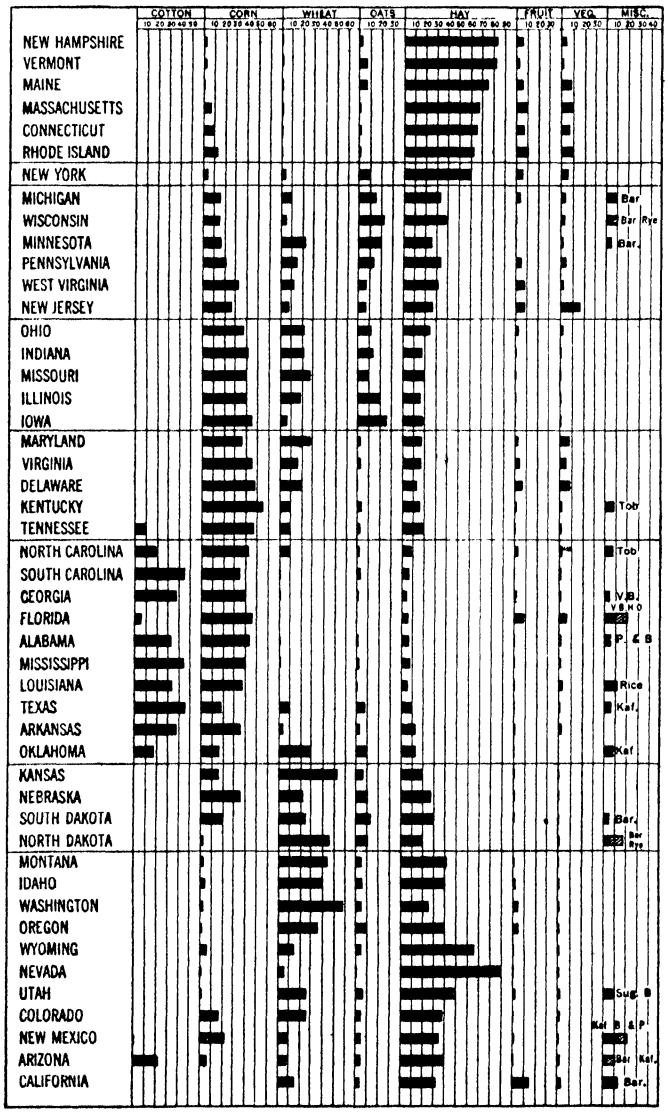


FIG 2.—GRAPH SHOWING THE PERCENTAGE DECREASE IN CROP AREA 1919–1924 AND THE PERCENTAGE OF CROP AREA OCCUPIED IN 1919 BY CROPS NAMED

in the direction of reduced costs of production On the other hand, he has never given serious attention to the possibility of economies in the traditional methods by which his produce reaches the consumer The farmer has regarded himself as a producer and has been content to leave the process of distribution to be organized for him from the outside The result has been the evolution of a chain of distributive services of extraordinary convenience to him England is covered with a complete net-work of markets and fairs, for the sale and purchase of livestock of every description. In every town of England there is a corn exchange, or merchants attend on regular days to purchase the farmers' corn

The system is so convenient, so fatally easy, that its economic weaknesses are too often obscured. The object of the farmer should be to reach the consumer by the most direct route. This involves the bulking, grading and processing of his products and their ultimate distribution amongst consumers with different requirements Take, for example, the case of fat cattle. The farmer will take his beasts, possibly one or two at a time, to the local market Here they will be offered to a highly organized group of buyers, competition amongst whom is still further reduced by reason of their different requirements Some will require fine quality large cattle for a hotel or restaurant trade; others prime quality small cattle for high class family trade, others again will want the inferior stock for the lowest class of industrial demand The small quantity of stock on offer at scores of little country markets will only attract a few buyers, whose self interest in forming a "ring" is as obvious in its policy as easy in its achievement The buyers at these small markets may be buying for their own requirements or they may be collecting stock for re-sale in the larger markets in the great consuming centres, and the wastefulness of this method of distribution needs no explanation What is wanted is a system of farmers' abattoirs, conveniently placed all over the country, to which fat stock should be sent without entering a market at all, for slaughter, grading of carcases, and sale direct to the retailers by grade and description (*See* F J Prewett, *The Marketing of Farm Produce*, Part I Livestock)

All the movement of fat stock about Great Britain, with its attendant expense and deterioration, would be obviated in this way, butchers' rings to depress prices would be impossible, and the farmer would secure the full value of his product

What is true of the marketing of fat cattle is equally true of other products Take, for example, milk Milk is produced for two purposes, namely—for consumption as liquid, and for manufacture into milk products At the present time milk is produced in roughly equal quantities for either purpose As regards price, it is obvious that the key to the situation lies in the control of the manufactured portion If the producers can manufacture all that portion in excess of the requirements for liquid consumption they can control the price of liquid milk On the other hand, if they have no organization for manufacture, and insist upon selling the whole of their production as liquid milk, leaving it to the purchaser to organize the manufacture of that portion which is surplus to requirements of liquid consumption, then it is the purchaser and not the producer who will dictate the price of milk

Obviously what is needed in the agricultural industry is the organization of producers upon a co-operative basis for the distribution of their goods There are many examples in various countries of what has been achieved by producers in this way. It must be noted, however, that in nearly every case these are countries farming to supply an export market, and where all the products of the land have to pass through a bottle-neck, so to speak, to reach their destination overseas Under these circumstances the organization of producers is immensely facilitated, whereas the task in a country like Britain, where everything grown can be sold virtually at the farm gate, presents much greater difficulty The farmer, too, is apt to be a fierce individualist, the idea of combination cuts across his notion that he can generally get the advantage in a deal, and the fact must be admitted that no society of British farmers has succeeded yet in putting up a marketing organization which can give a service of efficiency equal to that of the private trader If British farming is to retain anything more than a semblance of prosperity it is certain that many of the farmers' business methods will have to be reconsidered and ultimately reconstructed (*See* also AGRICULTURAL CO-OPERATION; AGRICULTURAL CREDIT, AGRICULTURAL ORGANIZATION, AGRICULTURAL MACHINERY.) (C S. O)

UNITED STATES

In the United States the organization of the farm is looked upon as an important part of the work of the farm manager. Farm organization and farm operation are therefore regarded as the two principal divisions of the subject of farm management;

they are so presented in agricultural schools The problems of farm organization and of farm operation overlap to a considerable extent, particularly in the matter of adjusting cropping systems and complements of livestock to changing economic conditions.

FARM ORGANIZATION

To facilitate the following discussion it may be stated at the outset that American writers on farm management generally make the following divisions of farm property

Distribution of Farm Capital	Per cent
Fixed capital (Real Estate)	70 90
Land	24 83
Buildings (including fences)	8 18
Water supply and sometimes drainage and irrigation system	
Working capital (Personal Property)	10 30
Livestock	5 13
Implements and machinery	1 5 8
Feed and supplies	1 4
Cash (or credit) for current expenses	1 2

For purposes of taxation the items listed above under the heading fixed capital are commonly termed real estate, while those listed as working capital are termed personal property

The percentage of the farm investment in the various classes of property varies with geographic conditions and with the type of farming The figures at the right of the table show the percentage of total investment in the various items found in twenty-five farm management surveys The wide variation of percentage investment in buildings is due to the fact that the surveys cover a wide variety of types of farming in different sections of the country In general, the percentage investment in buildings is small on large farms extensively operated, and large on small farms, particularly when devoted to intensive dairying The wide variation in livestock investment is due to the same causes

Leased Versus Owned Land.—The first problem in the organization of a farm business is whether to lease or to own the land An important factor determining the solution of this problem is the relative income on fixed capital and working capital In twelve American studies involving some thousands of farms, it was found that on the average fixed capital earned an income of 5 1%, while working capital earned 22 9% on the investment It is obvious, therefore, particularly when the amount of available capital is small, that it is more advantageous to farm leased than owned land Nevertheless, experience has shown that the great majority of American farmers invest their capital largely in land as soon as it becomes sufficient to permit a fair standard of living on owned land There are several reasons for this In the first place, the managerial ability of the average man is limited A considerable capital invested as working capital would provide a business larger than the average man is capable of managing efficiently As the capital grows, therefore, there is a strong tendency to invest a portion of it in land In the absence of satisfactory leasing contracts that give a tenant a share in the improvements he makes, especially in the residual fertility of the soil, the renting of farm land has usually led to the deterioration of the soil, a fact which induces many farmers to own rather than to lease land

Size of Farm.—The high wages that have prevailed in the United States since the World War have been an important factor in increasing the number of large power units and of large machines on American farms This has made it possible for the available labour to operate more acres of land and there has been a strong tendency, especially in those parts of the country where the topography is favourable to the operation of large size machinery, for the size of the farm to increase The advantages of large scale operation are emphasized when farming undergoes a period of depression This is well illustrated in the accompanying map (fig. 1), which shows decrease in percentage of land devoted to crops for the various counties of the United States during the period 1919 to 1924. This was a period of severe agricultural depression There was a very large decrease in crop area in the Ohio valley states, and in Virginia, Maryland, South Carolina, Georgia and Missouri The decrease was in general greatest in those sections where large scale operation is difficult because of rough topography

There was an increase in crop area around the western end of Lake Superior and along the western margin of the Plains Area from Texas to Montana This represents the bringing of new land into cultivation because of its cheapness In a large area extending from East Central Texas and northward to North Dakota, then eastward through Iowa, Minnesota, southern Wisconsin and central and northern Illinois, there was very little change in the percentage of crop area This latter region is in general one of good topography and for the most part of excellent soil. Farmers here are able to utilize large machinery to advantage, and in consequence were able to produce without loss in spite of the low prices that prevailed for their products It is in this region particularly that a notable increase occurred in the number of large power units and large machines during this period of depression At the same time there was a distinct increase in the size of farms in this region

Selection of Enterprises.—The next important problem in farm organization is that of determining what crops to grow and what productive livestock to keep The problem of what crops to grow is actually simpler than it would appear to be in view of the fact that the number of crops grown on American farms is very large Many of these crops are limited by climatic and economic conditions to very small acreage or to restricted localities In any one locality the number of crops that may be profitably grown is usually quite limited In general, the crop enterprises on which a farm business is based are determined by three classes of factors, physical, biological and economic

Physical and Biological Factors.—The physical factors are comprehended under the general terms climate, topography and soil The most important climatic factors are rainfall, temperatures, length of growing season and liability to injurious frosts Thus cotton is limited to the southern portion of the country by summer temperatures and the length of the growing season Corn is limited northward by low summer temperatures and short growing season, while westward it is limited by night temperatures which are relatively low in all arid regions Several instances are cited elsewhere in this article of the influence of topography on the choice of crops

Biological factors are the fungous diseases and insect and other animal pests that attack growing crops Thus wheat is excluded from warm, humid regions by rust Flax has in the United States generally been a new land crop because of the general distribution of the disease known as flax wilt on soils that have grown flax previously The destructiveness of the cotton boll weevil is an important factor responsible for the decrease in crop acreage in South Carolina and Georgia shown on the map referred to above At the present time (1929) the European corn borer is causing a decrease in the acreage of corn in the northern portion of the central corn belt

CROP ENTERPRISES

Economic Factors.—The economic factors that determine the selection of crop enterprises are numerous, the most important being the value of the product per unit of weight taken together with the cost of transportation to market A product worth less than about 1 5 cents a pound cannot be shipped to a distant market unless consumers in the distant market can pay a high price for it Thus the oat crop thrives best in the western mountain states Yields are larger and the weight per bushel much greater there than elsewhere in the country, but the cost of transportation to the principal markets is very high, consequently the oat crop in the mountain states is limited practically to local needs. The commercial oat crop is produced in much less favourable territory nearer the great market centres

Another important economic factor is competition with other regions that can produce more cheaply For example, previous to 1890, New England farmers were engaged largely in butter production They grow their roughage, but in general buy their concentrated feed from the West About 1890 the northern states of the Middle West entered into butter production on a large

scale and produced more cheaply than their New England competitors The result was a marked decrease in butter production and a large decrease in the area of land farmed in New England

Market demand is, of course, always a factor in determining the crops to grow There are only five crops grown in the United States for which there is a use or market demand for more than 10,000,000 acres of the product These are cotton, corn, wheat, oats and hay, and each of them occupies more than 40 million acres of land Together these five crops occupy 88% of the crop area American farming is therefore based in the main on cotton, corn, wheat, oats and hay

Transportation facilities are important economic factors, as are also the supply and character of the available labour and the adaptability of the crop to machine production The small grain crops, such as wheat, oats and barley, have benefited more by the introduction of machinery than any others, and they occupy a large place in the farming in those sections where the topography makes large machinery feasible Very recently large scale machinery has been made available for the cultivation of cotton and corn, and this fact is partly responsible for a recent tendency toward an increase in the acreage of these crops

Limitations on Crop Production.—In view of the limitations imposed by the above factors the list of crops from which a selection is to be made in the case of a given farm is severely restricted This is shown visually in the accompanying chart (fig 2), which shows for each of the states the percentage of crop area occupied by the crops named according to the census of 1919 This chart further emphasizes the fact that cotton, corn, wheat, oats and hay occupy the lion's share of the crop area The states are grouped in the chart according to the similarity of their agriculture. The group at the top consists of the New England States, but New York, which stands second, might very well be added to this group It is seen at once that of the five major crops the New England farmer is very closely limited to hay Cotton is eliminated and corn greatly restricted by climatic conditions So far as climate is concerned wheat and oats do very well in many parts of New England But in that section the topography is rough and the fields are small and often stony, facts which make impracticable the use of large machinery As already stated, the small grains, such as wheat and oats, are better adapted to machine methods of handling than any other crops This gives a tremendous advantage to the states of the Middle West, where climatic conditions are approximately as well adapted to wheat and oats as in New England, and where the topography is favourable to the use of large machinery These crops are thus produced much more cheaply there than in New England Because of this the New England farmer buys wheat (or flour), oats, barley and bran from the West

Examination of the two columns headed "Fruits" and "Vegetables" in the chart shows that, with the exception of vegetables in New Jersey and fruits in California, several of the New England states have a larger proportion of their crop area in crops of this class than the other states of the Union They are, in fact, producing about all the fruits and vegetables for which they can find a market in the relatively short season available to them

The above facts account for the very large percentage of hay acreage in New England, in spite of the fact that the region is not as well adapted to the production of hay as the middle western and far western states Even the production of hay could not be the basis of an extensive industry in New England were it not for the fact that the New England farmer has a very extensive market for fresh milk because of his nearness to many large cities The cows that produce this milk require large amounts of hay

In a similar manner the peculiarities of the agriculture of each of the remaining groups of states may be readily explained The reader who desires to pursue the subject further will find full explanations in Farmers' Bulletin No 1,289, issued by the United States Department of Agriculture

A glance at the chart shows the crops that must, in the main, be the basis of farming in the various groups of states The last column shows all crops not shown in the preceding columns and which occupy as much as 4% of the crop area of the various states

In the case of fruits and vegetables a relatively small acreage produces under average conditions a large return; their importance in American agriculture is considerably greater than is indicated by the chart But the total acreage of these two classes of crops is only about 4% of the acreage of all crops in the United States Yet the farming in many restricted areas is based almost wholly on fruits or vegetables

Amongst the fruits, oranges are grown extensively in California and Florida, and in small areas in other states along the southern border Lemons are confined mostly to California; peaches are grown extensively in central and southern latitudes, pears, mainly in the Pacific Coast States, while prunes and cherries are important commercial fruit crops on the Pacific Coast

The small fruits or berries, mainly strawberries, but with some blackberries and raspberries, are grown commercially in restricted areas widely scattered over the country, mostly in central and southern latitudes The advantages of cooperative marketing are believed to account for the increasing concentration of acreage of the berries

The commercial production of table vegetables is largely concentrated in areas of favourable soil near cities Several localities in the southern states grow vegetables to supply northern cities in winter and early spring

Major Crop Areas.—In summary of what has been said about the selection of crops, attention is called to the major type of farming areas in the country These areas are indicated by the grouping of the states in the chart Of first importance is the great Central Corn Belt, extending from Ohio to eastern Nebraska Corn is here the dominant crop This is the region where the major portion of the beef cattle and hogs are fattened

Lying to the north and northeast of the Corn Belt is a group of states in which dairying is the dominant industry, hay occupying a larger acreage than any other crop In general, the dairy industry is well developed only in those sections of the country where it is the only generally available industry for the farmers

In the far South lies the Cotton Belt, which extends from southern Virginia southward and westward to California The high prices of cotton which prevailed during the World War, and part of the time subsequently, have caused an enormous westward extension of the cotton area and an important extension northward Many millions of acres of land are still available for cotton production in the United States The introduction of cotton on these acres awaits only a market demand sufficient to absorb the product at a satisfactory price

Lying between the Cotton Belt and the central Corn Belt is a group of states, extending from Maryland to Kentucky and Tennessee, which may be called the South Central Corn Belt Corn occupies a larger percentage of the crop acreage in this group of states than in any other This is not because they are better adapted to corn than the Central Corn Belt states to the north of them; it is rather due to the fact that for the most part they lie too far north for cotton, too far south for wheat and oats, and have rainfall sufficiently heavy to make the curing of hay a precarious business In this group of states the dairy industry has recently been advancing rapidly merely because of the absence of other satisfactory enterprises As the demand for dairy products increases these states will probably become a more important factor in the dairy industry

A fifth group of states lies in the Plains region to the east of the Rocky mountains They are devoted largely to wheat production and to the range industry, with cattle and sheep Finally, we have the great group of far western states, consisting of the three Pacific Coast states and the nine Mountain states In most of these wheat and hay, mainly alfalfa, are the dominant crops These states are as yet, for the most part, sparsely settled, most of the land now cultivated being under irrigation, though there are extensive tracts with sufficient rainfall to permit wheat production without irrigation There are possibilities of great extension of agriculture in this region, particularly with the further development of irrigation projects.

Livestock Enterprises.—The principal livestock enterprises of the country are dairying, including production of market milk, and production of factory milk, beef cattle, including the raising of calves, and the fattening of beef cattle; swine, for the production of meat and lard; poultry, for eggs and meat; and sheep, for wool and lambs. The horse and mule industry was formerly important and many farmers devoted themselves largely to the raising of colts. But mechanical power is rapidly replacing horse power on American farms and the breeding of horses has become a precarious business. In all these forms of livestock farming the production of high quality breeding stock may become a principal feature of the business About 3% of the cattle and swine of the country are recognized as belonging to the improved breeds, the other 97% consisting of various grades and crosses of the improved breeds. The purebred stock furnish the better class of farmers with breeding animals

Market Milk.—This phase of the dairy industry is for the most part concentrated in the vicinity of cities and towns. It is a more profitable form of dairying than the production of factory milk. At the present time the dairy industry of the New England states is almost exclusively confined to the production of market milk This phase of the industry is also found highly developed in considerable areas about such cities as Cleveland, Detroit, Chicago, St Louis, Minneapolis and St. Paul, Seattle and Tacoma in the State of Washington, Portland, Oregon, and San Francisco and Los Angeles in California. Smaller developments are found in the vicinity of all cities

Factory Milk —Production of milk for sale to factories producing condensed milk, butter or cheese is the most extensive phase of the dairy industry in this country The business is largely concentrated in the northernmost of the middle western states, where feed is cheap and where the winters are long and severe. As already explained, this form of dairying began in the last decades of the previous century to shift from the New England states to the Middle West At present the industry is extending northwestward into the Northern Plains and Mountain States, and has long been important and increasing in the Pacific Coast States.

Raising Beef Calves —About half the beef calves are raised on ranches in the West, the other half on farms in the Middle West, and to some extent all over the country This is an extensive type of farming and produces low income from land devoted to it In the Corn Belt, where many steers are fattened, farmers quite generally keep a few beef cows mainly to consume corn stalks, unsalable hay, or other waste products, and incidentally to raise calves for the fattening pens On such farms the raising of beef calves is usually a minor enterprise In the arid regions of the far West, where the grazing is sufficiently good for cattle, the raising of beef calves becomes a principal business

Fattening Beef Cattle.—The fattening of beef cattle is mainly an industry of the region producing a surplus of corn. This means the Central Corn Belt In the far West a considerable number of beef cattle are fattened on alfalfa hay alone, or in combination with grains, mostly barley and oats In the Cotton Belt, a few cattle are fattened on cottonseed meal, the hulls of the cottonseed being fed for roughage The fattening of beef cattle is a somewhat speculative business because of the irregular changes in the price of cattle. When the price is rising the business may be quite profitable; when it is falling heavy losses may ensue When prices are steady, feeders usually count on the manure for their profit An important advantage in feeding steers is that the manure is a valuable fertilizer

Pork Production —Swine are kept as scavengers in all parts of the country, but extensive pork production is confined mainly to the region of cheap fattening foods, especially in those parts of the Corn Belt states where the yield of corn is high. In recent years the acreage of corn and the number of hogs fattened have increased markedly in the northern Plains States The industry may, in fact, be said to be moving in that direction

Poultry.—Chickens are kept on farms everywhere, for the most part in flocks of 25 to 150. These small flocks find most of their living about the barn lot and in the insect and weed seeds they can find about the farm. Until about 1890, these ordinary farm flocks produced a sufficient quantity of eggs to supply the needs of the urban population But in the last decade of the century the growth of cities became so marked that the ordinary farm flocks no longer sufficed to supply the demand; then came the development of the commercial poultry farm At the same time the great Middle Western portion of the country, where grains are cheap, increased the size of their poultry flocks A continued increase in the demand for poultry products has led to extensive development of commercial poultry farming on individual farms here and there in most of the states The major development has been in New England, New York, New Jersey, Pennsylvania, and on the Pacific Coast

In recent years the introduction of culling has increased the profitableness of the industry The culling process consists in a careful examination of the individual hens and the discarding of those evidently not good layers When the process was first introduced it resulted in discarding about 40% of the flocks culled, greatly to the advantage of the poultryman The method of cross breeding for the double purpose of securing increased egg-laying ability and of distinguishing the sexes at hatching, originally suggested by Punnett, of England, and widely adopted amongst English poultrymen, has been neglected in America. Its general adoption would still further increase the profitableness of the poultry industry

Sheep —Shortly before the beginning of the World War the supply of wool had fallen below world demand, and prices had risen to the point of considerable profit The sheep business has remained profitable in the United States since that time except that in 1920, when the financial depression became severe, woollen mills found themselves with enough imported wool on hand to supply the decreased demand for woollen clothing for nearly a year In consequence, American wool became unsalable But within a year the supply of imported wool had been consumed and the price of American wool went back to its pre-war level, where it has since remained

Goats —Goats are unimportant except in a few localities In southwest Texas there is a considerable area where goats are run in large numbers on the ranges They are of some importance on farms in western Oregon and on ranges in Arizona, New Mexico and Utah. For the most part the range goats are Angoras In the southern states, where livestock farming is little followed, the ordinary goat is quite widely kept in small numbers as a source of meat on farms. Since about 1900 several of the milk breeds of goats have received attention They are becoming fairly common in the vicinity of cities as a source of supply of milk for infants and invalids The most important development of this industry is in the Pacific Coast states, particularly California

Changes in Types of Farming.—A marked change in economic conditions, as, for instance, a drop in the price of a product because of overproduction, may cause a large region to shift from one type of farming to another Thus the high price of wheat during the war led to a 50% increase of wheat acreage in the United States. The low prices that have prevailed since the war have caused a return toward pre-war organization types Much work is yet to be done before a full understanding can be had of the forces that control types of farming in the various sections of the country

FARM OPERATION

In the operation of a farm business it is necessary every year to make decisions that may affect the farm organization It is just here that the subjects of farm organization and farm operation overlap A change in prices or the advent of an insect pest may make it desirable or even necessary to reduce the acreage of some crop or even to eliminate it entirely In any event the operator must decide each year in advance the acreage of each crop to grow, and the numbers of livestock of the various kinds to keep during the year. Fixed rotations are not common on American farms, but in some parts of the country the crops that are grown have more or less of a fixed order Thus, in localities where corn and the small grains are important, corn usually follows sod, or a previous corn crop; oats, sometimes wheat, follow corn, and wheat follows oats or wheat. Sod crops, usually timothy and clover (in the northern and eastern states), follow wheat Corn may occupy the land

one or two years; oats, one year, wheat, one or two years, and the sod crop from one to several years. This elasticity in rotation makes changes in the cropping system comparatively easy American farmers make such changes freely, usually in response to changes in the price of farm products

Maintenance of Soil Fertility.—Much of the land in America is so new that relatively little attention has been given to the maintenance of soil fertility. Along the Atlantic coast and in those portions of the southern states where the soils were originally not highly fertile, the practice has developed of using considerable quantities of commercial fertilizers Little else has been done with a view to maintaining soil fertility, though the subject is one of incessant study on the part of the various state experiment stations During the present century the use of commercial fertilizers has extended westward into the Mississippi valley Extensive tests are being conducted by experiment stations in the central part of the country to determine best practice in the use of fertilizers In the Corn Belt States, where much livestock is kept, farmers have generally depended upon barnyard manure as a means of keeping the soil fertile The future will undoubtedly see much change in practice in the matter of maintaining soil fertility

Labour.—About two-thirds of the farms in the United States are family farms This means that the labour on them is done largely by members of the farm family On the remaining third hired labour is regularly employed Even family farms employ hired labour at harvest time Restriction of immigration following the World War has resulted in reducing the supply of labour, in consequence of which there has been a marked rise in wages This has worked a hardship on American farmers, for the prices of farm products have not increased in the same ratio as the rate of wages and the cost of what the farmer has to buy High wages have been to a marked degree responsible for the greater use of large farm machinery The result has been a reduction in the number of labourers required on farms, and also a reduction in cost of production

Farm Records.—Very few farmers attempt to keep even approximately complete records of their operations On a family-sized farm it is usually possible for the operator to keep in his head the main facts of his business Records are thus of much less value to him than they would be in the case of a large and complex business One reason for the relatively few farmers who keep records is the fact that while it is easy enough to keep the daily record it requires considerable expert knowledge to summarize such records and make them useful Cooperative employment of experts to keep farm records has not been as highly developed in America as it has been in certain countries of Europe A few such cooperative organizations are in operation, particularly in Illinois, where the state experiment station has fathered the movement The results have been very satisfactory and the movement is extending Nevertheless, on the better conducted farms of the country one finds some kind of records kept On some farms these records are in sufficient detail to permit a financial balance sheet to be made from them

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FARMING THE TAXES. A method of collecting taxes indirectly through contractors instead of directly through officials of the State The system is best known through the *publicani* of Rome, who formed companies or syndicates to farm not only the indirect taxation of the state, but also sources of the state revenues, such as mines, fisheries, etc. (*see* PUBLICANI)

In monarchical Europe, which grew out of the ruins of the Roman empire, the revenue was almost universally farmed, but the system was gradually narrowed down until only indirect taxes became the subject of farming. France from the 16th to the 18th centuries is the most interesting modern example. Owing to the hopeless condition of its revenues, the French government was continually in a state of anticipating its resources, and was thus entirely in the hands of financiers In 1681 the indirect taxes were farmed collectively to a single company of forty capitalists (*ferme générale*), increased to sixty in 1755, and reduced to the original number in 1780 These farmers-general were appointed by the king for six years, and paid an annual fixed sum every year in advance The taxes which they collected were the customs (*douanes* or *traites*), the *gabelle* or salt tax, local taxes or octrois (*entrées*, etc.), and various smaller taxes They were under the management of a controller-general, who had a central office in Paris The office of farmer-general was the object of keen competition, notwithstanding that the successful candidates had to share a considerable part of the profits of the post with ministers, courtiers, favourites, and even the sovereign, in the shape of gifts (*croupes*) and pensions

The rapacity of the farmers-general was proverbial, and the loss to the revenue by the system was great, while very considerable hardships were inflicted on the poorer contributors by the unscrupulous methods of collection practised by the underlings of the farmers In addition, the unpopular nature of the taxes caused deep discontent, and the detestation in which the farmers-general were held culminated in the execution of 32 of them during the French Revolution and the sweeping away of the system

FARM ORGANIZATION AND EQUIPMENT. The study of the organization of the farm is a comparatively recent development of modern agricultural research In its earlier stages the investigation of the farmer's problems was confined to matters arising out of the application of the physical sciences to the production of crops and the feeding and breeding of live stock More recently it has come to be recognized that important as this aspect of agricultural development undoubtedly is, farming is also a business, the successful conduct of which can be determined only by a study of its economic structure The production of crops and stock is in many respects an art, but it is an art by which the farmer has to live, and maximum productivity secured by the uncontrolled application of scientific knowledge concerning the properties of feeding stuffs and manures is not always synonymous with maximum profit

Law of Diminishing Returns.—So long ago as 1879 Sir John Lawes (*q.v.*) drew the attention of farmers to this question He showed that there was no necessary connection between maximum production and economic production The point at which increased production becomes unprofitable depends upon the price of the commodity, other things being equal; in a rising market this point will rise and the farmer will be justified in farming for a higher output

An illustration of the importance of the study of organization is to be found in the comparisons which are often instituted between the intensity of farming in England and in certain Continental countries, notably Denmark Only by the study of farm organization, both at home and abroad, can a proper interpretation be placed upon crude statistics of agricultural production, which are apt to prove dangerous weapons without it The case of Denmark is cited as an example of what can be done to develop production from the land without the artificial stimulus applied in certain other European countries It is pointed out that, notwithstanding a fiscal policy which admits of free imports of agricultural produce, Danish agriculture has flourished during a period in which the industry in England has been stationary; the extent of arable land, and, with this, the agricultural population, has been maintained whilst the land of England has been going back to grass to the accompaniment of an exodus of the rural population; that the yield of the soil of Denmark has steadily increased until it has reached a point considerably in excess of that of this country (*see* DENMARK: *Agriculture*).

In their crude form these statements appear to be justified, but a study of the organization of farming in the two countries

gives a satisfactory explanation which involves no reflection on the business acumen and technical capacity of the English farmer The economic circumstances which give rise to the differences in agricultural progress in England and on the Continent may be classed under two heads. (*a*) the proportion of small farmers, and (*b*) the competition of urban industries. (*See* LAND TENURE, TARIFF)

Size and Efficiency As a Productive Unit.—The maintenance of a high standard of production is very generally associated in Continental agriculture with farming in small units, and the advocates of the extension of the small-holding movement in this country base their case very largely on this fact Figures collected in the course of investigations of farm organization go to show that this extra production is apparent rather than real, and that it is purchased by the expenditure of capital and labour which would be more productively employed on larger areas Here is a table showing the manual labour and the horse labour requirements of farms in three agricultural districts, grouped by size; it will be seen that in each of them the labour required in production, whether manual or horse, varies inversely with the size of the holding, or, alternatively, that the efficiency of labour varies directly with the size of the holding —

Size group	Persons employed per 100 acres	Draught horses employed per 100 acres
Acres	No	No
District 1		
Under 50	7 1	4 4
50 100	5 0	3 7
100 150	4 0	3 0
Over 150	2 4	2 5
District 2		
Under 50	7 1	5 1
50–100	6 4	3 7
100–150	4 2	3 5
150–250	3 3	2 5
Over 250	2 6	2 1
District 3		
Under 100	4 1	5 3
100–300	3 0	3 7
300–500	2 3	2 6
500–700	2 5	2 3
700–1,000	2 3	2 3

It might be argued, however, that the higher labour requirements on the smaller farms are the measure of their greater productivity, and the following table, showing the extent to which the production per unit of land and per unit of labour is affected by the size of the holding, supplies some confirmation of this The sales per acre in the group given below (which corresponds to District No 2 in the above table) show that the total production varies inversely with the size of the farm. The economic effect of this, however, is considerably discounted by the next column, showing the sales per person employed, when once more the greater advantage of the larger holdings is clearly indicated.—

District 2 Size group	Sales per acre			Sales per person employed		
Acres	£	s.	d.	£	s.	d
Under 50	11	19	9	168	19	0
50–100	9	19	2	156	2	0
100–150	7	19	1	189	0	0
150–250	7	5	8	222	12	0
Over 250	8	4	4	316	19	0

In a country where alternative employment is available to an extent such as is general in Great Britain, and at higher wages than those prevailing in agriculture, it is clear that the tendency of agricultural development must be in directions which will increase the value of the unit of labour—in other words, the movement will be towards large-scale production.

To consider, now, the capitalization of the farm, evidence of the influence of size is afforded by the table below, in which is shown the value of the implement equipment, per 100 acres, on farms in three other districts. Here, again, it is apparent that the capital cost of the implements per unit of land falls as the size of the holding increases

District A		District B		District C	
Size Group	Value of equipment	Size Group	Value of equipment	Size Group	Value of equipment
Acres	£	Acres	£	Acres	£
Under 100	446	Under 100	374	0–49	328
101– 300	286	101–180	266	50–99	294
301– 500	192	181–300	212	100–149	269
501– 700	164	Over 300	157	150–199	234
701 1000	173			200–299	213
				300–499	179
				Over 500	139

The question at once suggests itself—"What is the economic unit of production?" The answer will not be forthcoming until more work on the study of farm organization and equipment has been carried out In some of these tables it will be observed that the rate of variation slows down as the size of the holdings increases, in fact, if curves were plotted they would rise or fall steeply through the smaller size groups and then tend to flatten out from about the 300–400 acre farm upwards In other words there is evidence that the "economic unit" of farming in the districts used for the purposes of illustration, does not occur until this size group is reached, and that it continues for some considerable period above it Evidence is not yet complete on the question of a top limit, but there are certain indications that one-man management does not continue its efficiency beyond a certain point Thus, in a certain district, which contained a good many holdings extending to 1,000 acres and over, the efficiency curve rises sharply from the "under 100 acres" size group up to the "300 acres–500 acres" group, flattens out from this point up to the "500 acres–700 acres" group, and then shows a distinct tendency to fall This is illustrated in the following table, showing the production per man employed (*i e*, sales less cost of raw materials) according to size of holding.—

Size group	*Value of production per man employed*
Acres	£
Under 100 . . .	181 1
100–300	211 6
300–500	254 2
500–700	283 2
Over 700	245 1

This result is no more than an indication of what may be expected to emerge in future work, but the point is worth studying. For American conditions, *see* UNITED STATES *Agriculture*

However, the study of farm organization according to the size of the holding gives other results besides evidence of efficiency. The next table shows the influence of size on the nature of the farmer's business. In the district chosen it is clear to what an extent dairying concerns the small farmer, while sheep raising and corn growing become intensified as the size of the farm increases It is interesting to note that as regards meat the size has very little influence on the quantity produced, but an examination of the data shows that it is mainly pork and veal in the case of the smaller groups, and beef and mutton in the case of the larger ones

Production per Acre

Size group	Meat	Dairy produce*	Per acre		Potatoes	Hay	Straw
			Wool	Grain and Pulse			
Acres	lb	lb	lb	lb.	lb	lb.	lb.
Under–100	56	638	.	353	46	163	7
100–300	46	340	0 9	355	15	140	49
300–500	42	128	1 0	498	31	219	166
500–700	50	148	1·2	451	358†	202	78
700–1,000	50	72	2·0	484	25	178	110

*In terms of milk. †This high figure is due to the influence of one farm in the group which specialized entirely in potatoes

Economic Research.—On the continent of Europe investigation has been conducted mainly by the aid of book-keeping, directed towards the determination of the cost of the main products of the farm, the capitalization of different farming systems, the rental value of the land, the labour income of the peasant and so forth In particular, the work of Dr Ernst Laur amongst the Swiss peasant farmers and that of Dr O H Larsen, in Denmark, may be cited In America a great development of economic study of the agricultural industry has been witnessed during the present century About the year 1905 "farm management" became definitely a subject of study at the hands of the technical staffs of the agricultural colleges As on the continent of Europe, book-keeping afforded the principal instrument of study, and cost investigations were conducted in most of the clearly defined crop areas Following the formation of the American Farm Management association, a few years later, by those engaged in this work, the attention of economists as well as of agriculturalists was attracted to this subject The number of workers in the field increased rapidly, methods of study were rapidly developed and the association was reconstituted as the American Farm Economic association (*see* FARMERS' ORGANIZATIONS)

In England, the study of farm organization and equipment on a systematic basis dates from the establishment of the Agricultural Economics Research institute in 1913, as a result of an application by the University of Oxford to the Ministry of Agriculture for a grant in aid of economic research in agriculture As in other countries the institute started its work by the costing method, and allowing for the interruption caused by the war it has continued with it as one line of investigation ever since Costing is, of course, only the means, it is not the end itself and it may be useful to those who have not studied the process to give a few examples illustrating the kind of information got from this rather complicated exercise

First, there is the evidence it supplies on the efficiency of farm management in all its aspects To take one of these for example, the use of manual labour One object of any system of farming should be to give employment to a regular staff of men at all seasons of the year Few systems do this better than the ordinary four-course rotation and some of the modifications of it, but many rotations make the farmer dependent to a large measure on casual seasonal labour The results of costing show that dependence on casual seasonal labour has the effect of raising unit labour costs, and though systems of farming involving much seasonal labour are often justified on account of the usually profitable nature of the crops grown (as in the case of potatoes), it may well be that in certain cases the relative costliness of the labour involved may lead the farmer to consider whether after all it gives him an adequate return for the extra working capital and trouble involved The introduction of silage or of the sugar beet crop into the rotation can have a very upsetting effect on labour organization, unless plentiful supplies of casual labour are available at the right seasons, and cost records are the only means by which to confirm or correct the farm-manager's general ideas of the economic value of these and other new crops.

To take, as a second example, the organization of the horse labour on the farm It costs so much to keep a horse for the year, and on the great majority of farms the figure does not vary very appreciably But it does not follow that there is little variation in the cost of horse labour, for the cost of a day's work depends not only on the cost of keeping the horse, but on the number of days during which it is effectively employed Allowing for Sundays and Christmas day and for Saturday half-days, the maximum number of working days is 286 in the year, and every day less than this number worked by horses adds proportionately to the cost of the labour performed Figures collected recently from seven farms showed that the percentage of idle days varied from 13% up to 39%, and it will be realized how seriously the cost of horse labour mounts up in proportion as the number of idle days increases. This is a typical example of the way in which costing may direct the attention of the farmer to possible weaknesses in his management It may be simply that he has too many horses, in which case results such as these will make him consider the possibility of their reduction. It may be that his system of cropping is such that he needs an abnormal equipment of horses at certain seasons of the year, in which case he will be led to consider whether his system is so profitable as to make the idle horses at other seasons worth while, or whether he could not modify it in some way which would enable him to keep his horses more regularly employed.

Costing and Labour Costs.—A third example of the use of costing is the compilation of comparative labour costs, to establish measures of individual efficiency in the use of manual labour. The figures in the following table, compiled by A Bridges, represent the normal utilization of labour for crops and live stock on a series of farms in the eastern counties of England; similar figures have been published by Dr A G Ruston, of Leeds, and various tests of a like character can be devised which serve as standards of efficiency for other aspects of farm management

Average Labour Requirements of Farm Crops and Stock Arable Land

	Man days per Acre
Cereal Crops	
Winter Wheat	6 85
Spring Wheat	6 58
Winter Oats	7 58
Spring Oats	6 21
Barley	7 13
Beans	6·50
Peas	10 23
Root Crops	
Turnips and Swedes (eaten off)	8 31
Mangolds	16 73
Potatoes	33 80
Carrots	61 42
Seeds	
Mown	2 18
Grazed	0 71
Grass	
Meadow Hay	2 09
Pasture	0 09
Live Stock	
Cows	23 00
Other Cattle	7 13
Pigs	1 90
Sheep (Arable Breeds)	1 29

In the absence of data such as these nothing is more baffling than the attempt to trace leakages in farm management which cannot be located by any other means and which are often most surely responsible for the difference between profit and loss in farming In a great number of cases the partial failure of the farmer is due to faulty organization of labour or to some similar cause which defies detection by any process of inspection As the practice extends of recording daily the operations on the farm it will be possible to establish, district by district, certain efficiency standards by which to test individual farm management A good example of what has been done already in this direction is afforded in the case of milk-recording where, by careful observation and record, the farmer is provided with the means of weeding out the unprofitable elements in his dairy herd The case provides an illustration of that which will be possible in many other directions when full records of the various matters arising in farm management are available, and similar weaknesses in the organization of production can be detected

Although the costing method was thus the first line of attack on the problems of agricultural economics it was always realized that it would not be sufficient in itself, and it was suggested that valuable information could be collected by means of economic surveys of farming districts. The evidence to be got in this way is less complete than that furnished by the more intensive costing method; on the other hand, a much greater mass of it can be collected by the expenditure of an equal amount of time and energy. At the outset, these surveys were planned to deal with particular problems; thus, A. W. Ashby conducted a survey of allotments and small-holdings in Oxfordshire, as the basis for a study of the rural allotments and the small-holding problems, and similarly, J. Orr conducted surveys of the systems of farm management in the counties of Oxfordshire and Berkshire, and considered the problems arising therefrom. But this method was found to be incomplete, for although it may happen that special

problems will arise for investigation, the study of farm economics as a whole cannot best be pursued by the examination of particular questions. It was decided, therefore, to inaugurate general surveys, designed to collect all the information of any kind whatever which can be got by inquiry on the farm, for tabulation in a variety of ways, and then to study the tables in order to see what information they afforded The method has been made familiar by the work of American farm economists. This work has formed a part of the activities of the Oxford Institute, and data have been collected from nearly 1,500 farms.

A more recent investigation undertaken by the Institute is the study of the organization of agricultural marketing. The economic weakness of the existing marketing methods has often been a subject of comment, and particular attention has been attracted to it by the report of the departmental committee on distribution and prices of agricultural produce It was felt that it should be possible to organize an advisory service for farmers in marketing problems, in fact, that such a thing should be an essential part of the general advisory services available to them (*see* AGRICULTURE; AGRICULTURAL ARTICLES; and MARKETING).

Since 1922 arrangements have been completed by the Ministry of Agriculture for the local study of farm organization and equipment throughout England and Wales, to supplement the work carried on by the Agricultural Economics Research Institute at Oxford and with this body as a co-ordinating centre For the purpose of advisory work of all kinds among farmers the country was mapped out, some years ago, into provinces, each of which is equipped with an advisory staff of experts in the various branches of agricultural science These staffs have now been strengthened by the inclusion in each of an advisory economist, who is occupied with the study of farm management problems arising within his particular province Their function is mainly to assist the farmers of their districts to greater efficiency in the control of farm management, whilst, at the same time, the information and data accumulated by them in the course of their work is available for the use of the central institute at Oxford for co-ordination and review upon a national basis

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FARM RENTS. The rent of an agricultural holding is the consideration paid for its use by the occupier to the owner It may be paid in produce, in services or in money Feudalism, which was for centuries the dominant agrarian system in Europe, resulted, in the end, sometimes after serious political disturbance, in the emergence of two main classes—peasant proprietors and tenant farmers In Great Britain the manorial organization from the earliest times included a number of small occupying-owners (eventually the class of yeoman-farmers), but the great majority of the cultivators were "villeins" occupying their allotted shares in the common field on terms of service (*see* LAND TENURE)

The first stage in the development of farm rents was the definite fixing of the amount of service, *i e*, the number of days' labour, which the tenant was bound to render to the lord of the manor. Concurrently the practice of payment in produce instead of, or in combination with, services arose In a typical instance cited by Thorold Rogers the rent was partly produce and partly labour—a quarter of seed wheat at Michaelmas, a peck of wheat, four bushels of oats and three hens on Nov 12, a cock and two hens at Christmas, with the obligation to plough, sow and till an acre of the lord's land, and some other services. The only money payment was a halfpenny on Nov. 12 and a penny at every brewing.

This was in the 13th century, but a change was rapidly taking place. Landowners required money to maintain the rising standard of living and to meet the charges falling upon them With an extending market larger and more enterprising tenants were able to sell increasing quantities of their products The commutation of produce and service rents into money payments was in the interest of both classes and proceeded rapidly, the process being accelerated after the Black Death. By the end of the 15th century money rents were general although the old tradition was often perpetuated by still including some produce in the terms of the agreement Even as late as the 18th century traces of produce rents were often found among the conditions of a farm lease.

Comparisons of modern rents with those paid in the middle ages have little meaning owing to the changed value of money. Soon after the beginning of the era of improved farming, in the latter part of the 18th century, Arthur Young estimated the average rent of English farms at 10/- per acre. Thereafter there came during the Napoleonic Wars a substantial rise in rents But after Waterloo there was a collapse Landlords were reluctant to recognise that the high prices of the war period were due to temporary causes and rents were often kept up until many farmers were ruined and large tracts of land were left untenanted Nevertheless it is stated that by 1816 reductions of rent had amounted to a gross total of £9,000,000 The depression lasted for over 20 years, but after 1840 there was a marked recovery, and agriculture entered on a period of prosperity during which rents rose steadily until 1880

During the next 20 years rents fell almost continuously but at the beginning of the 19th century they reached something approaching stability. The World War saw no such raising of rents as characterized the war period a century earlier, and although farmers made high profits landowners generally profited little. After the World War many estates were sold and there was some increase of rents generally especially where the land had new owners

Average Rents: 1925.—In 1925 the Ministry of Agriculture obtained estimates, through their crop reporters, of the average rent paid in England and Wales for eight different sizes of agricultural holdings, distinguishing in each case between (1) holdings mainly arable (70% and over arable land), (2) holdings mainly pasture (70% and over pasture), (3) mixed holdings lying between these two groups, (4) fruit and vegetable farms, and (5) poultry farms

The average rents per acre paid for holdings in each of the three chief groups are shown in the following table —

Farm Rents

Size Groups	Mainly arable	Mainly pasture	Mixed	All kinds
Acres	s.	s.	s	s.
1-5	51	64	56	62
5-20	46	53	47	51
20-50	39	44	39	42
50-100	33	37	33	35
100-150	29	33	30	31
150-300	25	30	27	28
300-500	21	26	24	24
Over 500	18	23	21	20
Average	26	36	29	31

The average rent of fruit and vegetable farms was 82/- per acre and of poultry farms 64/- per acre.

In comparing size groups it is to be remembered that as the rental of a farm includes not only the land but the farm house and buildings the rent per acre naturally tends to diminish as the acreage increases. (R H. R.)

THE UNITED STATES

The history of agricultural rents in the United States of America commences with its colonial period, during which many proprietors who had received large grants of land in colonies south of New England attempted to collect quitrents from those who occupied their land In general, the annual quitrent pay-

ments were evaded, resisted and made tardily, if at all This failure of the quitrent system hastened the breaking up of the large land holdings Sales were facilitated where full title passed Except in sections of the South where plantations exist, the majority of individual landlords now own but one rented farm each, and about half of all rented farms in the country are thus owned Cheap land or free land on which a squatter might live was so plentiful in early colonial days that unless a farm was unusually well improved or situated it had little rental value But from early times there have always been farmers who have preferred the greater comforts and certainty of existence as tenants on improved farms of older settled neighbourhoods to pioneer life on land which they might own along the westward moving frontier

Except as grantor of grazing permits in national forests, the Federal Government, the original owner of a large part of all lands in the United States, has never attempted to fill the rôle of landlord The general policy of the Government has been to get the public domain into the hands of private owners as rapidly as possible There is still much land open for occupation, but because of the marginal or sub-marginal character of this land not much of it is now passing into private ownership and it has little effect on prices and rentals paid for land already in private ownership. Permits are sold for grazing privileges in the national forests but the amount charged the stockowner is based on the kind of live stock, the number of head and the number of months' grazing, and does not concern a definite area of land rented for a definite period of time Fees charged for permits to graze in the national forests have been adjusted upward and, when in full effect, will vary with the value of each range, averaging about 14 4 cents per month for cattle and 4 5 cents per month for sheep Formerly a flat rate of 10 4 cents per month for cattle and 2 9 cents per month for sheep was charged for all permits on all ranges (see *Report* of the secretary of agriculture, p 79, 1927)

Many of the States have held land and while much State land has been leased to private individuals pending sale, it has been the general policy of the States as owners of agricultural land to dispose of it by sale to individuals The rents collected by the States have rarely been looked upon as a permanent source of income During the 18th century agricultural writers frequently mentioned the fact that land was rented By 1843 a correspondent to one of the farm papers says that one-fourth to one-third of the farms in a New Jersey county were rented, mostly for a share of the product Other notes of a similar kind indicate that the practice of renting land was early established in all the older communities Statistics on agricultural tenancy in the United States are available, beginning with the census taken in 1880 Considering as owner-operated farms those worked by part owners and managers, the farms worked by tenants were 25 6% of all farms in the United States in 1880, 28 4% in 1890, 35 3% in 1900, 37 0% in 1910, 38 1% in 1920 and 38 6% in 1925 About the same proportion of improved farm land and of land and building values is operated by tenants, but tenants work a somewhat smaller part of the farm acreage

Farm lease contracts made for a year at a time are the rule, rather than the exception, in the United States. The average occupancy of tenant farmers is only about three years and many tenant farmers move almost every year This affords frequent opportunity to adjust the lease contract to changing use values of farm land Because of the large element of speculation in the value of farm lands in the United States, the prospective income from increments in value has been prevalently considered as supplementary to rentals. In many sections of the country the capitalization of expected increments has caused net rentals to appear to be a small percentage of return on capital values Net rentals from agricultural land are much less than they were before 1914. Cash rent rose with land values up to 1920 and, like them, has fallen since that year Share rent increased in value with the higher prices received for farm products and has fallen as the price level of agricultural products has fallen Taxes on farm real estate rose with other things, but have not fallen to the extent that the gross incomes available for tax payments have fallen, and this circumstance has seriously reduced net rentals. An indication of the trend of gross rents in fertile areas may be found in Iowa, which is in the heart of the principal maize-producing section Cash rent per acre for farm land in Iowa for specified years was 1900, $3 29, 1905, $3 57, 1910, $4 22, 1915, $5 14, 1920, $8 28, 1925, $7 03 (Figures for 1900–15 inclusive are given in U S Dept of Agr. *Bulletin 1224* and for 1920–25 are from the *U S. Census*)

Taxes on rented farm real estate are generally paid by the owners The depression in agriculture, however, has caused so many farmers to turn to other ways of getting a living that much farm land is wholly unoccupied in the poorer sections, and much of the mediocre land may be leased on terms which do not return landowners a sufficient income to meet the taxes currently levied against it In the United States more farms are worked by tenants on shares than are rented for a fixed amount payable in cash The census of agriculture for 1925 showed 393,452 farms rented for cash and 2,069,156 farms worked by tenants, who either rented entirely on shares, or rented part of their land on shares and part for cash An additional group of 554,842 farmers owned a part of the land they farmed and rented the rest of it from other landowners for cash or on shares As compared with 1920, these figures reveal a comparatively large decline in cash renting and an increase in other forms of rent payment Cash-rented farms outnumber farms occupied by other tenants only in a few agriculturally unimportant States On most farms leased for a fixed amount of rent in cash or kind the rent to be paid in the next year is determined in the autumn, by competition for land by tenants and for tenants by landowners This competition is largely controlled by the current prosperity of the tenant class and by the outlook for the ensuing year. In 1920, in the 16 southern States, 104,996 farms were occupied by standing renters, *i e*, renters who pay a fixed amount of product, such as so many bales of cotton Two-thirds of this class were in Georgia and South Carolina, principally in a belt of Piedmont cotton counties In share renting the agreement varies with respect to points such as the contribution of the work, stock, equipment, fertilizer and miscellaneous expenses, as well as with regard to the share each party is to have in the proceeds On many farms primarily leased on shares there are certain fields, pastures or perquisites for which the tenant pays cash rent Cash rent is seldom paid on farms from which the landlord gets a share of the live stock receipts The payment of cash rent on crop share rented farms often is to compensate the landlord for the fact that the tenant has opportunities to obtain an income from live stock kept on fields from which a crop may not be sold to advantage

Three-tenths of the two million and more farm tenants who paid something other than cash rent for the use of land in 1925 were croppers farming in the southern part of the United States For all practical purposes the majority of croppers may be described as married labourers without capital of their own, hired to raise a cotton crop in which they are given a half share interest in lieu of wages, and advances secured by that share interest so that they and their families may live while making the crop Croppers constitute the major exception to the rule that in the United States farm tenants own the work animals and the farming equipment (O M. J, H A T)

FARM TENANTRY: *see* LAND TENURE. *Primitive;* LANDLORD AND TENANT; LAND TAXES, etc

FARM VALUATIONS. The term farm valuation is frequently used in a limited sense, to describe the statement drawn up by a professional valuer of the various items for which an outgoing tenant of a farm is entitled to be paid by the incoming tenant. This is more properly termed a tenant-right valuation. It comprises all those matters for which compensation is payable under custom, agreement or statute, including the value of hay and straw left on the farm, growing crops, tillages and the unexhausted value of fertilizers and feeding stuffs. (*See* LAND TENURE: *Economic Aspects*)

A farm valuation in the wider sense is analogous to the stock-taking in a factory or shop. It is a complete inventory of the live and dead stock on the holding, growing crops, and also labour expended in the preparation of the land for prospective crops. In

other words it is a statement representing, item by item, the amount of working capital sunk in the farm It thus forms the basis of farm accounts, and it is usually made once a year at the date to which the accounts are made up The main headings of the valuation are (1) Live stock, (2) Implements, (3) Gathered crops—corn, hay, straw, etc, (4) Growing crops, (5) Cultivations, unexhausted manures, etc.

In the case of a farmer taking a farm for the first time and consequently having to buy the whole equipment the valuation is simple. Everything is naturally entered at cost price. At the end of the year the question arises as to the basis of the valuation. A common practice among farmers is to enter the value of live stock at current market prices and similarly to enter hay, straw and corn in rick at selling value

There has been much discussion on this subject It is contended, on the one hand, that by taking the prices which would be realized in the open market, the amount of the capital actually invested in the farm on that date is shown In other words by taking market prices farmers ascertain "what they are worth" at the time

On the other hand it is argued that the object of introducing the valuation into the farm accounts for the year is to show with greater precision than is indicated by income and expenditure alone what has been the profit or loss on the year's working If the object of the valuation were to show the amount which would be realized if the farmer were giving up farming it is agreed that current market prices must be taken But it is evident that fluctuations in prices from one year to another would have the effect of increasing or decreasing the nominal value of live stock and produce A simple instance will illustrate how this method of valuation works out The selling price of hay may be £2 per ton in one year and £5 per ton in the next year If in each year the farmer had 100 tons of hay in rick the valuation would show a fictitious profit of £300, and the balance of the year's accounts would exist only on paper and would not represent the actual facts The correct method, it is claimed, is to value the hay as nearly as possible at its cost—*i e*, labour, plus rent and interest on capital

The system of cost-accounting on the lines widely adopted in commerce has been vigorously advocated in recent years The principle of the system is to allocate to each department of the farm the expenditure chargeable to that department with the object of ascertaining the actual cost of each item of produce If this is done the figures entered in the valuation for crops, etc, represent the real value to the farmer at the time In the case of breeding stock current market prices are frequently taken but if the herd or flock remains constant in number it is contended that a better plan is to take a fixed value per head As regards machinery, implements and tools the principle of valuation is fairly clear, viz, to write off from the original cost a percentage for depreciation each year. The principle, however, must be applied with discretion, as if it were strictly applied it would reduce the value of some articles to *nil* long before they were in fact worn out.

Farm valuations have long been made on more or less traditional lines and the principles on which they should be constructed form an important branch in the study of agricultural economics. At present there is no general agreement on the subject (R H. R)

FARNABY, GILES, English composer, was born in the second half of the 16th century, probably at Truro, where his family lived He began to study music in 1580, according to his own statement in his *supplicat* (Wood; *Fasti,* ed Bliss, i. 257) when he was taking the degree of Mus B. at Oxford in 1592. Beyond these facts little is known of his life His son Richard is one of the composers included in the Fitzwilliam Virginal Book No connection has been traced between Giles and the grammarian and schoolmaster Thomas Farnaby who lived about the same time The name of Giles Farnaby lives today chiefly in his contributions to the Fitzwilliam Virginal Book The Fantasia was his favourite form, but his other pieces bearing such attractive titles as Giles Farnaby's Dream, His Rest, His Humour, Up Tails All, A Maske, A Toye, A Gigge—are full of quaintness and charm One tiny piece for two virginals is only 8 bars long, others, not much longer, are marvelous in their point and precision and intensely musical in feeling

His *Canzonets to foure voices, with a song of eight parts* were published in 1598 Other works are included in Thomas Este's *Whole Booke of Psalmes* (1592) and Ravenscroft's *Psalter* (1621) The madrigal *Come, Charon, come* is in the Royal College of Music, London, another *Construe my meaning* has been edited by W Barclay Squire An autograph volume of *The Psalmes of David, to fower parts, for viols and voyce, The first Booke, Doricke Motets, The Second, Divine Canzonets, Composed by Giles Farnaby, Bachilor of Musicke with a prelud, before the Psalmes, Chromaticke* is in a private library in Philadelphia, U S A *See* the articles "Farnaby," "Virginals," in Grove *Dictionary of Music and Musicians.*

FARNBOROUGH, THOMAS ERSKINE MAY, Baron (1815–1886), clerk of the British House of Commons and historian, was born in London on Feb 8, 1815, and was called to the bar at the Middle Temple in 1838. His *Treatise on the Law, Privilege, Proceedings and Usage of Parliament* (1844) is a standard work on its subject, and has itself influenced parliamentary procedure. Sir Erskine May (he received the K C B in 1866) was examiner of petitions for private bills (1846), taxing master of the House of Commons (1847), assistant clerk (1856), and clerk of the House of Commons (1871–86) His *Constitutional History of England . . . 1760–1860* (1861–63) is an important work, which was revised in later editions by its author and remains a standard authority Erskine May died in London on May 17, 1886, a few days after his elevation to the peerage

FARNBOROUGH, an urban district in the Aldershot parliamentary division of Hampshire, England, 33¼ m S W. by W from London, with two stations on the Southern railway Pop (1921) 12,636 (including the military) The old parish church in Farnborough park has a 12th century nave and ancient timber details. Farnborough Hill was occupied by the late ex-empress Eugénie. St Michael's Roman Catholic memorial church, erected by the ex-empress for the remains of Napoleon III and the prince imperial, later received her own remains An adjoining abbey is occupied by Benedictine fathers of the French congregation Aldershot North camp is within the parish, which also includes an establishment of the Tank Corps at Pinehurst barracks, a Royal Air Force station with school of photography, and the experimental section of the Royal Aircraft establishment

FARNE ISLANDS [also Fearne, Fern or The Staples], a group of rocky islands and reefs off the Northumberland coast, England In 1921 they had only three inhabitants They extend in a line of some 6 m in a north-easterly direction from the coast The Fairway, 1½ m across, separates the largest island, Farne, or House, from the mainland Farne is 16 ac in area, and has precipitous basaltic cliffs up to 80 ft in height The other principal islets are Staple, Brownsman, North and South Wamses, Longstone and Big Harcar On Farne is a small chapel of the 14th century, with a square tower near it built a century later for purposes of defence, in which religious services are still sometimes held The chapel is believed to occupy the site of St. Cuthbert's hermitage, whither he retired from the priory on the neighbouring Holy Island or Lindisfarne He was with difficulty persuaded to leave it on his elevation to the bishopric of Lindisfarne, and returned to it to die (687) Longstone lighthouse is famous as the scene of the bravery of Grace Darling in rescuing survivors of the "Forfarshire" wrecked (Sept 6, 1838) on the Harcars Farne lighthouse is another powerful light maintained here. The rocks abound in sea-fowl, including eider duck

FARNESE, Italian family which ruled the duchy of Parma for two centuries The Farnese are first heard of as lords of Farneto or Farnese, a castle near the lake of Bolsena, and they were consuls and signori of Orvieto They seem always to have been Guelphs, and in the civil broils of Orvieto they sided with the Monaldeschi faction against the Ghibelline Filippeschi Pietro Farnese commanded the papal armies under Paschal II (1099–1118), another Pietro led the Florentines to victory against the Pisans in 1363 Ranuccio Farnese served Eugene IV so well that the pope endowed him with large fiefs, and is reported to have said, "The Church is ours because Farnese has given it back to us."

Pope Alexander VI. was the lover of the beautiful Giulia Farnese, known as Giulia Bella Her brother Alessandro, created cardinal in 1493, was elected pope as Paul III (*q.v.*) in 1534. An unblushing nepotist, he alienated immense fiefs belonging to the Holy See in favour of his natural children Of these the most famous was Pierluigi Farnese (1503–1547), who served in the papal army in various campaigns, but also took part in the sack of Rome in 1527. On his father's elevation to the papacy he was made captain-general of the Church, and received the duchy of Castro in the Maremma, besides Frascati, Nepi, Montalto and other fiefs A shameless rake and a man of uncontrollable temper, his massacre of the people of Perugia after a rebellion in 1540 and an unspeakable outrage committed on the bishop of Fano are typical of his character In 1545 his father conferred on him the duchy of Parma and Piacenza He deprived the nobles of their privileges, and forced them to dwell in the towns, but to some extent he improved the conditions of the lower classes. When Pierluigi built a castle at Piacenza to overawe its inhabitants, a successful plot to murder him was organized by the marquis Anguissola and others, with the support both of Gonzaga, the imperial governor of Milan, and of Andrea Doria (*q.v.*), Charles's admiral, who sought revenge on Pierluigi for his part in the Fiesco conspiracy (*see* FIESCO). He was murdered on December 10, 1547, and Piacenza was occupied by the imperialists

Pierluigi had several children, for all of whom Paul made generous provision Alessandro (1520–1589), was created cardinal at the age of fourteen; he was a man of learning and artistic tastes, and lived with great splendour surrounded by scholars and artists, among whom were Annibal Caro, Paolo Giovio, Della Casa, Bembo, Vasari, etc It was he who completed the magnificent Farnese palace in Rome Orazio, Pierluigi's third son, was made duke of Castro when his father became duke of Parma, and married Diane, a natural daughter of Henry II. of France Ottavio, the second son (1521–1586), married Margaret of Austria (*q.v.*), the natural daughter of Charles V, and widow of Alessandro de Medici, at the age of fifteen After Pierluigi's death Paul appointed a papal legate to Parma; Ottavio pushed his claims, but did not receive the duchy until the accession of pope Julius III (1551) This did not end his quarrel with the emperor, for Gonzaga refused to give up Piacenza and even threatened to occupy Parma, so that Ottavio was driven into the arms of France Julius, who was anxious to be on good terms with Charles, ordered Farnese to hand Parma over to the papal authorities once more, and on his refusal deprived him of his Roman fiefs, while Charles did the same with regard to those in Lombardy A French army came to protect Parma, war broke out, and Gonzaga at once laid siege to the city But the duke came to an arrangement with his father-in-law, by which he regained Piacenza and his other fiefs The rest of his life was spent quietly at home, where the moderation and wisdom of his rule won for him the affection of his people. At his death in 1586 he was succeeded by his son Alessandro Farnese (*q.v.*) (1545–1592), the famous general of Philip II of Spain, who spent the whole of his reign in the Flemish wars

His son and successor, Ranuccio I (1569–1622), was a reserved and gloomy bigot; he instituted savage persecutions against supposed witches and heretics, and lived in perpetual terror of plots His eldest son Alessandro being deaf and dumb, the succession devolved on his second son Odoardo (1612–1646), who fought on the French side in the war against Spain His failure to pay the interest of the money borrowed in Rome, and the desire of Urban VIII to obtain Castro for his relatives the Barberini (*q.v.*), resulted in a war between that pope and Odoardo His son and successor Ranuccio II (1630–1694) also had a war with the Holy See about Castro, which was eventually razed to the ground His son Francesco Maria (1678–1727) suffered from the wars between Spain and Austria, the latter's troops devastating his territory. The succession devolved, at his death, on his brother Antonio (1679–1731), with whom the male line ended The powers had agreed that at the death of the latter the duchy should pass to Don Carlos of Bourbon, son of King Philip V of Spain by Elisabetta Farnese (1692–1766), granddaughter of Ranuccio II.

The Palazzo Farnese in Rome, one of the finest specimens of Roman Renaissance architecture, was begun under Paul III., while he was cardinal, by Antonio da San Gallo, and completed by his nephew Cardinal Alessandro under the direction of Michelangelo (1526). It was inherited by Don Carlos, afterwards king of Naples and Spain, and most of the pictures were removed to Naples. It now contains the French embassy to the Italian court, as well as the French school of Rome.

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FARNESE, ALEXANDER (1545–1592), duke of Parma, general, statesman and diplomatist, governor-general of the Netherlands under Philip II of Spain, was born at Rome on Aug. 27, 1545, and died at the abbey of St. Waast, near Arras, on Dec 3, 1592 He was the son of Ottavio Farnese, duke of Parma, and Margaret of Austria, natural daughter of Charles V He accompanied his mother to Brussels when she was appointed governor of the Netherlands, and in 1565 his marriage with the princess Maria of Portugal was celebrated in Brussels with great splendour Alexander Farnese had been brought up in Spain with his cousin, the ill-fated Don Carlos, and his uncle Don John of Austria, and after his marriage lived at the court of Madrid He fought under the command of Don John in 1571 at Lepanto In the autumn of 1577 Farnese was sent with reinforcements to Don John of Austria, governor-general of the Netherlands, and it was mainly his prompt decision at a critical moment that won the battle of Gembloux (1578) Shortly afterwards Don John died, and Farnese was appointed to take his place

In military ability Farnese was inferior to none of his contemporaries, as a skilful diplomatist he was the match even of William the Silent, and he was untroubled by scruples He fomented the divisions and jealousies between Catholic and Protestant, Fleming and Walloon, and by the treaty of Arras, Jan 1579, he secured the support of the "Malcontents," as the Catholic nobles of the south were styled, to the royal cause The reply to the treaty of Arras was the Union of Utrecht, concluded a few weeks later between the seven northern provinces, who abjured the sovereignty of King Philip and bound themselves to use all their resources to maintain their independence of Spanish rule

Farnese, as soon as he had obtained a secure basis of operations in Hainaut and Artois, set to work to reconquer Brabant and Flanders. Tournai, Maastricht, Breda, Bruges and Ghent opened their gates, and finally he laid siege (1584) to Antwerp The town was resolutely defended by the citizens under Philip de Marnix, lord of St Aldegonde, who was assisted by the engineer Gianibelli (*q.v.*) Farnese cut off all access to Antwerp from the sea by constructing a bridge of boats across the Scheldt from Calloo to Oordam On Aug. 15, 1585, Antwerp was compelled by famine to capitulate The whole of the southern Netherlands was brought once more to recognize the authority of Philip But Holland and Zeeland continued to defy Farnese (*see* NETHERLANDS: *History*).

In 1586 Alexander Farnese became duke of Parma by the death of his father Philip would not permit him to leave the Netherlands; but neither would he permit him to use his veteran army to reconquer the Northern Provinces, though the moment was opportune. The king's whole energies were directed to the preparation of an Invincible Armada for the conquest of England, and Parma was ordered to collect an enormous flotilla of transports and to keep his army concentrated and trained for the projected invasion of the island realm of Queen Elizabeth Thus the critical period passed by unused, and in the interval the Dutch had found in the youthful Maurice of Nassau, a military genius. Moreover, the accession to the throne of France of Henry of Navarre had relieved the pressure upon the Dutch, and placed Parma and his army between hostile forces. The expenditure upon the Armada had depleted the Spanish treasury, and in 1590 Farnese could get no regular supplies of money from the king for the payment of the soldiery, and he had to pledge his own jewels A mutiny

broke out, but was suppressed. Parma now received orders to raise the siege of Paris, which was blockaded by Henry IV. He left the Netherlands on Aug 3, 1590, at the head of 15,000 troops. By brilliant generalship he outwitted Henry and succeeded in relieving Paris, but owing to lack of money and supplies he was compelled immediately to retreat to the Netherlands, abandoning on the march many stragglers and wounded.

Again in 1591, in the midst of a campaign against Maurice of Nassau, Parma was obliged to march to relieve Rouen He succeeded but was wounded before Caudebec, and was finally compelled to withdraw his army He died at Arras on Dec. 3, 1592. He was honoured by a splendid funeral at Brussels, but his body was interred at his own capital city of Parma He left two sons, Ranuccio who succeeded him, and Edward, who was created a cardinal in 1591 by Pope Gregory XIV His daughter Margaret married Vincent, duke of Mantua

See L P Gachard, *Correspondance d'Alexandre Farnese, Prince de Parme, gouverneur général des Pays-Bas, avec Philippe II., 1578–1579* (Brussels, 1850), Pietro Fea, *Alessandro Farnese, duca di Parma* (1886)

FARNESE, ELIZABETH (1692–1766), queen of Spain, born on Oct 25, 1692, was the only daughter of Odoardo II, prince of Parma At the age of 21 (1714) she was married by proxy at Parma to Philip V of Spain The marriage was arranged by Cardinal Alberoni (*q v*), with the concurrence of the Princess des Ursins, the *Camerara Mayor* On arriving at the borders of Spain, Elizabeth was met by the Princess des Ursins, and at once ordered her to be removed from her presence and from Spain Over the weak king Elizabeth quickly obtained complete influence, which she exerted in favour of Alberoni's policy of expansion When the French forces advanced to the Pyrenees, she placed herself at the head of one division of the Spanish army But the Triple Alliance thwarted her plans, and in 1720 the allies made the banishment of Alberoni a condition of peace Sicily also had to be evacuated In 1724 Philip abdicated and retired to the palace of La Granja Seven months later, however, the death of the young king recalled him to the throne During his later years, when he was nearly imbecile, Elizabeth directed the whole policy of Spain so as to secure thrones in Italy for her sons In 1736 she saw the accession of her son Don Carlos (afterwards Charles III of Spain) to the throne of the Two Sicilies and his recognition by the powers in the treaty of Vienna Her second son, Philip, became duke of Parma Elizabeth survived her husband 20 years, dying in 1766

See *Mémoires pour servir à l'histoire d'Espagne sous le règne de Philippe V*, by the Marquis de St Philippe, translated by Maudave (1756), *Memoirs of Elizabeth Farnese* (1746), and E. Armstrong, *Elizabeth Farnese, the Termagant of Spain* (1892).

FARNHAM, a market town in the Farnham parliamentary division of Surrey, England, 38¼ m S W. by W from London on the Southern railway Pop. of urban district (1921) 12,128, but in 1926 the area of the urban district was enlarged Farnham lies on the left bank of the river Wey, on the southern slope of a hill rising about 700 ft above the sea-level The parish church of St Andrew is a transitional Norman and Early English building, with later additions, and was formerly a chapel of ease to Waverley abbey, of which a crypt and fragmentary remains, of Early English character, stand in the park attached to a modern residence of the same name. This was the earliest Cistercian house in England, founded in 1128 by William Gifford, bishop of Winchester. The *Annales Waverlienses,* published by Gale in his *Scriptores* and afterwards in the Record series of *Chronicles,* are believed to have suggested to Sir Walter Scott the name of his first novel. Farnham Castle, on a hill north of the town, the palace of the bishops of Winchester, was first built, shortly after the abbey, by Henry de Blois, bishop of Winchester, and brother of King Stephen; but it was razed by Henry III. Rebuilt and garrisoned for Charles I., it suffered during the Civil War, and was restored by George Morley, bishop of Winchester (1662–84). William Cobbett (*q v*) was born in the parish, and is buried in the churchyard of St Andrew's. The neighbouring mansion of Moor Park was the residence of Sir William Temple (d. 1699), when Swift worked here as his secretary. Hester Johnson, Swift's "Stella," was the daughter of Temple's steward, whose cottage still stands The town has grown in favour as a residential centre from the proximity of Aldershot Camp (3 m N E).

The town of Farnham (Ferneham) grew up round the castle of the bishops of Winchester, who possessed the manor at the Domesday Survey. Its position at the junction of the Pilgrim's Way and the road from Southampton to London was important. In 1205 Farnham had bailiffs, and in 1207 it was definitely a mesne borough under the bishops of Winchester In 1247 the bishop granted the first charter, giving, among other privileges, a fair on All Saints' Day Bishop Waynflete is said to have confirmed the original charter in 1452, and in 1566 Bishop Horne granted a new charter In the 18th century the corporation, a close body, declined, its duties being performed by the vestry, and in 1789 the one survivor resigned and handed over the town papers to the bishop. Farnham sent representatives to parliament in 1311 and 1460, on both occasions being practically the bishop's pocket borough Farnham was early a market of importance, and in 1216 a royal grant changed the market day from Sunday to Thursday in each week It was famous in the early 17th century for wheat and oats, and hop-growing has been carried on in the vicinity since 1597

FARNWORTH, urban district, Farnworth parliamentary division, Lancashire, England, on the Irwell, 3 m S W from Bolton on the L M S railway Pop (1921), 27,894 Collieries, cotton mills, iron foundries, brick and tile works employ many hands

FARO, the capital of a district bearing the same name, in southern Portugal; at the terminus of the Lisbon-Faro railway, and on the Atlantic Ocean Pop (1920) 12,925 Faro is an episcopal see Its broad but shallow harbour is protected on the south by the long island of Cães, and a number of sandy islets, which, being constantly enlarged by silt from the small river Fermoso, render the entrance of large vessels impossible Fish, with wine, fruit, cork, baskets and sumach, are the principal articles of export Little has been done to develop the mineral resources of the district, which include tin, lead, antimony and auriferous quartz Faro was taken from the Moors in 1249 It was sacked by the English in 1596, and nearly destroyed by an earthquake in 1755

The administrative district of Faro coincides with the ancient kingdom and province of Algarve (*q v*)

FARO, a game of cards, played with a full pack (from *Pharaoh,* a picture of the Egyptian king appearing in a card of the old French pack) Originally the pack was held in the dealer's left hand, but nowadays very elaborate and expensive implements are used. The dealer places the pack, after shuffling and cutting, in a dealing-box, face upwards, and the cards are taken from the top of the box in couples through a slit in the side The exposed card on top is called *soda,* and the last card left in the box is *in hoc* The implements include counters of various colours and values, a dealing-box, a case or frame, manipulated by a "case-keeper," upon which the cards already played are arranged in sight, a shuffling-board, and score-sheets for the players. Upon the table is the "lay-out," a complete suit of spades enamelled on green cloth, upon or near which to place the stakes The dealer takes two cards from the box, placing the first one near it and the second close beside it Each deal of two cards is called *a turn,* and there are 25 such, *soda* and *hoc* not counting The players stake upon any card they please, or in such manner as to take in several cards, reducing the amount, but increasing the chances of winning, as at roulette. The dealer, having waved the hand, after which no more bets may be made, deals the turn, and then proceeds to gather in the stakes won by him, and to pay those he has lost. The chances as between dealer and punters, or players, are equal, except that the banker wins half the money staked on the cards of a turn should they chance to be alike.

See J Debrett, *Faro and Rouge et Noir* (1793)

FAROE ISLANDS: *see* FAEROE ISLANDS

FARQUHAR, GEORGE (1677–1707), British dramatist, son of William Farquhar, a clergyman, was born in Londonderry, Ireland, in 1677. He was educated at Trinity College, Dublin. He became an actor on the Dublin stage, but in a fencing scene

in Dryden's *Indian Emperor* he forgot to exchange his sword for a foil, with nearly fatal results to a fellow-actor, and never acted again At the suggestion of Robert Wilks, the comedian, he wrote his first play, *Love and a Bottle,* which was performed at Drury Lane in 1698 His second comedy, *The Constant Couple* (1699) ridiculing the pilgrimages to Rome in the Jubilee Year, was enthusiastically received, Wilks as Sir Harry Wildair contributing largely to its success In 1701 he wrote a sequel, *Sir Harry Wildair,* and in 1702 *The Inconstant,* borrowed from Fletcher's *Wild Goose Chase.* In the same year he published a volume of miscellanies, *Love and Business,* containing a "Discourse on Comedy," defending the English neglect of the dramatic unities In 1703 he married, in expectation of a fortune which did not materialize The rest of his life was a constant struggle against poverty His other plays are *The Stage Coach* (1704), a one-act farce from the French, *The Twin Rivals* (Drury Lane, 1702), *The Recruiting Officer* (Drury Lane, 1706); and *The Beaux' Stratagem* (Haymarket, 1707) This is the best of his plays, and long kept the stage Genest notes 19 revivals up to 1808 It was revived again at the Lyric, Hammersmith, in 1927. The plot concerns the adventures of two embarrassed gentlemen who travel as master and servant, in the hope of marrying a fortune Archer, the supposed valet, was one of Garrick's best parts Before he had finished the second act of *The Beaux' Stratagem* he was taken mortally ill, but he finished the play, for which he had been paid in advance It was staged on March 8, and he had his third night, with an extra benefit on April 29, 1707, the day of his death

Farquhar marks the end of the true Restoration tradition Instead of the intellectual foil-play of his predecessors he gives us something of the cheerful singlestick of Elizabethan comedy, while his return to the romantic treatment of love, whether you regard it as a disastrous lapse into the "luscious" or a breath of purer air, is at any rate fatal to the maintenance of the Restoration atmosphere His characters are lively and amusing, his plots ingenious and well worked out But for his early death he might have been very great

Farquhar's dramatic works were published in 1728, 1742 and 1772, and by Thomas Wilkes with a biography in 1775 They were included in the *Dramatic Works of Wycherley, Congreve, Vanburgh and Farquhar* (1849) edit by Leigh Hunt *See* also A C Ewald, *Dramatic Works of George Farquhar, with Life and Notes* (2 vols, 1892), L I Guiney, *A Little English Gallery* (1894), *The Beaux' Stratagem,* ed H Macauley Fitzgibbon (1898), D Schmid, "George Farquhar," in *Wiener Beitrage zur engl Philol* (Vienna, 1904), *The Best Plays of George Farquhar,* edit William Archer (1906), H Ten E Perry, *The Comic Spirit in Restoration Drama* (New Haven, Conn 1925)

FARR, WILLIAM (1807–1883), English statistician, was born at Kenley, in Shropshire, on Nov 30, 1807 He studied medicine in Paris and London, but only practised for five years In 1837 he obtained a post in the registrar-general's office. For the censuses of 1851 and 1861 he acted as assistant-commissioner, for that of 1871 he was a commissioner, and he wrote the greater part of the reports of all He resigned in 1879 on failing to obtain the post of registrar-general He died on April 14, 1883 He was the author of many papers on general statistics and on life-tables for insurance A selection from his statistical writings was published in 1885 under the editorship of Mr Noël Humphreys

FARRAGUT, DAVID GLASGOW (1801–1870), American admiral, was born on July 5, 1801, near Knoxville, Tenn At New Orleans he formed a close friendship with Capt. David Porter of the Navy, the result of which was that Porter adopted his young namesake, and put him in the Navy in 1810. He went to sea the next year on board the U S S. "Essex" with Porter, who took every opportunity to throw responsibility on the boy. Farragut commanded a prize with ability when only 12 years old, served with credit in the "Essex's" desperate fight with H.M S. "Phoebe," and returned to the United States to go to school The next few years were devoted alternately to service afloat and to school He learned French, Italian and Arabic. Before he was 20 he was already a most accomplished officer. In 1823 the Navy department placed Comm Porter in command of a squadron to destroy the pirate strongholds in the West Indies. Farragut accompanied Porter, and very active service ashore and afloat may be said to have completed Farragut's education He had even had practice in handling a steamer and went home in 1824 in command of the U S S "Ferret" Routine service followed for many years As he entered his 60th year the Civil War was at hand, in which his brilliant record was to give him enduring fame He had had the most varied experience and was a practical seaman who found pleasure in the responsibilities of command Yet he had never failed to maintain professional and cultural studies. Somewhat under the middle height, he was of very unusual physical strength, still agile and athletic and a skilled swordsman Kindly and gentle in his demeanour and of a cheerful and humorous disposition, he was highly successful in making his ship's company both efficient and contented He was easily approachable, yet in his bearing there was dignity without stiffness In every way he reached the traditional naval standard of the "officer and gentleman" Withal, he was a highly religious man, who was accustomed in times of stress to draw strength and confidence from reliance upon the Almighty. To all these minor virtues of a great captain he added the supreme combatant qualities of a great reliance on his own abilities, a confidence that the enemy's difficulties, if not identical, were probably no less than his own, a firm resolution and readiness to attack, and finally a steadfast belief that "the best protection against the enemy's fire is a well-directed fire from our own guns"

The Civil War opened in the spring of 1861, and in Dec 1861 he was assigned to command the West Gulf Blockading squadron, with orders to enter the Mississippi river and capture New Orleans The strategic plan of the Administration for the reduction of the seceding States assigned a great rôle to the Navy While the armies in the field were to oppose the Southern forces, the task of the Navy was to cut the hostile armies from their sources of supply over seas, for which they expected to pay by exporting cotton The first step of the Navy was to establish a blockade of the coast from the Chesapeake to the Rio Grande By the end of 1861 this blockade was becoming fairly effective, but munitions of war landed in Mexico were finding their way along the Red river and the Mississippi to Southern armies The second great strategic operation of the Navy was to seize control of the Mississippi and stop the supply of food-stuffs and munitions coming from the South-west An army in conjunction with a flotilla of river craft undertook this task from the North, while Farragut with the same purpose moved from the open sea against New Orleans, the metropolis of the South, where success would secure him a most valuable base for subsequent advance. The War department believed that the forts on the river below the city should be reduced by mortar fire before attempting to thrust wooden ships past them, but Farragut carried out his own bolder plan of running by them in the dark and was completely successful on April 24, 1862 His position above the forts cut them off from the city Troops from the transports outside could land almost under his protecting batteries and the result was the surrender of the forts and the city. Against Farragut's opinion the department insisted on his proceeding further up the river, but the time was inopportune and nothing important was then accomplished But the following year, when Grant's army was occupied before Vicksburg, Farragut greatly aided him by passing the heavy works at Port Hudson below the Red river and stopping traffic along that stream. Vicksburg fell in July 1863 and the Mississippi was soon in Federal control to the great loss of the Southern armies fighting in Tennessee and Virginia Farragut now turned his attention to entering Mobile bay, where he expected an army from the North to meet him and so to cut off another great slice from the Confederacy, but the troops were employed elsewhere. Mobile bay was formed by a long sandspit enclosing a large inlet. It was defended by several forts, of which the strongest was Ft. Morgan at the end of the spit close to the channel. A line of mines obliged ships to pass close to Ft. Morgan, and besides the heavy ironclad "Tennessee" covered the approaches Farragut had to wait till he had monitors to pit against the "Tennessee" and on Aug 4, 1864, he entered in two columns, the monitors leading and the wooden frigates following each

with a gunboat lashed to her port side. Farragut in the "Hartford" held the second place in his column The leading monitor, "Tecumseh," in her anxiety to engage the "Tennessee," crossed the mine-field and was blown out of the water. The "Brooklyn," leading the wooden column, stopped. her head fell away; the line drifted in confusion while the tide swept all upon the fort This was the great moment of Farragut's life Disaster was imminent With instant decision he shouted "Damn the torpedoes" to the hesitating "Brooklyn," and swung his own ship clear of her and headed across the mines which had just been fatal to the monitor The mine cases rattled against the bottom but none exploded and the fleet followed on and anchored triumphantly above the fort Then the "Tennessee" came out from the shelter of the fort and after a hard fight, in which the wooden ships repeatedly rammed her, she was reduced to impotence and surrendered The forts were now isolated and surrendered one by one, Ft Morgan waiting till the troops lying outside in transports had landed their siege guns and brought them into action Farragut's health now forbade further active service. His work was over He had been made rear-admiral in 1862, vice-admiral in 1864, and admiral in 1866 In 1867 he went to Europe on board the U S S "Franklin" and paid a round of ceremonial visits to the seaports of the Great Powers to accept on behalf of the United States their congratulations on the conclusion of the Civil War He died at Portsmouth, N H , on Aug 14, 1870 (W L R)

FARRAND, LIVINGSTON (1867–), American educationalist, was born at Newark, N J , June 14, 1867 After he graduated from Princeton university in 1888, he studied medicine at the College of Physicians and Surgeons, New York (M D , 1891) During the next two years he studied at Cambridge (England) and at Berlin From 1893 to 1901 he was an instructor and from 1901 adjunct professor in psychology at Columbia university, from 1903 to 1914 he was professor of anthropology In 1897 he accompanied the Jesup North Pacific expedition, which visited the Indians of British Columbia From 1905 to 1914 he was executive secretary of the National Association for Study and Prevention of Tuberculosis, and from 1912 to 1914 treasurer of the American Health Association and editor of the *American Journal of Public Health* From 1914 to 1919 he was president of the University of Colorado, but in 1917 was granted leave of absence, following his appointment by the international health board of the Rockefeller Foundation to direct the work against tuberculosis in France In 1919 he was made chairman of the central committee of the American Red Cross In 1921 he was elected to succeed Jacob Gould Schurman as president of Cornell university He wrote *The Basis of American History* (1904) and various articles on psychology and anthropology

FARRANT, RICHARD (d. 1580), composer of English church music, became a gentleman of the Chapel Royal in the reign of Edward VI , but resigned his post in 1564 on being appointed master of the children of St George's chapel, Windsor It is stated by Hawkins (*History of Music*, vol iii 279) that Farrant was also one of the clerks and organists of St George's chapel, and that he retained these posts till his death Many of his compositions are printed in the collections of Barnard and Boyce Among the most admired of them are a service in G minor, and the anthems "Call to remembrance" and "Hide not Thou Thy face." It is doubtful whether Farrant is entitled to the credit of the authorship of the beautiful anthem "Lord, for thy tender mercies' sake" No copy of the music under his name appeared in print till 1800, although it had been earlier attributed to him Some writers have named John Hilton, and others Thomas Tallis, as the composer. Farrant died on Nov. 30, 1580.

FARRAR, FREDERIC WILLIAM (1831–1903), English divine, was born on Aug 7, 1831, in the fort of Bombay, where his father, afterwards vicar of Sidcup, Kent, was a missionary. His early education was received in King William's college, Castletown, Isle of Man, a school whose external surroundings are reproduced in his school tale, *Eric; or, Little by Little.* In 1847 he entered King's college, London, and was led by F D Maurice to the study of Coleridge, whose writings had a profound influence upon his faith and opinions. He went up in 1851 to Trinity college, Cambridge, where he became a fellow in 1856

On leaving the university Farrar became an assistant-master, first at Marlborough College, and then (1855) at Harrow In 1871 he was appointed headmaster of Marlborough College, and in the following year chaplain-in-ordinary to the queen, becoming canon of Westminster and rector of St Margaret's, Westminster, in 1876. Farrar's first book was his schoolboy story *Eric* (1858) followed by *Julian Home* and *Lyrics of Life* (1859) and by *St Winifred's; or the World of School* (1862) His Hulsean lectures were published in 1870 under the title of *The Witness of History to Christ. The Life of Christ,* which was published in 1874, passed through a great number of editions His volume of sermons on *Eternal Hope* (1877)—in which he called in question the dogma of everlasting punishment—caused much controversy but helped to mollify the harsh theology of an earlier age In 1879 appeared *The Life and Works of St Paul,* followed by *The Early Days of Christianity* (1882), and other popular works Farrar was a copious contributor of articles, to various magazines, encyclopaedias and theological commentaries In 1883 he was made archdeacon of Westminster and rural dean; in 1885 he was appointed Bampton lecturer at Oxford, and took for his subject "The History of Interpretation" He was appointed dean of Canterbury in 1895. He died at Canterbury on March 22, 1903.

See his *Life,* by his son R Farrar (1904)

FARRAR, GERALDINE (1882–), American dramatic soprano, was born at Melrose (Mass), on Feb 28, 1882 Her musical education was received in Paris under Trabedello and in Berlin under Lilli Lehmann When but 19 she made her début at the Royal Opera House, Berlin, as Marguerite in *Faust,* Oct 15, 1901, and continued to sing there consecutively until 1914 In Nov 1906 she appeared at the Metropolitan Opera House as Juliette in *Roméo et Juliette* and was a favourite prima donna of the New York stage until her retirement on April 22, 1922 She afterwards took her own company on the road and reappeared on the concert stage in New York in Dec 1927 Her rôles included Mme Butterfly, Manon, Micaela, Mignon, Mimi, Elizabeth, Tosca, Zerlina, Gilda and Violetta She acted also in motion pictures, her best-known films being *Carmen, Joan of Arc* and *The Woman and the Puppet*

FARRELL, JAMES A. (1863–), American business man, was born in New Haven (Conn), Feb 15, 1863, and was educated in the public schools there In 1889 he married Catherine E McDermott At a very early age he was a labourer in a steel-wire mill, in New Haven; a little later, labourer in the mills of the Pittsburgh Wire Company, then superintendent and manager of the Oliver Steel Wire Company, later, general superintendent of the same organization, and then, general manager of the Oliver Iron and Steel Company Following this, at Braddock (Pa), Farrell was employed by a wire company, which was made part of the American Steel and Wire Company in 1899, and of this consolidation Farrell was made foreign sales agent When, in 1901, the United States Steel Corporation was organized, the first billion-dollar American corporation, he was chosen for the position of foreign sales agent of all subsidiaries of the company So successful was he that in 1903 the United States Steel Products Export Company was formed to co-ordinate the foreign activities of all the subsidiary firms, with Farrell as president (1903–11) During this period he developed foreign sales to astounding figures He was responsible for the corporation building a fleet of its own, in which there were in 1928 54 vessels In 1911 he became president of the United States Steel Corporation. In 1928 he was a director of the American Bridge Company, Federal Steel Company; Tennessee Coal, Iron and Railroad Company, Minnesota Steel Company and other subsidiaries; and vice-president of the American Iron and Steel Institute

FARRELL, a borough of Mercer county, Pa., U S A , on the Shenango river, at the western boundary of the State, 60m N N W of Pittsburgh, and adjoining the city of Sharon, with which it forms virtually an industrial unit It is served by the Erie, the Mercer Valley, the New York Central, the Pennsylvania, and the Pittsburgh and Lake Erie railways The population was 15,586

in 1920, of whom 6,504 were foreign-born white and 1,349 were negroes It has important manufactures of steel, wire, tin plate, sheet steel and iron, castings, boilers and coke. The borough was incorporated in 1901, and took the name of Farrell.

FARREN, ELIZABETH (*c* 1759–1829), English actress, was the daughter of George Farren, an actor Her early years were spent among the touring company to which her parents belonged, and her first regular engagement was at a Liverpool theatre in 1773 She came to London in 1777, where she first played at the Haymarket as Miss Hardcastle in *She Stoops to Conquer* There was talk of a marriage between her and Charles James Fox, but her appearance in a "breeches" part convinced him that she had no figure A success in comedy parts from the start, she had at first to compete with Mrs Abington, who was generally thought her superior When Mrs Abington left Drury Lane in 1782 Miss Farren was her natural successor She was beloved by the Lord Derby of the time, after the death of his wife she left the stage and married him (1797) She died on April 23, 1829

Attempting tragedy rarely and unsuccessfully, she was supreme in her representations of the fine ladies of comedy, Lady Teazle, Lady Betty Modish and, above all, Lady Townley, in which part she was thought to surpass even Mrs Abington Walpole thought her the most perfect actress he had ever seen

See H Simpson and C. Braun, *A Century of Famous Actresses* (London, 1913)

FARREN, ELLEN (NELLIE) (1848–1904), English actress, was born on April 16, 1848, of a family of actors Her first London appearance was at the Sadler's Wells theatre in 1862. From 1864 to 1868 she was at the Olympic in burlesque and light comedy parts, including Nerissa in the *Merchant of Venice* In 1868 she joined Hollingshead at the Gaiety, where she played Robert in Gilbert's *Robert the Devil.* Here she stayed till she retired in 1891, playing every sort of part, farce, burlesque, old comedy and Shakespeare Her first association with Fred Leslie in the partnership which became so famous was in *Little Jack Sheppard,* as Jack In addition to innumerable burlesque parts of this type, she played Prue in *Love for Love,* both the leading girls' parts in *The Rivals,* Ursula in *Much Ado about Nothing,* and Maria in *Twelfth Night* With Fred Leslie she visited America in 1889 and Australia in 1891 She was forced to retire by gout, and died of it on April 28, 1904 Chiefly famous for her acting in burlesque, she had an amazingly vivid personality, and was easily the favourite actress of the lighter stage of her day She was the incarnation of the Cockney spirit Hollingshead says of her in *My Lifetime,* "She could play anything, dress in anything, say and do anything," and that she ought to go down to posterity as the best Principal Boy since women were admitted to the stage

FARRER, THOMAS HENRY FARRER, 1ST BARON (1819–1899), English civil servant and statistician, the son of a solicitor, was born in London on June 24, 1819, and was educated at Eton and Balliol college, Oxford He was called to the bar at Lincoln's Inn in 1844, but retired from practice in the course of a few years He entered the civil service in 1850, and in 1865 he was promoted to be one of the joint secretaries of the board of trade, of which he was permanent secretary from 1867 to 1886 In 1889 he was co-opted by the Progressives an alderman of the London County Council, of which he became vice-chairman in 1890, but soon resigned because, being a strong individualist, he deprecated municipalization of public services In 1893 he was raised to the peerage. From this time forward he devoted much of his energy to free trade propaganda. Farrer died at Abinger hall, Dorking, on Oct. 11, 1899 His works include: *The State in Relation to Trade* (1883), *Free Trade versus Fair Trade* (1886), and *Studies in Currency* (1898)

FARRÈRE, CLAUDE, pen-name of Charles Bargone (1876–1917), French novelist. He was a naval officer; he made his reputation with a series of novels, the scenes of which were laid in the Far East or in Eastern Europe He drew vivid pictures of men and women of alien civilizations, notably the old Chinaman in *La Bataille* (1909), and the old Turk of *L'Homme qui assassina* (1907). He then turned, with less artistic success, to the tale of adventure, of which the most famous is *Thomas d'Agnelet, gentilhomme de fortune* (1913). Farrère was killed in Flanders, where he was serving in a tank corps, on June 27, 1917.

FARRIER, and **FARRIERY,** the name given generally either to the professional shoer of horses or in a more extended sense to a practitioner of the veterinary art; farriery is the term for his business. Primarily the art of farriery is identical with that of the blacksmith, in so far as he makes and fixes shoes on horses (*see* HORSE-SHOES), he is liable in law for negligence, as one who holds himself out as skilled; and he has a lien on the animal for his expenses William the Conqueror is supposed to have introduced horse-shoeing into England, and the art had an important place through the middle ages, the days of chivalry, and the later developments of equitation In modern times it has been closely allied with the general progress in veterinary science and in the knowledge of the anatomy and physiology of the horse's foot and hoof

See A T Fisher, *The Farrier* (1803); A. Lungwitz, *Text-Book of Horse-shoeing* (Eng trans 1898)

FARRUKHABAD, a city and district of British India in the Agra division of the United Provinces The city is near the right bank of the Ganges, 87 m by rail from Cawnpore. It forms a joint municipality with Fatehgarh, the civil headquarters of the district Pop (1921) 48,331 At Fatehgarh is the government gun-carriage factory, and other industries include cotton-printing of curtain material and the like, and the manufacture of gold lace, metal vessels and tents

The DISTRICT OF FARRUKHABAD has an area of 1,683 sq m It is a flat alluvial plain in the middle Doab The principal rivers are. the Ganges, which has a course of 87 m either bordering on or passing through the district, the Kali-nadi (84 m) and the Isan (42 m), both tributaries of the Ganges, and the Arind which, after a course of 20 m in the south of the district, passes into Cawnpore The principal products are rice, wheat, barley, millets, pulses, cotton, sugar-cane and potatoes. Farrukhabad is one of the healthiest districts in the Doab

In the early part of the 18th century Mohammed Khan, governor of Allahabad and later of Malwa, established a considerable state of which the present district of Farrukhabad was the nucleus, founding the city of Farrukhabad in 1714 After his death in 1743, his sons were embroiled by Safdar Jang, the nawab wazir of Oudh, with the Rohillas, and afterwards with the Mahrattas, the struggle ending by the country becoming tributary to Oudh In 1801 the nawab wazir ceded to the British his lands in this district In 1804 the Mahrattas, under Holkar, ravaged this tract, but were utterly routed by Lord Lake at the town of Farrukhabad During the Mutiny the titular nawab was re-instated on the throne The English military residents took shelter in the fort, which they held until July 4 when, the fort being undermined, they endeavoured to escape by the river. One boat succeeded in reaching Cawnpore, but only to fall into the hands of Nana. Its occupants were made prisoners, and perished in the massacre of July 10 The other boat was stopped on its progress down the river, and all those in it were captured or killed, except four who escaped The prisoners were conveyed back to Fatehgarh, and murdered there by the nawab on July 19 The rebels were defeated in several engagements, and on Jan 3, 1858 the English troops recaptured Fatehgarh fort. In 1921 the population was 856,633. Part of the district is watered by distributaries of the Ganges canal; tobacco, potatoes and fruit, cotton-prints, scent and saltpetre are among the principal exports.

FARS, a province of Persia, bounded on the north by the provinces of Khuzistan and Isfahan, on the east by Yazd and Kirman, and on the south by the Persian gulf. It lies roughly between 50° and 57° E, and 26° and 32° N., and is composed of a great number of districts grouped together into some 20 sub-provinces, each under a governor. The coast towns of Bushire, Lingeh, Bandar Abbas, Jask, Chahbar and some other smaller places, though not all geographically within the boundaries of Fars, form a separate administrative district known as the "Gulf Ports" or "Southern Ports" under a governor appointed from Tehran.

Fars was the ancient Persis (*q v*) or Persia in the narrowest sense, the ancestral home of the Persians The country was in those days covered with fortresses, the best known of which were the three citadels which were built on peaks round Istakhr (*see* PERSEPOLIS)

Climatically, Fars may be divided into *garmsir* and *sardsir*—the warm and cold regions The former extends from the coast to the foothills running parallel to it and includes the coastal districts of Lirawi, Haiat Daud, Rud Hillah, Angali, Shabankareh, Zira, Dashtistan, Tangistan and Dashti The *sardsir* embraces the mountainous parts of the province which form a succession of ridges, prolongations of the Zagros chain, running from north-west to south-east and intersected by elevated plains some of which are fertile and afford good pasture The highest of these mountains, the Kuh Dinā in the north-western part of the province, has an elevation of over 13,000 feet The rivers within the limits of Fars are the Rud Hillah and Mund, and a notable feature is the great inland depressions or salt lakes near the middle of the province into which several inland streams drain

The chief town of the province is Shiraz (*q v*) 182 m N E of Bushire, and other populous centres are Niriz, Lar, Abadeh, Darab, Jahrum, Arsinjan, Ardakan, Fasa, Bastak, Kazerun, Firuzabad and Minab (under Bandar Abbas, *q v*) The population has been estimated at 750,000 but this is probably much too high About a third are nomads of mixed race and turbulent character Among the tribes of Fars are the Mamasseni whose habitat lies north of Kazerun, the Khamseh, a group of tribes of Arab origin and speech, and the Qashqai, really a collection of tribes, of Turk origin and speech and migratory habits, who are somewhat scattered and whose summer resorts are in the highlands between Shiraz and Isfahan The Qashqai are nominally under the control of an Ilkhani or chief, but his influence in Fars, which was once great, has of recent years been greatly restricted by the Central Government

Many districts of Fars are comparatively fertile, but are now impoverished by droughts, ravages of locusts and past misgovernment The products consist principally of cereals, tobacco, fruits and opium, with a little cotton The wine of Shiraz is highly thought of in Persia, and is, on occasions, of excellent quality Tobacco, of excellent quality, is grown mainly around Fasa, Darab and Jahrum for home consumption, and rosewater is exported from Maimand Sulphur and lead are found, but not in commercial quantities The coastal region of Fars has been explored for petroleum, several wells having been sunk by the Anglo-Persian Oil Co. Ltd at Salakh on Qishm island and at Bikarz, Chilingar and Gach Qaraguli, north of Ganawah, but hitherto without result A well was also sunk by the Persian Mining Rights Corporation in 1890–95 near Dalaki, but without success

The revenue of Fars and Southern Ports in 1926–27 was 20,677,167 Krans, coming fourth, in order of importance, as a revenue producing province (P Z C)

FARTHING, the smallest English coin, equal to the fourth of a penny (A S *feórtha,* fourth, +*ing,* diminutive) It became a regular part of the coinage from the reign of Edward I, and was, up to the reign of Mary, a silver coin No farthing was struck in the reign of Elizabeth, but a silver three-farthing piece was issued in that reign, with a profile bust of the queen crowned, with a rose behind her head, and inscribed "E D G Rosa sine spina" The copper farthing was first introduced in the reign of James I, a patent being given to Lord Harington of Exton in 1613 for the issue of copper tokens of this denomination. It was nominally of six grains weight, but was usually heavier Properly, however, the copper farthing dates from the reign of Charles II, in whose reign also was issued a tin farthing, with a small copper plug in the centre, and an inscription on the edge, "Nummorum famulus 1684" No farthings were actually issued in the reign of Queen Anne, though a number of patterns were prepared In 1860 the copper farthing was superseded by one struck in bronze In 1842 a proclamation was issued giving currency to half-farthings, and there were several issues, but they were demonetized in 1869. In 1897 the practice was adopted of darkening farthings before issue, to prevent their being mistaken for half-sovereigns

FARTHINGALE, a case or hoop, originally of bent rods, but afterwards made of whalebone, upon which were hung the voluminous skirts of a woman's dress (a corruption of Span *verdagado,* from *verdago,* a rod or stick) The fashion was introduced into England from Spain in the 16th century In its most exaggerated shape, at the beginning of the 17th century, the top of the farthingale formed a flat circular surface projecting at right angles to the bodice (*see* DRESS)

FARWELL, SIR GEORGE (1845–1915), English judge, was born at Codsall, Staffs, on Dec 22, 1845 He was educated at Rugby and at Balliol College, Oxford, and was called to the bar in 1871 In 1891 he became a Q C and in 1895 a bencher of Lincoln's Inn, while in 1899 he was raised to the bench In 1900 he came into prominence over the case known as the Taff Vale judgment, since his decision, though reversed by the court of appeal, was upheld in 1901 by the House of Lords, and ultimately led to the passing of the Trade Disputes Act (1906) In 1906 Farwell was made a lord of appeal, but resigned his position in 1913 He died at Dunster, Somerset, on Dec 30, 1915 He published *Concise Treatise on the Law of Powers* (1874)

FASCES, in Rome, bundles of elm or birch rods from which the head of an axe projected, fastened together by a red strap As the emblem of official authority, they were carried by the lictors, in the left hand and on the left shoulder, before the higher Roman magistrates, at the funeral of a magistrate, behind the bier The lictors and the *fasces* were so inseparably connected that they came to be used as synonymous terms The *fasces* represented the power over life and limb possessed by the kings; later, the consuls were preceded by 12 *fasces* Within the precincts of the city the axe was removed, in recognition of the right of appeal (*provocatio*) to the people in a matter of life and death, outside Rome, however, each consul retained the axe Valerius Publicola established the custom that the *fasces* should be lowered before the people, as the real representatives of sovereignty, lowering the *fasces* was also the manner in which an inferior saluted a superior magistrate A dictator had 24 *fasces* (including the axe, even within the city); other magistrates had *fasces* varying in number, with the exception of the censors, who, possessing no executive authority, had none A victorious general, who had been saluted "imperator" by his soldiers, had his *fasces* crowned with laurel Under the empire, the laurel was regarded as distinctive of the imperial *fasces*



FROM "DICTIONARY OF GREEK AND ROMAN ANTIQUITIES"
ROMAN LICTORS BEARING FASCES

In recent years in Italy, the *fasces* were adopted as the emblem of the Fascist Party (*see* FASCISM)

See J. E Sandys, *Companion to Latin Studies* (1921).

FASCIA or **FACIA,** in architecture, any horizontal decorative band or board.

FASCINATION. The art of enchanting or bewitching, especially through the influence of the "evil eye," and so, of the exercise of an evil influence over the reason or will (from Lat *fascinare,* to bewitch) The word is thus used of the supposed paralysing attraction exercised by some reptiles on their victims In a quite general sense, fascination means the exercise of any charm or strong attraction

FASCINE, a large faggot of brushwood used in the revetments of earthworks and for other purposes of military engineering (from the Lat *fascina, fascis,* a bundle of sticks) The British service pattern of fascine is 18ft long; it is tied as tightly as possible at short intervals, and the usual diameter is 9in Similar bundles of wood formed part of the foundations of the early lake-dwellings, and in modern engineering fascines are used in making rough roads over marshy ground and in building river and sea walls and breakwaters

FASCISM (fāsh'izm), the Italian Fascist movement, dates officially from the foundation in March 1919 by Benito Mussolini (*q v*), then editor of *Il Popolo d'Italia,* of the first *Fascio*

di Combattimento at Milan, although many of its ideas had been inspired by the Nationalist movement dating from 1910, and by Syndicalism, of which Mussolini himself had been a leader This first Fascio was composed of some 150 of Mussolini's friends who had supported his interventionist action at the beginning of the World War, mostly ex-Socialists of the Syndicalist wing, and nearly all ex-combatants The first Fascist programme was confused, demagogic and had a republican tinge, but the national patriotic note was conspicuous, and proper recognition was demanded for the men who had fought and won the war The word *Fascio* means a bundle or bunch, and was taken to define the close union of the adherents of the movement, as an emblem, the *fasces* of the Roman lictors on a tri-colour shield was adopted

At first the Milan Fascio only attracted a fraction of the people who opposed Bolshevism and Socialism, and it still savoured too much of Mussolini's revolutionary past to secure general support Fascism was also inspired by a sense of exasperation at the foreign policy of the Government, which did not, the Fascists believed, defend Italian interests at the Peace Conference with sufficient firmness and dignity This aspect of Fascism was largely the outcome of nationalism, which had first given the Italian people a sense of the importance of foreign affairs and of the necessity for colonial expansion After D'Annunzio's evacuation of Fiume at the beginning of 1921 many of his *legionari* joined Fascism, some of whose outward manifestations and the semi-mystical character, as well as the Roman reminiscences and ritual of which, they inspired

The Squadre.—At the elections of 1919 none of the Fascist candidates were returned During the troubles of 1919 and most of 1920 Fascism as an organization played but a small part But the Fascist idea was spreading all over Italy, and during the municipal elections held in many cities in the late autumn of 1920 the Fascists collaborated with the other anti-Socialist parties, and in several instances formed with them national blocs, which defeated the Reds In the Bologna riots (Nov 1920), which broke out on the occasion of the inauguration of the Socialist town council, it was the Fascists who, although only 200 strong, organized the reaction and brought about the rapid collapse of the "Red" organizations, first in that city and after throughout the lower Po valley The first armed Fascist *squadre* were now formed for the defence of the nation against what they considered revolutionary tyranny The *squadre* consisted of young men, mostly ex-combatants, many of them decorated for valour and adorned with wound badges, of others too young to have served in the war, and of not a few older men, made desperate by the spectacle of their country, victorious in the war, but now browbeaten by a factious minority There was as yet no real Fascist doctrine beyond this vague sense of outraged patriotism The *squadristi* were mostly armed with cudgels, although many possessed revolvers and carbines, for at that time a large number of ex-service men had brought back arms of some sort from the war Another weapon, a novelty in partisan conflicts, was castor oil, large doses of which were administered to recalcitrant Socialists and Communists, and sometimes even to other opponents of Fascism During 1921 and 1922 encounters between Fascists and the Reds were of almost daily occurrence In that period many hundreds of Fascists fell victims to their opponents, but their comrades were not slow to avenge these outrages When early in 1921 the Communists broke away from the Maximalist Socialist Party and indulged in a series of murderous outbreaks, the Fascist reprisals were ruthless

The bravery and devotion to an ideal of the *squadristi* was extraordinary At a time when armed Communists were ready to attack anyone wearing the Black Shirt or the Fascist badge, these youths marched on regardless of danger, ready to sacrifice their lives for the national cause Even orthodox Liberals, Catholics and others supported Fascism, in which they saw the only hope for the salvation of the country from chaos Many adhered to the movement for selfish reasons—landlords and manufacturers who simply regarded it as a form of protection for the rights of property which the Government allowed the seditious elements to violate with impunity, and others became Fascists out of a spirit of adventure, to secure positions for themselves or for other personal reasons But the immense majority were inspired by genuine patriotism

A Mass Movement.—In its early days the movement was unconnected with any particular labour policy, although Syndicalists were among its founders, later, individual workmen, peasant-proprietors and farm hands joined it individually, but, with the success of the Fascist campaign against the Red organization in the Po valley at the end of 1920 masses of workers became Fascists, and often whole unions came over in a body. This development changed the character of Fascism, and converted it into a mass movement At the elections of May 1921, held under the auspices of Signor Giolitti, 38 Fascists were returned, including Signor Mussolini himself, and ten Nationalists In the new chamber the Fascists and Nationalists formed a fighting band of vigorous youths strenuously opposed to the "Reds"—a nucleus which gathered around its standard members of other patriotic parties At the Fascist congress in Rome in Nov 1921 a review of the Fascist forces was held, and Fascism was constituted as a regular political party, the *Partito Nazionale Fascista,* and its statutes were then drafted

THE PROGRAMME OF THE FASCISTS

The programme of the Fascists differs from those of other parties, as it represents for its members not only a rule of political conduct, but also a moral code The programme states that "the nation is not merely the sum total of living individuals, nor the instrument of parties for their own ends, but an organism comprising the unlimited series of generations of which individuals are merely transient elements, it is the synthesis of all the material and non-material values of the race" The State must be reduced to its essential functions as a legal and political organ, the powers of parliament limited to questions concerning the individual as a citizen and the State as the organ for realizing the interests of the nation, whereas the activities of individuals as producers should be dealt with by technical councils Trade unions must be encouraged as a means of developing production, but they should not arbitrarily level all capacities The prestige of the State must be restored at all costs The national finances must be placed on a sound basis, free from all traces of demagogy. Fascism recognizes the social functions of private property, proposes a system of State discipline over class conflicts, and demands that both employers' and workmen's organizations shall be legally recognized and invested with responsibility, no strikes in the public services are to be tolerated The State should restore to private enterprise all industrial undertakings which it has proved incapable of running In foreign affairs Italy must "reaffirm her right to complete historic and geographic unity, and fulfil her mission as the bulwark of Latin civilization in the Mediterranean" The party is indissolubly bound up with its *squadre*—the volunteer militia at the service of the State It was this congress that declared that Fascism would supplant the State whenever the State should prove incapable of suppressing the elements of disorder

The organs of the party are the Directorate—the executive organ, composed of the general secretary and ten other members elected by the national council; the central committee, composed of the various district delegates and the members of the Directorate, elected by the national council for a year and entrusted with the conduct of the political and administrative action of the Fasci and with disciplinary authority, the national council, composed of members of the central committee and the provincial secretaries, and invested with controlling authority over the Fasci; the general secretariat, nominated by the national council; the Fasci, or local sections of the party, all the Fasci of a province constituting a provincial federation; the *squadre de combattimento,* afterwards converted into the National Militia; the parliamentary group, composed of the Fascist members of parliament; the various auxiliary groups, such as the women's *Fasci,* the *Avanguardie,* the *Balilla,* etc ; the congress, composed of delegates of the provinces, which meets at irregular intervals to express the views of Fascism as a whole. The general conception of Fascism is based on rigid hierarchy.

Attitude to Monarchy.—Fascism had been gradually shedding its demagogic elements, and at Udine, on Sept 29, 1922, Mussolini expressed his adherence to the monarchy, thereby securing widespread support for Fascism among many who had hesitated on account of its "implicit republican tendency" Fascism has ended by becoming the strongest bulwark of the monarchy, because, unlike other monarchical parties, it has no need to conciliate the revolutionary elements

ITALY UNDER THE FASCIST GOVERNMENT

When Fascism came into power (Oct 28, 1922), Signor Mussolini, although rejecting alliances with other parties, accepted their collaboration, and admitted several of their members into his first cabinet Nationalism was absorbed by Fascism early in 1923, but as the Opposition became more violent in its attacks, especially after the Matteotti murder, the party tended to concentrate more and more on itself, satisfied with its own strength and the general approval of public opinion, not attached to any party, and it still has millions of supporters who are not Fascists The party underwent certain changes in its constitution, among which the most important were the fusion with Nationalism and the creation of the Fascist grand council This body, which sums up, co-ordinates and directs all the activities of the party, is composed of the prime minister as chairman, and all the members of the Cabinet, with the general secretary of the party and certain other party officers both central and local At its meetings the opinion of Fascism in the direction of various legislative reforms is manifested, and the proposals voted are then submitted to the cabinet Although party and Government are separate, the connection between the two is very close, as Signor Mussolini is at once the head of the Government and the leader of the party (For the transformation of the grand council into an organ of the State *see* ITALY *History*)

Relations with the Vatican.—Fascism, since it has become the Government of Italy, has shown a marked sympathy for Catholicism, which as the religion of the vast mass of the Italian people is regarded to some extent as a national institution After long negotiations with the Vatican the Italian Government, in Feb 1929, agreed to surrender a small territory to the pope as absolute temporal sovereign, and thus ended an *impasse* which had troubled Italian politics since 1870 (*see* further PAPACY)

Fascist Aims.—The Fascist tendency to isolate itself and reject alliances with other parties was steadily advocated by Roberto Farinacci (*q v*) after his appointment as general secretary early in 1925 After the Matteotti trial in March 1926, he resigned his appointment, having accomplished the task of reorganizing the party, and was succeeded by Augusto Turati. The party directorate was also changed But the general character of Fascism remains unaltered. Its aim is to get its main principles generally accepted by the nation and embodied in a series of legislative reforms which shall make of Italy an essentially national State, as opposed to the pre-existing Liberal State, wherein the seditious elements were free to conspire against the general welfare in the interests of class or clique These reforms comprise the restoration of national finance, the reorganization of the bureaucracy in the interests of efficiency, the reform of education, the peaceable regulation of labour conflicts, the re-establishment of discipline in every department of the State and every aspect of national life, the improvement of agriculture and the progress of industry. Many of these reforms have already been carried out, and others are in progress Opponents accuse Fascism of crushing liberty, but the Fascists reply that if the freedom of the press is limited, and parties, other than the Fascist, are reduced to inactivity, the essential liberty of the people has been secured as never before—the freedom to work and to produce for the common good—and that only a strong Government like that of Signor Mussolini could achieve such a series of necessary and far-reaching reforms, which Liberal Governments may have desired, and even attempted, but had always failed to carry out owing to the tyranny of parliamentary obstruction The people, he said in July 1924, never asked him to free them from a tyranny which did not exist, but asked for railways, houses, roads, bridges, drains, water and light.

Fascist Doctrine.—Fascist doctrine, as it has been evolved during the last years, was authoritatively set forth by Prof Alfredo Rocco, minister of justice, in a speech at Perugia on Aug 31, 1925 After rejecting the Liberal, Socialist and Democratic theories of the State, he declared that, according to Fascism, society does not exist for the individual, but the individual for society, although Fascism does not annul the individual as the individuals annulled society under certain older doctrines, but merely subordinates him to society, while securing his right to develop his personality Economic progress is a social interest, but Fascism considers it best to leave the production and distribution of wealth to individual enterprise in order to secure the maximum results in the interests of the community. The social problem is not solved, however, by merely rejecting the Socialist doctrine; Fascism wishes to secure justice between classes, but class warfare must be eliminated, as it is the State which must establish justice between classes just as it does between individuals Signor Mussolini in an article in *Gerarchia* (Oct 1925) compares "the incessant and fertile activity of the Government with the paralysis of all the opposition parties within the chamber and without Everyone, explicitly or otherwise, is convinced that in the Italy of 1925 Fascism alone towers like a giant" The defects of Fascism are the general defects of the Italian character the tendency to rhetoric, *arrivismo* (excessive pushfulness of men on the make), which has been accentuated by the creation of the many party offices and appointments, often filled not by the worthiest but by the most pushful and ambitious Of the deeds of violence occasionally committed by Fascists, usually reprisals for similar deeds committed by adversaries, Signor Mussolini wrote in the above-quoted article "This violence does not facilitate the work of the Government, but compromises it" Fascism has gradually ceased to be a mere political party in the ordinary meaning of the term and has penetrated into and absorbed every manifestation of national activity It is the driving force of the Government and of national life, and may to-day be described as a state of mind, and is accepted and warmly approved by millions of persons who are not registered members of the party organization

Fascist Labour Organization.—Labour Syndicalism has become one of the most important aspects of Fascism The first statute of the party, drafted in Dec 1921, defined the Fascist labour corporations Labour is declared to be the basis of human welfare and progress, and all who devote themselves to productive work are regarded as workers Fascist Syndicalism, unlike the Socialist unions, accepts the patriotic idea, recognizes the importance of capital, and considers the fate of the worker as bound up with that of the whole nation (Fuller details will be found in the article entitled FASCISM, ECONOMICS OF)

The National Milizia.—Before Fascism came into power its action was largely that of the armed *squadre* and it was the 200 000 Black Shirts (though estimates of their number vary considerably), who effected the "March on Rome," enabling Fascism to become the government of the country But once this was achieved, the existence of irregular Fascist forces was incompatible with Mussolini's intention of constitutionalizing the Fascist movement To have disbanded them would have savoured of ingratitude, while their constituent elements might still be useful to overawe the revolutionary and anti-national parties and to consolidate the Fascist *régime*. At a cabinet council on Dec 28, 1922, it was decided to disband all the *squadre—Fascist, Nationalist, Arditi* and *Legionari fiumani*, and by royal decree of Jan 14, 1923, the *Milizia volontaria per la sicurezza nazionale* was created in their place The force was voluntarily recruited from among the *squadristi*, the men appointed by the prime minister or the authorities delegated by him, and the officers by royal decree on the proposal of the ministers of war and of the interior Neither officers nor men are paid, except those on permanent duty at the general or territorial headquarters (700 in all), while those who are temporarily called out for service outside their place of residence receive a daily allowance

The total budget comes to 53,000,000 lire annually, although certain special detachments, such as the railway *milizia*, are paid for by other departments The force, which comprises some

300,000 men, is "at the service of God and the Italian Fatherland, and takes orders from the head of the Government" Its duties are to "assist, together with the armed forces for the public safety and the army, in the maintenance of internal order and to prepare citizens for the defence of Italian interests in the world" It has relieved the army of many troublesome services, and although it has never been necessary to employ it to put down revolutionary outbreaks, its mere existence has sufficed to deter the seditious elements from such action The organization of the *milizia* was subsequently brought into closer harmony with existing institutions, the royal decree of Aug 4, 1924, provides that its members shall take the oath of allegiance to the king, and that the officers shall be recruited from among the reserve officers of the army, navy and air force. The force is also entrusted with the pre-military training of youths under 20, the object of this measure is to give a large part of the nation a military education without involving the country in too heavy expenditure Three legions of the *milizia* have served with distinction in Libya

On Oct 25, 1927, the membership of the Fascist party and the organizations connected with it were as follows —Fascists (regular registered members), 1,027,010, *Avanguardisti* (boys from 14 to 18 destined to become members of the party), 325,127; *Balilla* (schoolboys under 14 destined to become *Avanguardisti*), 780,037; student groups, 16,965; women Fascists, 88,083; *Giovani italiane* (corresponding to the *Avanguardisti*), 66,253; *Piccole italiane* (corresponding to the *Balilla*), 318,781; members of the workers' syndicates, 3,577,128, members of associations (civil servants, postal employees, railwaymen, teachers, etc.), 567,496; grand total 6,814,703

Save in a few cases of persons having rendered exceptional services, admission to the party is regularly granted only to those from the *Avanguardisti* (youths over 18 years), which means an annual addition of some 40,000

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FASCISM, ECONOMICS OF. A series of laws, decrees, and ministerial regulations, enacted since the Fascist Government came into power in Italy in Oct 1922, has radically transformed the legislation regulating occupational and trade unions (or "syndical associations" as they are termed in Italian law), the relations between employer and employed, and representative institutions The aim has been to replace the parliamentary régime existing in Italy since attaining unity in 1870 by a "corporative" or guild state

Basis of System.—The basic act of the new system is that of April 3, 1926, regulating the legal and economic representation of employers and workers in all industries (including agriculture), trades and professions For each category of employers and for the corresponding category of workers (manual and non-manual) the law provides that syndical associations may be formed and incorporated. Such associations must represent not less than 10% of the persons engaged in the business, profession or trade concerned in the territory for which they are formed; they must be organised to protect not only the economic but also the moral, educational and professional interests of their members, and their directors must be persons who afford guarantees of capacity, honesty and patriotism The activities of the associations must never run counter to the national interest and they may not be affiliated to international bodies without the express consent of the Ministry Unrecognised unions may continue to exist as *de-facto* associations

The incorporated associations are the authorised representatives of the category for which they are formed in (1) the stipulation of wage and work agreements, (2) disputes brought before the labour courts, (3) nominating members to sit on the many boards, councils and commissions, which form the representative organs of the guild State The collective agreements on wages and conditions of work stipulated by these associations become binding on all employers and workers for the area and occupation concerned, whether they be members or not, the associations becoming civilly responsible for carrying out the terms of what is, in fact, a legal contract

The act contemplates the formation of such associations for all branches of production and all forms of activity, with the exception of the civil services, State industries such as the railways, local government services, and public charities, employees in connection with which are otherwise provided for All forms of association are forbidden in the case of the armed forces of the State, magistrates, university professors, and the staff of the Ministry of Foreign Affairs With the above exceptions, membership of the incorporated associations is open to "all Italian citizens engaged in the occupations represented, of both sexes, of not less than 18 years of age, and of good moral and political conduct" Membership of the associations is voluntary, but the conditions they secure for their members are extended to all non-members similarly occupied Collective bargaining through legally recognised representative organs being thus provided for and given contractual force, it was logical that provision should be made for the settlement of disputes arising between organised employers and workers To this end the act provides that, failing settlement by conciliation, disputes be deferred to the ordinary courts of appeal acting as labour courts (*magistratura del lavoro*), the judges being assisted by experts selected from panels drawn up by the respective syndical associations The verdict of the court is final, and strikes and lock-outs are alike illegal and punishable by heavy fines, and in certain cases by imprisonment

Supreme National Expression.—The whole system has as its premise that the intensification of production is not only a national interest which the State, as the supreme expression of national life, must safeguard; but that it is in like degree the interest of the employers and the employed The recognition of this essential identity of interest differentiates Fascist from Socialist trade unionism; it also explains the different goals and diverse methods of the two schools of economic thought Socialist trade unionism works through the class struggle; Fascist syndicalism works through class collaboration and aims at organizing the guild state in which all the factors of production—capital, scientific research, technical direction, manual and clerical labor—are recognized as essential each in their degree, their several interests being conciliated and subordinated to the general or national interest of which they are an integral part. The theory and practice of Fascist economics derives from a conception of the State not as a mere policeman keeping order and seeing fair play, not as an instrument at the service of a party or a class, not as a force dominating but apart from the people, but as the supreme expression of all forms of national life, to which none of its activities are extraneous. "All within the State, nothing outside the State, nothing against the State" is the formula in which the leader of Fascism—Mussolini—expresses this conception which, in the early days of the Fascist labour movement,

led to the foundation of "mixed" syndical associations, representative of both employers and workers Experience showed this to be impracticable, and the act of April 1926 gave legal recognition to separate though parallel associations, the subsequent formation of joint guilds being, however, foreseen, and the whole system placed under the newly created Ministry of Guilds (*corporazioni*)

The Guilds.—The guild feature of the system is developing under the direct control of this Ministry. National guilds, affording equal representation to employers and employed, under a chairman appointed by the minister, are formed for the several branches of productive and business activity. Their main duties are to study the organization and development of the industries they represent with a view to securing greater co-ordination and simplification so as to reduce production costs and intensify output The scientific organization of production is as much an interest of the workers as of the employers, and the guilds afford them an opportunity of expressing their views and recording their vote on a footing of full equality. They may be described as permanent deliberative and advisory bodies, on a representative basis, in direct touch with the Government, appointed for the study of all phenomena affecting the prosperity of an industry. The guilds also act as boards of conciliation in trade disputes before they are referred to the labour courts, they organize employment bureaus (the only ones sanctioned) placed under the joint control of employers and workers; and regulate the conditions of vocational training and apprenticeship The Minister of Guilds is assisted by a National Guild Council on which sit representatives of the several government departments, of the syndical confederations, and of the national educational and welfare works—*Dopolavoro, Balilla,* and *National Institute for the Protection of Maternity and Childhood.*

Regulations.—The regulations for the enforcement of the act provide (1) for the formation of syndical associations for each category of employers or workers, known as first grade associations, (2) for their federation in provincial unions (second grade associations); and (3) for the federation of these unions in national federations (third grade associations), grouped (4) into seven confederations Within this general framework considerable elasticity is allowed to meet varying conditions. The organization adopted is generally twofold (a) geographical, all the associations of a province or a zone being grouped in a union, (b) occupational, separate federations covering the whole territory being formed for each industry or occupation

Employers' Organizations.—There are six confederations for employers of labour, with whom are grouped the syndical associations of works' engineers and managers, assimilated by their responsibility for the success of the concern to their employers These confederations are. (1) The *General Fascist Confederation of Italian Industries,* to which are affiliated the provincial unions, grouping together all the industrial employers' associations of each province and the National Federations for each industry (2) The *National Fascist Confederation of Agriculture,* to which are affiliated the provincial federations of the three syndical associations representing operating land-owners, non-operating land-owners, and owners renting their lands (3) The *National Fascist Confederation of Commerce* to which are affiliated provincial federations of all the syndical associations, and national federations formed for each category (4) The *General Fascist Confederation of Bankers,* to which are affiliated national associations for each category of banks (5) The *National Fascist Confederation of Land and Inland Water Transports,* to which are affiliated regional associations, and national federations for each category. (6) The *National Fascist Confederation of Sea and Air Transport,* to which are affiliated interregional federations for the ship owners and one national federation of air-transport employers.

Workers' Organizations.—Manual and non-manual workers are represented by national federations corresponding to the above, but united in one *National Confederation of Fascist Syndicates.* An exception is made for sea and air-transport workers organized in an *Autonomous Federation.* An *Autonomous Federation of Artisans* is affiliated to the general confederation of industries (employers), and a *National Federation of Intellectual Workers* groups together 16 national syndical associations for a like number of professions and is affiliated to the national confederation of Fascist syndicates (workers) The federations and confederations appoint their own officers, subject to the approval of the Ministry of Guilds.

Financial Arrangements.—Under the provisions for the enforcement of the act the necessary funds are secured by levying annually from all employers the equivalent of one day's pay for every worker in their service Workers, whether members of the associations or not, also contribute one day's pay per annum collected by their employers During the first year in which the act was in force (1927) £150,870,000 were thus secured and the system is expected to yield considerably more in the future When it is not practicable to collect a day's pay the contribution takes the form of a fixed percentage of the land or income tax Of the funds thus collected 10% are deposited with the Bank of Italy as surety for the fulfilment of contractual obligations; 10% go to the Ministry to meet the cost of the guild organization, a further percentage is assigned to the welfare and education work contemplated under the act, the remainder, for the working expenses of the syndical associations, federations and confederations

Status of Public Employees.—In the system above described the workers' organizations are placed at all stages on a footing of entire equality with those of their employers Such equality cannot exist in the relations between the State and local government bodies and their staffs, who are represented by the officially recognized *General Fascist Association of Public Employees,* entitled to representation on several of the advisory and consultative bodies recently created in connection with the system, and on the educational and welfare activities of the Guild State

The Labour Charter.—This document, issued by proclamation on April 21, 1927, sets forth Fascist labour policies. It asserts the subordination of individual to national interests, proclaims work to be a social duty, recognizes private initiative as "the most effective instrument of production" but holds the organizers of industry responsible to the State for results Workers are to be considered as active partners in the enterprise, the direction and management of which is, however, vested solely and unequivocally in the employer. The conditions which must regulate labour contracts are laid down and the right of the workers to Sunday rest and a paid annual holiday asserted The worker dismissed for no fault of his own is entitled to compensation and on his death a sum is due to his family Illness, unless prolonged beyond certain fixed limits, does not justify dismissal Employers must engage their workers through the labour exchanges opened under the control of the Ministry of Guilds The charter proclaims the intention of the Fascist State to perfect accident and maternity insurance, to enact sickness insurance (as a first step compulsory insurance of industrial workers against tuberculosis has been enacted), to perfect unemployment insurance and introduce special forms of dowry insurance for young workers The provision of education and recreational facilities and of vocational training is among the chief duties of the syndical associations.

Representative Institutions.—The outstanding feature of Fascist economics is the representative, advisory and consultative functions assigned to the federations and confederations of the syndical associations which are represented on (1) the grand council of the Fascist Party, (2) the superior economic council, (3) the 92 provincial economic councils, (4) the municipal boards (*consulte*), (5) the central committee on prices, costs and wages, (6) the inter-syndical provincial committees for price, cost and wage adjustments, (7) the boards of experts assisting the labour courts. The act of May 17, 1928, reforming parliamentary representation assigns to the 13 national confederations and federations, jointly with other corporate bodies and associations of national importance, the duty of nominating the candidates from whom the grand council of the Fascist Party selects the list of names submitted to the nation for election Payment of the dues levied under the act of April 3, 1926, entitles the male citizen to a vote.

Position in 1928.—By the end of 1927 all categories of employers and workers were represented by incorporated associations, and the next stage of the work, that of forming the guild organizations, was taken in hand In March 1928 the membership of the workers' syndical associations stood at 2,809,461; that of the employers' at 885,968 When the first national congress of manufacturers was called by the general confederation of industries in June 1928 the president announced that the manufacturers' syndical associations were organized in 49 national federations, representing 66,557 firms, employing 1,750,000 persons, *i.e.*, 70% of Italian manufacturers employing 82% of industrial workers, besides these 355,000 artizans were affiliated to the confederation At that date 2,435 national, 101 regional and inter-provincial, and 2,289 provincial trade agreements had been signed between employers and workers under the new laws The activities of the inter-syndical committees on prices and wages proved valuable in overcoming the economic difficulties consequent on currency and credit deflation and monetary revalorization, which entailed extensive readjustments of wages, prices and farm rents In the revision of these latter no fewer than 31,120 cases were submitted to them for adjustment, while in the matter of wage disputes the fact that in spite of the exceptional difficulties of the situation it has only been found necessary to defer two cases of some importance for settlement to the labour courts (those of the rice workers and of the seamen, in both of which the verdict of the courts upheld the claims of the workers) shows how successful the syndical associations have been in conciliating apparently conflicting interests (O. R A)

FASHODA: *see* KODOK

FAST AND LOOSE, a cheating game played at fairs by gypsies and sharpers A strap, usually in the form of a belt, is rolled or doubled up with a loop in the centre, and laid edgewise on a table. The showman then bets that the loop cannot be caught with a stick or skewer as he unrolls the belt As this looks to be easy to do the bet is often taken, but the sharper unrolls the belt in such a manner as to make the catching of the loop practically impossible *Cf* Shakespeare in *Antony and Cleopatra* (IV 12) —

> Like a right gipsy, hath, at fast and loose,
> Beguiled me to the very heart of loss

From this game is taken the colloquial expression, "To play fast and loose"

FASTI, the plural of the Latin adjective *fastus*, but more commonly used as a substantive (derived from *fas*, meaning what is allowable by divine law) *Fasti dies* came to mean the days on which law business might be transacted without impiety, corresponding to our own "lawful days" The word *fasti* itself then came to be used to denote lists or registers of various kinds, which may be divided into two great classes

1 *Fasti Diurni*, divided into *urbani* and *rustici*, an official yearbook, with dates and directions for religious ceremonies, market-days, etc Until 304 B C the lore of the *calendaria* remained a monopoly of the priesthood, but Gnaeus Flavius then published the forum tables containing the requisite information This list was the origin of the public Roman calendar Ovid's *Fasti* is a poetical description of the Roman festivals of the first six months, written to illustrate the *Fasti* published by Julius Caesar after he remodelled the Roman year.

2. *Fasti Magistrales, Annales* or *Historici*, were concerned with everything relating to the gods, the emperors, etc , and the feasts and ceremonies established in their honour They came to be denominated *magni*, by way of distinction from the bare calendar, or *fasti diurni*. Of this class, the *fasti consulares* were a chronicle of events in which the several years were denoted by the respective consuls The *fasti triumphales* contained a list of persons who had obtained a triumph The word *fasti* thus came to be used in the sense of "historical records" A famous specimen of this class is the *fasti Capitolini*, so called because deposited in the Capitol by Alexander Farnese, after their excavation from the Roman forum in 1547

A considerable number of fasti of the first class have been discovered, but none older than the time of Augustus. The Praenestine calendar, arranged by the famous grammarian Verrius Flaccus, contains the months of January, March, April, and December, and a portion of February. The tablets give an account of festivals, as also of the triumphs of Augustus and Tiberius. Some kinds of fasti included under the second general head were, from the very beginning, written for publication The *Annales Pontificum*—different from the *calendaria* properly so called—were annually exhibited in public on a white table, on which the memorable events of the year, with special mention of the prodigies, were set down in the briefest possible manner In fact, all the state offices had their fasti corresponding in character to the consular fasti named above

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FASTING, in the strict sense of the word, denotes complete abstention from food and drink, but it is commonly applied also to the use of a diet somewhat severely limited, either by the rejection of certain customary kinds of food or by a diminution of the total quantity of food consumed Fasting, in the former sense, is generally required in preparation for a surgical operation, in the latter sense it is often recommended for health's sake, and is voluntarily undertaken by many Occasionally an individual will keep a prolonged fast, in the stricter sense, as a public view, in order to earn the reward of entertainment by giving a demonstration of unusual vitality In recent times fasting has been used as a means of protesting against the alleged injustice of the law of the land, and even of defeating that law, the hunger-strike being practised with such persistency that it has led either to the release of the protesting prisoner or to his death A close resemblance is to be seen between this modern application of the practice of fasting and an older use of it as an expression of overmastering desire and stern intention in the quest of justice Thus men of different lands and ages have bound themselves by an oath to take no food until they have performed some act of revenge for their own honour, or for the sake of their people (*cf* Acts XXIII 12), and among the Celts it was not uncommon for a man who was refused a lawful request, to "fast against" the one who had denied him his right, so as either to persuade him to an act of justice or to bring upon his head the blood of the oppressed

Commonest by far, however, of all the uses of voluntary fasting, in the past and at the present time, is its practice as an act of self-denial with definite religious intention By the greater number of religions, in the lower, middle, and higher cultures alike, fasting is largely prescribed, and where it is not required it is nevertheless practised to some extent by individuals in response to the promptings of nature

I. Religious Sanctions and Regulations.—Fasting is practised by all the peoples of the lower cultures, in which it is supported by the rudimentary science which takes the form of magical lore, as well as by a variety of crude religious beliefs Special discipline is laid upon medicine-men and other experts, for the perfecting of their abnormal powers and for the ready performance of their peculiar tasks But when danger threatens in all its many forms, fasting is required of individuals, of groups, and of the whole community, for the avoidance of various hostile influences, and the fear of punishment at the hands of the tribal authorities (including the gods), and, still more, of automatic results of a terrible nature, is sufficient to secure the strictest obedience

Among the religions of intermediate development, now extinct, that of the Celts laid some stress on the practice of fasting, while the religion of the Teutons appears to have found little or no place for it. The ancient Mexicans and Peruvians resembled the Babylonians and Assyrians in that fasting was largely used by them in connection with penance and the offering of sacrifice; and, though the records do not show that fasting bulked very large in the religious life of the ancient Egyptians, there are clear indications of its use The Romans appear to have used the practice but little until they came under the influence of the later Greek religion, in which fasting was required of all initiates by the guardians

of the mystery-religions, and recommended to individuals by philosophers of various schools, Cynics, Stoics, Pythagoreans, and Neo-Platonists

In the Far East, Hindu and Jain ascetics are committed by their faith to very severe fasting in conjunction with numerous other austerities, and abstinence in lesser degree is imposed upon Hindus generally by the requirements of caste-law, and by the performance of due accompaniments of pilgrimages and of preparation for certain festivals Primitive Buddhism recommends moderation rather than extreme self-deprivation, but in practice in its various developed forms the religion covers a considerable amount of fasting, especially in Tibet, in direct contradiction of the Buddha's teaching The higher Taoism of China imposes periods of strict abstinence upon its professors, and Confucianism has followed the practice of its great expounder in approving the customary observance of fasting as a preparation for the worship of ancestral spirits.

Judaism requires an annual fast on the Day of Atonement For a long time the Jews observed four other annual fast-days appointed during the Babylonian exile to commemorate the siege and destruction of Jerusalem, and a fifth day was added subsequently in remembrance of the three days' fast of Esther Additional voluntary fasts on the part of individuals were common, and at the beginning of the Christian era, Monday and Thursday in each week were kept as voluntary fast-days by the stricter Jews (*cf* Lc xviii 12) The Qur'ān (ii 179 *sqq*) requires all Muslims other than young children and idiots to observe the ninth month (Ramadān) of the year as a fast, food and drink being forbidden from sunrise to sunset during each of the 30 days Any who are prevented from keeping the fast by sickness or by the necessity of travelling, must fast for an equivalent period at another time Voluntary fasts are also recommended on certain days in the year, and fasts are required in recognition of responsibility for specified offences and in discharge of obligation for the same Muslim mystics (Sūfīs) and members of the darwesh orders practice much additional fasting for their special purpose of communion with the Divine

In the Christian world there exists, at the present day, considerable diversity of opinion and practice in the matter of fasting, but on a historical survey it may be said that in no other religion has fasting been more widely approved, more rigorously required, and more extensively practised The Founder Himself laid down no rules on the subject. He fasted (Lc iv. 2), He declared that fasting would have a place in the practice of His followers (Mk ii 19 *seq*), and He required that fasting, like the almsgiving and prayer with which it is associated, should be without ostentation (Mt vi 16 *seq*) But it was left to the Church to prescribe the rules that were to govern the corporate practice of the fast Out of the voluntary use of individuals there gradually arose a common mind and a common discipline, according to which a fasting preparation was required by the Church for the due observance of appointed festivals, and for the reverent reception of the benefits of Holy Baptism and Holy Communion The preparation for the feast of Easter developed slowly from a fast of one day, 40 hours (the time during which the Lord's body rested in the tomb), two days or more, to the full 40 days of Lent, and in close association with it the pre-baptismal fast came to be required of catechumens The fasting varied in rigour according to locality, but on the whole it involved real self-denial, and in places was literally a complete abstention from food and drink From the 2nd century it began to be the custom in some countries to fast on Wednesday and Friday in each week, these days being known as "stations," when Christians considered themselves to be on guard Under the influence of the Montanists this fasting increased in strictness, and by the end of the 4th century it had become a universal custom in the Church, Saturday being added to Friday as a "superposition" in many parts of the West. By the same date the fast before Communion, dictated long before this time by a growing appreciation of the full significance of the sacrament, had also become oecumenical. Dispensation from this fast, in particular, seems to have been very rarely granted, only the dying being recognized as necessarily exempt. Bishops prescribed additional fasts for their own dioceses as occasion required, voluntary fasts were added to these obligatory acts of discipline at the discretion of individuals, and, with the growth of monastic communities from the middle of the 4th century, special fasts began to be largely used

The Eastern Church took an independent line in the development of appointed fast-days, and its present practice differs considerably from that of the Church in the West In Lent the Saturdays (with the exception of Easter Even) are excluded from the fast as well as the Sundays The Fast of the Apostles lasts for a week from the octave of Pentecost, which is the Sunday of All Saints, or in some cases until June 29, which is the Feast of St Peter and St Paul The fortnight before the Feast of the Repose of the Virgin, which is celebrated on August 15, is kept as the Fast of the Mother of God The Fast of the Nativity of our Lord, beginning on November 15, lasts until Christmas, thus covering a period of 40 days And the Wednesdays and Fridays throughout the year are fast-days The fast before Communion is generally insisted on

The post-Reformation Church of Rome continued to fast, as in the middle ages, during Lent, on the Ember Days and Rogation Days, on the days appointed as Vigils, and on Fridays, the Wednesday and Saturday fasts having practically lapsed, but in 1781 a reduction was made in the severity of the fasting required of the English Roman Catholics by the introduction of a distinction between fasting and abstinence Recent years have seen further concessions, and the new *Codex Juris Canonici*, issued in 1917, shows that abstinence from flesh meat is alone required on days of abstinence, no restriction being laid upon the quantity of food taken Days of fasting which are not marked also as days of abstinence admit of any kind of food being taken at the one full meal that is allowed, flesh meat being forbidden, however, at the two smaller meals which are permitted The strict fast before Communion, rarely excused at all before the present century, may now be modified in the case of any who are in serious ill-health, dispensation being granted both to lay-people and to priests

At the Reformation the Church of England included in its Book of Common Prayer a list of days of fasting or abstinence, the two terms being used synonymously, and required that notice of these days should be given in church No directions for their observance were issued, the matter presumably being left to every man's conscience, yet there can be no doubt that the list was issued with serious intention, for provision was made by law for the granting of dispensations by the archbishop of Canterbury, by diocesan bishops, and by incumbents of parishes, according to the nature of the case (25 Hen VII, cap 21, 5 Eliz, cap 5) The list includes the 40 days of Lent, the Ember-days at the four seasons, the three Rogation-days, and all the Fridays in the year, except Christmas Day The fast before Communion was not referred to, but in the form provided in 1661 for the ministration of baptism to such as are of riper years, the first rubric states that candidates "may be exhorted to prepare themselves with prayers and fasting for the receiving of this Holy Sacrament" On the whole the practice of English churchmen after the Reformation included less and less fasting until the time of the Tractarian movement It was never entirely lost, and there were notable revivals of the practice in the Wesleyan and Evangelical movements, but the recovery of a true sense of its earlier obligation and importance and of a steady persistence in its practice dates from the second quarter of the 19th century Special stress has been laid by the followers of the Tractarians upon the necessity of the fast before Communion, and this, together with the evangelical opposition which it has aroused, led to the insertion in the revised Prayer Book which was presented to parliament in 1928 of a new rubric stating that "It is an ancient and laudable custom of the Church to receive this Holy Sacrament fasting Yet, for the avoidance of all scruple, it is hereby declared that such preparation may be used or not used, according to every man's conscience in the sight of God." The new Prayer Book also revised the list of days of fasting or abstinence, excluding the Epiphany when it chances to fall on a Friday, and the Fridays

in the octaves of Christmas, Easter, and the Ascension, and adding the Vigils before the Nativity of our Lord, Pentecost, St. John the Baptist, All Saints and St Andrew

In the other Reformed churches and in the Free churches which have separated themselves from the Church of England, fasting has had its place, but the sense of its importance has generally diminished, and there has arisen not a little prejudice against its use

II. Purposes of Fasting.—In any general survey of the different types of religious fasting, it is important to remember that great diversity exists between the mind and motives of men of different cultures and religions who yet do the same thing for what is ostensibly the same purpose, and that, in consequence, it is highly erroneous to suppose that the religious value of any one variety of fasting is constant in all cases that admit of being placed in that particular class

(1) *Purificatory Fasting*.—Under the influence of the mistaken idea that it is that which enters into a man which defiles him, the rejection of food and drink is often practised by those who would avoid every possibility of the contagion of evil at times of special importance In the lower culture the initiation of lads and girls to adult membership of their tribe, admission to secret societies, and entry into the married state, are prefaced by a period of fasting, mainly on the basis of this idea; and the same precaution has much to do with the fasting that belongs to the ritual of mourning after a death and of preparation for the reception of sacred food The endurance of fasting leads, sometimes, to the experience of seeing visions and hearing voices, and it is naturally adopted as a means thereto by "holy" men of all sorts who interpret the operation of the method they use with a physical or a psychological emphasis according to their understanding Again, fasting is practised as a preparation for spiritual and sacramental communion, because the spirit is intent on its guest For the sake of its own purgation and freedom of activity, it subordinates the desire for bodily food to the craving for spiritual sustenance This is the ultimate basis of the Christian fast of purification before Communion. It is not prompted by a Manichaean conception of matter, but is due solely to concentration on the things of the Spirit and an ancillary rejection for the time being of the means of physical life Thus, in the Church of England homily "of Fasting" the second "end" specified is "that the spirit may be made more earnest and fervent to prayer", and Hooker says (Eccl Pol v 72) that the object of fasting is "to temper the mind, lest contrary affections coming in place should make it too profuse and dissolute."

(2) *Sympathetic Fasting*.—The practice of fasting after a death is complex in its origin and significance It may be connected with the sacrifice involved in making provision for the dead; it may have to do with the placation of the ghost; it may be purificatory, or it may be a contradiction of normal practice intended to sever connection with the departed; but in most cases it is undoubtedly to be regarded also as an expression of grief, whether formal or sincere Such sympathetic fasting becomes a recurring practice in the case of a saint or deity who has conferred benefits and is to be duly honoured Thus March 24 was observed as a day of fasting and mourning in the ritual of the Mater Magna, in memory of the mother's grief for Attis, the Shī'ah Muslims similarly commemorate the martyrdom of 'Alī and his two sons, Hasan and Husain; and the Christian observance of Lent is largely inspired by the thought of fellowship with Christ in His suffering during the 40 days in the wilderness and during the events leading to His death

(3) *Penitential Fasting*.—In the minds of wrongdoers who are suffering or anticipating the reward of sin and convicted by their consciences, fasting serves to attest the genuineness of their repentance, to turn aside the wrath of the offended gods, and either to forestall and cancel at an easy rate the punishment due to them, or to denote a readiness to accept whatever is right, if only reconciliation may be had. At the lowest there is a large element of commercialism; at its best it is the expression of a truly contrite heart, and is associated with "prayers and supplications" and with "strong crying and tears" Such penitential fasting is found particularly in Jewish and Christian practice; and it may be said of all Christian restraint in the matter of food and drink that it partakes of this character

(4) *Meritorious Fasting*.—The fasting that is undertaken in order to obtain reward or to secure power is sometimes held to work magically, as in the Intichiuma ceremonies of the tribes in Central Australia, where fasting is practised for the increase of the totem food supply. Or again, it is a personal appeal for favour, as when Jain girls fast in order to win a good husband and a happy married life. Both ideas are mingled in the fasting which is practised as a means of gaining power to exorcise evil spirits and to secure the "holiness" which is the reward of works of supererogation.

(5) *Disciplinary Fasting*.—This figures in those religions attaching great importance to moral conduct, and it is regarded as a reasonable and useful practice, even by those who consider all other forms of fasting to be misconceived and vain When it is undertaken as a reaction from surrounding voluptuousness, and in protest against prevailing licence, it is apt to be unduly severe; but normally it is a reasonable part of the soul's preparation for the maintenance of self-control in times of strong temptation The Lenten discipline of Christians is shared by not a few to whom its religious significance makes no appeal, solely because they recognize its moral value

III. Criticism and Rejection of Fasting.—Fasting may be an irksome discipline, and there are many who, having absolved themselves from its practice, find reasons why it is no longer required

Thus, it is frequently urged that the strenuous conditions of modern life make it practically impossible, and that the use of frequent and light meals renders unnecessary a discipline which was, perhaps, of some service when men ate less frequently but more immoderately The plea of difficulty and inutility may be reinforced by arguments drawn from quite a different quarter Zoroastrianism taught that "he who fasts commits a sin," for he rejects that which is good, in so doing he tortures in himself another part of the good creation, and he weakens himself for the conflict with evil which is his proper work. Protests have also been made in the name of true religion by Old Testament prophets and early Christian writers, who have resented the abuse of fasting as a formal and merely external act, unblushingly offered as the accompaniment of an immoral life. "Behold, in the day of your fast ye find your own pleasure, and exact all your labours Behold, ye fast for strife and contention, and to smite with the fist of wickedness ye fast not this day so as to make your voice to be heard on high" (Isai lviii 3 *seq*) To the rebuke of the religious critic may be added the unfavourable verdict of some who regard the matter from medical and psychological standpoints, doubt as to the wisdom and efficacy of fasting as an aid to devotion and self-control being seriously increased by the citation of numerous cases in which physical and mental evil has resulted from excess

In spite of such criticism the practice of fasting persists, and it is likely to continue so long as men are capable of religious and moral aspiration. For it has the authority of very widespread use from time immemorial; it is supported by ecclesiastical authority in by far the greater part of Christendom; and, above all, it is rooted in some of the strongest emotions incident to human nature. There will always be the few who practise fasting rigorously, according to the strict interpretation of the term; the many will no doubt continue, according to a growing fashion, to regard *fasting* as a term which covers self-denial in general, and will impose it upon themselves in a variety of forms, including the discipline of some sort of abstinence in respect of food and drink at stated times. (O. H)

FASTOLF, SIR JOHN (d. 1459), English soldier, in some part the prototype of Shakespeare's Falstaff, was the son of a Norfolk gentleman, John Fastolf of Caister and is said to have been squire to Thomas Mowbray, duke of Norfolk, before 1398. He served with Thomas of Lancaster in Ireland during 1405 and 1406, and in 1408 made a fortunate marriage with Millicent, widow of Sir Stephen Scrope of Castle Combe in Wiltshire In 1413 he was serving in Gascony, and took part in all the subse-

quent campaigns of Henry V. in France. He must have earned a good repute as a soldier, for in 1423 he was made governor of Maine and Anjou, and in February 1426 created a knight of the Garter But later in this year he was superseded in his command by John Talbot On Feb. 12, 1429 when in charge of the convoy for the English army before Orleans he defeated the French and Scots at the "battle of herrings." On June 18 an English force under the command of Fastolf and Talbot was defeated at Patay According to the French historian Waurin, who was present, the disaster was due to Talbot's rashness, and Fastolf only fled when resistance was hopeless Other accounts charge him with cowardice, and John of Bedford at first deprived him of the Garter, though after inquiry he was honourably reinstated This incident was made unfavourable use of by Shakespeare in *Henry VI.* (pt. 1. act iv. sc. 1.) Fastolf continued to serve with honour in France, and was trusted both by Bedford and by Richard of York He returned home in 1440, when past sixty years of age. But the scandal against him continued, and during Cade's rebellion in 1451 he was charged with having been the cause of the English disasters through minishing the garrisons of Normandy In his later days he showed himself a grasping man of business A servant wrote of him,—"cruel and vengible he hath been ever, and for the most part without pity and mercy" (*Paston Letters*, i 389) He had large estates in Norfolk and Suffolk, and a house at Southwark, where he also owned the Boar's Head Inn He died at Caister on Nov. 5, 1459 There is some reason to suppose that Fastolf favoured Lollardry, and this circumstance with the tradition of his braggart cowardice may have suggested the use of his name for the boon companion of Prince Hal, when Shakespeare found it expedient to drop that of Oldcastle. In the first two folios the name of the historical character in the first part of *Henry VI* is given as "Falstaffe," not Fastolf Other points of resemblance between the historic Fastolf and the Falstaff of the dramatist are to be found in their service under Thomas Mowbray, and association with a Boar's Head Inn But Falstaff is in no true sense a dramatization of the real soldier.

The facts of Fastolf's early career are to be found chiefly in the chronicles of Monstrelet and Waurin. For his later life there is much material, including a number of his own letters, in the *Paston Letters* There is a full life by W Oldys in the *Biographia Britannica* (1st ed., enlarged by Gough in Kippis's edition) *See* also Dawson Turner's *History of Caister Castle*, Scrope's *History of Castle Combe*, J. Gairdner's essay *On the Historical Element in Shakespeare's Falstaff*, ap *Studies in English History*, Sidney Lee's article in the *Dictionary of National Biography*, and D W. Duthie, *The Case of Sir John Fastolf and other Historical Studies* (1907).

FAT, the name given to certain animal and vegetable products which are oily solids at ordinary temperatures, and are chemically distinguished as being the *glyceryl esters* of various fatty acids (*See* the article OILS, FATS AND WAXES) Fat is a normal constituent of animal tissue, being found even before birth; it occurs especially in the intra-muscular, the abdominal, and the subcutaneous connective tissues In the vegetable kingdom fats especially occur in the seeds and fruits, and sometimes in the roots. Physiological subjects concerned with the part played by fats in living animals are treated in the articles, CONNECTIVE TISSUES, NUTRITION; CORPULENCE; METABOLIC DISEASES

FATALISM, strictly the doctrine that all things happen according to a prearranged fate, necessity or inexorable decree (Lat *fatum*, that which is spoken, decreed) It has frequently been confused with determinism (*q v*), which, however, differs from it categorically in assigning a certain function to the will The essence of the fatalistic doctrine is that it assigns no place at all to the initiative of the individual, or to rational sequence of events Thus an oriental may believe that he is fated to die on a particular day; he believes that, whatever he does and in spite of all precautions he may take, nothing can avert the disaster The idea of an omnipotent fate overruling all affairs of men is present in various forms in practically all religious systems Thus Homer assumes a single fate (Μοῖρα), an impersonal power which makes all human concerns subject to the gods: it is not powerful over the gods, however, for Zeus is spoken of as weighing out the fate of men (*Il.* xxii. 209, viii 69). Hesiod has three Fates (οἶραι), daughters of night, Clotho, Lachesis and Atropos In Aeschylus fate is powerful even over the gods The Epicureans regarded fate as blind chance, while to the Stoics everything is subject to an absolute rational law

The doctrine of fate appears also in what are known as the higher religions, *e g.*, Christianity and Mohammedanism In the former the ideas of personality and infinite power have vanished, all power being conceived as inherent in God It is recognized that the moral individual must have some kind of initiative, and yet since God is omnipotent and omniscient man must be conceived as in some sense foreordained to a certain moral, mental and physical development. In the history of the Christian Church emphasis has from time to time been laid specially on the latter aspect of human life (*cf.* the doctrines of election, foreordination, determinism) Even those theologians, however, who have laid special stress on the limitations of the human will have repudiated the strictly fatalistic doctrine which is characteristic of oriental thought and is the negation of all human initiative (*see* PREDESTINATION, AUGUSTINE, SAINT; FREEWILL) In Islam fate is an absolute power, known as *Kismet*, or *Nasib*, which is conceived as inexorable and transcending all the physical laws of the universe The most striking feature of the oriental fatalism is its complete indifference to material circumstances men accept prosperity and misfortune with calmness as the decree of fate

FATA MORGANA. A mirage frequently seen in the Straits of Messina, consisting of an apparent vertical elongation of an object situated on the opposite shore *See* MIRAGE

FATE. (Gr. *Moira, Moirai, μοῖρα, μοῖραι*) In Homer, fate or necessity is conceived as an abstract power, *Moira* or *Aisa* (Gr Αἶσα). Both words indicate "apportionment" *Moira* is sometimes apparently identified with Zeus, sometimes differentiated from him, and is regarded as assigning to everyone his share of good and evil, although he may increase the latter by his own folly This is a nascent philosophical conception; a mythological tone is found in a few passages in which it is said that some one shall "suffer such things as *Moira* (or *Aisa*, or the Klothes, *i e*, the spinners) span upon the thread at his birth" (*Iliad*, xxiv, 210, xx, 127, *Odyssey*, vii 197) With this the usual account agrees; the *Moirai* are spinners, generally conceived (but not represented in classical art) as very old women, three in number and often named Klotho (spinner), Lachesis (she of the lot) and Atropos (inflexible) It is highly probable that they were in origin spirits of birth, not of fate, although the two notions are closely combined, destiny being decided at birth, for instance, in modern Greek and Slavonic folk-beliefs In this capacity they appear, *e g*, in the legend of Meleager Several authors fancifully assign different functions to the three *Moirai* as *e g*, dealing respectively with past, present and future.

In Rome, *fatum* meant the "spoken" decree, presumably of the gods, occasionally in the plural, under Greek influence, the Fata became identified with the *Moirai* From this again came a singular *fatus* or *fata* (*e g*, Fata Scribunda, the birth-fairy "who writes," *sc*, the child's destiny, Tertullian, *De Anima* 37), whence Mod Ital *fata*, Fr *fée* Another identification was with the Parcae (originally *Paricae*, from *parere*, to bring forth); this, although probably due in large part to a false etymology, *Parca* being derived from *pars* (Gr *μοῖρα*), was not far wrong, for the Parcae really were spirits of birth, and may quite possibly therefore have been spirits of destiny also

See especially Weizsacker-Drexler in Roscher's *Lexikon*, *s v* Moira; Wissowa, *Rel. u Kultus* (2nd ed., p 264). (H J R)

FATEHPUR, a town and district of British India, in the Allahabad division of the United Provinces The town is 73 m by rail N W. of Allahabad Pop (1921) 14,948 The district has an area of 1,642 sq m It is situated in the extreme south-eastern corner of the Doab or tract of country between the Ganges and the Jumna, which respectively mark its northern and southern boundaries The central part is almost perfectly level and consists of highly cultivated land interspersed with tracts impregnated with saltpetre (*usar*) A ridge of higher land, forming the watershed of the district, runs along it at an average distance of about 5 m. from the Ganges The country near the banks of

the two rivers is cut up into ravines and nullahs running in all directions, and is almost entirely uncultivable Besides the Ganges and Jumna the only rivers of importance are the Pandu, a tributary of the Ganges, and the Arind and Nun, which both fall into the Jumna

The tract in which this district is comprised was conquered in 1194 by the Pathans; but subsequently, after a desperate resistance, it was wrested from them by the Moguls In 1736 it was overrun by the Mahrattas, who retained possession of it until, in 1750, they were ousted by the Pathans of Fatehpur In 1753 it was reconquered by the nawab of Oudh In 1765, by a treaty between the East India Company and the nawab, it was made over to the Delhi emperor, who retained it till 1774, when it was again restored to the nawab wazir's dominions Finally in 1801, the nawab, by treaty, reconveyed it to the Company in commutation of the amount which he had stipulated to pay in return for the defence of his country In 1921 the population was 652,392 Trade is mainly agricultural, but the town of Fatehpur is noted for the manufacture of ornamental whips, and Jafarganj for artistic curtains

FATEHPUR SIKRI, a town in the Agra district in the United Provinces of India, on the road from Agra to Jaipur Pop (1921) 5,173 The magnificent ruins under which the modern hamlet nestles represent one of Akbar's capitals He founded it in 1569 as a thank-offering for the birth of a son, Selim, afterwards the emperor Jahangir, foretold by Selim Chisti, a famous Mohammedan saint The principal building is the great mosque, which is hardly surpassed by any in India In its courtyard, which measures 350 ft by 440 ft , stand two tombs One is that of Selim Chisti, built of white marble, and the windows with pierced tracery of the most exquisite geometrical patterns The other tomb, that of Nawab Islam Khan, is soberer and in excellent taste, but quite eclipsed by its surroundings The crowning glory of the mosque is its southern gateway, in appearance, says Fergusson, "noble beyond that of any portal attached to any mosque in India, perhaps in the whole world " The palace of Jodh Bai, the Rajput wife of Akbar, consists of a courtyard surrounded by a gallery, above which rise buildings roofed with blue enamel A rich gateway gives access to a terrace on which were the houses of Birbal and Miriam, and beyond these is another courtyard, where were Akbar's private apartments and the exquisite palace of the Turkish sultana Here are also the Panch Mahal or five-storeyed building, consisting of five galleries in tiers, and the audience chamber The special feature in the architecture of the city is the softness of the red sandstone, which could be carved almost as easily as wood, and so lent itself readily to the elaborate Hindu embellishment Fatehpur Sikri was a favourite residence of Akbar throughout his reign, and his establishment here was of great magnificence After Akbar's death Fatehpur Sikri was deserted, within 50 years of its foundation The buildings are situated within an enclosure, walled on three sides and about 7 m in circumference They are all more or less in ruins, but are now being carefully tended by the Archaeological Department

FATHER, the begetter of a child, the male parent The word is used of male ancestors more remote than the actual male parent, and of ancestors in general, and is the orthodox term for the First Person of the Trinity One who stands as a spiritual parent to another is his "father," *e g* , godfather, and bishops or archbishops are given the title Right or Most Reverend Father in God In the Roman church the pope is the Holy Father, while "father" is applied to a "regular," a member of one of the religious orders, and so to a confessor, whether regular or secular, and to any Roman priest It is also used sometimes of sub-members of a religious society or fraternity in the English church The first founders of an institution, constitution, epoch, etc , are often called fathers, *e g* , the earliest settlers of North America are the Pilgrim Fathers, and the framers of the United States constitution are the Fathers of the Constitution In ancient Rome the members of the senate are the *Patres conscripti*, the "conscript fathers." The senior member of a society is sometimes called the father. Thus the member of the British House of Commons or of the House of Representatives in the United States, America, who has sat for the longest period uninterruptedly, is the Father of the House. (*See* also FATHERS OF THE CHURCH.)

FATHER OF THE CHAPEL: *see* CHAPEL.

FATHER RIGHT: *see* PATRIARCHATE

FATHERS OF THE CHURCH. The "fathers of the Church" are the great bishops and other eminent Christian teachers of the earlier centuries, who were conspicuous for soundness of judgment and sanctity of life, and whose writings remained as a court of appeal for their successors, especially in reference to controverted points of faith or practice. A list of fathers drawn up on this principle will begin with the Christian writers of the 1st century whose writings are not included in the New Testament where it ought to end is a more difficult point to determine Perhaps the balance of opinion is in favour of regarding Gregory the Great (d 604) as the last of the Latin fathers, and John of Damascus (d *c* 760) as the last of the fathers of the Greek Church A more liberal estimate might include John Scotus Erigena or even Anselm or Bernard of Clairvaux in the West and Photius in the East The abbé Migne carried his Latin patrology down to the time of Innocent III (d 1216), and his Greek patrology to the fall of Constantinople (1453), but, while this large extension of the field is much to the advantage of his readers, it undoubtedly stretches the meaning of *patrologia* far beyond its natural limits For ordinary purposes it is best to make the patristic period conterminous with the life of the ancient Catholic Church In the West the Church enters the mediaeval stage of its history with the death of Gregory, while in the East even John of Damascus is rather a compiler of patristic teaching than a true "father "

A further question arises Are all the Christian writers of a given period to be included among the "fathers," or those only who wrote on religious subjects, and of whose orthodoxy there is no doubt? Migne, following the example of the editors of *bibliothecae patrum* who preceded him, swept into his great collection all the Christian writings which fell within his period, but he is careful to state upon his title-page that his patrologies include the "ecclesiastical writers" as well as the "fathers" and "doctors" of the Church, and an "ecclesiastical writer" is not necessarily orthodox It is clear that in the circumstances the terms "father," "patristic," "patrology" must be used with much elasticity, since it is now too late to substitute for them any more comprehensive terms

By the "fathers," then, we understand the whole of extant Christian literature from the time of the apostles to the rise of scholasticism or the beginning of the middle ages However we may interpret the lower limit of this period, the literature which it embraces is immense Some method of subdivision is necessary, and the simplest and most obvious is that which breaks the whole into two great parts, the ante-Nicene and the post-Nicene This is not an arbitrary cleavage, the Council of Nicaea (A D. 325) is the watershed which actually separates two great tracts of Christian literature The ante-Nicene age yields priceless records of the early struggles of Christianity; from it we have received specimens of the early apologetic and the early polemic of the Church, the first essays of Christian philosophy, Christian correspondence, Christian biblical interpretation we owe to it the works of Justin, Irenaeus, the Alexandrian Clement, Origen, Tertullian, Cyprian In these products of the 2nd and 3rd centuries there is much which in its own way was not surpassed by any of the later patristic writings Yet the post-Nicene literature, considered as literature, reaches a far higher level Both in East and West, the 4th and 5th centuries form the golden age of dogmatic theology, of homiletic preaching, of exposition, of letter-writing, of Church history, of religious poetry. Two causes may be assigned for this fact The conversion of the empire gave the members of the Church leisure and opportunities for the cultivation of literary taste, and gradually drew the educated classes within the pale of the Christian society Moreover, the great Christological controversies of the age tended to encourage in Christian writers and preachers an intellectual acuteness and an accuracy of thought and expression of which the earlier centuries had not felt the need

The ante-Nicene period of patristic literature opens with the

"apostolic fathers," *i e.* the Church writers who flourished toward the end of the apostolic age and during the half century that followed it, including Clement of Rome, Ignatius of Antioch, Polycarp of Smyrna and the author known as "Barnabas" (The term *patres apostolici* is due to the patristic scholars of the 17th century *See* Lightfoot, *St Clement of Rome*, 1 p 3, "sub-apostolic" is perhaps a more accurate designation) Their writings, like those of the apostles, are epistolary, but editions of the apostolic fathers now usually admit also the early Church order known as the *Didachē*, the allegory entitled the *Shepherd*, and a short anonymous apology addressed to one Diognetus A second group, known as the "Greek Apologists," embraces Aristides, Justin, Tatian, Athenagoras and Theophilus, and a third consists of the early polemical writers, Irenaeus and Hippolytus Next come the great Alexandrians, Clement, Origen, Dionysius, the Carthaginians, Tertullian and Cyprian, the Romans, Minucius Felix and Novatian, the last four laid the foundations of a Latin Christian literature Even the stormy days of the last persecution yielded some considerable writers, such as Methodius in the East and Lactantius in the West This list is far from complete, the principal collections of the ante-Nicene fathers include not a few minor and anonymous writers, and the fragments of many others whose works as a whole have perished

In the post-Nicene period the literary output of the Church was greater Only the more representative names can be mentioned here From Alexandria we get Athanasius, Didymus and Cyril, from Cyrene, Synesius, from Antioch, Theodore of Mopsuestia, John Chrysostom and Theodoret, from Palestine, Eusebius of Caesarea and Cyril of Jerusalem, from Cappadocia, Basil, Gregory of Nyssa and Gregory of Nazianzus The Latin West was scarcely less productive, it is enough to mention Hilary of Poitiers, Ambrose of Milan, Augustine of Hippo, Leo of Rome, Jerome, Rufinus and a father lately restored to his place in patristic literature, Niceta of Remesiana Gaul alone has a goodly list of Christian authors to show John Cassian, Vincent of Lerins, Hilary of Arles, Prosper of Aquitaine, Salvian of Marseilles, Sidonius Apollinaris of Auvergne, Caesarius of Arles, Gregory of Tours The period ends in the West with two great Italian names, Cassiodorus and Pope Gregory I, after Leo the greatest of papal theologians

The reader to whom the study is new will gain some idea of the bulk of the extant patristic literature, if we add that in Migne's collection ninety-six large volumes are occupied with the Greek fathers from Clement of Rome to John of Damascus, and seventy-six with the Latin fathers from Tertullian to Gregory the Great The Greek patrology contains, however, besides the text, a Latin translation, and in both patrologies there is much editorial matter

For a discussion of the more important fathers the student is referred to the articles which deal with them separately. In this place it is enough to consider the general influence of the patristic writings upon Christian doctrine and biblical interpretation Can any authority be claimed for their teaching or their exegesis, other than that which belongs to the best writers of every age? The decree of the council of Trent (*ut nemo . . contra unanimum consensum patrum ipsam scripturam sacram interpretari audeat*) is studiously moderate, and yet it seems to rule that under certain circumstances it is not permitted to the Church of later times to carry the science of biblical interpretation beyond the point which it had reached at the end of the patristic period Roman Catholic writers, however, have explained the prohibition to apply to matters of faith only, and in that case the Tridentine decree is little else than another form of the Vincentian "canon," *curandum est ut id teneamus quod ubique, quod semper, quod ab omnibus creditum est.* The fathers of the first six or seven centuries, so far as they agree, may be fairly taken to represent the main stream of Christian tradition and belief during the period when the apostolic teaching took shape in the great creeds and dogmatic decisions of Christendom The English reformers realized this fact, and notwithstanding their insistence on the unique authority of the canon of Scripture, their appeal to the fathers as representatives of the teaching of the undivided Church was as wholehearted as that of the Tridentine divines Thus the English canon of 1571 directs preachers "to take heed that they do not teach anything in their sermons as though they would have it completely held and believed by the people, save what is agreeable to the doctrine of the Old and New Testaments, and what the Catholic Fathers and ancient Bishops have gathered from that doctrine"

The patristic writings are no longer used as an armoury from which opposite sides may draw effective weapons, offensive or defensive, nor on the other hand are they cast aside as the rubbish of an ignorant and superstitious age All patristic students now recognize the great inequality of these authors, and admit that they are not free from the faults of their times, it is not denied that much of their exegesis is untenable, or that their logic is often feeble and their rhetoric offensive to modern taste But against these disadvantages may be set the unique services which the fathers still render to Christian scholars Their works comprise the whole literature of the Church during the decisive centuries which followed the apostolic age They are important witnesses to the text of the New Testament, to the history of the canon, and to the history of interpretation It is to their pages that we owe nearly all that we know of the life of ancient Christianity We see in them the thought of the ancient Church taking shape in the minds of her bishops and doctors, and in many cases they express the results of the great doctrinal controversies of their age in language which leaves little to be desired

BIBLIOGRAPHY —Among the more recent and most accessible sources of information we may mention Hastings, *Encyclopaedia of Religion and Ethics* (with Index vol), Smith and Wace's *Dictionary of Christian Biography*, Herzog-Hauck's *Realencyklopadie*, Bardenhewer's *Patrologie* and *Geschichte der altkirchlichen Litteratur*, Harnack's *Geschichte der altchristlichen Litteratur bei Eusebius* and Ehrard's *Die altchristliche Litteratur und ihre Erforschung* The contents of the volumes of Migne's patrologies are given in the *Catalogue général des livres de l'abbé Migne*, and a useful list in alphabetical order of the writers in the Greek *Patrologia* has been compiled by Dr J B Pearson (Cambridge, 1882) Migne's texts are not always satisfactory, but since the completion of his great undertaking two important collections have been begun on critical lines—the Vienna edition of the Latin Church writers, *Corpus scriptorum ecclesiasticorum Latinorum*, and the Berlin edition of the Greek writers of the ante-Nicene period, *Griechischen christlichen Schriftstellern der ersten drei Jahrhunderte*

For English readers there are three series of translations from the fathers, which cover much of the ground, the Oxford *Library of the Fathers*, the *Ante-Nicene Christian Library* and the *Select Library of Nicene and Post-Nicene Fathers* Satisfactory lexicons of patristic Greek and Latin are still a desideratum but assistance may be obtained in the study of the Greek fathers from Suicer's *Thesaurus*, the *Lexicon of Byzantine Greek* by E A Sophocles, and the *Lexicon Graecum suppletorium et dialecticum* of Van Herwerden, whilst the new great *Latin Lexicon*, published by the Berlin Academy, is calculated to meet the needs of students of Latin patristic literature For a fuller list of books useful to the reader of the Greek and Latin fathers *see* H B Swete's *Patristic Study* (2nd ed 1900)

FATHOM, a measure of length, being the distance from the tip of one middle finger to the tip of the other, when the arms are stretched out to their widest extent (a word common, in various forms, to Scandinavian and Teutonic languages, *cf* Danish *favn*, Dutch *vaam* and Ger *Faden*, and meaning "the arms extended", the ultimate origin is a root *pet*, seen in the Gr πεταννύναι, to spread) This length has been standardized to a measure of 6 ft., and as such is used mainly in soundings as a unit for measuring the depth of the sea "Fathom" is also used in the measurement of timber, when it is equivalent to 6 ft sq., similarly, in mining, a fathom is a portion of ground running the whole thickness of the vein of ore, and is 6 ft in breadth and thickness The verb "to fathom," *i e*, to sound or measure with a fathom-line, is used figuratively, meaning to go into a subject deeply, to penetrate, or to explore thoroughly.

FATHOMETER, a device which is a practical development of the sonic or echo depth-finding principle for modern navigation purposes This device is manufactured by the Submarine Signal Corporation in the United States, is a development of Prof Fessenden's submarine oscillator, and produces a submarine sound, and detects the returning sound by electrical means The fathometer system consists essentially of three parts: a sound-producer attached to the skin of the ship, a sound-receiver located in a

small tank of water, which tank is mounted on the inner surface of the skin of the ship, and the fathometer indicator, which controls the despatch of the electrical impulses as sound waves, and converts the elapsed time of the resulting echoes into visual indications of depth

The relation between the sound-producer and the sound-receiver is comparatively simple The sound is reflected back from the bottom of the ocean and strikes the plates of the ship That section of the plate supporting the tank which contains the sound-receiver transmits the vibrations through the fresh water in the tank to the sound-receiver which converts the vibrations into electrical waves Wires running from the sound-receiver carry the electrical waves to the fathometer indicator, where they are shown as visual indications of depth For soundings within the range required for ordinary navigation purposes, it is only necessary to glance at the dial of the fathometer as the soundings are shown by a flash of light that appears opposite a numeral on the dial For soundings beyond the range usually required in navigation, a different method is used The observer listens with head telephones and notes the position of a revolving light when he hears the returning echo in the telephones

The fathometer is started and stopped by means of a simple switch Once started, the operation is entirely automatic, depth indications being given continuously The apparatus contains no parts that require expert adjustment or careful maintenance This method of taking soundings has many advantages over the older methods For example, the soundings shown by a fathometer indicate the depth directly beneath a vessel whether the vessel is proceeding or stopped, ordinary speeds have no effect whatever on the operation of the device On the other hand, the older forms of sounding instruments requiring physical contact with the bottom, consume so much time in their operation that when the sounding is finally reported, the ship, if it has been moving, is far away from the spot, the depth of which is reported Furthermore, the fathometer can be left in operation for indefinite periods of time resulting in thousands of soundings being indicated per hour. This feature of the device has led navigators to take lines of soundings when approaching objectives and to chart the soundings for comparison with soundings shown on subsequent trips Thus these navigators become so familiar with the soundings on their true course that they can check position readily by reference to soundings Fathometers are in operation on practically every important class of vessel

FATIGUE, in psychology, a condition of mind resulting from prolonged mental activity It is characterized by an increasing inability to pay attention to things, failing memory, and inability to think It is also accompanied by peculiar organic sensations (*See* EXPERIMENTAL PSYCHOLOGY; INDUSTRIAL PSYCHOLOGY)

The non-military work carried out by soldiers, such as cleaning the barracks and keeping them in repair, is termed fatigue For fatigue in muscle, *see* MUSCLE.

FATIGUE IN INDUSTRY. Before the introduction of power-driven machinery, production depended almost wholly on human effort and skill, but with the so-called Industrial Revolution and the subsequent enormous developments in mechanical and technical methods, the machine was generally accepted as the all-important factor, while the operative *per se* was assumed to play a subordinate and even negligible part We find, for instance, that the successive reforms in labour conditions made during the 19th century were introduced and advocated solely on humanitarian grounds; that is, it was always tacitly assumed that the worker alone would benefit, and it was frequently asserted (and even admitted by the reformers themselves) that the manufacturers might suffer some disadvantage The principle that maximum production is contingent on maximum fitness of the worker had not yet been realized Yet, all the available evidence goes to show that the attainment of the best conditions for the worker is an essential factor in productive capacity

The study of industrial fatigue, then, which aims at determining those conditions, is of very recent origin The earliest instance occurred in 1893, when Messrs Mather and Platt of Manchester, tried their well-known experiment of abolishing the pre-breakfast spell of work, so reducing the weekly hours of work from 54 to 48 Two years' experience showed that this change had brought about a considerable increase in production and a decrease in the amount of lost time, and on the basis of this experiment the 48-hour week was shortly afterwards introduced into the British Government arsenals and dockyards

Experiments with similar results were soon afterwards undertaken in other countries, notably Abbé's studies at the Zeiss optical works, Berlin, and those of Fromont at the Engis chemical works in Belgium, whilst, on the more individual side of industrial work, the researches of Taylor on time study and rest pauses, of Gilbreth on movement study, and Munsterberg on the more psychological aspects of industrial life, remain examples of brilliant pioneer work in an untried field

Meanwhile, in Great Britain interest in these questions continued to grow In 1913 an investigation on industrial fatigue was undertaken by Stanley Kent on behalf of the Home Office, and in the same year the British Association for the Advancement of Science appointed a research committee for the purpose of investigating fatigue from the economic standpoint Shortly afterwards, the Health of Munition Workers Committee, formed in 1915, gained valuable knowledge on the effects of hours of work on fatigue and efficiency, accidents and lost time In 1918, the Industrial Fatigue Research Board was set up by the Medical Research Council to continue the work already started and to study on systematic and scientific lines the laws governing the employment of the human body and mind in industry Lastly, in 1922 was founded the National Institute of Industrial Psychology, a self-supporting body, which, in addition to research on vocational psychology conducts investigations for individual firms against payment

Elsewhere good progress has been made, and almost every country—at all events every country with wide industrial interests —possesses one or more institutions or committees dealing with the study of the human factor in industry, chiefly on the side of vocational psychology

Scope of Term.—Fatigue has been defined as "the sum of the results of activity which show themselves in a diminished capacity for work" This definition, though probably the best devised up to the present, suffers from the fact that it includes within itself other factors, such, for instance, as monotony or boredom, which under present conditions are operative to an equal or even greater extent in industry In our present state of knowledge, indeed, it appears preferable not to attempt any precise definition of so elusive a phenomenon, but rather to use the term in a wider sense, as including not only the lessened capacity or inclination to do work which results from the previous doing of work of the same kind, but all conditions affecting the body and mind that impede the normal man from working with his maximum fitness or efficiency In its strict sense, then, the term would include the effects of numerous wide sociological and economic factors, admittedly of great importance, but it is here confined to the narrower field, which has been more explored, namely, the effects of conditions arising in or directly concerned with the work itself These may be regarded as falling roughly into three categories:—

(*a*) Hours of labour, including length of spell, rest pauses, etc

(*b*) Conditions of employment, *i e* , the physical conditions of the worker's environment, such as ventilation and lighting

(*c*) Methods of work, constituting the personal factors in efficiency and fatigue, *e g.*, vocational psychology and movement study (*See* article on INDUSTRIAL PSYCHOLOGY)

Tests of Fatigue.—For the quantitative estimation of industrial fatigue the tests selected must necessarily depend upon circumstances. They fall naturally into two classes, according to whether they consist in the application to the person himself of some test that has been previously standardized (direct tests) or in the measurement of some existing phenomenon indicative of or susceptible to the presence of fatigue (indirect tests)

Notwithstanding many researches, no direct test suitable for practical application has yet been evolved The McDougall dotting test, which has been frequently used in comparing the results of experimental changes, is more truly an indirect test.

Of indirect tests, variations in output (together with other tests of performance such as the McDougall dotting test) have been far the most generally used and are probably the most trustworthy, provided that adequate allowance can be made for certain disturbing factors such as incentive or technical improvement Other tests, adopted to meet special circumstances, have been sickness and mortality rates, labour turnover, lost time and accidents

Examples of Results Obtained.—Any attempt to cover the whole of the work done during recent years would obviously be impossible within the scope of the present article. Accordingly, a few examples have been selected illustrative of results recently obtained in each of the three categories already mentioned

(*a*) *Hours of Work* The false economy of excessive hours of work was clearly demonstrated by Vernon, who found that the long weekly hours introduced during the World War in the supposed interests of increased production, usually resulted in a reduction in hourly output which more than counterbalanced the additional time available, so that the total output was actually less than when the hours were subsequently reduced

Another subject that has received much study recently is the introduction of short rest-pauses of 5–10min in the 4½ or 5-hour spell With few exceptions, the effect has been a small but genuine increase in output, notwithstanding the shorter time actually worked

(*b*) *Conditions of Employment* The physical environment of the worker has been shown to have a well marked influence on his productive capacity Vernon and Farmer, for instance, have shown independently that in heavy work, especially when it involves exposure to high temperatures, output usually undergoes a consistent seasonal variation, being greatest in winter and least in summer This variation can only be ascribed to the relatively disadvantageous effects of the higher atmospheric temperatures in summer That the reduction in summer can be largely avoided by good ventilation has been shown by Vernon and by Wyatt This is illustrated by the following table —

Comparison of Output in Summer and Winter (Tinplate Manufacture)

Factory	State of artificial ventilation	Mean output in		Percentage reduction in summer
		Dec and Jan	July and Aug	
A	Good	100 5	97 5	3 0
B	Moderately good	102 5	97 0	6 4
C	Moderate (or none)	105 5	94 5	10 4
D	None (good natural)	104 5	93 0	11 0
E	None (poor natural)	108 0	93 5	13 4

Evidence also has been adduced by Osborne and Vernon to show that temperature may be a factor in accident causation and that the incidence of minor accidents reaches a minimum at 67 5° F , increasing above and below that temperature

The effect of illumination on working capacity has been recently explored by Weston in letterpress composing The results of his experiments in the printing industry show that the increase in output and the diminution of errors (both total and "turned letters") vary as the logarithm of the illumination value, whilst daylight values are only reached at an artificial illumination (25-foot candles) considerably higher than that usually found in practice.

(*c*) *Methods of Work* The examples hitherto given have for the most part illustrated the resultant effects of improved conditions on large groups of workers. The possibilities underlying the study of the individual worker were first recognized by F. W. Taylor in the United States and have since led to the development of a special science known as industrial psychology. Since several examples are already given in the article on this (*q v*) only two need be quoted here.

Various experiments in the many different methods of weight-carrying have been compared by Bedale on the basis of the energy expended in carrying various loads a given distance The results suggest that these methods can be arranged roughly in order of merit, according to the degree of displacement of the body necessary to bring the centre of gravity over the feet. Thus, carrying by means of the yoke and by bundles on the shoulders, were found to be far the most economical, and carrying things on the hip the least Other factors, however, have an influence; thus, carrying loads on the head, in which the body is maintained upright, was nevertheless found to be ineffective, probably owing to chest-fixation and undue muscular tension

The final example is derived from an investigation on movement study In "sweet dipping," a "centre" such as an almond is dipped in a basin of melted sugar with the left hand, covered with the sugar by working it with a fork held in the right hand, and finally placed on a tray. On being photographed, the paths travelled over by the hands of several workers were found by Farmer in most cases to assume roughly the form of straight lines and to involve several reversals of direction. A new improved method of doing the work was then introduced, in which the hand moved in curves, the frequent changes in direction being thus avoided and maximum momentum being used for the most tiring part of this particular work After a short course of instruction, the output increased by 27% owing to the greater ease with which the work was done

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FATIGUE OF METALS, a generic term denoting all phenomena associated with the behaviour of metals subjected to repetitions of a range of stress The term, however, is more generally applied to the progressive deterioration, leading to ultimate fracture, caused by repetitions of a cycle of stress, the maximum stress of the cycle being numerically less than that stress which causes failure on a single application Fracture by fatigue can be caused by repeated cycles of direct, bending, torsional, or combined stresses, and is accelerated by the presence of shock conditions or surface defects, sudden discontinuities of section, etc , which create local concentrations of stress

Three Types of Stresses.—Cyclical variations of stress can be divided into three main types: *Alternating stresses* (maximum and minimum stress of cycle differ in sign), *pulsating stresses* (stresses vary from zero to maximum value) and *fluctuating stresses* (vary in magnitude but not in sign) *Any* stress cycle is defined numerically by the expression $M \pm \frac{1}{2}R$, where M is the average stress, and R is the range of stress (algebraic difference of maximum and minimum stresses) Fatigue range or limiting range (R) is the greatest range of stress which can be applied for an indefinitely great number of repetitions without causing fracture *Endurance*, under a given range of stress, is the number of repetitions necessary to cause fracture

In 1849 Jones and Galton investigated the behaviour of cast-iron bars subjected to pulsating bending strains Fracture occurred in less than 100,000 strainings when the range of strain exceeded one-third of the static ultimate deflection. The endurance decreased at an increasing rate with increased ranges of strain Bars which had been partially fatigued suffered no loss in static ultimate strength. Somewhat similar tests, on a wrought-iron built-up girder, were made by Fairbairn in 1860–1 The loading was applied with shock. Fairbairn's conclusions confirmed those of the earlier workers and also pointed to the existence of a definite fatigue range for metals These conclusions received further support from the experiments of Wohler (1871), in which, for the first time, strict attention was paid to the *magnitude* of the applied stresses Wohler used iron and steel subjected to

cycles of direct, bending, and torsional stresses

Subsequent to these early classical investigations, the fatigue of metals has formed the subject of several hundreds of independent researches The main objects of these investigations and the conclusions drawn from the results are briefly summarised below (Except where otherwise stated, the remarks apply only to tests conducted at air temperature)

Evidence of a Limiting Range of Stress.—The results of a series of endurance tests, where any one type of straining action and a constant value of the mean stress of the cycle are employed, show that the endurance (N) to fracture increases at an increasing rate as the range of stress (S) decreases A curve connecting S and N tends to become parallel to the N axis It is regarded as established that, in the case of ferrous metals, the S/N curve has become parallel to the N axis at values of N of 10^7 or 2×10^7 reversals, and remains so for the maximum endurances investigated (10^8 to 10^9 cycles) This is also true for some of the pure metals and non-ferrous alloys Tests on *some* non-ferrous metals and alloys, however, have shown fractures to occur after several hundred millions of reversals, although, at these endurances, the slope of the S/N curve is very small In general, *sound metals appear to possess a definite limiting range of stress* (R_L).

Two relations have been suggested, both of which can be expressed by the formula $R_L=R_{LR}(1-\frac{M}{f})^x$ where R_L is the limiting range when M is the corresponding value of the mean stress, R_{LR} is the limiting range when M=0, f is the static ultimate strength of the metal, and x has the value of 1 or 2 Some experimental results agree with one of these relations, others conform to neither For cycles of direct stresses, the linear relation is generally a safe rule between the limits of M=0 and M=½R Some experiments employing torsional stresses have shown that the value of R_L is not altered appreciably by wide variations in the value of M

Effect of Frequency of Cycle (F) on Limiting Range (R_L)—It is now established that a constant value of R_L is obtained at frequencies up to 5,000 cycles per minute Tests made on copper, iron, and mild steel at frequencies of 3,000, 30,000, and 60,000 cycles per minute gave progressively greater values of R_L at the higher frequencies

Under repetitions of the limiting range, or a numerically inferior range, a state is ultimately reached when no further plastic strain occurs, approximate elasticity only results as strain hysteresis can be detected These *natural* elastic limits are not related to the *primitive,* or original, elastic limits of the material When the applied range of stress exceeds the limiting range, plastic deformation generally occurs until the cracking stage is reached

Effect on Limiting Range of Temperature of Test.—Available data relate only to reversed stresses (M=0) The limiting range (R_L) is largely unaffected in value until temperatures of about 400°C. are reached At higher temperatures R_L decreases, the rate of decrease varying with different metals The effect of elevated temperatures on R_L is not, in general, as marked as on the static ultimate strength under prolonged loading; *e g*, the values of ½R_L for four steels and one non-ferrous alloy, at various temperatures between 550°C and 750°C, have been found to be *equal to, or greater than,* the static strength (under prolonged loading) at the same temperatures

Effect of Repeated Stresses on Microstructure of Metals.—Repeated stresses applied to *crystalline aggregates* cause slip bands to appear on the surfaces of favourably orientated crystals If R_L is not exceeded, this local action ceases after a certain number of repetitions and the metal becomes strain-hardened Under repetitions of greater stress ranges, microscopic cracks are initiated in the regions of maximum slip, and fracture is caused by propagation of these cracks throughout the metal. Even in ductile materials, the process of initiation and propagation of these cracks may be so highly localised that the appearance of fracture is one usually associated with that of brittle materials Precisely similar surface phenomena are exhibited by single metallic crystals subjected to repeated stresses, suggesting that fatigue failure is essentially a process of deterioration of crystalline material and that the chief effect of the inter-crystal boundaries in aggregates is to inhibit slip due to the change in orientation of neighbouring crystals

A fundamental theory of fatigue has yet to be advanced The attrition theory (Ewing and Humfrey) is not supported by the results of recent research A number of theories have been based on the assumption (Beilby) that plastic strain in metals causes a change from the crystalline to the amorphous state on the surfaces of slip The manner in which the fatigue crack is initiated has not been explained satisfactorily The results of experiments on single crystals (Gough, Hanson, and Wright) suggest that the effect of slip is to produce local distortions within the crystal, thus setting up internal stresses which, under repetitions of stress ranges, lead to the disruption of inter-atomic bonds and the initiation of cracks The breaking-up, under strain, of a crystal grain into a number of crystallites of slightly varying orientations is an alternative hypothesis which is consistent with observed facts Little doubt exists that, in some manner, fatigue failure is the direct result of local plastic deformation, and it seems highly improbable that fatigue would occur in a material which is truly elastic

The importance of an understanding of fatigue phenomena in its relation to industry cannot be over-estimated Those machine and structural components whose working conditions can be so adjusted as to exclude the possibility of fatigue failure constitute a very small minority The whole trend of development of modern engineering lies in the direction of the employment of higher working stresses, speeds, and temperatures These considerations, together with the necessities of eliminating unnecessary material—to reduce first cost—and the reduction of the weight power factor—which has become of prime importance since the advent of aircraft—tend to make the static strength properties of metals (except at elevated temperatures) of less relative importance than their fatigue properties A conservative estimate of failures in modern engineering practice attributes 80% of such failures to fatigue As fatigue failures are usually unaccompanied by any marked preliminary warnings, a deplorable loss of life has often resulted *See* METALLOGRAPHY, METALLURGY; MATERIALS, STRENGTH OF

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(H J G)

FATIMITES, also called **FATIMIDES,** the name of a dynasty called after Fatima, daughter of the prophet Mohammed, from whom and her husband the Caliph Ali, son of Abu Talib, they claimed descent The dynasty is also called 'Obaidi (Ubaidī) after 'Obaidallah, the first sovereign, and 'Alawī, a title which it shares with other dynasties claiming the same ancestry Three sovereigns, who reigned in north-western Africa before the annexation of Egypt, are worthy of mention al-Mahdī 'Obaidallah 297 (909), al-Qā'im Mohammed 322 (934); al-Mansūr Ismā'il 334 (945)

The dynasty owed its rise to the attachment to the family of the prophet which was widespread in the Muslim world, and the belief that the sovereignty was the right of one of its members Owing, however, to the absence of the principle of primogeniture there was difference of opinion as to the person whose claim should be enforced, and a number of sects arose maintaining the rights of different branches of the family The Fatimites were supported by those who regarded the sovereignty as vested in Ismā'il, son of Ja'far al-Sādiq, great-great-grandson of Alī, through his second son Hosain (Ḥusain). Of this Ismā'il the first Fatimite caliph was supposed to be the great-grandson The line of ancestors between him and Ismā'il is, however, variously given, even his father's name being quite uncertain, and in some of the pedigrees even Ismā'il does not figure

Apparently when the family first became of political importance their Alid descent was not disputed at Baghdad, and the poet al-Sharīf al-Radī (d AH 406· A.D. 1015), in whose family the office of Naqīb (registrar of the Alids) was hereditary, appears to have acknowledged it (*Dīwān,* ed. Beirut, p 972). When their

success became a menace to the caliphs of Baghdad, genealogists were employed to demonstrate the falsity of the claim, and a considerable literature, both official and unofficial, rose in consequence The founder of the dynasty was made out to be a scion of a family of heretics from whom the terrible Carmathian sect had originated· later on (perhaps owing to the rôle played by Jacob, son of Killis, in bringing the Fatimites to Egypt), the founder was made out to have been a Jew, either as having been adopted by the heretic supposed to be his father, or as having been made to personate the real 'Obaidallah, who had been killed in captivity

The Difficulty of the Problem.—The uncertainty of the genealogies offered by their partisans renders any positive solution of the problem impossible What seems to be clear is that secretly within the Abbasid empire propaganda was carried on in favour of one or other Alid aspirant, and the danger which any such aspirant incurred by coming forward openly led to his whereabouts being concealed except from a very few adherents What is known then is that towards the end of the 3rd Islamic century the leader of the sect of Ismā'īlites (Assassins, *q v*) who afterwards mounted a throne, lived at Salamia, near Emesa (Homs), having agents spread over Arabia Persia and Syria, and frequently receiving visits from pious adherents, who had been on pilgrimage to the grave of Hosain (Husain) Such visitors received directions and orders such as are usual in secret societies One of these agents, Abū Abdallah al-Hosain called al-Shī'ī, said to have filled the office of censor (*muhtasib*) at Basra, received orders to carry on a mission in Arabia, and at Mecca is said to have made the acquaintance of some members of the Berber tribe Kutama, south of the bay of Bougie These persons persuaded him to travel home with them in the character of teacher of the Koran, but according to some authorities the ground had already been prepared there for a political mission He arrived in the Kutama country in June 893, and appears very soon to have been made chief, thereby exciting the suspicion of the Aghlabite ruler of Kairawān, Ibrāhīm b Ahmad, which, however, was soon allayed His success provoked a civil war among the Berbers, but he was protected by a chief named Hasan b Hārūn, and displaced sufficient military ability to win respect Nine years after his arrival he made use of the unrest following on the death of the Aghlabite Ibrāhīm to attack the town of Mila, which he took by treachery, and turned into his capital, the son and successor of Ibrāhīm, Abu'l-'Abbās 'Abdallah, sent his son al-Ahwal to deal with the new power, and he defeated al-Shī'ī in some battles, but in 903 al-Ahwal was recalled by his brother Ziyādatallah, who had usurped the throne, and put to death

At some time after his first successes al-Shī'ī sent a messenger (apparently his brother) to the head of his sect at Salamia, bidding him come to the Kutama country, and place himself at the head of affairs, since al-Shī'ī's followers had been taught to pay homage to a Mahdī who would at some time be shown them It is said that 'Obaidallah, who now held this post, was known to the court at Baghdad, and that on the news of his departure orders were sent to the governor of Egypt to arrest him but by skilful simulation 'Obaidallah succeeded in escaping this danger and with his escort reached Tripoli safely Instructions had by this time reached the Aghlabite Ziyādatallah to be on the watch for the Mahdī, who was finally arrested at Sijilmāsa (Tafilalt) in the year AH 292 (AD 905); his companion, al-Shī'ī's brother, had been arrested at an earlier point, and the Mahdī's journey to the south-west must have been to elude pursuit

THE EARLY FATIMITES

The invitation to the Mahdī was premature, for Ziyādatallah had sent a powerful army to oppose al-Shī'ī, which, making Constantine its headquarters, had driven al-Shī'ī into the mountains after six months al-Shī'ī secured an opportunity for attacking it, and won a complete victory Early in 906 another army was sent to deal with al-Shī'ī, and an earnest appeal came from the caliph Muqtafī (Moktafi), addressed to all the Muslims of Africa, to aid Ziyādatallah against the usurper. The operations of the Aghlabite prince were unproductive of any decided result, and by September 906 al-Shī'ī had got possession of the important fortress Tubna and some others Further forces were immediately sent to the front by Ziyādatallah, but these were defeated by al-Shī'ī and his officers, to whom other towns capitulated, till Ziyādatallah found it prudent to retire from Al-Urbus or Laribus, which had been his headquarters, and entrench himself in Raqqāda, one of the two capitals of his kingdom, Kairawān being the other

By March 909 Raqqāda had become untenable, and Ziyādatallah resolved to flee from his kingdom, he made for Egypt, and thence to 'Irak his final fate is uncertain The cities Raqqāda and Kairawān were immediately occupied by al-Shī'ī, who proceeded to send governors to the other places of importance in what had been the Aghlabite kingdom, and to strike new coins, which, however, bore no sovereign's name Orders were given that the Shī'ite peculiarities should be introduced into public worship

Al-Shī'ī's Victories.—In May 909 al-Shī'ī led a tremendous army westwards to the kingdom of Tahert, where he put an end to the Rustamite dynasty, and appointed a governor of his own he thence proceeded to Sijilmāsa where 'Obaidallah lay imprisoned, with the intention of releasing him and placing him on the throne After a brief attempt at resistance, the governor fled, and al-Shī'ī entered the city, released 'Obaidallah and presented him to the army as the long-promised Imām The day is given as Aug 26, 909 'Obaidallah had been in prison more than three years Whether his identity with the Mahdī for whom al-Shī'ī had been fighting was known to the governor of Sijilmāsa is uncertain If it was, the governor and his master the Aghlabite sovereign might have been expected to make use of their knowledge and outwit al-Shī'ī by putting his Mahdī to death Opponents of the Fatimites assert that this was actually done, and that the Mahdī presented to the army was not the real 'Obaidallah, but (as usual) a Jewish captive, who had been suborned to play the rôle

The chief command was now assumed by 'Obaidallah, who took the title "al-Mahdi, Commander of the Faithful," thereby claiming the headship of the whole Muslim world Raqqāda was at the first made the seat of the court, and the Shī'ite doctrines were enforced on the inhabitants, not without encountering some opposition Revolts which arose in different parts of the Aghlabite kingdom were, however, speedily quelled

The course followed by 'Obaidallah in governing independently of al-Shī'ī soon led to dissatisfaction on the part of the latter, who, urged on it is said by his brother, decided to dethrone their Mahdī, and on the occasion of an expedition to Ténés, which al-Shī'ī commanded, organized a conspiracy with that end The conspiracy was betrayed to 'Obaidallah, who took steps to defeat it, and on the last day of July 911 contrived to assassinate both al-Shī'ī and his brother Thus the procedure which had characterized the accession of the 'Abbāsid dynasty was repeated It has been conjectured that these assassinations lost the Fatimites the support of the organization that continued to exist in the East, whence the Carmathians figure as an independent and even hostile community, though they appear to have been amenable to the influence of the African caliph

The New Revelation.—'Obaidallah had now to face the dissatisfaction of the tribes whose allegiance al-Shī'ī had won, especially the Kutāma, Zenāta and Lawāta· the uprising of the first assumed formidable proportions, and they even elected a Mahdī of their own, one Kādū b Mu'ārik al-Māwatī, who promulgated a new revelation for their guidance They were finally defeated by 'Obaidallah's son Abu'l-Qāsim Mohammed, who took Constantine, and succeeded in capturing the new Mahdī, whom he brought to Raqqāda 'Obaidallah ousted other opponents by ruthless executions By the middle of the year 913 by his own and his son's efforts he had brought his kingdom into order After the style of most founders of dynasties he then selected a site for a new capital, to be called after his title Mahdia (*q v*), on a peninsula called Ḥamma (Cape Africa) south-south-east of Kairawān Eight years were spent in fortifying this place, which in 921 was made the capital of the empire.

After defeating internal enemies 'Obaidallah turned his attention to the remaining 'Abbāsid possessions in Africa, and his general Habāsah b Yūsuf in the year 913 advanced along the northern coast, taking various places, including the important town of Barca He then advanced towards Egypt, and towards the end of July 914, being reinforced by Abu'l-Qāsim, afterwards al-Qā'im, entered Alexandria. The danger led to measures of unusual energy being taken by the Bagdad caliph Moqtadir, an army being sent to Egypt under Mu'nis, and a special post being organized between that country and Bagdad to convey messages uninterruptedly The Fatimite forces were defeated, partly owing to the insubordination of the general Habāsah, in the winter of 914, and returned to Barca and Kairawān with great loss.

FURTHER EXPEDITIONS

A second expedition was undertaken against Egypt in the year 919, and on July 10 Alexandria was entered by Abu'l-Qāsim, who then advanced southward, seizing the Fayum and Ushmūnain (Eshmunain). He was presently reinforced by a fleet, which, however, was defeated at Rosetta in March of the year 920 by a fleet despatched from Tarsus by the 'Abbāsid caliph Moqtadir, most of the vessels being burned. Through the energetic measures of the caliph, who sent repeated reinforcements to Fostat, Abu'l-Qāsim was compelled in the spring of 921 to evacuate the places which he had seized, and return to the west with the remains of his army, which had suffered much from plague as well as defeat on the field On his return he found that the court had migrated from Raqqāda to the new capital Mahdia (*q v*) Meanwhile other expeditions had been despatched by 'Obaidallah towards the west, and Nekor (Nakur) and Fez had been forced to acknowledge his sovereignty. The remaining years of 'Obaidallah's reign were largely spent in dealing with uprisings in various parts of his dominions, the success of which at times reduced the territory in which he was recognized to a small area

'Obaidallah's Death.—'Obaidallah died on March 4, 933, and was succeeded by Abu'l-Qāsim, who took the title al-Qā'im biamr allah. He immediately after his accession occupied himself with the reconquest of Fez and Nekor, which had revolted during the last years of the former caliph He also despatched a fleet under Ya'qūb b Ishāq, which ravaged the coast of France, took Genoa, and plundered the coast of Calabria before returning to Africa A third attempt made by him to take Egypt resulted in a disastrous defeat at Dhāt al-Humām, after which the remains of the expedition retreated in disorder to Barca

The later years of the reign of Qā'im were troubled by the uprising of Abū Yazīd Makhlad al-Zenātī, a leader who during the former reign had acquired a following among the tribes inhabiting the Jebel Aures, including adherents of the 'Ibādī sect After having fled for a time to Mecca, this person returned in 937 to Tauzar (Touzer), the original seat of his operations, and was imprisoned by Qā'im's orders His sons, aided by the powerful tribe Zenāta, succeeded in forcing the prison, and releasing their father, who continued to organize a conspiracy on a vast scale, and by the end of 943 was strong enough to take the field against the Fatimite sovereign, whom he drove out of Kairawān Abū Yazīd proclaimed himself a champion of Sunnī doctrine against the Shī'is, and ordered the legal system of Mālik to be restored in place of that introduced by the Fatimites Apparently the doctrines of the latter had as yet won little popularity, and Abū Yazīd won an enormous following, except among the Kutāma, who remained faithful to Qā'im

The Rout of Qa'im.—On the last day of Oct 944, an engagement was fought between Kairawān and Mahdia at a place called al-Akhawān, which resulted in the rout of Qā'im's forces, and the caliph's being shortly after shut up in his capital, the suburbs of which he defended by a trench Abū Yazīd's forces were ill-suited to maintain a protracted siege, and since, owing to the former caliph's forethought, the capital was in a condition to hold out for a long time, many of them deserted and the besiegers gained no permanent advantage After the siege had lasted some ten months Abū Yazīd was compelled to raise it (Sept 945); the struggle, however, did not end with that event, and for a time the caliph and Abū Yazīd continued to fight with varying fortune, while anarchy prevailed over most of the caliph's dominions. On Jan 13, 946, Abū Yazīd shut up Qā'im's forces in Susa which he began to besiege, and attempted to take by storm

DECLINE OF THE FATIMITES

On May 18, 945, while Abū Yazīd was besieging Susa, the caliph al-Qā'im died at Mahdia, and was succeeded by his son Ismā'īl, who took the title Mansūr He almost immediately relieved Susa by sending a fleet, which joining with the garrison inflicted a severe defeat on Abū Yazīd, who had to evacuate Kairawān also, but though the cities were mainly in the hands of Fatimite prefects, Abū Yazīd was able to maintain the field for more than two years longer, while his followers were steadily decreasing in numbers, and he was repeatedly driven into fastnesses of the Sahara In Aug 947 his last stronghold was taken, and he died of wounds received in defending it His sons carried on some desultory warfare against Mansūr after their father's death A town called Mansūra or Ṣābrā was built adjoining Kairawān to celebrate the decisive victory over Abū Yazīd, which, however, did not long preserve its name The exhausted condition of north-west Africa due to the protracted civil war required some years of peace for recuperation, and further exploits are not recorded for Mansūr, who died on March 19, 952

Widening Authority.—His son, Abū Tamim Ma'add, was 22 years of age at the time, and succeeded his father with the title Mo'izz lidīn allah His authority was acknowledged over the greater part of the region now constituting Morocco, Algeria and Tunisia, as well as Sicily, and he appears to have had serious thoughts of endeavouring to annex Spain At an early period in his reign he made Jauhar, who had been secretary under the former caliph, commander of the forces, and the services rendered by this person to the dynasty made him count as its second founder after al-Shī'ī. In the years 958 and 959 he was sent westwards to reduce Fez and other places where the authority of the Fatimite caliph had been repudiated, and after a successful expedition advanced as far as the Atlantic As early as 966 the plan of attempting a fresh invasion of Egypt was conceived, and preparations made for its execution, but it was delayed, it is said at the request of the caliph's mother, who wished to make a pilgrimage to Mecca first, and her honourable treatment by Kāfūr when she passed through Egypt induced the caliph to postpone the invasion till that sovereign's death

In Aug 972 Mo'izz resolved to follow Jauhar's pressing invitation to enter his new capital Cairo With his arrival there the centre of the Fatimite power was transferred from Mahdia and Kairawān to Egypt, and their original dominion became a province called al-Maghrib, which immediately fell into the hands of a hereditary dynasty, the Zeirids, acknowledging Fatimite suzerainty. The first sovereign was Bulukkīn, also called Abu'l-Futūh Yūsuf, appointed by Mo'izz as his viceroy on the occasion of his departure for Egypt separate prefects were appointed for Sicily and Tripoli, and at the first the minister of finance was to be an official independent of the governor of the Maghrib On the death of Bulukkīn in 984 he was succeeded by a son who took the royal title al-Mansūr, under whose rule an attempt was made by the Kutāma, instigated by the Caliph, to shake off the yoke of the Zeirids, who originated from the Sanhaja tribe This attempt was defeated by the energy of Mansūr in 988; and the sovereignty of the Fatimites in the Maghrib became more and more confined to recognition in public prayer and on coins, and the payment of tribute and the giving of presents to the viziers of Cairo The fourth ruler of the Zeirid dynasty, called Mo'izz, endeavoured to substitute 'Abbāsid suzerainty for Fatimite. his land was invaded by Arab colonies sent by the Fatimite caliph, with whom in 1051 Mo'izz fought a decisive engagement, after which the dominion of the Zeirids was restricted to the territory adjoining Mahdia; a number of smaller kingdoms rising up around them The Zeirids were finally overthrown by Roger II. of Sicily in 1148.

The Last Fatimite Caliph.—After the death of al-Ādid, the last Fatimite caliph in Egypt, some attempts were made to place on the throne a member of the family, and at one time there

seemed a chance of the Assassins, who formed a branch of the Fatimite sect, assisting in this project. In 1174 a conspiracy for the restoration of the dynasty was organized by 'Umarah of Yemen, a court poet, with the aid of eight officials of the government: it was discovered and those who were implicated were executed. Two persons claiming Fatimite descent took the royal titles al-Mo'tasim billah and al-Hāmid lillah in the years 1175 and 1176, respectively, and as late as 1192 we hear of pretenders in Egypt. Some members of the family are traceable till near the end of the 7th century of Islam.

The doctrines of the Fatimites as a sect, apart from their claim to the sovereignty in Islam, are little known, and we are not justified in identifying them with those of the Assassins, the Carmathians or the Druses, though all these sects are connected with them in origin. A famous account is given by Maqrīzī of a system of education by which the neophyte had doubts gently instilled into his mind till he was prepared to have the allegorical meaning of the Koran set before him, and to substitute some form of natural for revealed religion. In most accounts of the early days of the community it is stated that the permission of wine-drinking and licentiousness, and the community of wives and property formed part of its tenets. There is little in the recorded practice of the Fatimite state to confirm or justify these assertions, and they appear to have differed from orthodox Muslims rather in small details of ritual and law than in deep matters of doctrine.

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(D. S. Ma., X.)

FATS IN COOKERY. Besides being a highly concentrated form of heat-supplying food (hydro-carbons) fats have many specialized uses in cookery as a frying medium, for shortening pastry, or other flour mixtures, greasing receptacles in which food is cooked and basting roast or baked meats. Cooking fats, obtained from "fixed oils and fats" may be either of animal or vegetable origin. The following are the chief culinary fats:—

Animal.—Cream is easily digested; it can replace cod liver oil, and is used for making delicate dishes (creams, ice creams, soufflés, cream soups, etc.). Clotted cream is also used as a garnish. With the addition of sugar, cream will keep in a cool place for about 36 hours. Butter, if pure and kept cool, is one of the best fats for making pastry, cakes, etc., and for blending with flour in sauce-making, and also for nutrition, as it contains vitamins. For frying vegetables and delicate fish or meats, butter is preferable to any other fat on account of its delicate flavour. Fresh butter is better than salt for pastry-making. Margarine is made from animal fat (often mixed with vegetable oils) churned in milk. Dripping and clarified fat is obtained by roasting meat. Chicken fat is the most delicate, and is good for cake making. Lard (*q.v.*) is a very rich fat, excellent for light frying if used with other fats, but inclined to make food a little greasy if used alone. It is best to use one-third lard to two-thirds other fat for pastry and frying purposes. Lard should not be used for "pan" frying. Pure lard is frequently mixed with other cheaper fats and sold as compound lard. Suet is much used in making boiled puddings where the fat can be chopped up with other ingredients; also for adding to certain dishes to make up fat deficiency. Both beef and mutton suet are used, but beef suet is generally preferred to mutton on account of its nutty flavour. Kidney suet should be used where possible.

Vegetable.—(1) Olive oil is the best frying medium and superior to animal fat, as it keeps the colour of the food fried a light golden-brown; it must, however, be carefully used as the flavour is spoilt if the oil is raised to too high a temperature. Olive oil is also much employed for making salad dressings and for greasing dishes for delicate foods such as creams, etc. As an ingredient in batter mixtures for frying fish, olive oil is particularly useful in producing a light batter. It is much adulterated with cheaper oils such as cotton-seed, peanut, etc. (2) Margarine from nut fats is tute for butter. Owing to the fact that it contains milk and salt, margarine is not suitable for frying where boiling fat is needed. (3) Cacao fat (butter) is a vegetable fat that is solid at ordinary temperatures. Though excellent as a cooking fat it has the great drawback of possessing a decidedly pungent flavour rather like chocolate, which makes it undesirable for general use. (4) Vegetable and nut oils, refined and tasteless, are much used in the United States for "pan" frying, frying, salad dressings and flour mixtures. Those most generally used are cotton-seed, corn and peanut oils. Some are solidified (hydrolized).

Larding.—This is a method of introducing fat into lean or dry meat and consists of either placing slices of fat (usually pork or bacon fat) over meat which is to be roasted or threading strips of fat through the flesh with a larding needle.

Basting.—When meat, fish or game is baked or roasted, the flesh is kept moist by basting the surface over with some kind of fat. Oil may be used for fish, but as a general rule dripping is better for meat. Butter is frequently used for game because of its more delicate flavour. (*See* also Oils and Fats.)

(J. A. Sr.)

FATTY ACIDS, a highly important class of compounds of carbon, hydrogen and oxygen, in which one group, the carboxyl(ic) group, CO·OH, has a hydrogen atom replaceable by metals and basic radicles. One class of fatty acids can be regarded as derived from the hydrocarbons (*see* Hydrocarbon) of the paraffin series, through the substitution of a hydrogen atom by the acidic carboxyl group. Thus, counting hydrogen as the first hydrocarbon, we get the two series

Hydrocarbon	*Fatty or Aliphatic Acid*
Hydrogen, H-H	Formic Acid, H-COOH
Methane, CH_3-H	Acetic Acid, CH_3-COOH
Ethane, C_2H_5-H	Propionic Acid, C_2H_5-COOH
Proprane, C_3H_7-H	Butyric Acid, C_3H_7-COOH
Butane, C_4H_9-H	etc.

The earlier acids in the series are treated in separate articles (q.v.; *see* also Chemistry *Organic: Aliphatic Compounds*). Other fatty acids are similarly related to the ethylene and acetylene groups of "unsaturated" hydrocarbons, further complications are introduced in hydroxy-acids, where one or more hydroxyl (-OH) groups may replace hydrogen atoms besides those replaced by the carboxyl group. Here will be discussed only those higher members of the series which play an important part in the chemistry of the naturally occurring glycerides (q.v.; *see* also Oils and Fats).

Some of these fatty acids may contain as few as four carbon atoms in the molecule, others as many as 24, the most common natural fatty acids contain 12, 16 or 18 carbon atoms in each molecule. There are two main types of these fatty acids, "saturated" and "unsaturated," and it is essential to know something of the difference between them.

In saturated fatty acids each carbon atom is united with as much hydrogen as it can hold and palmitic acid, $C_{16}H_{32}C_2$, the most widespread saturated acid, is formulated, for instance, as $CH_3(CH_2)_{14}$·COOH. The most common members of this group are lauric ($C_{11}H_{23}$·COOH), myristic ($C_{13}H_{27}$·COOH), palmitic ($C_{15}H_{31}$·COOH), and stearic ($C_{17}H_{35}$·COOH) acids; from C_9H_{19}·COOH (capric acid) upwards they (and the corresponding glycerides) are solids at the ordinary temperature and the melting-point increases with increasing number of carbon atoms, stearic acid, for example, melting at 71° C. The melting-point of a fat is determined by the particular acids present in greatest quantity.

In unsaturated acids there is a deficiency of hydrogen in each molecule, so that one or more pairs of carbon atoms, instead of being completely saturated with hydrogen (-CH_2-CH_2-), have some of their chemical combining power left unsatisfied (-CH:CH-). In consequence, such bodies, especially if several of these unsaturated centres are present in the molecule, can become attached to other elements, for example, atmospheric oxygen, and this is the basis of the utility of linseed and other oils in paints; fixation of oxygen at the unsaturated centres causes the oil to become a solid tenacious film. Obviously this

nishes, may be a detriment in other cases, where it causes the development of rancidity in edible fats or even soaps Of the acids with one unsaturated centre, oleic acid is by far the most common and is present in practically all known fats, other similar acids are palmitoleic, $C_{15}H_{29}COOH$, and erucic, $C_{21}H_{41}COOH$, whilst linoleic acid, $C_{17}H_{31}COOH$, and linolenic acid, $C_{17}H_{29}COOH$, contain respectively two and three unsaturated centres.

The position, in the molecule of a fatty acid, of the pair of carbon atoms which form an unsaturated centre, is known in several cases, for example in

Oleic acid	$CH_3(CH_2)_7CH\ CH(CH_2)_7COOH$
Linoleic acid	$CH_3(CH_2)_4CH\ CH\ CH_2\ CH\ CH(CH_2)_7COOH$
Palmitoleic acid	$CH_3(CH_2)_5CH\ CH(CH_2)_7COOH$
Erucic acid	$CH_3(CH_2)_7CH\ CH(CH_2)_{11}COOH$

Obviously it is important to be able to assess the average magnitude of the fatty acids present in naturally occurring glycerides, and also their state of "unsaturation" The former value is arrived at by measurement of the amount of caustic alkali necessary to combine exactly with the fatty acid present, and is known as the *saponification number*, it is inversely proportional to the molecular weight of the fat The unsaturation is measured by the power of the fat under examination to combine with iodine under specified conditions, the percentage of iodine absorbed being known as the *iodine value* of the fat

Finally, it may be mentioned that compounds of the fatty acids with alcohols other than glycerol are widely distributed in nature, the alcohols in question being usually similar in chemical structure to palmitic and stearic acids (for example, cetyl alcohol $C_{16}H_{33}OH$, or ceryl alcohol, $C_{26}H_{53}OH$) Such compounds are classified as *waxes*, and include beeswax, spermaceti, carnauba and other waxes, these substances are useful in polishes and were formerly used in candles, but the waxes as a class have much less utility than the fats (*See* GLYCERINE, OILS AND FATS, WAX, etc)

FAUBOURG, the French name for a portion of a town which lies outside the walls, hence properly a suburb The name survives in certain parts of Paris, such as the Faubourg St Antoine and the Faubourg St Germain, etc , which have long since ceased to be suburbs The earlier spelling *faux-bourg*, and the occurrence in mediaeval Latin of *falsus-burgus* (*see* Ducange, *Glossarium*, s v "Falsus-Burgus"), was taken as showing its obvious origin and meaning, the sham or quasi-borough

FAUCES, in anatomy, the hinder part of the mouth, which leads into the pharynx In architecture a term given by Vitruvius to narrow passages on either side of the tablinum, through which access could be obtained from the atrium to the peristylar court in the rear, and therefore the term often applied to narrow connecting passages in Roman houses

FAUCHER, LÉONARD JOSEPH [LÉON] (1803–1854), French politician and economist, was born at Limoges on Sept 8, 1803 With the revolution of 1830 he was drawn into active political journalism on the Liberal side He was on the staff of the *Temps* from 1830 to 1833, when he became editor of the *Constitutionnel* for a short time He was editor from 1839 until 1842 of the *Courrier Français* Faucher belonged in policy to the dynastic Left, and consistently preached moderation to the more ardent Liberals He advocated a customs union between the Latin countries to counterbalance the German Zollverein, but narrowed his proposal in 1842 to a customs union between France and Belgium In 1843 he visited England to study the English social system, publishing the results of his investigations in a series of *Études sur l'Angleterre* (2 vols , 1845), published originally in the *Revue des deux mondes* He helped to organize the Bordeaux association for free-trade propaganda, and was elected in 1847 to the chamber of deputies for Reims as a free-trader After the revolution of 1848 he represented the department of Marne in the Constituent Assembly, where he opposed the limitation of the hours of labour, the creation of the national relief works in Paris and the abolition of the death penalty. Under the presidency of Louis Napoleon he became minister of public works, and then minister of the interior, but was compelled to resign office on May 14, 1849 In 1851 he was again minister of the interior until Napoleon declared his intention of resorting to universal suffrage He died at Marseilles on Dec. 14, 1854

His miscellaneous writings were collected (2 vols , 1856) as *Mélanges d'économie politique et de finance*, and his speeches in the legislature were printed in vol. II of *Léon Faucher, biographie et correspondance* (2 vols., 1875).

FAUCHET, CLAUDE (1744–1793), French revolutionary bishop, was born at Dornes (Nièvre) on the 22nd of September 1744 He was a curate of the church of St Roch, Paris, when he was engaged as tutor to the children of the marquis of Choiseul He was successively grand vicar to the archbishop of Bourges, preacher to the king, and abbot of Montfort-Lacarre. The "philosophic" tone of his sermons caused his dismissal from court in 1788 before he became a popular speaker in the Parisian sections He was one of the leaders of the attack on the Bastille, and on Aug 5, 1789 he delivered an eloquent funeral sermon for the citizens slain on July 14 In September he was elected to the Commune, from which he retired in October 1790 The last occasion on which he carried his public with him was in a sermon preached at Notre Dame on Feb 14, 1791 In May he became constitutional bishop of Calvados, and was deputy to the Legislative Assembly, and afterwards to the Convention At the king's trial he voted for the appeal to the people and for the penalty of imprisonment He protested against the execution of Louis XVI in the *Journal des amis* (January 26, 1793), and next month was denounced to the Convention for prohibiting married priests from the exercise of the priesthood in his diocese He remained secretary to the Convention until the accusation of the Girondists in May 1793 In July he was imprisoned on the charge of supporting the federalist movement at Caen, and of complicity with Charlotte Corday, whom he had taken to see a sitting of the Convention on her arrival in Paris Of the second of these charges he was certainly innocent With the Girondist deputies he was brought before the revolutionary tribunal on Oct 30, and was guillotined on the following day.

See *Mémoires ou Lettres de Claude Fauchet* (5th ed , 1793), *Notes sur Claude Fauchet* (Caen, 1842)

FAUCIT, HELENA SAVILLE (1817–1898), English actress, the daughter of John Saville Faucit, an actor, was born in London Her first London appearance was made on Jan 5, 1836, at Covent Garden as Julia in *The Hunchback* Her success in this was so definitely confirmed by her subsequent acting of Juliet, Lady Teazle, Beatrice, Imogen and Hermione, that within 18 months she was engaged by Macready as leading lady at Covent Garden In 1851 she was married to Mr (afterwards Sir) Theodore Martin, but still acted occasionally for charity She died at her home near Llangollen in Wales on Oct 31, 1898.

See Sir Theodore Martin's *Helena Faucit* (1900)

FAUJAS DE SAINT-FOND, BARTHÉLEMY (1741–1819), French geologist and traveller, was born at Montélimart on May 17, 1741 He studied law at Grenoble, and was admitted advocate to the parliament He rose to be president of the seneschal's court (1765) There he began to study the forms, structure, composition and superposition of rocks in the Alps. In 1775 he discovered in the Velay a rich deposit of pozzuolana, which in due course was worked by the government He was appointed by Louis XVI assistant naturalist to the museum, to which office was added some years later (1785, 1788) that of royal commissioner for mines In 1793 he became professor at the Jardin des Plantes, Paris In *Recherches sur les volcans éteints du Vivarais et du Velay* (1778) he developed his theory of the origin of volcanoes Faujas recognized the volcanic nature of the basaltic columns of the cave of Fingal (Staffa). Among his separate works are—*Voyage en Angleterre . .* (1797); *Histoire naturelle de la province de Dauphiné* (1781–1782); *Minéralogie des volcans* (1784), and *Essai de géologie* (1803–1809) Faujas died on July 18, 1819.

FAULT, a failing, mistake or defect. (Mid Eng *faute*, through the French, from the popular Latin use of *fallere*, to fail; the original *l* of the Latin being replaced in English in the 15th century)

In geology, a fault is a dislocation in rocks, the result of crustal movements Faults differ from joints in not being simply cracks, but fissures when differential movement of the two sides has taken place The three principal types are known as *normal faults, reversed faults* or *overthrusts* and *transcurrent faults* The surface of dislocation is called the *fault-plane* not a plane in the mathematical sense, since the surface is always found to be irregular and

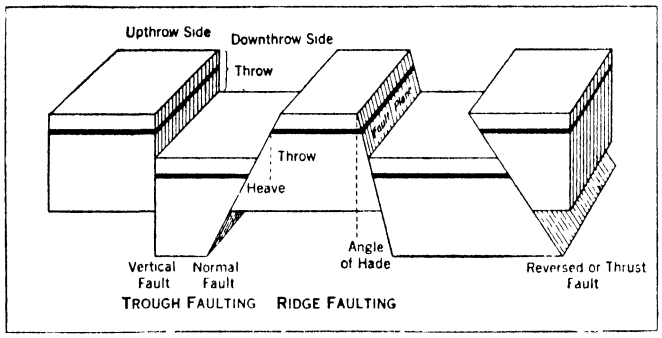

FIG 1 —THE EFFECT OF FAULTING ON OUTCROP

curved on being traced for any distance The general inclination of this plane to the horizontal is the *dip* of the fault, to the vertical the *hade*, where the fault is vertical there is no dip or hade The amount of vertical displacement is the *throw* of the lateral displacement, the *heave* In a gently inclined fault the heave will be great for even a small throw The *downthrow* or *downcast* side of a fault is that side where the strata have moved relatively downwards the other side is the *upthrow* or *upcast* Faults, especially minor dislocations, run in any direction, but they are frequently found to coincide with the directions of dip and strike of stratified rocks and so to have a causal connection with systems of folding Thus *dip faults* and *strike faults* arise The effect of such faults on the outcrops of stratified rocks is shown in the diagrams

Normal faults are those in which the fault plane is vertical, or inclined in such a manner that the downthrow is on the dip side of the fault plane Reversed faults are those where the upthrow is on the dip side, so that one faulted block has been thrust upon

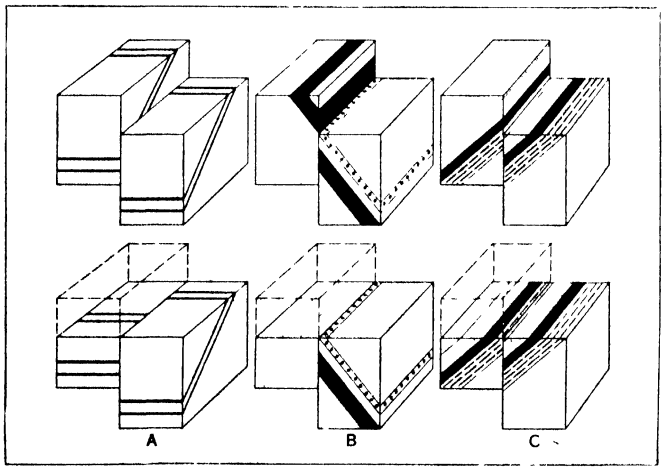

FIG 2 —(A) DIP FAULT SHIFTING OUTCROP DOWN THE DIP (B) STRIKE FAULT WITH DOWNTHROW DOWN THE DIP CUTTING OUT BEDS (C) STRIKE FAULT WITH DOWNTHROW UP THE DIP WITH REPEATING BEDS THE BLOCKS SHOWN IN BROKEN OUTLINE HAVE BEEN REMOVED BY DENUDATION

the other Transcurrent faults occur in regions of great folding, often extending for miles along the dip of the strata. there is no vertical, only horizontal movement

Normal Faults[1].—When two blocks of rock masses have moved relatively to one another, the fault plane is likely to have an irregular surface and its outcrop, or trace of the plane on the surface of the earth, will show minor departures from a straight line quite apart from the wider deviations due to topography In places undisturbed rock may be found on either side, but generally there is a crushed and pulverized zone, with slickensiding, for inches or even several feet Where this zone is composed of shattered rock debris it is known as *fault breccia* Many metalliferous and mineral veins are dislocations filled with crystallized material In an important fault, several types of rocks may occur on either side at different localities and the nature of the dislocation will differ from place to place Thus with hard rocks on either

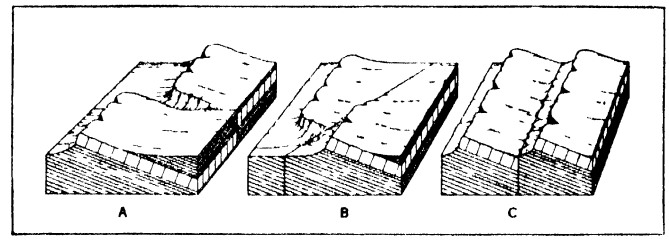

FIG 3 —(A) DIP FAULT SHIFTING ESCARPMENT (B) OBLIQUE FAULT, ESCARPMENT EN ECHELON (C) STRIKE FAULT, REPEATING ESCARPMENT

side there may be hardly any selvage, passing through shales the fault may become a zone of contortion and slickensiding of considerable width In throw, faults vary from the merest slip to a movement of thousands of feet in distance across country, from a few hundred feet to hundreds of miles Often faults are found to pass into monoclinal folds, but as often they die out by gradually diminishing throw Downwards, faulting must evidently disappear when the zone of rock flowage is reached at some eight miles When stratified rocks are traversed by a fault, the beds are often found to be bent on either side, as would be expected in rocks which could adjust themselves to slow movement by folding Thus in a normal fault the beds bend downwards on the upthrow and upwards on the downthrow the opposite is the case in a reversed fault Normally denudation planes down the surface equally on either side of a fault, but a resistant rock, abutting against much more easily denuded beds, may give rise to an unstanding ridge or face, a *fault scarp*

Groups of Faults.—Small faults generally occur singly, but the more extensive dislocations are more often composed of a number of parallel dislocations running into each other to give the effect of a fault zone A number of parallel faults with downthrows in one direction give rise to *step-faulting* Fault planes with the same strike but hading towards one another give rise to *trough faults* when one faults another when hading away from one another, to *ridge faults* Strike and dip faults of the same age rarely, if ever, cross one another, though they coalesce When one fault crosses another and shifts it in the same way as a stratum is shifted in outcrop by a fault, the two faults belong to different periods, the shifted fault being obviously the older

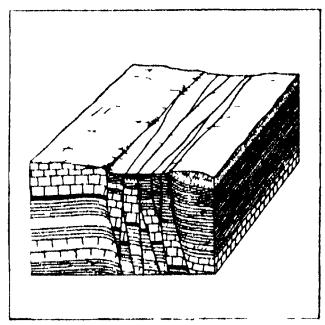

FIG 4 —GROUP OF FAULTS

Reversed Faults.—These are almost always confined to highly folded and disturbed regions Great masses of the earth's crust, as for example in the N W Highlands of Scotland and in the Western Alps, have been thrust considerable distances over the underlying rocks the dividing plane is a *thrust plane* Crushed and shattered material in this plane is termed *crush-breccia* or *crush-conglomerate*

Origin of Faults.—Faults are connected with horizontal movements and folding of the earth's crust During the formation of mountains of elevation the crust is bulged upwards and the rocks are subjected to great compression Relief is effected partly by folding and partly by overthrusting if shear takes place before overfolding reversed faulting obtains Transcurrent faults signify the differential movements forward of parts of thrusts Normal faults form at the conclusion of the great movement when the mass begins to settle down. Direct subsidence in uncrushed regions

[1]The term "normal" is an old but convenient one for a certain class of fault. It is not necessarily the most widely distributed type.

also gives rise to normal faulting In the great majority of cases faults have been as slow in their making as folds, for great river systems have been undisturbed by faults of thousands of feet throw, as in the course of the Colorado River Fault scarps are nearly always due to the juxtaposition of rocks of widely differing resistance to weathering Occasional cases occur, however, where ancient faults have increased their throw by sudden jumps at intervals, giving rise to earthquakes

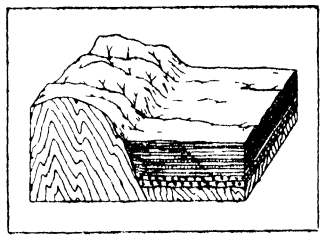

FIG 5.—FAULT SCARP, ANCIENT METAMORPHOSED ROCKS FAULTED AGAINST SOFT TERTIARY BEDS AMOTAPE MOUNTAINS, PERU

FAUNA, the feminine partner (in later times explained as sister or wife) of Faunus (*q v*), and apparently identical originally with the Bona Dea The term is used collectively for all the animals in any given geographical area or geological period, or for an enumeration of the same It thus corresponds to the term "flora" in respect to plant life

FAUNUS, an old Italian rural deity (the "kindly," from Lat *favere*), the bestower of fruitfulness on fields and cattle As such he is akin to or identical with Inuus ("fructifier") and Lupercus (*see* LUPERCALIA) He was also called Fatuus, and with him was associated Fatua He is represented as having prophetic powers, and is not unlike the fairies, pucks, etc, of British mythology Under Greek influence he was identified with Pan Rationalizing mythologists made him into an early king of Latium, the son of Picus and father of Latinus, the teacher of agriculture and cattle-breeding, and the introducer of the religious system of the country, honoured after death as a tutelary divinity Two festivals called Faunalia were celebrated in honour of Faunus, one on Feb 13 in his temple on the island in the Tiber, the other in the country on Dec 5 (Ovid, *Fasti,* ii 193, Horace, *Odes,* iii 18, 10)

FAURE, FRANÇOIS FÉLIX (1841–1899), president of the French Republic, was born in Paris on Jan 30, 1841, the son of a small furniture maker He made a fortune as a tanner and merchant at Havre, and was elected to the National Assembly on Aug 21, 1881 He sat on the Left, interesting himself chiefly in matters concerning economics, railways and the navy He was under-secretary for the colonies (1882–85 and 1888), and in 1893 was made vice-president of the chamber In 1894 he obtained cabinet rank as minister of marine under Dupuy In the January following he was unexpectedly elected president of the Republic upon the resignation of Casimir-Périer His fine presence and his tact on ceremonial occasions rendered the state some service when in 1896 he received the tsar of Russia at Paris, and in 1897 returned his visit, after which meeting the momentous Franco-Russian alliance was publicly announced The latter days of Faure's presidency were embittered by the Dreyfus affair, which he was determined to regard as *chose jugée* But at a critical moment in the proceedings he died (Feb 16, 1899)

See E Maillard, *Le Président F Faure* (1897); P. Bluysen, *Félix Faure intime* (1898), and F Martin-Ginouvier, *F Faure devant l'histoire* (1895).

FAURÉ, GABRIEL (1845–1924), French musical composer, was born at Pamiers (Ariège) on May 13, 1845 He studied at the school of sacred music directed by Niedermeyer, first under Dietsch, and subsequently under Saint-Saëns. He became "maître de chapelle" at the church of the Madeleine in 1877, and organist in 1896 Fauré was made professor of composition at the Conservatoire (1896), and director (1905) He retired in 1920 and died on Nov 4, 1924 His work at the Conservatoire, extending over nearly a quarter of a century, had great importance in the history of French music Roger-Ducasse, Ravel and Florent Schmitt were among his pupils He himself wrote music in all forms, but his fame rests mainly on his exquisite songs and on a considerable body of original and interesting chamber music Recognition came to him slowly, probably because of the quality of unexpectedness in his compositions Among the more familiar of his chamber music works are two sonatas for violin and pianoforte, two sonatas for violoncello, a posthumous string quartet and two quintets for pianoforte and strings For a bibliography of his works *see* Octave Séré, *Musiciens français, d'aujourd'hui* (5th ed 1910)

FAURIEL, CLAUDE CHARLES (1772–1844), French historian, philologist and critic, was born at St Étienne Though the son of a poor joiner, he received a good education in the Oratorian colleges of Tournon and Lyons He was twice in the army and from 1799 to 1801 he was private secretary to Fouché (*q v*). Some articles which Fauriel published in the *Décade philosophique* (1800) on a work of Madame de Stael's—*De la littérature considérée dans ses rapports avec les institutions sociales*—led to an intimate friendship with her About 1802 he contracted with Madame de Condorcet a liaison which lasted till her death (1822)

At the revolution of July, 1830, he became professor of foreign literature at the Sorbonne The *Histoire de la Gaule méridionale sous la domination des conquérants germains* (4 vols, 1836) was the only completed section of a general history of southern Gaul which he had projected In 1836 he was elected a member of the Academy of Inscriptions, and in 1837 he published a translation of a Provençal poem on the Albigensian war He died on July 15, 1844 After his death his friend Mary Clarke (afterwards Madame J Mohl) published his *Histoire de la littérature provençale* (3 vols, 1846)—his lectures for 1831–32 Fauriel was biased in this work by his preconceived and somewhat fanciful theory that Provence was the cradle of the *chansons de geste* and even of the Round Table romances; but he gave a great stimulus to the scientific study of Old French and Provençal *Dante et les origines de la langue et de la littérature italiennes* (2 vols) was published in 1854

Fauriel's *Mémoires,* found with Condorcet's papers, are in the Institute library They were written at latest in 1804, and include some interesting fragments on the close of the consulate, Moreau, etc Though anonymous, Lalanne, who published them (*Les Derniers Jours du Consulat,* 1886), proved them to be in the same handwriting as a letter of Fauriel's in 1803. The same library has Fauriel's correspondence, catalogued by Ad Régnier (1900) For Fauriel's correspondence with Guizot see *Nouvelle Rev* (Dec 1, 1901, by V Glachant), and for his love-letters to Miss Clarke (1822–44) the *Revue des deux mondes* (1908–09, by E. Rod). *See* further Sainte-Beuve, *Portraits contemporains,* ii, A Guillois, *Le Salon de Mme Helvétius* (1894) and *La Marquise de Condorcet* (1897), O'Meara, *Un Salon à Paris: Mme. Mohl* (undated); and J B Galley, *Claude Fauriel* (1909)

FAUST or **FAUSTUS,** the name of a magician and charlatan of the 16th century, famous in legend and in literature The historical Faust forms little more than the nucleus round which a great mass of legendary and imaginative material gradually accumulated That such a person existed, there is, however, sufficient proof, though the opinion long maintained by some that he was identical with Johann Fust the printer is now universally rejected He is first mentioned in a letter, dated Aug 20, 1507, of the learned Benedictine Johann Tritheim or Trithemius (1462–1516) abbot of Spanheim, to the mathematician and astrologer, Johann Windung Trithemius, himself reputed a magician, speaks contemptuously of Faust, who called himself Magister Georgius Sabellicus Faustus Junior, as a fool rather than a philosopher, a vain babbler and mountebank who ought to be whipped The same unflattering estimate is contained in the second extant notice of Faust, in a letter of the jurist and canon Konrad Mudt (Mutianus Rufus) of Oct 3, 1513, to Heinrich Urbanus Mudt, too, simply regards Faust as a charlatan So does another contemporary, Philipp Begardi, who in his *Index sanitatis* (Worms, 1539) ranks Faust, with Theophrastus Paracelsus, among the "wicked, cheating, useless and unlearned doctors."

It was Johann Gast (d 1572) a Protestant pastor of Basel who in his *Sermones convivales* (Basel, 1543) first credited the magician with genuine supernatural gifts Gast believed Faust to be in league with the devil, by whom about 1525 he was ultimately carried off, and declared the performing horse and dog by which he was accompanied to be familiar and evil spirits Further information was given to the world by Johann Mannel or Manlius (d. 1560), councillor and historian to the emperor Maximilian II.,

in his *Locorum communium collectanea* (Basel, undated) Manlius reports a conversation of Melanchthon in which the Reformer speaks of Faust as "a disgraceful beast and sewer of many devils" as having been born at Kundling (Kundlingen or Knittlingen), a little town near his own native town (of Bretten), and as having studied magic at Cracow According to Melancthon Faust was killed by the devil wringing his neck While he lived he had taken about with him a dog, which was really a devil A similar opinion seems to have been held of Faust by Luther, who in Widmann's Faust-book is mentioned as having declared that, by God's help, he had been able to ward off the evils which Faust with his sorceries had sought to put upon him. Bullinger also, in his *Theatrum de beneficiis* (Frankfurt 1509) mentions Faust as one of those "of whom the Scriptures speak in various places, calling them *magi*" Lastly Johann Weiher, Wierus or Piscinarius (1515–88) a pupil of Cornelius Agrippa, body physician to the duke of Cleves and a man of enlightenment, who opposed the persecution of witches—in his *De praestigiis daemonum* (Basel 1563, etc) speaks of Faust as a drunken vagabond who had studied magic at Cracow, and before 1540 had practised "this beautiful art shamelessly up and down Germany, with unspeakable deceit, many lies and great effect"

Such was the man as he appeared to his contemporaries: a wandering charlatan who lived by his wits, or a necromancer whose supernatural gifts were the outcome of a foul pact with the enemy of mankind Whatever his character, his efforts to secure notoriety certainly succeeded By the latter part of the 16th century he had become the necromancer *par excellence*, and all that legend had to tell about the great wizards of the middle ages, Virgil, Pope Silvester, Roger Bacon, Michael Scot, or the mythic Klingsor, had become for ever associated with his name When in 1587, the oldest Faust-book was published, the Faust legend was, in all essential particulars, already complete The origin of the main elements of the legend must be sought far back The idea of a compact with the devil for the purpose of obtaining superhuman power or knowledge, is of Jewish origin, dating from the centuries immediately before and after the Christian era which produced the Talmud. the Kabbalah and such magical books as that of Enoch In the mystical rites that accompanied the incantations with which the Jewish magicians evoked the Satanim we have the prototypes and originals of all the ceremonies which occupy the books of magic down to the various versions of the *Hollenzwang* ascribed to Faust The other principle underlying the Faust legend, the belief in the essentially evil character of purely human learning, has existed ever since the triumph of Christianity set divine revelation above human science The legend of Theophilus (a Cilician archdeacon of the 6th century, who sold his soul to Satan for no better reason than to clear himself of a false charge brought against him by his bishop) was immensely popular throughout the middle ages, and in the 8th century formed the theme of a poem by the nun Hroswitha of Gandersheim Equally widespread were the legends which gathered round the great name of Gerbert (Pope Silvester II) Gerbert's vast erudition, far in advance of his age, cast upon him the suspicion of traffic with the infernal powers; and in due course the tale arose of a compact with the arch-fiend, by which the scholar had obtained the summit of earthly ambition at the cost of his immortal soul These are but the two most notable of many similar stories, and in an age which believed in witchcraft and the ubiquitous activity of devils, it was natural that they should be retold in all good faith of a notorious wizard who was himself at no pains to deny their truth The Faust legend, however, owes its peculiar significance to the special conditions of the age which gave it birth; the age of the Renaissance and the Reformation The opinion that the religious reformers were the champions of liberty of thought against the obscurantism of Rome is mistaken To themselves they were the protagonists of "the pure Word of God" against the corruptions of the Church, and the sceptical spirit of Italian humanism was as abhorrent to them as to the Catholic reactionaries. If, then, in Goethe's drama, Faust ultimately develops into the type of the unsatisfied yearning of the human intellect for "more than earthly meat and drink" this was because the great German humanist infused into the old story a spirit absolutely opposed to that by which it had originally been inspired The Faust of the early Faust-books, of the ballads, the dramas and the puppet-plays which grew out of them, is damned because he prefers human to "divine" knowledge, "he laid the Holy Scriptures behind the door and under the bench, refused to be called doctor of theology, but preferred to be styled doctor of medicine." The orthodox moral of the earliest versions is preserved to the last in the puppet-plays The voice to the right cries. "Faust! Faust! desist from this proposal! Go on with the study of theology, and you will be the happiest of mortals" The voice to the left answers "Faust! Faust! leave the study of theology Betake you to necromancy, and you will be the happiest of mortals!" The Faust legend was, in fact, the creation of orthodox Protestantism, its moral the inevitable doom which follows the wilful revolt of the intellect against divine authority as represented by the Holy Scriptures and its accredited interpreters

It was doubtless this orthodox and Protestant character of the Faust story which contributed to its immense popularity in the Protestant countries The first edition of the *Historia von D Johann Fausten* published by Johann Spies at Frankfurt in 1587, sold out at once, and before the year was out it had been reprinted in four pirated editions In the following year a rhymed version was printed at Tubingen, a second edition was published by Spies at Frankfurt, and a version in Low German by J J. Balhorn at Lubeck Reprints and amended versions continued to appear in Germany every year, till they culminated in the pedantic compilation of Georg Rudolf Widmann, who obscured the dramatic interest of the story by his well-meant efforts to elaborate the orthodox moral Widmann's version of 1599, formed the basis of that of Johann Nicholaus Pfitzer, published at Nuremberg in 1674, which passed through six editions, the last appearing in 1726. Lastly there appeared about 1712, what was to prove the most popular of all the Faust-books· *The League with the Devil established by the world-famous Archnecromancer and Wizard Dr Johann Faust,* by a Christian Believer (*Christlich Meynenden*). This version which bore the obviously false date of 1525, passed through many editions, and was circulated at all the fairs in Germany Abroad the success of the story was scarcely less striking A Danish version appeared in 1588. In England the *History of the Damnable Life and Deserved Death of Dr. John Faustus* was published some time between 1588 and 1594 In France the translation of Victor Palma Cayet was published at Paris in 1592, and in the course of the next 200 years went through 15 editions; the oldest Dutch and Flemish versions are dated 1592; and in 1612 a Czech translation was published at Prague Besides the popular histories of Faust, numerous ballads on the same subject were also soon in circulation Of these, the most interesting for the English reader is *A Ballad of the Life and death of Dr. Faustus the great congerer,* published in 1588 with the imprimatur of the learned Aylmer, bishop of London. This ballad is supposed to have preceded the English version of Spies's Faust-book, on which Marlowe's drama was founded

To Christopher Marlowe belongs the honour of first seeing the great dramatic possibilities of the Faust legend. *The Tragicall History of D Faustus as it hath bene acted by the Right Honourable the Earle of Nottingham his servants* was first published by Thomas Bushall in 1604 As Marlowe died in 1593, the play must have been written shortly after the appearance of the English version of the Faust story on which it was based The first recorded performance was on Sept. 30, 1594 As Marlowe's *Faustus* is the first, so it is incomparably the finest of the Faust dramas which preceded Goethe's masterpiece, though, like most of Marlowe's work, it is very unequal. In Marlowe, too, Protestant orthodoxy is conciliated by irrelevant insults to the Roman Church and by the final catastrophe, when Faustus pays for his revolt against the Word of God by the forfeit of his soul. This conception, which followed that of the popular Faust histories underlay all further developments of the Faust drama for nearly 200 years. Of the serious stage plays founded on this theme, Marlowe's *Faustus* remains the sole authentic example until near the end of the 18th century; but in Germany the *Comedy of Dr. Faust,* in

one form or another continued to be a popular item in the repertories of theatrical companies until far into the 18th century It is supposed that the German versions were based on those introduced into the country by English strolling players early in the 17th century However this may be, the dramatic versions of the Faust legend followed much the same course as the prose histories Just as these gradually degenerated into chap-books hawked at fairs, so the dramas were replaced by puppet-plays, handed down by tradition through generations of showmen In this way the traditional Faust story retained its popularity until far into the 19th century, long after, in the sphere of literature, Goethe had for ever raised it to quite another plane

It was natural that during the literary revival in Germany in the 18th century, when German writers were eagerly on the look-out for subjects to form the material of a truly national literature, the Faust legend should have attracted their attention Lessing was the first to point out its great possibilities, and he himself wrote a Faust drama, of which only a fragment remains To Lessing, not to Goethe, is due the new point of view from which the story was approached by most of those who, after about the year 1770, attempted to tell it The traditional Faust legend represented the sternly orthodox attitude of the Protestant reformers Even the mitigating elements which the middle ages had permitted had been banished by the stern logic of the theologians of the new religion Theophilus had been saved in the end by the intervention of the Blessed Virgin, Faust was irrevocably damned, since the attractions of theology proved insufficient to counteract the fascinations of the classic Helen But if he was to become, in the 18th century, the type of the human intellect faced by the problems of human life, it was intolerable that his struggles should issue in eternal reprobation *Es irrt der Mensch so lang er strebt,* which sums up in one pregnant line the spirit of Goethe's *Faust,* sums up also the spirit of the age which killed with ridicule the last efforts of persecuting piety Lessing, in short, proclaimed that the final end of Faust must be not his damnation, but his salvation This is the measure of Goethe's debt to Lessing The essential change which Goethe himself introduced into the story is in the nature of the pact between Faust and Mephistopheles, and in the character of Mephistopheles himself. The Mephistopheles of Marlowe, as of the old Faust-books, for all his brave buffoonery, is a melancholy devil, with a soul above the unsavoury hell in which he is forced to pass a hopeless existence Goethe's Mephistopheles is no such fallen angel He is according to his own definition, the Spirit of Denial, the impersonation of that utter scepticism which can see no distinction between high and low, between good and bad, and is therefore without aspiration because it knows no "divine discontent" And the compact which Faust makes with this spirit is from the first doomed to be void Faustus had bartered away his soul for a definite period of pleasure and power The conception that underlies the compact of Faust with Mephistopheles is far more subtle. He had sought happiness vainly in the higher intellectual and spiritual pursuits, he is content to seek it on a lower plane since Mephistopheles gives him the chance, but he is confident that nothing that "such a poor devil" can offer him could give him that moment of supreme satisfaction for which he craves He goes through the traditional mummery of signing the bond with scornful submission, for he knows that his damnation will not be the outcome of any formal compact, but will follow inevitably, and only then, when his soul has grown to be satisfied with what Mephistopheles can purvey him It is because Mephistopheles fails to give him this self-satisfaction that the compact comes to nothing When, at last, Faust cries to the passing moment to remain, it is because he has forgotten self in enthusiasm for a great and beneficent work, in a state of mind the very antithesis of all that Mephistopheles represents In the old Faust-books, Faust had been given plenty of opportunity for repentance, but the inducements had been no higher than the exhibition of a throne in heaven on the one hand and the tortures of hell on the other. Goethe's *Faust* departs widely from this orthodox standpoint. Faust shows no signs of "repentance"; he simply emerges by the innate force of his character from a lower into a higher state The triumph, foretold by "the Lord" in the opening scene, was inevitable from the first, since though—

> Man errs so long as he is striving,
> A good man through the obscurest aspiration
> Is ever conscious of the one true way.

This idea, which inspired also the kindred theme of Browning's *Paracelsus,* is the main development introduced by Goethe into the Faust legend The episode of Gretchen does not belong to the legend at all, and it is difficult to deny the pertinency of Charles Lamb's criticism, "What has Margaret to do with Faust?" Yet in spite of all that may be said of the irrelevancies with which Goethe overloaded especially the second part of the poem, his *Faust* remains for the modern world the final form of the legend out of which it grew, the magnificent expression of the broad humanism which has replaced the spirit inspiring the early Faust-books

See Karl Engel, *Zusammenstellung der Faust-Schriften vom 16 Jahrhundert bis Mitte 1884*—a 2nd ed of the *Bibliotheca Faustiana* (1874) (Oldenburg, 1885), a complete bibl of all pub matter concerned, even somewhat remotely with Faust Carl Kiesewetter, *Faust in der Geschichte und Tradition* (Leipzig, 1893). (W A P)

FAUSTINA, ANNIA GALERIA, the younger, daughter of Antoninus Pius, and wife of Marcus Aurelius Antoninus She is accused by Dio Cassius and Capitolinus of gross profligacy, and was reputed to have instigated the revolt of Avidius Cassius against her husband, but this may be untrue, as he was always devoted to her She died in AD 175 or 176 (so Clinton, *Fasti rom*) at Halala, near Mount Taurus, in Cappadocia, whither she had accompanied Aurelius Charitable schools for orphan girls (hence called *Faustinianae*) were founded in her honour

See Capitolinus, *Marcus Aurelius;* Dio Cassius lxxi 22, lxxiv 3, E Renan, in *Mélanges d'histoire et des voyages,* 169–195

FAUSTUS OF RIEZ (*c* 408–*c* 492), bishop of Riez in Provence, was born probably in Britain, and at an early age entered the monastery of Lerins, where he became abbot in 433 He was appointed bishop of Riez about 460, but his opposition to Arianism led Euric, king of the Visigoths, to banish him in 477 About this time he wrote his chief work, the *Libri duo de Gratia Dei et humanae mentis libero arbitrio,* against Predestinarianism, a work marred by Semipelagianism and finally condemned by the Synod of Orange in 529 Faustus seems to have returned from exile on the death of Euric in 485

His works are to be found in the series, *Corpus Scrip eccles lat,* vol xxi, and in Migne's *Patrol Lat,* vol xlviii *See* Herzog, *Realenzyklopadie*

FAUVISM: *see* PAINTING

FAVARA, a town of Sicily, province of Girgenti, 8 m E of the city of that name by rail Pop (1921), 21,379 An agricultural centre, with sulphur and other mines, and a fine castle (1280) of the Chiaramonte family.

FAVART, CHARLES SIMON (1710–1792), French dramatist, was born in Paris, the son of a pastry-cook He was educated at the college of Louis-le-Grand, and after his father's death carried on the business for a time After the production of his first vaudeville, *Les Deux Jumelles* (1734), he devoted himself entirely to the drama Among his most successful works were *Annette et Lubin, Le Coq du village* (1743), *Ninette à la cour* (1753), *Les Trois Sultanes* (1761) and *L'Anglais à Bordeaux* (1763) Favart became director of the Opéra Comique, and in 1745 married Marie Justine Benoîte Duronceray (1727–72), a beautiful young dancer, singer and actress, who as "Mlle Chantilly" had made a successful début the year before. By their united talents and labours the Opéra Comique rose to such a height of success that it aroused the jealousy of the rival Comédie Italienne and was suppressed Favart then undertook the direction of a troupe of comedians which was to accompany the army of Maurice de Saxe into Flanders The enemy became desirous of hearing Favart's company, and permission was given to gratify them, battles and comedies thus curiously alternating with each other But the marshal, who was an admirer of Mme Favart, began to persecute her with his attentions. To escape him she went to Paris A *lettre de cachet* was issued against the husband, who fled to Strasbourg and hid in a cellar. Mme. Favart mean-

while had been established by the marshal in a house at Vaugirard, but as she proved a fickle mistress she was suddenly arrested and confined in a convent, where she was brought to unconditional surrender in the beginning of 1750 Before the year was out the marshal died, and Mme Favart reappeared at the Comédie Italienne, where for 20 years she was the favourite actress To her is largely due the beginnings of the change in this theatre to performances of a lyric type adapted from Italian models, which developed later into the genuine French comic opera She was also a bold reformer in matters of stage costume, playing the peasant with bare arms, in wooden shoes and linen dress, and not, as heretofore, in court costume with enormous hoops, diamonds and long white kid gloves With her husband, and other authors, she collaborated in a number of successful pieces, and one—*La Fille mal gardée*—she produced alone.

Favart survived his wife 20 years He died in Paris on May 12, 1792 His plays have been several times republished in various editions and selections (1763–72, 12 vols , 1810, 3 vols ; 1813, 1853) His correspondence (1759–63) with Count Durazzo, director of theatres at Vienna, was published in 1808 as *Mémoires et correspondance littéraire, dramatique et anecdotique de C S Favart* It furnishes valuable information on the state of the literary and theatrical worlds in the 18th century

FAVERSHAM, a market town and river-port, member of the Cinque Port of Dover, and municipal borough in the Faversham parliamentary division of Kent, England, on a creek of the Swale, 9 m W N W of Canterbury on the Southern railway Pop (1921) 10,865 The church of St Mary of Charity (restored 1874) is of Early English architecture, and has some remains on one of the columns of frescoes of the same period, while the 14th-century paintings in the chancel are in better preservation Some of the brasses are very fine, and there is one commemorating King Stephen, as well as a tomb said to be his and to have been transferred from the abbey which he founded (1147), of which only a wall and the foundations below ground remain At Davington, close to Faversham, there are remains, incorporated in a residence, of the cloisters and other parts of a Benedictine priory founded in 1153 Faversham has a free grammar school founded in 1527 and removed to its present site in 1877 Faversham creek is navigable up to the town for vessels of 200 tons The shipping trade by London hoys is considerable, chiefly in coal, timber and agricultural produce, and the port maintains a customs officer The oyster fisheries are important, and are managed by a very ancient gild, the Company of Free Dredgermen of the Hundred and Manor of Faversham Hops and cherries are largely grown in the neighbourhood, brewing, brickmaking and the manufacture of cement are carried on, and there are large powder mills in the vicinity. The town is governed by a mayor, four aldermen and 12 councillors, has its own Quarter Sessions and a separate commission of the peace; and owns its own electricity undertaking and recreation grounds (20 ac)

There was a Romano-British village on the site of Faversham The town (Fauresfeld, Faveresham) owed its early importance to its situation as a port on the Swale, to the fertile country surrounding it, and to the neighbourhood of Watling Street In 811 it was called the king's town "of Fafresham," and a witenagemot was held here under Aethelstan In 1086 it was assessed as royal demesne, and a market was held here at this date Stephen and Matilda were buried in the abbey which they had endowed with the manor and hundred of Faversham, this grant caused many disputes between the abbot and men of Faversham concerning the abbot's jurisdiction. Faversham was probably a member of Dover from the earliest association of the Cinque Ports, certainly as early as Henry III , as shown by a charter of 1252 granting among other liberties of the Cinque Ports, that the "barons" or freemen of Faversham should plead only in Shepway Court In this reign also the abbot appointed the mayor, but from the reign of Edward I he was elected by the freemen and then installed by the abbot The corporation was prescriptive, and a hallmote held in 1293 was attended by a mayor and twelve jurats All the liberties of the Cinque Ports were granted to the barons of Faversham by Edward I in 1302, and confirmed by Edward III in 1365, and by later monarchs. The governing charter till 1835 was that of Henry VIII , granted in 1545 and confirmed by Edward VI

FAVORINUS (2nd century A D), Greek sophist and philosopher, was born at Arles, but at an early age began his lifelong travels through Greece, Italy and the East His extensive knowledge and great oratorical powers, raised him to eminence both in Athens and in Rome With Plutarch, who dedicated to him his treatise Περὶ τοῦ πρώτου ψυχροῦ, with Herodes Atticus, to whom he bequeathed his library at Rome, with Demetrius the Cynic, Cornelius Fronto, Aulus Gellius, and with Hadrian himself, he lived on intimate terms It was Favorinus who, on being silenced by Hadrian in an argument, remarked that it was foolish to criticize the logic of the master of thirty legions Of his numerous works, we possess only a few fragments (unless the Κορινθιακὸς λόγος attributed to his tutor Dio Chrysostom is by him), preserved by Aulus Gellius, Diogenes Laertius, Philostratus, and Suidas, the second of whom borrows from his Παντοδαπὴ ἱστορία (miscellaneous history) and his Ἀπομνημονεύματα (memoirs) As a philosopher, Favorinus belonged to the Sceptics, his chief work being Πυρρώνειοι τρόποι (the Pyrrhonean Tropes) in which he endeavours to show that the methods of Pyrrho were useful to those who intended to practise in the law courts

See Philostratus, *Vitae sophistarum,* i 8, Suidas, *s v* , frags in C W Muller, *Frag Hist Graec* iii 4, I. Legré, *Favorin d'Arles* (Marseilles, 1900), T Colardeau, *De Favorini Studiis et Scriptis* (1903)

FAVRAS, THOMAS DE MAHY, Marquis de (1744–1790), French royalist, was born on March 26, 1744, at Blois In 1772 he became first lieutenant of the Swiss guards of the count of Provence (afterwards Louis XVIII) He retired in 1775, and married in 1776 Victoria Hedwig Caroline, princess of Anhalt-Bernburg-Schaumburg, whose mother, deserted by her husband Prince Carl Ludwig in 1749, had found refuge with her daughter in the house of Marshal Soubise After his marriage he went to Vienna to press the restitution of his wife's rights, and spent some time in Warsaw In 1787 he was authorized to raise a patriotic legion to help the Dutch against the stadtholder William IV and his Prussian allies Returning to Paris at the outbreak of the Revolution, he became implicated in schemes for the escape of Louis XVI He was commissioned by the count of Provence, through the comte de la Châtre, to negotiate a loan of two million francs from the bankers Schaumel and Sartorius Favras was betrayed, and, with his wife, he was arrested on Christmas Eve 1789 In the course of a trial of nearly two months' duration the witnesses disagreed, and even the editor of the *Révolutions de Paris* (No 30) admitted that the evidence was insufficient, but an armed attempt of the Royalists on the Châtelet on Jan 26, which was defeated by La Fayette, sealed his fate He was hanged on the Place de Grève on Feb 19, 1790 Favras was generally regarded as a martyr to his refusal to implicate the count of Provence, and Madame de Favras was pensioned by Louis XVI

The official *dossier* of Favras's trial for high treason against the nation disappeared from the Châtelet, but its substance is preserved in the papers of a clerk

Bibliography —For particulars *see* A Tuetey, *Répertoire général des sources manuscrites de l'histoire de Paris pendant la Révolution Française* (vol 1, 1890, pp 175–177), M Tourneux, *Bibl de l'histoire de Paris pendant la Révolution Française* (vol 1 pp 196–198, 1890) *See* also a memoir by Eduard, Freiherr v Stillfried Ratènic (Vienna, 1881), and an article by Alexis de Valon in the *Revue des deux mondes* (June 15, 1851).

FAVRE, JEAN ALPHONSE (1815–1890), Swiss geologist, born at Geneva on March 31, 1815, was for many years professor of geology in the academy at Geneva, and afterwards president of the Federal Commission with charge of the geological map of Switzerland In 1867 he published *Recherches géologiques dans les parties de la Savoie, du Piémont et de la Suisse voisines du Mont Blanc* He died at Geneva in June 1890

FAVRE, JULES CLAUDE GABRIEL (1809–1880), French statesman, was born at Lyons on March 21, 1809, and

was an advocate by profession From the time of the revolution of 1830 he declared himself a republican After the revolution of 1848 he was deputy for Lyons to the constituent assembly On the 2nd of December 1851 he tried with Victor Hugo and others to organize an armed resistance to Louis Napoleon in the streets of Paris. After the *coup d'état* he withdrew from politics, resumed his profession, and distinguished himself by his defence of Felice Orsini, the perpetrator of the attack against the life of Napoleon III In 1858 he was elected deputy for Paris, and was one of the "five" who gave the signal for the republican opposition to the empire. In 1863 he became the head of his party, and delivered a number of addresses denouncing the Mexican expedition and the occupation of Rome These addresses, eloquent, clear and incisive, won him a seat in the French Academy in 1867 With Thiers he opposed the declaration of war against Prussia in 1870, and at the news of the defeat of Napoleon III at Sedan he demanded from the legislative assembly the deposition of the emperor In the government of national defence he became vice-president under General Trochu, and minister of foreign affairs, with the onerous task of negotiating peace with victorious Germany He proved to be less adroit as a diplomat than he had been as an orator, and committed several irreparable blunders His statement on Sept 6, 1870, that he "would not yield to Germany an inch of territory nor a single stone of the fortresses" was a piece of oratory which Bismarck met on the 19th by his declaration to Favre that the cession of Alsace and of Lorraine was the indispensable condition of peace He arranged for the armistice of June 28, 1871, without knowing the situation of the armies, and without consulting the government at Bordeaux He neglected to inform Gambetta that the army of the East (80,000 men) was not included in the armistice, and it was thus obliged to retreat to neutral territory Favre withdrew from the ministry, discredited, on Aug 2, 1871, but remained in the chamber of deputies Elected senator on Jan 30, 1876, he continued to support the government of the republic against the reactionary opposition, until his death on Jan 20, 1880

His works include many speeches and addresses, notably *La Liberté de la Presse* (1849), *Défense de F Orsini* (1866), *Discours de réception à l'Académie française* (1868), *Discours sur la liberté intérieure* (1869) In *Le Gouvernement de la Défense Nationale*, 3 vols , 1871–1875, he explained his rôle in 1870–1871 After his death his family published his speeches in 8 volumes

See G Hanotaux, *Histoire de la France contemporaine* (1903, etc.); also E. Benoît Lévy, *Jules Favre* (1884)

FAVUS, a disease of the scalp, but occurring occasionally on any part of the skin, and even at times on mucous membranes The uncomplicated appearance is that of a number of yellowish, circular, cup-shaped crusts grouped in patches like a piece of honeycomb, each about the size of a split pea, with a hair projecting in the centre These increase in size and become crusted over, so that the characteristic lesion can only be seen round the edge of the scab Growth continues to take place for several months, when the scab comes away, leaving a shining bare patch destitute of hair The disease is essentially chronic, lasting from 10 to 20 years It is caused by the growth of a fungus (*Achorion Schonleinii*) and was the first disease in which a fungus was discovered—by J. L Schonlein in 1839 Since then other varieties of the fungus have been described. Favus is commonest among the poorer Jews of Russia, Poland, Hungary, Galicia and the East, and among the same class of Mohammedans in Turkey, Asia Minor, Syria, Persia, Egypt, Algiers, etc It is not rare in the southern departments of France, in some parts of Italy, and in Scotland It is spread by contagion, usually from cats, often, however, from mice, fowls, or dogs Before treatment can be begun the scabs must be removed by means of carbolized oil, and the head thoroughly cleansed with soft soap The cure is then brought about by the judicious use of parasiticides.

FAWCETT, HENRY (1833–1884), English politician and economist, was born at Salisbury on Aug 25, 1833, the son of a successful business man He was educated at King's College school, London, and at Peterhouse and Trinity Hall, Cambridge He was seventh wrangler in 1856, and was elected to a fellowship at his college. He then entered Lincoln's Inn. His brilliant prospects, however, were shattered when he was blinded by a shooting accident in 1858 Nevertheless he fished, rowed, skated, walked and rode, and even learnt to play cards and at Trinity Hall, Cambridge, he entered cordially into the social life of the college. He now specialized in political economy He was a loyal follower of Mill, and as a popularizer of his economic theory and a demonstrator of its principles by concrete examples he had no rival His power of exposition was illustrated in his *Manual of Political Economy* (1863), of which in 20 years as many as 20,000 copies were sold. In 1863, Fawcett stood and was elected for the chair of Political Economy at Cambridge. He was already known in political circles as an advanced Radical, and in 1865 he was elected M P. for Brighton In 1867 he married Millicent, daughter of Mr Newson Garrett of Aldeburgh, Suffolk (*see* FAWCETT, DAME MILLICENT).

Fawcett was a severe critic of Liberal Administration and protested against the limited scope of the Elementary Education Bill, Gladstone's method of abolishing army purchase, certain grants to the royal family, and methods of Indian finance In short he was a thorough going radical who was looked at askance by the Liberal Party Constructively he accomplished some reform in Indian finance methods, and secured public attention to the preservation of commons, and of New Forest and Epping Forest As an opponent of the Disraeli government (1874–80) Fawcett came more into line with the Liberal leaders When the Liberal party returned to power in 1880 Gladstone offered Fawcett a place in the new government as postmaster-general (without a seat in the cabinet) He showed himself a most capable head of a public department. To his readiness in adopting suggestions, and his determination to push business through instead of allowing it to remain permanently in the stage of preparation and circumlocution, the public was mainly indebted for five substantial postal reforms —(1) The parcels post, (2) postal orders, (3) sixpenny telegrams, (4) the banking of small savings by means of stamps, (5) increased facilities for life insurance and annuities In connection with these last two improvements Fawcett, in 1880, with the assistance of James Cardin, took great pains in drawing up a small pamphlet called *Aids to Thrift,* of which over a million copies were circulated gratis A very useful minor innovation of his provided for the announcement on every pillar-box of the time of the "next collection" In the post office, as elsewhere, he was a strong advocate of the employment of women Proportional representation and the extension of franchise to women were both political doctrines which he adopted very early in his career, and never abandoned He died at Cambridge on Nov 6, 1884, and was buried in Trumpington churchyard, near Cambridge

In the great affliction of his youth Fawcett bore himself with a fortitude which it would be difficult to parallel The kindness evoked by his misfortune, a strongly reciprocated family affection, a growing capacity for making and keeping friends—these and other causes tended to ripen all that was best, and apparently that only, in a strong but somewhat stern character His acerbity passed away, and in later life was reserved exclusively for official witnesses before parliamentary committees Frank, helpful, conscientious to a fault, a shrewd gossip, and a staunch friend, he was a man whom no one could help liking

See Leslie Stephen, *Life of Henry Fawcett* (1885).

FAWCETT, DAME MILLICENT GARRETT, G.B.E. (1847–) the eighth child of Newson Garrett, merchant shipowner of Aldeburgh, Suffolk Educated at a private school, she married at 20 Professor Henry Fawcett M P , afterwards postmaster-general. Her husband's blindness and the perfect sympathy between them led to the closest interdependence of their activities Under his inspiration she wrote an elementary manual on political economy Since his death in 1884 she has lived in London with her sister Miss Agnes Garrett and her daughter Philippa, who like her father achieved the distinction of being Senior Wrangler at Cambridge

Her best known work is that begun immediately after marriage and continued for 50 years, as a leader—after the first few years

the chief leader—of the constitutional movement for women's suffrage The changes it wrought in women's status are typified by the fact that in 1867, after her first speech at the first meeting advocating women's suffrage, she and another were referred to in parliament as "two ladies, wives of members of this House, who had disgraced themselves" by speaking in public. Yet the quality of the supporters whom the movement immediately secured is shown by those who spoke at the same meeting—J S. Mill, Charles Kingsley, John Morley, Sir Charles Dilke, James Stansfeld, Professor Fawcett.

The work that ensued put a heavy strain on Mrs. Fawcett's predominant qualities—her invincible tenacity of purpose, unfaltering faith in ultimate victory combined with sagacious appreciation of present difficulties, and unfailing humour Practically every session for 50 years, save when the nation was at war, a Woman's Suffrage bill was introduced into parliament, occasionally to achieve a second reading victory, but always to be talked out, blocked or defeated. Every year's work meant a growing volume of meetings, petitions, processions, press campaigns, etc. After 1905, when the militant suffrage campaign began, this army became divided into two main forces, which fought separately without turning their arms against each other

Mrs Fawcett was always passionately patriotic. During the South African War, the Government sent her to investigate the concentration camps for Boer women and children The report she produced vindicated (her opponents said white-washed) their administration The outbreak of the World War was the heaviest blow of her political life. Immediately the whole strength of her organization was turned to efforts for "sustaining the vital forces of the nation" In Jan 1918, the national change of heart towards women's claims for which her patient work had paved the way, was consummated by the passing of the Representation of the People Act, enfranchising about six million women A year later, her National Union of Women Suffrage Societies having become the National Union for Equal Citizenship, she retired from active leadership and gave herself to writing, travel and music She has since written *The Women's Victory and After* (1919), and *What I Remember* (1924) The order of D B E was conferred on her after the war, and she was given the G B E in 1925 (E RA)

FAWKES, FRANCIS (1720–1777), English poet and divine, born at Warmsworth, near Doncaster, where his father was rector, and baptized on April 4, 1720 After studying at Jesus college, Cambridge, he took orders, and finally was made one of the chaplains to the princess of Wales His first publication is said to have been *Bramham Park, a Poem,* in 1745, a volume of poems and translations appeared in 1761; and *Partridge Shooting,* an ecologue, in 1764 His translations of the minor Greek poets—(Anacreon, Sappho, Bion and Moschus, Musaeus, Theocritus and Apollonius)—were celebrated at the time, but they are less likely to be remembered than his song, "Dear Tom, this brown jug, that now foams with mild ale" Fawkes died on Aug 26, 1777

BIBLIOGRAPHY —For his translations *see* A. Chalmers, *Works of the English Poets,* vol. xx.

FAWKES, GUY (1570–1606), English "gunpowder plot" conspirator, son of Edward Fawkes of York, a member of a good Yorkshire family and advocate of the archbishop of York's consistory court, was baptized at St. Michael le Belfrey at York on April 16, 1570 His parents being Protestants, he was educated at the free school at York. Soon after his father's death his mother re-married. Fawkes's stepfather was connected with many Roman Catholic families, and was probably a Roman Catholic himself, and Fawkes himself became a zealous adherent of the old faith. In 1593 he went to Flanders and enlisted in the Spanish army, assisting at the capture of Calais by the Spanish in 1596 and gaining some military reputation.

The Gunpowder Plot.—In 1604 Thomas Winter, at the instance of Catesby, in whose mind the gunpowder plot had now taken definite shape, introduced himself to Fawkes in Flanders, and as "a confident gentleman," "best able for this business," brought him on to England as assistant in the conspiracy. Shortly afterwards he was initiated into the plot, after taking an oath of secrecy, meeting Catesby, Thomas Winter, Thomas Percy and John Wright at a house behind St. Clement's (*see* GUNPOWDER PLOT and CATESBY, ROBERT) Owing to his being unknown in London, to his exceptional courage and coolness, and probably to his military experience, Fawkes was entrusted with the actual accomplishment of the design and when the house adjoining the parliament house was hired in Percy's name, he took charge of it as Percy's servant, under the name of Johnson. He acted as sentinel while the others worked at the mine in Dec 1604, and on the discovery of the adjoining cellar, situated immediately beneath the House of Lords, he arranged in it the barrels of gunpowder, which he covered with firewood and coals and with iron bars to increase the force of the explosion When all was ready in May 1605 Fawkes was despatched to Flanders to acquaint Sir William Stanley, the betrayer of Deventer, and the intriguer Owen with the plot He returned in August and brought fresh gunpowder into the cellars to replace any which might be spoilt by damp A slow match was prepared which would give him a quarter of an hour in which to escape from the explosion For the discovery of the scheme *see* GUNPOWDER PLOT.

Fawkes behaved with the utmost fortitude when arrested He refused stubbornly to give information concerning his accomplices, on Nov 8 he gave a narrative of the plot, but it was not till the 9th, when the fugitive conspirators had been taken at Holbeche, that torture wrung from him their names. His signature to his confession of this date, consisting only of his Christian name and written in a faint and trembling hand, is probably a ghastly testimony to the severity of the torture (*"per gradus ad ima"*) which James had ordered to be applied if he would not otherwise confess He was tried, together with the two Winters, John Grant, Ambrose Rokewood, Robert Keyes and Thomas Bates, before a special commission in Westminster Hall on Jan 27, 1606 He suffered death in company with Thomas Winter, Rokewood and Keyes on the 31st, being drawn on a hurdle from the Tower to the Parliament House, opposite which he was executed He made a short speech on the scaffold, expressing his repentance, and mounted the ladder last and with assistance, being weak from torture and illness

The lantern said to be Guy Fawkes's is in the Bodleian library at Oxford

BIBLIOGRAPHY —*Hist. of England,* by S R. Gardiner, vol. i; and the same author's *What Gunpowder Plot was* (1897), *The Fawkeses of York in the 16th Century,* by R Davies (1850), *Dict. of Nat Biog* and authorities cited there The official account (untrustworthy in details) is the *True and Perfect Relation of the Whole Proceedings against the late most Barbarous Traitors* (1606), reprinted by Bishop Barlow of Lincoln as *The Gunpowder Treason* (1679).

FÁY, ANDREAS (1786–1864), Hungarian poet and author, was born on May 30, 1786, at Kohány (Zemplin), and studied law at the Protestant college of Sárospatak. His *Mesék* (*Fables*), first published at Vienna in 1820, caused him to be regarded as the Hungarian Aesop He wrote numerous poems, plays, romances and tales. In 1835 Fáy was elected to the Hungarian diet, and for a time led the opposition He died on July 26, 1864

His earlier works were collected at Budapest (8 vols, 1843–44). His poems appear in the collections *Bokréta* (*Nosegay*) (Budapest, 1807) and *Frís Bokréta* (*Fresh Nosegay*) (Budapest, 1818). His *Mesék* were translated into German by Petz (Raab, 1821), and partly into English by E. D. Butler, *Hungarian Poems and Fables* (1877).

FAYAL, a Portuguese island forming part of the Azores archipelago. Pop. (1920) 19,009, area, 63 sq.m. Fayal, *i e*, "the beech wood," was so called from the former abundance of the *Myrica faya,* which its discoverers mistook for beech trees. It has an excellent harbour at Horta (*q v*), a town of 5,718 inhabitants. Cedros (3,014) and Feteira (1,760) are the other chief towns. The women of Fayal manufacture fine lace from the agave thread They also execute carvings in snow-white fig-tree pith, and carry on the finer kinds of basket-making A small valley, called Flamengos, perpetuates the name of the Flemish settlers, who have left their mark on the physical appearance of the inhabitants. (*See* AZORES)

FAYETTEVILLE, a city of north-western Arkansas, U S A, in the heart of the beautiful Ozark mountains, at an altitude of 1,500ft.; the county seat of Washington county and the seat of the State university It is on Federal highway 71, and is served

by the Frisco Lines The population was 5,362 in 1920 (93% native white) The University of Arkansas (established 1871) had in 1927–28 an enrolment of over 1,700 in the colleges and 7,000 in other courses Its School of Medicine is at Little Rock, and its Agricultural, Mechanical and Normal school (for negroes) is at Pine Bluff Mount Sequoyah, at the eastern edge of town, is the meeting place of the Western Methodist Assembly A settlement was made here between 1820 and 1825, which in 1828, when the county was created, became the county seat, under the name of Washington Courthouse, changing its name to Fayetteville in 1829 It was incorporated in 1841, received a city charter in 1859, which was abolished by act of the legislature in 1867, was re-incorporated as a town in 1869, and in 1906 again became a city At the opening of the Civil War the sympathies of the citizens were mainly with the Confederate cause The town was raided by Federal cavalry on July 14, 1862, and was occupied by Federal troops later in the year It was attacked by Confederate cavalry April 18, 1863, but they were driven off, was burned in Aug 1863, and was shelled by a detachment of Gen Price's army on Nov 3, 1864 A National cemetery here contains 1,375 graves, and a Confederate cemetery, 725

FAYETTEVILLE, a city of North Carolina, U S A , at the head of navigation on the Cape Fear river, 80m from the ocean, the county seat of Cumberland county It is served by the Aberdeen and Rockfish, the Atlantic Coast Line, and the Norfolk Southern railways, and by steamers to Wilmington, at the mouth of the river The population was 8,877 in 1920 (38% negroes) and was estimated locally at nearly 16,000 in 1928 It has numerous cotton mills and other factories, and a large shipping trade in naval stores, cotton, lumber and garden truck A State normal school for negroes is situated here, and 10m N W is Ft Bragg, an important army post, with the largest artillery range in the country This region was settled by Highlanders between 1729 and 1747, and a village called Cross Creek was within the present limits of Fayetteville In 1762 a town was laid out, including Cross Creek, and was named Campbelltown, and in 1784, when Lafayette visited the town and spoke from the balcony of the town hall, the name was changed to do him honour The Scottish heroine Flora McDonald, with her husband and children, spent most of the year 1775 here Fayetteville was one of four towns that aspired to be the State capital The general assembly met here in 1787, 1788 and 1789, and here in 1789 the Federal Constitution was ratified At the outbreak of the Civil War there was a U S arsenal in the town, containing 37,000 muskets and a complete equipment for a battery of light artillery, and it was promptly seized by the State authorities In March, 1865, Gen Sherman entered the town, destroying the arsenal and considerable property In the early part of the 19th century Fayetteville was a great inland market for western North Carolina, eastern Tennessee and south-western Virginia It was chartered as a city in 1893

FAYOLLE, MARIE ÉMILE (1852–1928), French soldier, entered the Polytechnique in 1873, joined the 16th regiment of artillery in 1875, entered, in 1889, the École de Guerre, where he was professor (of the artillery course), 1897–1907, and where, against orthodox opinion, he urged the importance of concentration of fire and the obstacle it offered to an attacker Made a general of brigade in 1910, Fayolle, on the outbreak of the World War, was given command of the 70th reserve division, which, with the 77th, formed under Gen Pétain the III army Corps and played a brilliant part in the offensive of May 1915 In June 1915 Fayolle was given command of the XXXIII Corps, which he directed during the attack at Souchez and Vimy of Sept , in Feb 1916 he was given the VI Army which took part in the battle of the Somme, and in May 1917 succeeded Pétain at the head of the Centre Group of armies (holding the Champagne and Verdun fronts) After a few weeks in Italy he was recalled in Feb 1918 in expectation of the German offensive, and in March took command of all the forces engaged between Péronne and Barisis—the Reserve Army Group—and definitely checked by March 31 the German attempt to break through; he also carried out the two great offensives of July 18 and Aug 8, 1918, and after the armistice was entrusted with the occupation of the Rhine provinces Gen Fayolle became a marshal of France on Feb 21, 1921. He died on Aug 27, 1928

FAYRER, SIR JOSEPH, BART. (1824–1907), English physician, born in Plymouth on Dec 6, 1824, was a member of the Indian medical service, and on his return to England acted as president of the medical board of the India Office from 1874 to 1895 In 1896 he was created a baronet Sir Joseph Fayrer wrote much on the practice of medicine in India, and was especially known for his studies on the poisonous snakes of that country and on the physiological effects produced by their virus (*Thanatophidia of India,* 1872) This book is the standard work on the subject, and is illustrated by splendid plates drawn from the life by members of the Calcutta School of Art He read before various learned societies important papers on tropical medicine and on epidemiology Other important works by him are *Clinical and Pathological Observations in India* (1873), *Epidemiology of Cholera* (1888) In 1900 appeared his *Recollections of my Life* He died at Falmouth on May 21, 1907

FAYUM, a mudiria (province) of Upper Egypt, having an area of 669 sq m and a population (1917) of 507,617 The capital, Medinet-el-Fayum, is 81 m S S W of Cairo by rail The Fayum proper is an oasis in the Libyan desert, connected with the Nile by the Bahr Yusuf, which reaches the oasis through a gap in the hills separating the province from the Nile valley Southwest of the Fayum, and forming part of the mudiria, is the Gharak depression Another depression, entirely barren, the Wadi Rayan, covering 280 sq m , lies west of the Gharak The whole region is below sea-level, and save for the gap mentioned is encircled by the Libyan hills The lowest part of the province, the north-west end, is occupied by the Birket el Kerun, or Lake of the Horns, whose surface level is 140 ft below that of the sea

Differing from the typical oasis, the fertility of which depends on the water obtained from springs, the cultivated land in the Fayum is formed of Nile mud which is brought down by the Bahr Yusuf, and distributed from it by irrigation canals Over 400 sq m of the Fayum is cultivated, the principal crops being cereals and cotton The completion of the Assuan dam by ensuring a much fuller supply of water enabled thousands of acres of land to be brought under cultivation Three crops are obtained in 20 months The province is noted for its figs and grapes, the figs being of exceptionally good quality Olives are also cultivated Rose trees are very numerous and most of the attar of roses of Egypt is manufactured in the province The Fayum also possesses an excellent breed of sheep Lake Kerun abounds in fish

Medinet-el-Fayum (or Medina), the capital of the province, is a great agricultural centre, with a population (1917) of 44,400 Mounds north of the town mark the site of Arsinoe, earlier Crocodilopolis, where was worshipped the sacred crocodile kept in the Lake of Moeris (*q v*) Besides Medina there are several other towns in the province, among them Senuris and Tomia to the north of Medina and Senaru and Abuksa on the road to the lake, some of which are served by railways. There are also, especially in the neighbourhood of the lake, many ruins of ancient villages and cities Miss Caton-Thompson has recently (1925 onwards) inaugurated a fresh investigation of the Fayum, with important consequences for the study of the physical geography and prehistoric archaeology, these results are still in process of elucidation

See H J L Beadnell, *The Topography and Geology of the Fayum Province of Egypt* (Cairo, 1905), "Preliminary Report on Neolithic Pottery and Bone Implements from the Northern Fayum" in *Man* (1925 no 96)

FAZOGLI, a district in the Sennar division of the Anglo-Egyptian Sudan It forms part of the foot-hills of the Abyssinian plateau and is traversed by the Blue Nile and its affluent the Tumat Immediately south are the Beni Shangul gold washings in Abyssinia The inhabitants of Fazogli are Berta and other Shangalla tribes with an admixture of Funj blood, the country having been conquered by the Funj rulers of Sennar at the close of the 15th century There are also Arab settlements. Fazogli, on the Blue Nile near the Tumat confluence, and nearer the Abyssinian frontier is the prosperous town Kiri Abu Shaneina on the Nile below Fazogli is the place where the trade route from Beni

Shangul strikes the river The chief imports from Abyssinia are coffee, cattle, transport animals and gold Durra and tobacco are the principal crops

FAZY, HENRI (1842–1920), Swiss statesman and historian, great-nephew of James Fazy, was born at Berne on Jan. 31, 1842 Fazy was a prominent figure in Genevese politics from 1868 onwards His proposal to separate Church and State in Geneva was rejected by the people in 1880, but finally accepted in 1907 He was a member of the Swiss *conseil national* from 1896 to 1899, and from 1902 onwards After the Radical defeat of 1918 he was the only member of his party who remained in office, but he became more and more conservative as time went on For many years he was the archivist of Geneva, and also professor of Swiss history at the university of Geneva (1896–99, and from 1902) He died at Geneva on Dec 22, 1920 He was the author of many historical works, chiefly connected with the town and canton of Geneva

FEALTY: *see* FEUDALISM; SEIGNORY

FEASTS AND FESTIVALS. A festival or feast is a day or series of days specially and publicly set apart for religious observances Whether its occurrence be casual or periodic, whether its ritual be grave or gay, carnal as the orgies of Baal and Astarte, or spiritual as the worship of a Puritan Sabbath, it is to be regarded as a festival or "holy day" as long as it is professedly held in the name of religion The most savage of tribes celebrate funeral feasts, some of them month by month or at regular longer intervals, the ancient Egyptians had three festivals of the seasons, twelve festivals of the month and twelve festivals of the half-month; the Athenians had their annual Νεκύσια or Νεμέσεαι, the Romans their *Feralia* and *Lemuralia* and the Parsees, Chinese and other Orientals had festivals at stated periods

But not all such festivals were held in honour of the dead Many were purely seasonal, thanksgiving for good harvest, propitiation feasts against feared calamities, etc The ancient Aztecs of Mexico, the Peruvians, the Egyptians, the Celts, the Teutons, Aryans and Semitic peoples all developed, along with the Calendar System, a well-organized series of feasts and festivals

Greek Festivals.—Perhaps the annual Attic festival in honour of Erechtheus alluded to in the *Iliad* (II 550) ought to be regarded as an instance of ancestor-worship, but the seasonal character of the ἑορτή or new-moon feast in *Od* XX 156, and of the θαλύσια or harvest-festival in *Il* IX 533, is generally acknowledged But the earlier Greek calendar was a comparatively simple one, it later developed into so complicated a catalogue of feast- and holy-days that holidays came to be in excess of working days (Strabo) Each *demos* of ancient Greece during the historical period had its own local festivals For the great national πανηγύρεις—Olympian, Pythian, Nemean and Isthmian—*see* the article GAMES, CLASSICAL *See* also CALENDAR *Greek Calendar*

Roman Festivals.—For the purpose of holding *comitia* and administering justice, the days of the Roman year were regarded as being either *dies fasti* or *dies nefasti*—the *dies fasti* being the days on which it was lawful for the praetors to administer justice in the public courts, while on the *dies nefasti* neither courts of justice nor meetings of *comitia* were allowed to be held Some days were *fasti* during one portion and *nefasti* during another, these were called *dies intercisi* For the purposes of religion a different division of the year was made, the days were treated as *festi* or as *profesti*,—the former being consecrated to acts of public worship, such as sacrifices, banquets and games, while the latter (whether *fasti* or *nefasti*) were not specially claimed for religious purposes The *dies festi* or *feriae publicae* were either *stativae, conceptivae* or *imperativae* The *stativae* were such as were observed regularly, each on a definite day, the *conceptivae* were observed annually on days fixed by the authorities for the time being, the *imperativae* were publicly appointed as occasion called for them In the Augustan age the *feriae stativae* were very numerous, as may be seen from what we possess of the *Fasti* of Ovid *See* also CALENDAR. *Roman Calendar*

Feasts of the Jews.—Of the Jewish feasts which are usually traced to a pre-Mosaic origin the most important and characteristic was the weekly Sabbath, but special importance was also attached from a very early date to the lunar periods It is probable that other festivals also, of a seasonal character, were observed (*see* Exod v 1) In common with most others, the Mosaic system of annual feasts groups itself readily around the vernal and autumnal equinoxes. In Lev xxiii, where the list is most fully given, they seem to be arranged with a conscious reference to the sacred number seven (compare Numb xxviii) Those belonging to the vernal equinox are three in number, a preparatory day, that of the Passover, leads up to the principal festival, that of unleavened bread, which again is followed by an after-feast, that of Pentecost (*see* PASSOVER, PENTECOST) Those of the autumnal equinox are four, a preparatory day on the new moon of the seventh month (the Feast of Trumpets) is followed by a great day of rest, the day of Atonement (which, however, was hardly a *festival* in the stricter sense of the word), by the Feast of Tabernacles, and by a great concluding day (Lev xxiii 36, John vii 37) There was also a considerable number of post-Mosaic festivals, of which the principal were that of the Dedication (described in 1 Macc iv 52–59, comp John x 22) and that of Purim, the origin of which is given in the book of Esther (ix 20 *seq*) (*see* ESTHER)

Earlier Christian Festivals.—While making it abundantly manifest that Christ and his disciples observed the appointed Jewish feasts, the New Testament nowhere records the formal institution of any distinctively Christian festival But we have unambiguous evidence of the actual observance, from a very early period, of the first day of the week as a holy day (John xx 19, 26, 1 Cor xvi 2, Acts xx 7, Rev i 10) The 16th canon of the council of Laodicea almost certainly means that solemn public service was to be held on Saturday as well as on Sunday In other quarters, however, the tendency to regard both days as equally sacred met with considerable resistance The 36th canon of the council of Illiberis, for example, deciding that Saturday should be observed as a fast-day, was doubtless intended to enforce the distinction between Saturday and Sunday At Milan in Ambrose's time Saturday was observed as a festival, but Pope Innocent is found writing to the bishop of Eugubium to urge that it should be kept as a fast Ultimately the Christian church came to recognize but one weekly festival

Even Origen (in the 8th book *Against Celsus*) enumerates as Christian festivals the Sunday, the παρασκευή, the Passover with the feast of the Resurrection, and Pentecost, under which latter term, however, he includes the whole period between Easter and Whitsuntide (*see* the article EASTER) Christmas day and Epiphany were among the later introductions, the feast of the Epiphany being somewhat the earlier of the two Both are alluded to indeed by Clemens Alexandrinus (i 340), but only in a way which indicates that even in his time the precise date of Christ's birth was unknown, that its anniversary was not usually observed, and that the day of his baptism was kept as a festival only by the followers of Basilides (*see* EPIPHANY, FEAST OF).

When we come down to the 4th century we find that, among the 50 days between Easter and Pentecost, Ascension Day has come into new prominence Augustine, for example, enumerates as anniversaries celebrated by the whole church those of Christ's passion, resurrection and ascension, along with that of the outpouring of the Holy Ghost, while he is silent with regard to Christmas and Epiphany

Later Practice.—In the present calendar of the Roman Catholic Church the number of feast days is very large Each is celebrated by an appropriate office, which, according to its character, is either duplex, semi-duplex or simplex A duplex again may be either of the first class or of the second, or a major or a minor The distinctions of ritual for each of these are given with great minuteness in the general rubrics of the breviary, they turn chiefly on the number of Psalms to be sung and of lessons to be read, on the manner in which the antiphons are to be given and on similar details The duplicia of the first class are the Nativity, the Epiphany, Easter with the three preceding and two following days, the Ascension, Whitsunday and the two following days, Corpus Christi, the Nativity of John Baptist, Saints Peter and Paul, the Assumption of the Virgin, All Saints, and, for each church, the feast proper to its patron or title and the feast of its dedication

The duplicia of the second class are the Circumcision, the feast of the Holy Name of Jesus, of the Holy Trinity, and of the Most Precious Blood of Christ, the feasts of the Purification, Annunciation, Visitation, Nativity and Conception of the Virgin, the Natalitia of the Twelve Apostles, the feasts of the Evangelists, of St Stephen, of the Holy Innocents, of St Joseph and of the Patrocinium of Joseph, of St. Lawrence, of the Invention of the Cross and of the Dedication of St Michael The Dominicae majores of the first class are the first Sunday in Advent, the first in Lent, Passion Sunday, Palm Sunday, Easter Sunday, Dominica in Albis, Whitsunday and Trinity Sunday; the Dominicae majores of the second class are the second, third and fourth in Advent, Septuagesima, Sexagesima and Quinquagesima Sundays, and the second, third and fourth Sundays in Lent.

The calendar of the Greek Church is even fuller than that of the Latin, especially as regards the ἑορταὶ τῶν ἁγιῶν. Thus on the last Sunday in Advent the feast of All Saints of the Old Covenant is celebrated, while Adam and Eve, Job, Elijah, Isaiah, etc , have separate days The distinctions of ritual are analogous to those in the Western Church In the Coptic Church there are seven great festivals, Christmas, Epiphany, the Annunciation, Palm Sunday, Easter Sunday, Ascension and Whitsunday, on all of which the Copts "wear new clothes (or the best they have), feast and give alms" (Lane) They also observe, as minor festivals, Maundy Thursday, Holy Saturday, the feast of the Apostles (11th July), and that of the Discovery of the Cross

In common with most of the churches of the Reformation, the Church of England retained a certain number of feasts besides all Sundays in the year They are, besides Monday and Tuesday both in Easter-week and Whitsun-week, as follows the Circumcision, the Epiphany, the Conversion of St Paul, the Purification of the Blessed Virgin, St Matthias the Apostle, the Annunciation of the Blessed Virgin, St Mark the Evangelist, St Philip and St. James (Apostles), the Ascension, St. Barnabas, the Nativity of St John Baptist, St Peter the Apostle, St. James the Apostle, St Bartholomew, St. Matthew, St Michael and all Angels, St Luke the Evangelist, St Simon and St Jude, All Saints, St Andrew, St Thomas, Christmas, St Stephen, St John the Evangelist, the Holy Innocents

Several attempts have been made at various times in western Europe to reorganize the festival system on some other scheme than the Christian Thus at the time of the French Revolution, during the period of Robespierre's ascendancy, it was proposed to substitute a tenth day (Décadi) for the weekly rest, and to introduce the following new festivals, that of the Supreme Being and of Nature, of the Human Race, of the French people, of the Benefactors of Mankind, of Freedom and Equality, of the Martyrs of Freedom, of the Republic, of the Freedom of the World, of Patriotism, of Hatred of Tyrants and Traitors, of Truth, of Justice, of Modesty, of Fame and Immortality, of Friendship, of Temperance, of Heroism, of Fidelity, of Unselfishness, of Stoicism, of Love, of Conjugal Fidelity, of Filial Affection, of Childhood, of Youth, of Manhood, of Old Age, of Misfortune, of Agriculture, of Industry, of our Forefathers, of Posterity and Felicity The proposal, however, was never fully carried out, and soon fell into oblivion

Mohammedan Festivals.—These are chiefly two—the 'Eed es-Sagheer (or minor festival) and the 'Eed el-Kebeer (or great festival), sometimes called 'Eed el-Kurban The former, which lasts for three days, immediately follows the month Ramadan, and is generally the more joyful of the two, the latter begins on the tenth of Zu-l-Heggeh (the last month of the Mohammedan year), and lasts for three or four days Besides these festivals they usually keep holy the first ten days of Moharram (the first month of the year), especially the tenth day, called Yom Ashoora, the birthday of the prophet, on the twelfth day of the third month, the birthday of El-Hoseyn, in the fourth month; the anniversary of the prophet's miraculous ascension into heaven, in the seventh month; and one or two other anniversaries. Friday, called the day of El-Gumah (the assembly), is a day of public worship; but it is not usual to abstain from public business on that day except during the time of prayer.

Hindu and Buddhist Festivals.—In modern India the leading popular festivals are the Holí, which is held in March or April and lasts for five days, and the Dasahara, which occurs in October Although in its origin Buddhism was a deliberate reaction against all ceremonial, it does not now refuse to observe festivals By Buddhists in China, for example, three days in the year are especially observed in honour of the Buddha,—the eighth day of the second month, when he left his home, the eighth day of the fourth month, the anniversary of his birthday; and the eighth of the twelfth, when he attained to perfection and entered Nirvāna In Siam the eighth and fifteenth days of every month are considered holy, and are observed as days for rest and worship At Trut, the festival of the close of the year, visiting and play-going are universal The new year (January) is celebrated for three days, in February is another holiday, in April is a sort of Lent, ushering in the rainy season, on the last day of June presents are made of cakes of the new rice, in August is the festival of the angel of the river, "whose forgiveness is then asked for every act by which the waters of the Meinam have been rendered impure" *See* Bowring's *Siam* and Carné's *Travels in Indo-China and the Chinese Empire.* Copious details of the elaborate festival-system of the Chinese may be found in Doolittle's *Social Life of the Chinese*

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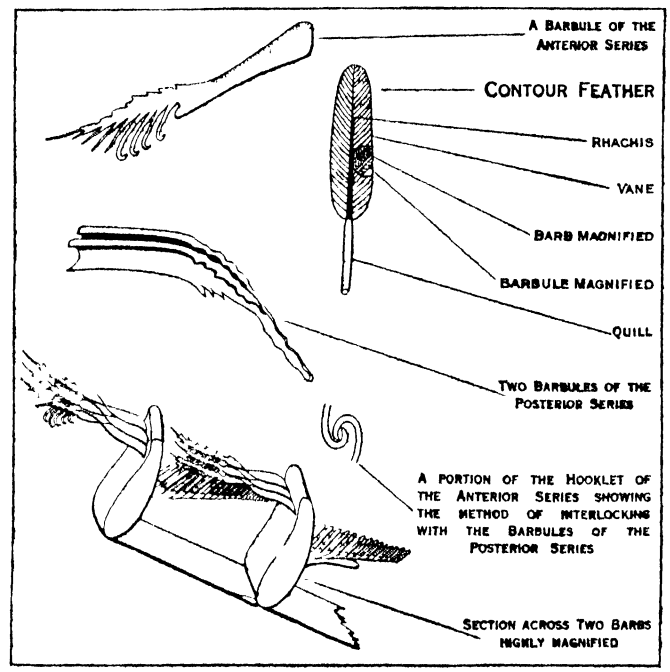
FEATHER, a horny outgrowth of the skin of birds, homologous with the scale of the reptile The body-covering of all birds is composed of feathers, and by this character alone birds may be distinguished from all other animals

The most perfect form of feather is made up of a long, tapering rod, fringed on either side, for the greater part of its length,



AFTER PYCRAFT

FIG 1 —A DETAILED STUDY OF THE MINUTE ANATOMY OF A FEATHER The section here shown was taken through the barbs of one of the primaries, where, as in the secondaries, the system of interlocking is more perfect than in the smaller body-feathers

by a secondary series of slender and tapering rods forming an acute angle with the central axis This fringe is the *vexillum* or "vane" The central axis is divisible into two distinct parts—a hollow, cylindrical, transparent *calamus*, or "quill," the base of which is inserted into the skin, and a solid, quadrangular *rhachis* or "shaft" supporting the vane At the lower end of the quill is a small hole—the lower *umbilicus*—through which the nutritive pulp passes during the growth of the feather, while at the upper end, where it passes into the shaft, a similar hole will be found—

the upper *umbilicus*—and from this the last remains of the capsules which contained the nutritive pulp may sometimes be seen protruding If the quill is cut open a series of these capsules will be found fitting one into the other throughout the length of the chamber

The rods composing the vane are the *rami* or "barbs," and will be found, on microscopic examination, to be lath-shaped and to taper to a point. Each barb supports a double series of *radii*, or "barbules" These "barbules" differ markedly in structure on the two sides of the barb, those pointing towards the tip of the feather—the "anterior barbules"—being ribbon-shaped from the base outwards for about half their length, when they become cut up to form a series of long, delicate hooklets (fig 1) On the opposite side of the barb the barbules are also ribbon-shaped for about half their length, but the ribbon is curved trough-fashion, so that the whole series of posterior barbules forms a number of deep valleys, and into these the hooklets are thrust so as to catch hold of the upper edges of the troughs, which are set so that the upper edge is towards the upper, and the lower towards the under surface of the feather (fig 1)

In one of the primary or "quill" feathers of the wing of a crane, each barb of the inner side of the vane was found to bear about 600 pairs of barbules, which would make about 800,000 barbules for the inner web of the vane alone, or more than a million for the whole feather It is to these hooklets that the closely-knit elastic vanes of the flight feathers and the body feathers are due Where these are wanting the barbs do not adhere, resulting in a loose "discontinuous" vane such as is found in the plumes of the ostrich

Many feathers, in addition to the main axis, bear a second, generally much shorter axis, supporting a loose discontinuous vane, this is the "aftershaft" and arises from the under surface of the feather In the cassowary and emu the aftershaft is as large as the main shaft

There are several different kinds of feathers—contour feathers, semiplumes, down-feathers, filoplumes and powder-down Contour feathers are those which form the outline of the body, and are all that can generally be seen Those which form the "flight feathers" of the wing, and the tail feathers, are the most perfectly developed Semiplumes are degenerate contour feathers The down-feathers are generally hidden by the contour feathers they form in many birds, such as gulls and ducks, a thick underclothing comparable to the under-fur of seals In all cases they are loose, soft and "fluffy," the barbs being long and slender, while the barbules are often long and provided with knob-like thickenings answering to the hooklets of the contour feathers, these thickenings help to "felt" the separate down-feathers together, the barbs of one down-feather interlocking with those of its neighbour Down-feathers do not possess a main axis, all the barbs arising from a common centre Filoplumes are degenerate structures having a superficial resemblance to hairs, but they always bear a minute vane at the tip They occur in all birds, in clusters about the bases of contour feathers In some birds they may project beyond the contour feathers, forming conspicuous white patches, as on the thighs of cormorants In their early stages of development they often possess a large aftershaft The eyelashes and bristles round the mouth in many birds appear akin to filoplumes Powder-down feathers are degenerate down-feathers which secrete a dry, waxy powder This rapidly disintegrates and becomes distributed over the plumage adding thereto a peculiar bloom In birds of the heron tribe powder-down feathers have reached a high degree of development, forming large patches on the breast and thighs.

Nestling Down.—The majority of young birds either emerge from the egg clothed in down-feathers, or develop these a day or two afterwards But this covering, though superficially similar in all, may differ widely in its constitution, even in closely related forms, while only in a few species can the complete history of these feathers be made out.

The tawny owl (*Strix aluco*) is one of these At hatching, the young is thickly clad in white, woolly down-feathers, of the character known as umbelliform—that is to say, the central axis or main shaft is wanting, so that the barbs all start from a common centre These feathers occupy the position of the ultimate contour feathers They are shortly replaced by a second down-like covering, superficially resembling, and generally regarded as, contour-feathers but of a "semi-plumous" type They differ from the down-feathers which preceded them in that their barbs spring from a central axis as in typical contour feathers Feathers of this last description indeed have made their appearance in the shape of the "flight" or quill feathers (*remiges*) and of the tail feathers This plumage is worn until the autumn, when the adult plumage is assumed The down-feathers which appear at hatching are known as *pre-pennae* when they precede contour feathers, or *pre-plumulae* when they precede down feathers The first generation of pre-pennae, in the tawny owl is made up of *protoptyles*, while the succeeding plumage is made of *mesoptyles*, and these in turn give place to the *teleoptyles* or adult feathers The two forms of nestling plumage—pre-pennae and pre-plumulae—may be collectively called "neossoptyles" In the nestling cormorant the down represents pre-plumulae only, in hawks a mixture of pre-pennae and pre-plumulae, in owls pre-pennae only

As a rule the nestling develops but one generation of neossoptyles, and this generally answers to the mesoptyle plumage

As development proceeds and the contour feathers make their appearance they thrust the mesoptyle feathers out of their follicles—the pockets in the skin in which they were rooted—and these will often be found adhering to the tips of the contour feathers for many weeks after the bird has left the nest.

The Colours of Feathers.—In variety and brilliancy of colour birds are not surpassed by any other group of animals Yet the pigments to which these colours are due are few in number, as many resplendent hues are produced by structural peculiarities of the colourless horny surface of the feathers

The principal colour pigments are (*a*) *melanin* pigments, derived possibly from the haemoglobin of the blood, or from the blood plasma, and (*b*) *lipochrome* or "fat" pigments, which are regarded as reserve products, though in birds this is doubtful

The melanin pigments (*zoomelanin*) occur as granules and give rise to black, brown and grey tones, or they may combine with the lipochrome series

The lipochrome pigments (*zoonerythrin* and *zooxanthin*) tend to be diffused throughout the substance of the feather, and give rise respectively to red and yellow colours

Turacin, found in the quill-feathers of touracoes and elsewhere, is a reddish-purple pigment, containing 5 to 8% of copper These feathers lose their colour when wet, but regain it on drying

What effect food may have on colour in birds in a wild state we do not know, but it is significant that flamingoes and linnets in confinement never regain their bright hues following their first moult in captivity If cayenne pepper be mixed with the food of certain strains of canaries, from the time the birds are hatched onwards, the yellow colour of the feathers becomes intensified, till it takes on a deep orange hue Bullfinches, if fed on hemp-seed, turn black

Structural colours include all metallic or prismatic colours, blue, green, white, some yellows, and, in part, glossy black In metallic feathers the barbules are modified in various ways, frequently to form flattened, overlapping plates or tiles, while the surfaces of the plates are either smooth, finely striated or pitted But, save in white feathers, beneath this colourless, glazed outer coat there is a layer of pigment

While in many birds the coloration is a uniform hue or in bands and patches of colour on the breast more or less brilliant, in others it is sombre, and made up of dark longitudinal stripes or transverse bars on a lighter ground The latter is the more primitive, and there seems good reason to believe that longitudinal stripes preceded transverse bars This is indicated by the fact that the nestlings of the more primitive groups are longitudinally striped, and that young hawks in their first feather-plumage are so striped, while the adults are barred

There is also evidence that the evolution of brilliant plumage began with the males, and has, in many cases, been acquired by the females, and lastly by the young, as in the kingfishers Often

where the parents are alike the young wear a different, duller livery, as in the common starling (*Sturnus vulgaris*) But where the female differs from the male in coloration the young resemble the female The physiological explanation of complete disappearance of pigment in adult life, *e g*, the gannet, is not apparent

Moulting.—At least once annually birds renew their feathers completely by a process known as a moult Until the new feathers have a brush-like appearance Generally this replacement takes a soft sheath, and, as development proceeds, the sheath breaks up from the tip downwards, so that for a time the new feathers have a brush-like appearance Generally this replacement takes place gradually, new and old feathers occurring side by side

The "quill" feathers of the wing and tail are renewed in pairs, so that flight is little impaired, the change taking place in the wing from the wrist inwards, as to the primaries, and from the body outwards, towards the tip of the wing, as to the secondaries In certain birds, however, as in ducks and rails, all the quill-feathers of the wing are shed at once, so that for some time flight is impossible

In the penguins this simultaneous moulting is carried still further The old feathers covering the body are replaced *en masse*

Some birds moult twice within the year, the additional moult taking place in the spring, as in the warblers (Sylviidae) But when this is the case the spring moult is only partial, since the quill feathers of the wings and the tail feathers are not renewed

At this spring moult a special "nuptial" plumage, commonly conspicuous for its vivid coloration, is often assumed, *e g*, godwits, knots, dunlins, and ruffs This plumage, at first assumed at the mating period by the males only, and doffed soon after the young appear, has been retained in some species for longer and longer periods, so that the succeeding plumage is worn only for a few weeks, as in many ducks, wherein the males, as soon as the young are hatched, assume an "eclipse" dress

But the assumption at the breeding season of a brilliant plumage is not always due to a moult In many birds, notably many passerines, this change is brought about by shedding the tips of the feathers, which are duller than the rest In this way the bright rose pink of the linnet's breast, the blue and black head of the chaffinch, and the black throat and chestnut-and-black markings of the back of the sparrow, are assumed

The Development of Feathers.—Feathers correspond with the scales of reptiles rather than with the hairs of mammals They make their first appearance as small papillae in the developing chick at about the sixth day of incubation Each papilla consists of a cluster of dermal cells —that is to say, of cells of the deeper layer of the skin— capped by cells of the epidermis These last form a single superficial layer of flattened cells— the *epitrichium*—overlying the cells of the malpighian layer, which are cylindrical in shape and form several layers The papillae assume a cone-shape with its apex directed backwards, while the base is carried down by the growth of the malpighian cells, so that the cone is sunk in a deep pit Thereby these malpighian cells become divided into two portions (1) those taking part in the formation of the walls of the "feather follicle," (2) those enclosed within the cone These last surround the central mass or core formed by the dermis This mass constitutes the nutritive pulp for the development of the growing feather, and is highly vascular. The cells of the malpighian layer within the cone now become differentiated into three layers· (1) an inner, extremely thin, forming a delicate sheath for the pulp, and found in the fully developed feather in the form of a series of hollow, transparent caps enclosed within the calamus, (2) a thick layer which forms the feather itself, and (3) a thin layer which forms the investing sheath of the feather As growth proceeds the cells of this middle layer arrange themselves in longitudinal rows to form the barbs, while the barbules are formed by a secondary splitting At their bases these rudimentary barbs meet to form the ohachis Finally the tips of the barbs break through the investing sheath and the fully formed feather emerges A part of the pulp and malpighian cells remains over after the growth of the two generations of down-feathers, and from this, succeeding generations of adult feathers are developed The reproductive power of the feather follicle appears almost inexhaustible, since it is not diminished appreciably by age, or restricted to definite moulting periods

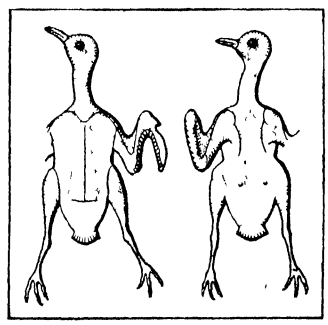


FIG 2 —PTERYLOSIS OF PLOVER
The feathers are clustered together to form well defined tracts or pterylae, separated by spaces called "apteria"

The feathers of birds grow only along certain definite tracts known as *pterylae*, leaving bare spaces or *apteria* These pterylae differ in their conformation in different groups of birds, and hence are of service in systematic ornithology

The principal pterylae are as follows —

(1) The head tract (*pt capitis*), which embraces the head only.
(2) The spinal tract (*pt spinalis*), which extends the whole length of the vertical column It is one of the most variable in its modifications In its simplest form it runs down the back in the form of a band of almost uniform width, but generally it expands considerably in the lumbar region, as in Passeres Frequently it is divided into two portions, an upper, terminating in the region of the middle of the back in a fork, and a lower, which commences either as a fork, *e g*, plover, or as a median band, *e g*, swallow
(3) The ventral tract (*pt ventralis*), which presents almost as many variations as the spinal tract In its simplest form it runs from the throat backwards in the form of a median band as far as the base of the neck, where it divides, sending a branch to each side of the breast This branch commonly again divides into a short, broad outer branch which lodges the "flank" feathers, and a long, narrow, inner branch which runs backwards to join its fellow of the opposite side in front of the cloacal aperture This branch lodges the abdominal feathers For convenience sake the cervical portions of the spinal and ventral tracts are generally regarded as separate tracts, the *pt colli dorsalis* and *pt colli ventralis* respectively
(4) The humeral tract (*pt humeralis*), which gives rise to the "scapular" feathers
(5) The femoral tract (*pt femoralis*), which forms an oblique band across the thigh
(6) The crural tract (*pt cruralis*), which clothes the rest of the leg
(7) The tail tract (*pt caudalis*), including the tail feathers and their coverts, and
(8) The wing tract (*pt alaris*), which presents many peculiar features Each segment—arm, forearm and hand—bears feathers essential to flight, and these are divided into *remiges*, or "quill" feathers, and *tectrices*, or "coverts."

The remiges of the arm, collectively known as the *parapteron* and *hypopteron*, are composed respectively of long, quill-like feathers forming a double series, the former arranged along the upper, and the latter along the lower aspect of the humerus They fill up the gap which, in long-winged birds, would otherwise occur during flight between the quill-feathers of the forearm and the body In short-winged birds they are reduced The quills of the forearm are known as "secondaries," those of the hand as "primaries" The former are attached to the ulna by their bases at relatively wide distances apart, while the primaries are crowded close together and attached to the skeleton of the hand Birds which fly much have the outer primaries of great length, giving the wing a pointed shape, as in swifts, while in species which fly little the outer primaries are short, giving the wing a rounded appearance.

The tectrices or wing coverts are arranged in several series, decreasing in size from behind forwards. The number of rows on the dorsal aspect and the method of their overlap afford characters of general importance in classification.

The wings of struthious birds differ from those of the Neognathae in many ways All are degenerate and useless as organs of flight Those of the ostrich and rhea are the least degraded.

In the ostrich ankylosis has prevented the flexion of the hand at the wrist joint so that the quills—primaries and secondaries—form an unbroken series of about 40 in number. Of these 16 belong to the primary or metacarpo-digital series, a number ex-

ceeding that of any other bird The coverts in their disposition, bear a general resemblance to those of neognathine wings, but they differ on account of the length of the feathers and the absence of overlap

The wing of the rhea more nearly resembles that of flying birds since the hand can be flexed at the wrist joint, and the primaries are 12 in number, as in grebes The coverts, as in the ostrich, are remarkable for their length In both ostrich and rhea, as well as in all the other struthious birds, the under surface of the wing is entirely bare The wing of the cassowary, emu and apteryx has undergone complete degeneration, so that only a vestige of the hand remains The wing of the penguins has become transformed into a paddle, clothed on both sides with a covering of small, close-set feathers A pollex is wanting, as in the cassowary, emu and apteryx

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Commercial Applications of Feathers.—The chief purposes for which feathers become commercially valuable may be comprehended under four divisions —(1) Bed and upholstery feathers, (2) quills for writing, (3) ornamental feathers, and (4) miscellaneous uses

Bed and Upholstery Feathers.—The qualities which render feathers available for stuffing beds, cushions, etc, are lightness, elasticity, freedom from matting and softness These are combined in the most satisfactory degree in the feathers of the goose and allied aquatic birds. Goose feathers and down, when plucked in spring from the living bird, are most esteemed The down of the eider duck, *Somateria mollissima*, is valued above all other substances for lightness, softness and elasticity, but it has some tendency to mat, and is consequently more used for quilts and in articles of clothing than unmixed for stuffing beds The feathers of swans, ducks and the domestic fowl are also largely employed for beds; but in the latter bird, the feathers are harsher and less downy than are those of the natatorial birds generally

Quills for Writing.—The earliest period at which the use of quill feathers for writing is recorded is the 6th century, and from that time till the introduction of steel pens early in the 19th century they formed the principal writing implements of civilized communities It has always been from the goose that quills have been chiefly obtained, although the swan, crow, eagle, owl, hawk and turkey all have been laid under contribution Swan quills, indeed are better than are those from the goose, and for fine lines crow quills have been much employed Only the five outer wing feathers of the goose are useful for writing, and of these the second and third are the best, while left-wing quills are more esteemed than those of the right as they curve outward and away from the writer using them. Quills obtained in spring from living birds are the best.

Ornamental Feathers.—Feathers do not appear to have been much used in Europe for ornamental purposes till the close of the 13th century; during Elizabeth's reign feathers began to occupy an important place as head-dress ornaments of women Ostrich feathers hold a pre-eminent position among ornamental feathers, and the ostrich is the only bird reared exclusively for the sake of its feathers Ostrich farming is one of the established industries of South Africa, and is also practised in North Africa, Argentina, Arizona and California The feathers are cut from the living animal and the stumps withdrawn later In the male, the long feathers of the tail, and wings are white, and the short feathers of the body are jet black, while the tail and wing feathers of the female are white, tinged with a dusky grey The feathers of the male are consequently much more valuable than those of the female, and are separately classified in commerce The art of the plumassier embraces the cleaning, bleaching, dyeing, curling and making up of ostrich and other plumes and feathers

In addition to those of the ostrich, the feathers of certain other birds form articles of steady commercial demand Among these are the feathers of the South American ostrich, *Rhea americana*, the marabout feathers of India obtained from *Leptoptilus argala* and *L javanica*, the aigrettes of the heron, the feathers of the various species of birds of paradise, and of numerous species of humming-birds

Miscellaneous Applications of Feathers.—Quills of various sizes are extensively employed as holders for the sable and camel hair brushes used by artists, etc Feather brushes and dusters are made from the wing-feathers of the domestic fowl and other birds, those of a superior quality, under the name of vulture dusters, being really made of American ostrich feathers A minor application of feathers is found in the dressing of artificial fly-hooks for fishing (W P P)

FEATHER RIVER. A river of northern California which rises in the Sierra Nevada range and flows in a south-west direction through some of the most beautiful scenery in the State, till it becomes part of the Sacramento It is only partly navigable

FEATHER STARS, the popular name for the beautiful star-fish (*q v*) of the class Crinoidea (*see* ECHINODERMA), from their branched, feathery arms

FEATHERSTONE, an urban district in the Normanton parliamentary division of the West Riding of Yorkshire, England, 6 m E of Wakefield, and 2½ m S W of Pontefract on the L M S railway Pop (1921), 14,842 The industrial population is employed in large collieries Here, on Sept 7, 1893, serious riots, during a strike, resulted in the destruction of some colliery works

FEATLEY or FAIRCLOUGH, **DANIEL** (1582–1645), English divine, was born at Charlton, Oxfordshire, on March 15, 1582 His varied activities included a "scholastick duel" with James I in 1625, and the publication of (1) the report of a conference with some Jesuits in 1624, (2) a devotional manual entitled *Ancilla Pietatis* (1626), (3) *Mystica Clavis, a Key opening divers Difficult Texts of Scripture in 70 Sermons* (1636) He was appointed provost of Chelsea College in 1630, and in 1641 was one of the sub-committee "to settle religion" He sat in the Westminster Assembly 1643, and was the last of the Episcopal members to remain For revealing its proceedings he was expelled and imprisoned He died at Chelsea on April 17, 1645

FEBRONIANISM, the name given to a powerful movement within the Roman Catholic Church in Germany, in the latter part of the 18th century, directed towards the "nationalizing" of Catholicism, the restriction of the monarchical power usurped by the papacy at the expense of the episcopate, and the reunion of the dissident churches with Catholic Christendom It was thus, in its main tendencies, the equivalent of what in France is known as Gallicanism (*q v*) The name is derived from the pseudonym of "Justinus Febronius" adopted by Johann Nikolaus von Hontheim (*q v*), coadjutor bishop of Treves (Trier), in publishing his work *De statu ecclesiae et legitima potestate Romani pontificis*

Papal Fallibility.—The main propositions defended by "Febronius" were as follows The constitution of the Church is not, by Christ's institution, monarchical, and the pope, though entitled to a certain primacy, is subordinate to the universal Church. Though as the "centre of unity" he may be regarded as

the guardian and champion of the ecclesiastical law, and though he may *propose* laws, and send legates on the affairs of his primacy, his sovereignty (*principatus*) over the Church is not one of jurisdiction, but of order and collaboration (*ordinis et consociationis*) The Roman (ultramontane) doctrine of papal infallibility is not accepted "by the other Catholic Churches" and, moreover, "has no practical utility" The Church is based on the one episcopacy common to all bishops, the pope being only *primus inter pares*. It follows that the pope is subject to general councils, in which the bishops are his colleagues (*conjudices*), not merely his consultors; nor has he the exclusive right to summon such councils The decrees of general councils need not be confirmed by the pope nor can they be altered by him; on the other hand, appeal may be made from papal decisions to a general council As for the rights of the popes in such matters as appeals, reservations, the confirmation, translation and deposition of bishops, these belong properly to the bishops in provincial synods, and were usurped by the papacy gradually as the result of a variety of causes, notably of the False Decretals (*see* DECRETALS) For the health of the Church it is therefore necessary to restore matters to their condition before the False Decretals, and to give to the episcopate its due authority The main obstacle to this is not the pope himself, but the Curia, and this must be fought by all possible means, especially by thorough popular education (*primum adversus abusum ecclesiasticae potestatis remedium*), and by the assembling of national and provincial synods, the neglect of which is the main cause of the Church's woes. If the pope will not move in the matter, the princes, and notably the emperor, must act in co-operation with the bishops, summon national councils even against the pope's will, defy his excommunication, and in the last resort refuse obedience in those matters over which the papacy has usurped jurisdiction.

The Revolt of the Princes.—The views of Febronius had but little originality In the main they were those that predominated in the great general councils of Constance and Basel in the 15th century, but they were backed by him with such a wealth of learning, and they fitted so well into the intellectual and political conditions of the time, that they found a widespread acceptance The book, indeed, was at once condemned at Rome (February 1764), and by a brief of the 21st of May the pope commanded all the bishops of Germany to suppress it The papal condemnation met with a very mixed reception, in some dioceses the order to prohibit the book was ignored, in others action upon it was postponed pending an independent examination, in yet others (nine in all) it was at once obeyed "for political reasons," though even in these the forbidden book became the "breviary of the governments" The Febronian doctrine, in fact, exactly fitted the views of the German bishops, which were by no means disinterested It must be remembered that the bishops were at this time great secular princes rather than Catholic prelates; with rare exceptions, they made no pretence of carrying out their spiritual duties, they shared to the full in the somewhat shallow "enlightenment" of the age As princes of the Empire they had asserted their practical independence of the emperor, they were irked by what they considered the unjustifiable interference of the Curia with their sovereign prerogatives, and wished to establish their independence of the pope also In the ranks of the hierarchy, then, selfish motives combined with others more respectable to secure the acceptance of the Febronian position Among secular rulers the welcome given to it was less equivocal. Even so devout a sovereign as Maria Theresa refused to allow "Febronius" to be forbidden in the Habsburg dominions, her son, the emperor Joseph II, applied the Febronian principles with remorseless thoroughness In Venice, in Tuscany, in Naples, in Portugal, they inspired the vigorous efforts of "enlightened despots" to reform the Church from above; and they gave a fresh impetus to the movement against the Jesuits, which, under pressure of the secular governments, culminated in the suppression of the society by Pope Clement XIV. in 1773

Roman Victory.—Whether the "Febronian movement" would have led to a reconstitution of the Roman Catholic Church on permanently Febronian lines must for ever remain doubtful. The French Revolution intervened; the German Church went down in the storm; and in 1803 the secularizations carried out by order of the First Consul put an end to the temporal ambitions of its prelates Febronianism, indeed, survived Karl Theodor von Dalberg, prince primate of the Confederation of the Rhine, upheld its principles throughout the Napoleonic epoch and hoped to establish them in the new Germany to be created by the congress of Vienna He sent to this assembly, as representative of the German Church, Bishop von Wessenberg, who in his diocese of Constance had not hesitated to apply Febronian principles in reforming, on his own authority, the services and discipline of the Church But the times were not favourable for such experiments The tide of reaction after the Revolutionary turmoil was setting strongly in the direction of traditional authority, in religion as in politics; and that ultramontane movement which, before the century was ended, was to dominate the Church, was already showing signs of vigorous life. Moreover, the great national German Church of which Dalberg had a vision—with himself as primate—did not appeal to the German princes, tenacious of their newly acquired status as European powers One by one these entered into concordats with Rome, and Febronianism from an aggressive policy subsided into a speculative opinion As such it survived strongly, especially in the universities (Bonn particularly had been, from its foundation in 1774, very Febronian), and it reasserted itself vigorously in the attitude of many of the most learned German prelates and professors towards the question of the definition of the dogma of papal infallibility in 1870 It was, in fact, against the Febronian position that the decrees of the Vatican Council were deliberately directed, and their promulgation marked the triumph of the ultramontane view (*see* VATICAN COUNCIL, ULTRAMONTANISM, PAPACY) In Germany, indeed, the struggle against the papal monarchy was carried on for a while by the governments on the so-called *Kulturkampf*, the Old Catholics representing militant Febronianism The latter, however, since Bismarck "went to Canossa," have sunk into a respectable but comparatively obscure sect, and Febronianism, though it still has some hold on opinion within the Church in the chapters and universities of the Rhine provinces, is practically extinct in Germany The ultramontane doctrine of absolute papal supremacy was reasserted in uncompromising form in the Encyclical of 1908 against Modernism, and in the Encyclical of 1927, where the conditions of "Church Reunion" are laid down as unconditional surrender to Rome

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FEBRUARY, the second month of the modern calendar. In ordinary years it contains 28 days; but in bissextile or leap year, it consists of 29 days. This month was not in the Romulian calendar In the reign of Numa two months were added to the year, namely, January at the beginning and February at the end, in 452 B.C. the decemvirs placed February after January. In February the Lupercalia were held, and women were purified by the priests of Pan Lyceus at that festival The Anglo-Saxons called this month Sprout-Kale from the sprouting of the cabbage at this season The most generally noted days of February are the following —the 2nd, Candlemas day, one of the fixed quarter days used in Scotland, and the 14th, St Valentine's day.

FEBVRE, ALEXANDRE FRÉDÉRIC (1835–1916), French actor, was born in Paris, and after the usual apprenticeship in the provinces and in several Parisian theatres in small parts, was called to the Comédie Française in 1866, where he made his début as Philip II in *Don Juan d'Autriche*. In 1894 he toured the principal cities of Europe, and in 1895, of America He married Mlle Harville, daughter of one of his predecessors at the Comédie Française, herself a well-known actress He died in Paris

on Dec. 14, 1916.

FÉCAMP, a seaport and bathing resort of northern France, in the department of Seine-Inférieure, 28 m N N E of Havre on the Ouest-État railway Pop (1926) 16,015 The town stands at the mouth of the small river Fécamp, and occupies the bottom and sides of a narrow valley opening out between high cliffs

The town grew up round the nunnery founded in 658 to guard the relic of the True Blood which, according to the legend, was found in the trunk of a fig-tree drifted from Palestine to this spot, and which still remains the most precious treasure of the church The original convent was destroyed by the Northmen, but was re-established by Duke William Longsword as a house of canons regular, later converted into a Benedictine monastery King Richard I greatly enlarged this, and rebuilt the church The dukes of Normandy improved the harbour, but later the town was overshadowed by the rising port of Havre

The abbey church of La Trinité dates mostly from 1175 to 1225, and has a fine central tower and chapel-screens The *hôtel-de-ville* with a municipal museum and library occupy the remains of the abbey buildings (18th century) The church of St Étienne (16th century) and the Benedictine liqueur distillery[1], are of some interest There are a tribunal and chamber of commerce, a board of trade-arbitrators and a nautical school The harbour is tidal with docks capable of receiving ships drawing 26 ft at spring-tide, 19 ft at neap-tide Fishing for herring and mackerel is carried on and Fécamp sends a large fleet to the codbanks of Newfoundland and Iceland The chief exports are oil-cake, flint, cod and Benedictine liqueur Imports include coal timber, tar, hemp and ground-nuts Steam sawing, metal-founding, fish-salting, shipbuilding and repairing, and the manufacture of ship's-biscuits and fishing-nets are among the industries

FECHNER, GUSTAV THEODOR (1801–1887), German experimental psychologist, was born on April 19, 1801 at Gross-Sarchen, Lower Lusatia, where his father was pastor He was educated at Dresden and Leipzig, where he spent the rest of his life In 1834 he was appointed professor of physics, but, because of an affection of the eyes, turned in 1843 to the study of mind and the relations between body and mind He died at Leipzig on Nov 18, 1887 His chief works are *Das Büchlein vom Leben nach dem Tode* (1836, Eng trs 1882); *Nanna, oder über das Seelenleben der Pflanzen* (1848); *Zendavesta, oder über die Dinge des Himmels und des Jenseits* (1851); *Über die physikalische und philosophische Atomenlehre* (1853), *Elemente der Psychophysik* (1860); *Vorschule der Ästhetik* (1876), *Die Tagesansicht gegenüber der Nachtansicht* (1879) Besides chemical and physical papers, he wrote poems and humorous pieces, such as the *Vergleichende Anatomie der Engel* (1825), written under the pseudonym of "Dr Mises"

Fechner's epoch-making work was his *Elemente der Psychophysik* (1860) He starts from the Spinozistic thought that bodily facts and conscious facts, though not reducible one to the other, are different sides of one reality His originality lies in trying to discover an exact mathematical relation between them The most famous outcome of his inquiries is the law known as Weber's or Fechner's law which may be expressed as follows —"In order that the intensity of a sensation may increase in arithmetical progression, the stimulus must increase in geometrical progression" Though holding good within certain limits only, the law has proved immensely useful Unfortunately, from the tenable theory that the intensity of a sensation increases by definite additions of stimulus, Fechner was led on to postulate a unit of sensation, so that any sensations might be regarded as composed of *n* units Sensations, he argued, being representable by numbers, psychology may become an "exact" science His general formula for getting at the number of units in any sensation is $I=C \log. S$, where I stands for the sensation, S for the stimulus numerically estimated, and C for a constant that must be separately determined by experiment in each particular order of sensibility The fundamental mistake in this theory lies in the fact that though stimuli are composite, sensations are not The idea of the exact measurement of sensation, however, has been a fruitful one, and mainly through his influence on Wundt, Fechner was the father of that laboratory psychology which investigates human faculties with scientific apparatus His general philosophy conceives the world as highly animistic, even plants and the stars being animated, God, the soul of the universe, has an existence analogous to men, and natural laws are just the modes of the unfolding of God's perfection Fechner was remotely a disciple of Schelling, learnt much from Herbart and Weisse, and decidedly rejected Hegel and the monadism of Lotze

Bibliography —*See* W. Wundt, *G Th. Fechner* (Leipzig, 1901), J E Kuntze, *G. Th Fechner* (Leipzig, 1892), K Lasswitz, *G Th. Fechner* (Stuttgart, 1896), E B Titchener, *Experimental Psychology* (New York, 1905), G F Stout, *Manual of Psychology* (1898), Liebe, *Fechners Metaphysik, im Umriss dargestellt* (1903), H Adolph, *Die Weltanschauung G T Fechners* (Stuttgart, 1923)

FECHNER'S LAW, in psychology, states that the intensity of a sensation (I) varies with the logarithm of the strength of the stimulus (S), or briefly $I=C \log S$, when C is a constant which is different for different sensations (seeing, hearing, etc), or even for the same kind of sensation in the case of different individuals This law is sometimes combined with *Weber's Law* (*q v*), from which it is derived, and called the *Weber-Fechner Law* (*See* Psychology)

FECHTER, CHARLES ALBERT (1824–1879), Anglo-French actor, was born, probably in London, on Oct 23, 1824, of French parents He started as a sculptor, and though he made his début at the Comédie Française in 1844, he returned to his studio, but in 1846 he made a decisive success with a French company in Berlin Next year he married the actress Eléonore Rabut (d 1895) For the next ten years he acted successfully in Paris; after 1860 he appeared with great success in London, and in 1870 he went to the United States, where he died on Aug 5, 1879

FECKENHAM, JOHN (*c* 1515–1584), English ecclesiastic, last abbot of Westminster, was born at Feckenham, Worcestershire Educated at Gloucester hall, Oxford, as a Benedictine student, he was professed at Evesham On the surrender of the abbey to the king (1540), he became chaplain to Bishop Bell of Worcester and to Bonner of London, and in 1544 received the living of Solihull About 1549 Cranmer sent him to the Tower of London, but being released by Mary in 1553, he was made prebendary of St Paul's, rector of Finchley, then of Greenford Magna, chaplain and confessor to the queen, and dean of St Paul's (1554) He was sent by the queen to prepare Lady Jane Grey for death, and when Elizabeth was sent to the Tower Feckenham interceded for her, even at the cost of displeasing the queen

The royal abbey of Westminster having been restored to its primitive use, Feckenham was appointed abbot in 1556 On the accession of Elizabeth, he opposed all legislation for changes in religion, and, when the hour of trial came, refused the oath of supremacy, rejecting also Elizabeth's offer to remain with his monks at Westminster if he would conform to the new laws The abbey was dissolved (July 12, 1559), and within a year Feckenham was sent by Archbishop Parker to the Tower After 14 years' confinement, he was released on bail and lived in Holborn, where he devoted himself to works of charity In 1577 he was committed to the care of Cox of Ely with strict rules for his treatment; and in 1580 he was removed to Wisbeach castle where he died on Oct 16, 1584

See E Taunton, *English Black Monks of St Benedict* (1897). Bibliography in *Dict Nat Biog.*

FEDCHENKO, ALEXIS PAVLOVICH (1844–1873), Russian naturalist and traveller, was born at Irkutsk, Siberia, on Feb 7, 1844 In 1868 he travelled through Turkestan, the district of the lower Syr-Darya, and Samarkand, and shortly after his return he set out for Khokand, where he visited a large portion of territory till then unknown Soon after his return to Europe he perished on Mont Blanc while engaged in an exploring tour in Switzerland, on Sept 15, 1873

Accounts of the explorations and discoveries of Fedchenko have been published by the Russian Government—his *Journeys in*

[1]The liqueur is said to have been made by the monks as far back as 1510, since the Revolution it has been produced by a secular company The familiar legend D O M (*Deo Optimo Maximo*) on the bottles preserves the memory of its original makers.

Turkistan in 1874, *In the Khanat of Khokand* in 1875, and *Botanical Discoveries* in 1876. *See* Petermann's *Mittheilungen* (1872–74).

FEDERAL COUNCIL OF EVANGELICAL FREE CHURCHES. This body was formed to give expression to the unity in matters of spiritual principle which had been found to exist among the evangelical free churches of England and to co-ordinate their activities and resources It represents the denominations as organized corporate bodies Its aims are convergent with those of the National Council of Evangelical Free Churches (*q v*), but its constitution and area of operation are different

The original document consists of a "Declaratory Statement concerning Common Faith and Practice" (with a preamble) and a Constitution The preamble states that "the Evangelical Free Churches of England claim and cherish their place as inheritors, along with others, of the historic faith of Christendom which found expression in the oecumenical creeds of the early and undivided Church, and this Declaratory Statement does not profess to be a comprehensive creed, but a declaration of such truths as, in the circumstances, it seems proper to rehearse and emphasize It is not to be imposed as a disciplinary standard on any of the federating Churches" In the course of the statement of common faith and practice it is declared that "of the visible Church, and every branch thereof, the only Head is the Lord Jesus Christ, and in its faith, order, discipline and duty it must be free to obey Him alone, as it interprets His holy will", that "the Sacraments—Baptism and the Lord's Supper—are instituted by Christ, who is Himself certainly and really present in His own ordinances, though not bodily in the elements thereof", that "the Ministry is an office within the Church—not a sacerdotal order—instituted for the preaching of the Word, the ministration of the Sacraments, and the care of souls", and "the sovereign authority of our Lord Jesus Christ over every department of human life" is solemnly affirmed The objects of the Federation include the following "to bring the Evangelical Free Churches of England into Federal Union upon the basis of the Evangelical Faith and the autonomy of the federating Churches", and "to enter into communion, and united action where possible, with other branches of the Church of Christ throughout the world" The "governing body" of the Federation is a Federal Council, consisting of representatives elected annually by the supreme authorities of the federating Churches, but its powers are advisory and not executive except under conditions explicitly defined *See* REUNION (CHURCH)

FEDERAL FARM LOAN SYSTEM: *see* AGRICULTURAL CREDITS

FEDERAL GOVERNMENT, a form of government of which the essential principle is that there is a union of two or more states under one central body for certain permanent common objects (Lat. *foedus,* a league) In the most perfect form of federation the states agree to delegate to a supreme federal government certain powers or functions inherent in themselves in their sovereign or separate capacity, and the federal government, in turn, in the exercise of those specific powers acts directly, not only on the communities making up the federation, but on each individual citizen So far as concerns the residue of powers unallotted to the central or federal authority, the separate states retain unimpaired their individual sovereignty, and the citizens of a federation consequently owe a double allegiance, one to the state, and the other to the federal government They live under two sets of laws, the laws of the state and the laws of the federal government (J Bryce, *Studies in History and Jurisprudence,* II 490) The word "confederation," as distinct from "federation," is usually, though not universally, used to distinguish from such a federal state (*Bundesstaat*) a mere union of states (*Staatenbund*) for mutual aid, and the promotion of interests common to all (*see* CONFEDERATION)

Ancient Federation.—In ancient Greece the most striking fact of political development was the existence of separate city states, each asserting an absolute autonomy, though all spoke practically the same language and shared to some extent in the same traditions, interests and dangers This insistence on autonomy is most marked in the cases of the more important states, Athens, Sparta, Argos, Corinth, but Greek history is full of examples of small states deliberately sacrificing what must have been obvious commercial advantage for the sake of a precarious independence Thus the Spartan hegemony in the Peloponnese was not a federation The states did, it is true, meet occasionally for discussion, but their relation, which had no real existence save in cases of immediate common danger, was that between a paramount leader and unwilling and suspicious allies The Athenian empire again was a thinly disguised autocracy The synod (*see* DELIAN LEAGUE) of the "allies" soon degenerated into a mere form, of comprehensive united policy there was none, at all events after the League had achieved its original purpose of expelling the Persians from Europe

None the less it is possible, even in the early days of political development in Greece, to find some traces of a tendency towards united action The Amphictyonic unions had one of the characteristic elements of federation, that they were free sovereign states combining for a particular purpose (*see* AMPHICTYONY) But these unions, at all events in historic times, were mainly concerned with religion, and the authority of the councils did not seriously affect the autonomy of the individual states

There are, however, examples in Greece proper of unions approaching to real federal unions The chief Greek federations were those of Thessaly, Boeotia, Acarnania, Olynthus, Arcadia, Aetolia, Achaea, the most important as well as the most completely organized being the Aetolian League and the Achaean League (*See* ACHAEAN LEAGUE, AETOLIA)

The governing council of the Aetolian League (*τὸ κοινὸν τῶν Αἰτωλῶν*) was the permanent representative body, there was also a popular assembly (*παναιτωλικόν*), partly of a primary, partly of a representative kind, any one being free to attend, but each state having only one official representative and one vote Of all the federal governments of Greece, this league was the most certainly democratic in constitution There was a complete system of federal officers, at the head of whom was a Strategus entrusted with powers both military and civil This officer was annually elected, and, though the chief executive authority, was strictly limited in the federal deliberations to presidential functions (*cf* Livy xxxv 25, "ne praetor, quum de bello consuluisset, ipse sententiam diceret"—the praetor, on a question of war, shall not offer his own opinion) The Achaean League was likewise highly organized, joint action was strictly limited, and the individual cities had sovereign power over internal affairs There were federal officers, all the military forces of the cities were controlled by the league, and federal finance was quite separate from city finance

Of ancient federal government outside Greece we know very little, though of the Lycian federation in Asia Minor Strabo informs us that the federation, composed of 23 cities, was governed by a council (*κοινὸν συνέδριον*) which assembled from time to time at that city which was most convenient for the purpose in hand The cities were represented according to size by one, two or three delegates, and bore proportionate shares in financial responsibility

The history of Italy supplies a few examples, of which the chief is perhaps the league of the cities of Latium (*q v ; see* also ETRURIA)

See E A Freeman, *Hist of Federal Government in Greece and Rome* (2nd ed, 1893, J B Bury), and works quoted in the special articles.

Switzerland.—The Swiss republic is the most fully federal Government of modern Europe As now constituted it consists of 22 sovereign states or cantons The government is vested in two legislative chambers, a senate or council of state (*Standerat, Conseil d'État*) in which each Canton has equal representation and a national council (*Nationalrat, Conseil National*) chosen on the basis of one member to every 20,000 of the population, the two bodies together constituting unitedly the federal assembly. The executive council (*Bundesrat, Conseil Fédéral*) of seven members is elected by the federal assembly for a period of three years, and one of its members is chosen annually, also by the federal assembly, to be president of the council. Though only chairman of the council, with no more power than his colleagues, the

president is also president of the confederation and represents the nation on all ceremonial occasions The federal council is unique in two respects—in composition, in that the provision that not more than one councillor can come from any canton carries the federal principle into the structure of the executive, and in powers, in that the federal council, whilst responsible to the federal assembly, is of a non-party or inter-party character and does not resign if its policy is rejected by the legislature Its members are usually re-elected from year to year, and it approaches a council of permanent "heads of departments" more nearly than the cabinet of a parliamentary system (*See* SWITZERLAND)

Germany.—The constitution of Germany under the empire (1871–1918), whilst presenting many aspects peculiar to itself, was so far federal that the *Bundesrat,* in which the component States were represented by their delegates, was "the authoritative representative of the body of German sovereigns and the senates of the free cities" (Woodrow Wilson, *The State*, p 264) The imperial chancellor was a member of this body, it initiated the bulk of legislation, could veto any bill proposed by the *Reichstag* (popularly elected assembly), and exercised important administrative and judicial functions But the predominance of Prussian influence in the Constitution was ensured by the unequal representation of the states, whilst the powers of the states were liable in most cases to reduction by the federal legislature even without their own consent The present constitution of the German republic approaches still more nearly to a unitary type The predominance of Prussia has been greatly reduced, and every state has at least one vote in the *Reichstag* though, apart from this provision, representation in this body is on a population basis But the principle of popular sovereignty is explicitly asserted, and the *Reichsrat* has only a limited veto upon the legislation of the *Reichstag* (Art 74) Further the provisions of the Constitution defining the powers of the *Reich* are so widely drawn as to leave little scope for State activity German writers are themselves divided upon the question whether the constitution is federal or unitary, it is in fact a compromise between advocates of the two systems in which the supporters of a unitary democracy have gained more than their rivals (*See* R Brunet, trans J Gollomb, *The German Constitution*, 1923)

The United States.—The United States of America in some respects resembles the Swiss federation, though retaining marks of its English origin The original 13 states were colonies wholly independent of each other By the articles of confederation and perpetual union adopted by the Continental Congress in 1777, and in effect in 1781–89, the states bound themselves in a league of common defence By the written Constitution, drafted in 1787 and in operation since 1789, a stronger and more centralized union was established—a federal republic formed by the voluntary combination of sovereign states A common citizenship was recognized for the whole union; but the federal government was to exercise only such powers as were expressly delegated to it (amendment of 1791) These powers are, however, much more extensive than those enjoyed by the Confederation, and the Federal Government acts directly upon the citizens through its executive judicial officers The powers of the central government are entrusted to three distinct authorities—executive, legislative and judicial The president, elected for a term of four years by electors chosen for that purpose by each state, is the executive head of the republic He chooses and dismisses his own cabinet, members of which are responsible to the president and not to the legislature for the policy and administration of their departments The vice-president, *ex officio* president of the senate, assumes the presidency in case of resignation or death Legislative power is vested in a Congress consisting of two Houses. a senate, composed of two members elected by each state for a term of six years; and a House of Representatives, consisting of representatives in numbers proportionate to the population of each state, holding their seats for two years The supreme judicial authority is vested in a supreme court, which consists of a chief justice and eight associate justices, all appointed for life by the president, subject to confirmation by the senate.

Other Federations.—The extension of responsible government to the chief British colonies, under a governor or viceregal representative of the crown, has been followed in British North America by the union of the Canadian maritime and Pacific provinces under a federal government—with a senate, the members of which are nominated by the crown, and a house of commons elected by the different provinces according to their relative population The governor-general is appointed by the Crown for a term of five years, and represents the sovereign in all matters of federal government The lieutenant-governors of the provinces are nominated by him, and all local legislation is carried on by the provincial parliaments

The Commonwealth of Australia (*q v*) proclaimed in 1901, is another interesting example of self-governing states federating into a united whole There is, however, a striking difference to be observed in the powers of the federal governments of Canada and Australia The federal parliament of Canada has jurisdiction over all matters not specially assigned to the local legislatures, while the federal parliament of Australia has only such jurisdiction as is expressly attributed to it by the constitution, the states retaining legislative control over all subjects not thus expressly withdrawn from them This jurisdiction is undoubtedly extensive, comprising power to legislate concerning trade and industry, criminal law, taxation, quarantine, marriage and divorce, weights and measures, legal tender, copyrights and patents, and naturalization and aliens Moreover the federal principle of equal representation of the States in one house of the legislature is carried out in the Commonwealth act, but was only partially followed in the British North America act

There was also an early attempt to federate the South African colonies, and an act was passed for that purpose (South African Act, 1877), but it expired on Aug 18, 1882, without having been brought into effect by the sovereign in council, in 1908, however, the Closer Union movement (*see* SOUTH AFRICA) ripened, and in 1909 the South African act was passed which set up a Union instead of a Federation, though, as in the senate, some quasi-federal characteristics were adopted

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FEDERALIST PARTY, in American politics, the party that organized the national government of the United States under the constitution of 1787 It may be regarded as, in various important respects, the lineal predecessor of the American Whig and Republican parties The name *Federalists* (*see* ANTI-FEDERALISTS) was first given to those who championed the adoption of the Constitution They brought to the support of that instrument "the areas of intercourse and wealth" (Libby), the influence of the commercial towns, the greater planters, the army officers, creditors and property-holders generally—in short, of interests that had felt the evils of the weak government of the Confederation—and also of some few true nationalists (few, because there was as yet no general national feeling), actuated by political principles of centralization independently of motives of expediency and self-interest Most of the Federalists of 1787–88 became members of the later Federalist Party

The Federalist Party, which may be regarded as definitely organized practically from 1791, was led, leaving Washington aside, by Alexander Hamilton (*q v*) and John Adams A nationalization of the new central government to the full extent warranted by a broad construction of the powers granted to it by the constitution, and a correspondingly strict construction of the powers reserved to the States and the citizens, were the basic principles of Hamilton's policy The friends of individual liberty and local government naturally found in the assumption by the central government of even the minimum of its granted powers, constant stimulus to their fears (*see* DEMOCRATIC PARTY), while the financial measures of Hamilton—whose wish for extreme centralization was nowise satisfied by the government actually created in 1787—were calculated to force an immediate and firm assumption by that government, to the limit, of every power it could be held to possess To the Republicans (Democratic Republicans)

they seemed intended to cause a usurpation of powers ungranted. Hence these measures became the issues on which the first American parties were formed. Their effect was supplemented by the division into French and British sympathizers; the Republicans approving the aims and condoning the excesses of the French Revolution, the Federalists siding with British reaction against French democracy. The Federalists controlled the government until 1801 Having the great opportunity of initiative they organized it in all its branches, giving it an administrative machinery that in the main endures to-day; established the doctrine of national neutrality toward European conflicts; and fixed the practice of a liberal construction of the Constitution—not only by Congress, but above all by the United States Supreme Court, which, under the lead of John Marshall (who had been appointed chief-justice by President John Adams), impressed enduringly on the national system large portions of the Federalist doctrine. These are the great claims of the party to memory.

After 1801 the Federalist Party never regained power. In attempts to do so, it impaired its morale by internal dissension, by intrigues, and by inconsistent factious opposition to Democratic measures on grounds of ultra-strict construction. It took up, too, the Democratic weapon of States' rights, and in New England carried sectionalism dangerously near secession in 1808, and in 1812–14, during the movement, in opposition to the War of 1812, which culminated in the Hartford convention (*see* HARTFORD) It lost, more and more, its influence and usefulness, and by 1817 was practically dead as a national party. It is sometimes said that Federalism died because the Republicans took over its principles of nationality Rather it fell because its great leaders, John Adams and Alexander Hamilton, became bitter enemies, because neither was even distantly comparable to Jefferson as a party leader; because the party could not hold the support of its original commercial, manufacturing and general business elements, because the party opposed sectionalism to a growing nationalism on the issues that ended in the War of 1812; and, above all, because the principles of the party's leaders (*e g* of Hamilton) were out of harmony, in various respects, with American ideals

The Federalists were charged by the Republicans with being aristocrats and monarchists, and it is certain that their leaders (who were really a very remarkable body of men) distrusted democratic government, that their Sedition law was outrageous in itself, and (as well as the Alien law) bad as a party measure; that in disputes with Great Britain they were true English Tories when contrasted with the friendly attitude toward America held by many English Liberals; and that they persisted in New England as a pro-British, aristocratic social-cult long after they lost effective political influence In short, the country was already thoroughly democratic in spirit, while Federalism stood for obsolescent social ideas and was infected with political "Toryism"

Besides the standard general histories *see* O. G Libby, *Geographical Distribution of the Vote of the Thirteen States on the Federal Constitution, 1787–1788* (Madison, Wis., 1894), the *Memoirs* of Oliver Wolcott (ed by Gibbs), C. D Hazen, *Contemporary American Opinion of the French Revolution* ("J H U Studies," Baltimore, 1897), Henry Adams, *Documents relating to New England Federalism, 1800–1815* (Boston, 1878); A E. Morse, *The Federalist Party in Massachusetts* (Princeton, N.J, 1909), and the biographies and writings of George Cabot, Fisher Ames, Gouverneur Morris, John Jay, Rufus King, Timothy Pickering, Theodore Sedgwick, C C Pinckney and J. A. Bayard *See* also John Bassett Moore, *Four Phases of American Development* (Baltimore, 1912); *The Founders of the Union,* Part 1, "The Fathers of the Constitution," by Max Farrand, and Part 2, "Washington and His Colleagues," by Henry Jones (New Haven, Conn, 1918–21), and Claude Gernade Bowers, *Jefferson and Hamilton* (Boston, 1925)

FEDERAL RESERVE SYSTEM, THE, a United States banking system which began operation on Nov. 16, 1914. The system consists of 12 Federal Reserve Banks, 25 branches, two agencies, and a Government supervisory body sitting in Washington known as the Federal Reserve Board The 12 Federal Reserve Banks are situated in Boston, New York, Philadelphia, Cleveland, Richmond, Atlanta, Chicago, St. Louis, Minneapolis, Kansas City, Dallas and San Francisco. Every Federal Reserve Bank, with its branches, serves a separate district not coterminous with State boundaries The Reserve Banks are bankers' banks in that they perform for the banks of the United States a service similar to that which commercial banks of deposit perform for their customers. They receive deposits from banks, they make loans to banks, they receive and collect checks. In addition, they have power to issue Federal Reserve notes and act as fiscal agents of the U S Government. In more technical language, they are banks of issue and rediscount, with somewhat similar powers to the Bank of England, the Bank of France, the Reichsbank and other European banks of issue

Reasons for Establishment.—Although the United States was among the last of the important countries of the world to establish a bank of issue and rediscount, there is no other country where the needs for such an institution had been so thoroughly demonstrated The outstanding peculiarity of the U.S banking system has been its large number of independent banks Until recent years branch banking had developed hardly at all. By 1914 as many as 27,000 independent banks had been organized, each operated by its own local board of directors and its own separate official staff and each carrying its cash reserve in its own vaults, or in the vaults of other similar banks in large cities Not only was there this large number of independent banks, but they differed greatly in powers, size and character About 7,500 of them were national banks, incorporated under laws of the U S Government and supervised by the comptroller of the currency, who is a Federal political officer The others were all created pursuant to the laws of the several States of the Union governing the establishment of banks, which differed widely

The disadvantages of this system of many independent banks, with their reserves widely scattered or redeposited in city banks, became apparent, not only at every period of serious credit stringency, but also at times of normal seasonal demands for funds There was no certain means by which a fairly elastic supply of credit and currency could be supplemented at times of stress Other difficulties arose from the lack of a competent fiscal agent for the Government Under a plan instituted in 1846, known as the Independent Treasury system, all revenues were paid into the Treasury or a Subtreasury in actual cash, causing stringency, especially as taxes were largely collected at certain seasons of the year Then the disbursements caused undue plethora of funds To overcome this the Government deposited money in the national banks Abuses grew out of that practice In time of stringency the Government had to take special, and frequently extraordinary, measures The Treasury thus found itself with many of the responsibilities of a central bank of issue, but without the machinery necessary for fulfilling the duties of such a bank

The evils arising from the lack of a central bank of issue and rediscount were long recognized in the United States In 1908 the U S monetary commission was appointed by Congress under the chairmanship of Senator Nelson W Aldrich of Rhode Island and produced an exhaustive report covering monetary conditions in the United States and the experiences of other countries with banks of issue and rediscount A change of political parties occurred and the recommendations of the Aldrich commission were not adopted The Federal Reserve Act as passed, represented a series of compromises between the recommendations of the commission and other proposals. The act in its present form was largely a product of the Committee on Banking and Currency of the House of Representatives under the chairmanship of Carter Glass of Virginia The principal points at which the Federal Reserve Act is a harmonization of differences between divergent interests, are its compromises between national and local interests, between Government and private interests and between banking and business interests

A Federal System.—Most European countries have a single central bank of issue and rediscount; in the United States a plan more suited to geographical area and psychological peculiarities was found in the establishment of 12 such banks, each serving a different section of the country. Co-ordination in policy and practice between these banks is effected through the Federal Reserve board, a Government body consisting of the secretary of the Treasury as chairman, ex-officio, the comptroller of the currency, ex-officio member, and six additional members appointed by the

President for ten-year terms, one of whom is designated governor, the chief executive officer of the board. This body has important supervisory powers including the issuance of regulations under which the several Reserve Banks conduct their business Discount rates are established by each Reserve Bank, subject to "review and determination of the Federal Reserve Board"

Public and Private Interests.—Governmental interest in the Federal Reserve system is safeguarded, not only through the supervisory power of the Federal Reserve board, but also through the power of that board to appoint three of the nine directors of each Federal Reserve Bank, for terms of three years, one of these three being designated chairman of the board of each bank and Federal Reserve agent The other six directors of each Reserve Bank are elected in each district, for terms of three years, by the member banks All of the stock of the Federal Reserve Banks is held by the member banks, each of which is required by law to subscribe to this stock in an amount equal to 6% of its own paid-in capital and surplus. Each member bank receives interest limited to 6% per annum on its holdings of Federal Reserve stock Earnings of each Reserve Bank beyond expenses and these limited dividends is paid each year into a surplus fund until that fund equals the subscribed capital of the bank, and beyond that amount 10% of net earnings in excess of expenses and dividends is paid each year into a surplus fund All remaining net earnings are paid to the U S Government as a franchise tax These provisions relieve Federal Reserve policy from any pressure for profits and make public service the sole aim Thus the Reserve Banks are privately owned institutions and a majority of their directors are elected by the member banks. The principal executive officer of each bank, the governor, is chosen by the directors The Reserve Banks are not Government banks, but in view of the supervisory power exercised by the Government, and of the public character of the business conducted by these banks, it might be said that they are quasi-governmental, or quasi-public

Banking and Business Influence.—The sentence in the Federal Reserve Act specifying the composition of the Federal Reserve board reads, "in selecting the six appointive members of the Federal Reserve board, not more than one of whom shall be selected from any one Federal Reserve district, the President shall have due regard to a fair representation of the financial, agricultural, industrial and commercial interests, and geographical divisions of the country" The act provided also for the creation of a body known as the Federal Advisory council, composed of one representative from each Federal Reserve district, elected annually by the board of directors of the local Reserve Bank, and required to hold at least four meetings each year to question and advise with the Federal Reserve board. This advisory body has been composed largely of bankers.

In the organization of the several Federal Reserve Banks, the relative weight of business and banking interests is specifically provided for Three of the six directors elected by the member banks, known as class A directors, are to be representative of the member banks, and the other three elected directors (class B) must not be officers, directors, or employés of any bank and at the time of their election must be actively engaged in "commerce, agriculture or some other industrial pursuit" The law also specifies that the three directors appointed by the Federal Reserve board (class C directors) must not be officers, directors, employés, or stockholders of any bank As a matter of practice business interests have had a majority representation on the directorates of these banks.

Growth of the System.—The Reserve system had modest beginnings. The first function of the Federal Reserve Banks was to receive on deposit the cash reserves of the member banks Every member bank was required by law to deposit with its Reserve Bank a percentage of its net demand and time deposits, differing according to the location of the bank, as shown in table.

Banks in	Original Act effective 1914		Amendment of June 21, 1917	
	Net demand deposits	Time deposits	Net demand deposits	Time deposits
	%	%	%	%
Central Reserve cities	18	5	13	3
Reserve cities	15	5	10	3
All other localities	12	5	7	3

Note Prior to the amendment of 1917, banks were permitted to keep a portion of the required reserve in their own vaults and with other banks.

The provisions of the Federal Reserve Act as to membership required all national banks in the respective districts to become members of the system, to purchase stock of the Reserve Bank of the district and to deposit their reserves therein State banks might become members of the system subject to certain conditions, including a minimum requirement as to capital and surplus and a financial condition and character of management satisfactory to the Federal Reserve board One-third of the banks of the country, with two-thirds of the banking resources, are now members of the Federal Reserve system The growth of the system may be illustrated by the following figures for membership —

Number and Resources of Members of the Federal Reserve System

Year (as of June 30)	Number of banks			Resources (in millions)		
	National	State	Total	National	State	Total
				$	$	$
1915	7,508	17	7,615	11,790	97	11,887
1916	7,572	34	7,606	13,920	307	14,227
1917	7,600	53	7,653	16,282	756	17,038
1918	7,700	513	8,213	18,347	6,104	24,451
1919	7,780	1,042	8,822	21,228	8,628	29,856
1920	8,025	1,374	9,399	23,403	10,351	33,753
1921	8,150	1,595	9,745	20,510	10,426	30,936
1922	8,244	1,648	9,892	20,698	11,026	31,724
1923	8,236	1,620	9,856	21,507	12,203	33,705
1924	8,080	1,570	9,650	22,555	13,222	35,777
1925	8,066	1,472	9,538	24,330	14,766	39,105
1926	7,972	1,403	9,375	25,302	15,543	40,845
1927	7,700	1,309	9,009	26,566	16,244	42,810

The principal growth in membership took place during and following the World War period and this is typical of all the operations of the Reserve Banks With the entry of the United States into the World War in April 1917, there was suddenly thrown upon the Reserve Banks the responsibility for handling Government financial operations and with it a great increase in lending operations, currency payments, check clearings, etc The sale of huge war loans and short-time Treasury loans made it necessary for the member banks to begin borrowing heavily at the Reserve Banks and, simultaneously, war prices and war wages led to a large demand for additional currency which was met by the issue of Federal Reserve notes. The Reserve system thus was forced into an expansion of function and activity which under normal conditions could have been the result only of many years of growth

After the conclusion of the war and post-war expansion, there were reductions in the amount of loans to member banks, the amount of Federal Reserve currency in circulation and the size of fiscal agency operations Other phases of the work continued, however, in increasing volume, as for example, the number of checks handled in the Federal Reserve collection system and the amount of currency received and paid out from day to day Since check collections and currency operations engage about half of the employés of the Reserve Banks, the expansion of these two functions, along with a number of other activities such as telegraph payments, custody of securities for member banks and services for foreign banks of issue makes the work of the Reserve Banks substantial in amount.

The total number of employees of the Reserve System is now about 10,000. The largest Reserve Bank is that at New York, which employs some 2,400 people and being situated in the country's principal money market carries on between one-quarter and one-third of the system's operations including the handling of all foreign accounts and of a large part of all direct operations in the money market. By the terms of one of the clauses in the McFadden bill which was signed by President Coolidge on Feb 25, 1927, the charters of the Federal Reserve Banks, which under the

terms of the original act were for a period of 20 years, were made indeterminate and will, therefore, continue indefinitely unless they are terminated by act of Congress

Results of Operations.—It is too early to pass judgment broadly on the effects of Federal Reserve operations upon the economic life of the United States, but some interesting evidence of the kind of change which has been effected is found in the movement of interest rates In the first place, the evidence given below appears to show that the tendency has been for funds for business use to be somewhat cheaper, and funds for speculative use to be somewhat dearer than before the establishment of the Reserve system

Average Open Market Interest Rates—New York

Period	Commercial paper		Stock exchange loans	
	60 to 90 day	4 to 6 months	On call	60 to 90 day
1900 to 1913	4¾	5½	3¾	4¼
1915 to 1926	5	5¼	4½	5
1922 to 1926	4¼	4½	4¼	4½

Another interesting change in interest rates is that there now appears to be less difference between interest rates in Eastern cities and those in Western and Southern cities than there was before the system was established This may in part be due to the natural tendency for interest rates to level out as the country's money markets become more highly organized, but may be ascribed in part at least to Federal Reserve facilities for the free movement of funds from one part of the country to another Still a third evidence is found in the seasonal movement of money rates Under the old banking system with its inelastic currency and lack of adequate reserve supplies of credit for emergency use, there was a seasonal credit strain every spring and autumn which became serious when added to an otherwise strained monetary condition Recent figures show that this seasonal strain has been almost eliminated and interest rates show little tendency to be higher in the spring and autumn than at other times during the year This is a natural consequence of the capacity to expand bank funds and currency to meet seasonal or unusual needs In these particulars there is evidence that the Federal Reserve system has corrected certain long experienced defects in the structure of the monetary system

Discount and Open Market Policy.—In its discount and open market policy the Reserve system has been able, to a certain extent, to profit from the experience of the European banks of issue, but in other directions has had to depend upon the accumulation of its own experience In its open market operations it has followed the practice of the Bank of England and other banks of issue in influencing the market, at times, by the purchase or sale of Government securities The purchase of securities has had the effect of making funds available to the market, thus tending to make money conditions easy, and the sale of securities to draw funds from the market, thus tending to make money dearer Open market operations have been used from time to time largely to prepare the way for or to make effective changes in discount rate The chief difference from European practice has perhaps been that the Federal Reserve System has published so complete a weekly statement of condition that any changes in holdings of Government securities are immediately obvious and are made the subject of wide popular comment

In fixing the discount rate, European precedent has proved of limited value, for the discount rate in the United States applies to a wholly different kind of credit instrument In most European centres prime bankers' acceptances or bills of exchange constitute the principal discounts of the banks of issue In the United States, however, no such acceptances existed prior to the establishment of the system, and although a considerable volume and market has been developed since that time, largely by the aid of the Reserve Banks, the volume of business done by the Reserve Banks in accepted bills is small compared with other types of advances The principal means by which the Federal Reserve system makes funds available to the banks and the money market is the loan to a member bank, which may take the form of a rediscount of customers' promissory notes, or of a discount of the member bank's own collateral note secured by Government obligations or the promissory notes of its customers The discount rate of a Federal Reserve Bank applies to this kind of paper, and the fixing of the rate is complicated by the fact that banks in different parts of the country may be lending to their customers at rates differing as widely as 4 and 8% or more Thus, it is impossible for a Federal Reserve Bank to fix its rate above the rate the member bank charges its customers, nor has this proved to be necessary It has been found from experience that a discount rate a little higher than the rate at which bankers' acceptances are sold in the open market, and a little lower than the rate at which commercial paper is sold in the open market is satisfactory With the discount rate at that level, member banks appear as a rule to have limited their borrowing to the sums necessary to meet needs of business

Gold Policy.—Between 1915 and 1924, the gold holdings of the United States increased from slightly under $2,000,000,000 to $4,500,000,000, an amount equal to nearly half of the monetary gold of the world Huge gold imports performed the valuable service of building up an adequate reserve behind the country's expanded credit and currency, and enabling member banks to liquidate much of their indebtedness at the Reserve Banks While the United States has probably as much as half of the bank deposits of the world and therefore requires a large gold reserve, the present gold stock is probably sufficient to meet the country's needs for several years to come and to meet, in addition, any reasonable demand for gold from abroad

The presence of this huge gold supply has made it impossible for the Federal Reserve system to follow what are sometimes considered orthodox precedents in its credit policy Discount rates could not be determined by the need of protecting the country's gold supply Instead, discount policy has had to be guided on the one hand by the nature and extent of credit expansion in its relation to business, and on the other by the general world gold position To put the problem in more simple terms, it has been necessary to adopt a discount rate high enough to avoid inflation in the United States and yet low enough so that gold would not be drawn from the countries of Europe and the return to, and maintenance of, the gold standard abroad again be thus imperilled

It has been the opinion of Federal Reserve authorities that, from the broad point of view of the mutual advantage of all nations, the speedy return of all the nations of the world to the gold standard is of utmost importance, and not only has the credit policy of the Reserve Banks been directed, when consistent with domestic needs, with that end in view, but the Reserve Banks have also, from time to time, made credit arrangements with European banks of issue to support their return to a gold basis Such an arrangement was made in May 1925, when the Federal Reserve Bank of New York, in association with the other Federal Reserve Banks, agreed to sell the Bank of England up to $200,000,000 in gold if desired Credit arrangements were also made in 1926 with the National Bank of Belgium, and in 1927 with the Bank of Poland and again with the Bank of Italy, under which the Federal Reserve Bank of New York, in association with the other Federal Reserve Banks, agreed, if desired, to purchase prime commercial bills from those institutions It is believed that these arrangements were a substantial aid to the efforts of those countries to return to the gold standard

The general scheme of the Federal Reserve system, the functions exercised by the banks and the general methods and policies pursued, incorporate no novel ideas for which European experience does not offer precedent, except for the regional arrangements by which there are 12 banks of issue instead of one. There is nothing in the construction of the Federal Reserve Act which is really experimental except that one unique feature Many years of experience will be required to test the feasibility of this arrangement, and its success is likely to depend as much upon the personal qualities of the individuals responsible for the management of the system as upon the provisions of the act (B S.)

FEDERAL TRADE COMMISSION, THE (U.S.A.) This was created by Federal legislative enactment in 1914 in response to a demand on the part of the public that the growth

of monopoly in the United States should be checked Ever since colonial days, "special privilege" in one form or another has organized itself into combinations that have contended with the public at the seat of the Government at Washington as well as in the business world for unfair preferences The utterances of Washington, Jefferson, Lincoln, Roosevelt and Wilson teem with philippics against them At certain periods in the country's history, the pressure and revolt of the public has been so great that it has registered itself in Federal legislation The reason for Federal legislation in addition to State legislation is due to the fact that "special privilege" lays its burden particularly upon interstate commerce over which State laws have practically no control Moreover, the form which monopoly takes is generally that of a holding company which dominates or entirely controls a great group of subsidiaries who were formerly competing companies The actions of the holding company seldom, if ever, come under the jurisdiction and control of State laws, since it is usually outside and beyond their jurisdiction and having to do with interstate commerce The result has been that when the public found it could not get relief or redress from combinations in restraint of trade under their State laws, they have descended upon Congress and demanded some Federal relief

In 1890, economic concentration in the form of mergers and combines in the railroad and industrial world became so threatening that Congress enacted what has been called the Sherman Act which prohibited under severe civil and criminal penalties every contract or combination of interstate or foreign commerce and every monopolization or attempt to monopolize The law included criminal penalties, suits in equity to restrain such combinations and actions at law for triple damages by private parties injured thereby The Sherman Act was strictly interpreted by the U S Supreme Court for a number of years, but was not always strictly enforced by the administrative departments of the Federal Government The result was that while somewhat held in check, monopolies still grew so that in 1902 under the administration of President Roosevelt the public demanded further relief It was Roosevelt's idea that publicity could cure or at least hold in check the growth of monopoly This idea also was an outgrowth of an investigation by the Industrial commission, created by Congress in 1898, which recommended greater publicity regarding the operations of corporations and the establishment of some organ of publicity in the Federal Government The result was the creation of the bureau of corporations, organized in 1903, under the Department of Commerce and Labor The commissioner of corporations was required to investigate the organization and conduct of corporations and combinations engaged in interstate commerce, excepting common carriers, and to give information about the same to the President, in order to enable him to make recommendations to Congress

The bureau functioned successfully, but in 1907, when the country was in the throes of a panic, the United States Steel corporation was permitted to absorb its southern competitor, the Tennessee Coal and Iron Company, on the theory that unless this were done, a business panic of tremendous proportions would result After the money panic had passed and this combine in the steel world existed, there followed another period of similar concentration, mergings and combinations in other lines of industry which again caused the public to demand some greater protection on the part of the Federal Government The demand was recognized by planks in the platforms of both the Democratic and Republican Parties in the campaign of 1912

On Jan 20, 1914, President Wilson made an address before a joint session of Congress, recommending the establishment of a Federal Trade commission He said he did not wish to see the commission empowered to make terms with monopoly or in any sort to assume control of business He asserted that the public demanded a commission as an indispensable instrument of information and publicity It was to be a clearing house for facts by which both the public mind and the mergers of great business undertakings should be guided It was to be an instrument for doing justice to business where the processes of the courts or the natural forces of correction outside the courts were inadequate to adjust the remedy to the wrong in a way that would meet all the equities and circumstances of the case Congress, in turn, enacted the necessary legislation and in 11 words defined the commission's jurisdiction It declared "that unfair methods of competition in commerce are hereby declared unlawful," and it gave the commission two distinct powers The first was couched in language similar to that given to the bureau of corporations In fact, the bureau was transferred to and became a part of the commission Under this power, the commission could investigate corporations and business and report its findings to Congress, the President or the public at large It could also, at the request of Congress or either House, or the President or the attorney general make investigations and report the results The commission, in the industrial world, was to keep the public and the administrative and legislative departments of the Government informed of the conditions in the several industries, and to make special studies and inform Congress The second great power entrusted to it came into play when, in the interest of the public welfare, the commission deemed it necessary to issue a complaint against any offending business unit that was practising an unfair method of competition against a competitor It then required the offender to reply and when issue was thus joined, testimony was taken, under oath, relative to the issue involved The statute required the commission either to dismiss the complaint in the event that the testimony was insufficient to establish an unfair method of competition in interstate commerce, or if a case was made out, to issue an order to cease and desist from the offending method Approximately 95% of the complaints that have been issued have been based upon charges made by one competitor against another

It was thought that with this additional power of stopping unfair methods of competition at their very inception, monopoly would thus be checked since most monopolistic tendencies start with unfair methods The commission had no more than set up the machinery for carrying out its jurisdiction, than it was deluged with complaints by business interests, and has been ever since The policy of the commission in its earliest days was not to name the offender publicly, but to make findings and issue an order to cease and desist As this did not seem to halt the practices complained of, the commission changed its procedure and named the offenders publicly when a complaint was issued The reaction caused considerable protest in the business world because those desiring "special privileges" and those offending against the statute were fearful of the publicity that resulted in an order declaring them unfair There has been a change to another plan whereby the offender, having been proceeded against, signs a secret stipulation with the commission agreeing not to continue the practice and is permitted to go without further publicity In the event that he violates the stipulation, complaint against him is generally made public, and the commission proceeds with the trial

Congress has also entrusted the commission with the enforcement of some of the provisions of the Clayton Act which was passed on Oct 15, 1914 The purpose of these provisions as it related to the Federal Trade commission was to prevent certain practices which were regarded as lessening competition or tending to monopoly, but which it was feared would not always in themselves be sufficient to bring the person who practised them within the scope of the Sherman Anti-Trust Act Later on, the commission was given jurisdiction under what is known as the Webb-Pomerene Act, which permits American business interests to associate themselves together solely for the purpose of selling their goods abroad as a single unit and without the restrictions of the Anti-Trust laws (H TH)

FEDERATION OF BRITISH INDUSTRIES. Founded in 1916, as a national organization to voice the sectional views of industry, this federation differs from other important commercial organizations in restricting its membership to manufacturers or producers, and such as serve their needs The members number nearly 2,500 manufacturing firms and 200 associations, which represent all the leading British industries The federation was recognized in 1923 by the grant of a Royal Charter.

The aims and objects of the federation are adequately summarized in the statement that whatever affects the interests of British

industry, at home or abroad, falls within its scope It does not, however, deal with questions affecting rates of pay or conditions of labour, nor does it intervene in any matter of purely political party controversy

The direction of policy is in the hands of a grand council, elected annually For the purpose of this election, members are divided into 23 main groups, representing the main industries of Great Britain, and the groups in turn into sub-groups, each sub-group covering a subdivision or trade within the industry The sub-group is the unit for electing the council, receiving representation proportional to the number of workpeople employed by its members An executive committee, of about 100 representatives, meeting monthly, deals with the less important and more urgent questions, and this too is elected upon a similar proportional basis, the unit in this case being the main group

Members are organized also upon a geographical basis the country has been divided into 16 districts, each with a resident secretary serving under a district chairman and committee, and with a representative upon the grand council and executive committee The federation, being thus organized both by industrial groups and by districts, is enabled rapidly to obtain its members' views upon matters affecting either trades or localities

The federation has ready access to Ministers and Government departments, with whom it is in continual consultation upon industrial legislation, and gives evidence to all official committees or Royal Commissions reviewing questions of industrial importance Special committees are engaged in considering taxation as it affects industry, and in advising members upon local rating

The federation has also constantly to negotiate on behalf of industry with other sections of the community In conjunction with other important organizations it formed a traders' co-ordinating committee, to co-ordinate the views of industry and commerce upon the difficult questions emanating from the Railways Act, 1921, in negotiations with the railway companies, and before the Railway Rates Tribunal to this committee the head of the federation's transport department serves as secretary Similarly, a shipping committee discusses with the shipping conferences questions of freights and shipping facilities, and a contracts committee confers with municipalities and other large contractors in order to standardize conditions of contracts

Industrial Efficiency.—A further branch of the federation's activities is concerned with aspects of industrial efficiency Such matters as smoke abatement, the avoidance of river pollution, and electric power supply, are the concern of special committees Technical committees advise members upon fuel, industrial art and design The overseas committee devotes attention to all general questions affecting export trade It is particularly concerned with foreign tariffs upon British goods, and, either through the British Government or by other means, is constantly seeking to obtain modifications which will enable British products more easily to enter foreign markets

Internationally, the federation has close relations with the national industrial federations in other countries Visits are exchanged with foreign industrialists, and valuable conversations held upon questions of common interest, such as, *e g*, the carrying out of the decisions taken at the World Economic Conference

Apart from this "policy" work, much attention is devoted to rendering direct services to individual members Highly qualified experts are in charge of departments dealing with insurance, advertising and publicity, in addition to those already mentioned—taxation, rating, fuel economy, railway transport, shipping—and are prepared to advise upon individual problems as well as upon more general questions. Similarly, an intelligence department is engaged in the supply of miscellaneous information.

Notable assistance is given to exporters by the overseas organization In addition to its home staff, it is represented in all parts of the world either by duly qualified correspondents, who recommend suitable agents, supply reports on market conditions, forward information upon tariffs, compose difficulties with customers, and generally facilitate export trade Assistance is given to members desiring to visit foreign markets, by introductions, by obtaining passports, and by settling the details of their itinerary. Advice is also given in regard to overseas exhibitions The federation issues a journal—"British Industries"—twice a month

(D G W)

FEDERER, HEINRICH (1866–1928), a prolific Swiss novelist, was born at Brienz on Oct 7, 1866, and died at Zurich on April 29, 1928 Destined for the priesthood, he had to give up his pastoral duties on account of his health, and thenceforth devoted himself to literary work He is one of the most poetic, richest and delectable of the so-called "Heimatkunstler," or authors dealing mainly with native subjects, while his Roman Catholicism introduces a note that is rather unusual in German Swiss literature His second subject was Italy, especially the Abruzzi. Among the best-known of his novels are *Berge und Menschen* (1911), *Jungfer Therese* (1913), *Das Matteliseppi* (1916; his own favourite) and *Papst und Kaiser im Dorfe* (1924) His short stories are equally charming, such as *Sisto e Sesto* (1913), an extraordinarily popular little book, and the collection under the title of *Lachwyler Geschichten* (1911) His last work was a volume of reminiscences, *Am Fenster, Jugenderinnerungen* (1927)

FEDERZONI, LUIGI (1878–), Italian politician and journalist, was born at Bologna on Sept 17, 1878 Educated at the university there, he took to journalism and literature, and for several years was on the staff of the *Giornale d'Italia*, Rome In politics he was a Conservative, and became a warm supporter of the Nationalist movement After the Florence Nationalist congress in Dec 1910, he helped to found the *Idea Nazionale*, at first the weekly and subsequently the daily organ of the Nationalist movement At the elections of 1913 Federzoni was elected for one of the divisions of Rome In the Chamber he never missed an opportunity to combat the Socialists, Republicans and Democrats. As soon as Italy intervened in the World War he joined the army as a lieutenant of artillery, he afterwards joined a trench mortar battery and was awarded a medal for valour Federzoni supported Mussolini when the latter issued his manifesto of Oct 26, 1922, announcing the march on Rome In the Cabinet formed by Mussolini five days later Federzoni was Minister for the Colonies In this capacity he provided for the reconquest of all the Libyan territories evacuated during the War, and proceeded to reorganise the whole colonial administration After the Matteotti murder in June 1924, Mussolini selected Federzoni for the post of Minister of the Interior He was minister for the Colonies in 1926–28

FEE, an estate in land held of a superior lord on condition of the performance of homage or service (*see* FEUDALISM) In English law "fee" signifies an estate of inheritance (*i e.*, an estate descendable to the heirs of the grantee so long as there are any in existence) as opposed to an estate for life It is divisible into three species, (1) fee simple, (2) conditional fee, (3) fee tail (*See* ESTATE) A fee farm rent is the rent reserved on granting a fee farm, *i e*, land in fee simple, to be held by the tenant and his heirs at a yearly rent Also payment for professional services (*See* RENT)

FEEBLE-MINDEDNESS, a term descriptive of a condition of low intelligence. In England the term has been reserved for the highest group of mental defectives, those now called morons in the United States. In America the term covers the entire group of mental defectives. The following definition of feeble-mindedness was adopted by the American Association for the Study of Feeble-mindedness—the only authoritative body on this subject in the United States. Resolved:

"1. That the term, feeble-minded, be used generically to include all degrees of mental defect due to arrested or imperfect mental development as result of which the person so affected is incapable of competing on equal terms with his normal fellows or managing himself or his affairs with ordinary prudence. 2. That the feeble-minded be divided into three classes, viz . Idiots —Those so deeply defective that their mental development never exceeds that of a normal child of about two years. Imbeciles.—Those whose mental development is above that of an idiot but does not exceed that of a normal child of about seven years. Morons.—Those whose mental development is above that of an imbecile

but does not exceed that of a normal child of about twelve years

"This grouping admits of the use of the older pathological terms, such as hydrocephalic, microcephalic, paralytic, etc., as adjectives indicating the respective complications."

As will be seen, this classification accepts the term feeble-mindedness as generic, referring to the entire group of mental defectives, and adopts a new term, moron (Gr. *moros*), for the highest group The present view is that the moron is not necessarily a person "incapable of competing on equal terms with his normal brothers or of managing his affairs with ordinary prudence" The reason we have had so many morons in the past who did suffer from this incapacity was that they had been improperly trained or educated

Care and Treatment of Feeble-minded.—It is commonly stated that primitive peoples and the ancients destroyed their mentally defective children Not until late in the 16th century does human sympathy seem to have been aroused for this defective class and then attention was centred on the cretin, a special form of mental defective due to non-functioning of the thyroid gland At that time Felix Platten, of Basel, Switzerland, called attention to this group of unfortunates In the early part of the 17th century, St Vincent de Paul at the French asylum known as the Bicêtre gave some special attention to idiot children, not, however, until the 19th century was any considerable effort made to care for these cases In Germany a private school had been established by Dr Saegert, in Berlin, in 1842 The first school in England was established in 1846 through the efforts of Dr. Parmalee and Dr Reid, and soon after that came Carchester and Earlswood

In 1792 a wild boy known later as the "savage of Avéyron" was found in the woods by some hunters He was trained by Itard, who thought to demonstrate certain philosophical tenets He was observed in his work by Seguin, who, impressed with the possibilities of educating idiots, opened a private school in Paris in 1837 and devoted the rest of his life to this work In 1848 he emigrated from France to the United States, and it was largely as a result of his work that institutions for the feeble-minded were started in the United States In that year, two schools were started in Massachusetts one, a private school at Barre; the other the beginning of a State institution, which was in connection with the Perkins Institution for the Blind, and was also under the direction of Dr Howe, who had previously found feeble-mindedness among his blind children in South Boston The second State institution was established by New York State in 1851 The third was in Pennsylvania in 1852, now known as the Pennsylvania Training school at Elwyn The fourth institution was established at Columbus, O, in 1857, and the fifth in Connecticut in 1858 Kentucky and Illinois established institutions in 1860 and 1865 Other States followed as their populations increased or their needs developed, until at present there is a State institution in all States except Nevada, Utah, Arizona and New Mexico There is also an institution in the Territory of Hawaii The early institutions were influenced largely by Seguin's example and enthusiasm, and they were motivated largely by the impulse to educate or cure the idiot It was found, however, that there were large groups which were practically incapable of any education Accordingly, in 1878, an institution was established in Newark, N Y, for the custodial care of untrainable idiots The custodial idea then prevailed for some time

In 1923, the latest census available, there were in institutions in the United States 50,640 feeble-minded persons This is approximately 5 per 10,000 of the population About one-half of these are of imbecile grade, one-sixth idiots and one-third morons. It is generally agreed now by students of the problem that 1% of the population need such care This would be proportionately reduced if the public schools took care of the moron as suggested above A new epoch began in 1896; at Faribault, Minn, was opened a psychological laboratory for the study of the feeble-minded. Ten years later, in 1906, the Training school at Vineland, N J, opened a psychological laboratory at that institution which has been in continuous operation Similar work has been done in various other institutions for short periods Psychological study has led to a clearer understanding of the abilities and disabilities of the feeble-minded of the various grades, with the result that their education and training has been established upon a sound scientific basis. Present day ideals for the feeble-minded are stated by saying. The idiot may be trained to make known his physical wants, and to eat a little less like an animal, the imbecile may be trained in the lower grades to a little self help, and in the higher grades to considerable useful work if under careful direction and supervision, the moron may be trained to be an efficient institution helper and even for self support outside the institution, provided his training is begun early enough and done thoroughly enough along right lines.

Types.—Previous to the adoption of the classification above given, much emphasis was laid upon types of mental defectiveness As already pointed out, work for the feeble-minded began with a consideration of the cretin, a condition endemic in Switzerland and northern Italy, where it is due to an hypertrophied thyroid gland showing as a goitre. In the United States the cretin, or cretinoid, as he should be called, is the result of the congenital absence of the thyroid gland. In either case, the condition is the result of lack of iodine in the food or drinking water The cretin does not grow, either physically or mentally, he has marked physical characteristics easily recognized If the condition is discovered early, thyroid extract may be administered, producing the same result as though the child had a normally functioning thyroid gland Another type of considerable importance is the so-called "mongoloid" or "mongolian," so named because of a fancied resemblance to the northern Asiatic races This type is congenital, but not hereditary It is believed to be due to the failure of the mother to nourish the child properly *in utero*. Mongoloids in general have the intelligence about equal to a four-year-old child, rarely they attain to that of an eight-year-old If understood and carefully treated, they are affectionate, interesting little children, but always little children The hydrocephalic is the result of the disease hydrocephalus, producing the greatly enlarged head, and as a rule, mental deterioration, varying in all degrees of mentality, even up to normal The microcephalic, or small head individual, is generally not higher than imbecile grade The typical feeble-minded person is simply and solely a person whose mind has not developed He is what the name implies, simply weak or simple minded There are no peculiarities or typical features, except such as result naturally from the low degree of mentality Much confusion results from considering extraneous circumstances as essential characteristics of feeble-minded people There are, it is true, some slight fundamental differences according to what has been the cause of the condition

Causes.—For many years it was thought that many physical conditions caused feeble-mindedness such as children's diseases, certain fevers, injuries to the head, falls, blows, etc—and even maternal impressions As a result of careful studies it is now generally accepted that about two-thirds of all feeble-mindedness is inherited The remaining third is perhaps the result of early illness, accidents and unknown causes Of the diseases, meningitis, sleeping sickness and infantile paralysis do cause mental defect sometimes There is no good evidence that the other diseases formerly listed as causes do in fact have any such consequences Another supposed cause often cited by the laity is some form of head injury—resulting from a fall or a blow This seems reasonable until one learns that the brain is not a single organ, injury to any part of which impairs the efficiency of all the rest In reality the brain is a group of organs, and some of them may be injured without harming the rest Adults often recover from very severe brain injuries The effect of similar injuries on a growing child may be thought to have more serious consequences Nevertheless the symptoms are not usually those of feeble-mindedness. Still more doubtful causes are parental alcoholism and parental syphilis While it is easy to believe that these conditions may produce any kind of horrible result, as often claimed, as a matter of fact there is no conclusive evidence that either of them causes feeble-mindedness in the offspring There is always to be found a small percentage of cases where no adequate cause for the condition may be discovered, but these

cases are from neither alcoholic nor syphilitic parents

Treatment.—The first rule for the treatment of the feeble-minded is to make them happy and to remember that, no matter what their chronological age, they are irresponsible children It is useless to scold them for their mistakes, because they do not understand Encouragement for all their good efforts and praise for all their successes is the rule As to education and training, it must be concrete and definite, manual and industrial training rather than book work They cannot handle abstractions, or understand general principles It is useless to teach them rules of morality, for they cannot apply them The high grades can be trained to do many useful things *under direction* They can do many kinds of house work and farm work, simple repair work and even use simple machinery, to which they have been thoroughly trained They do most of the manual work in and about the institutions where they live This materially reduces the cost of their maintenance As a rule, these children are happier in an institution than they are in their own homes, because in institutions they are with children of their own mentality and consequently are more comfortable than in their own homes where they are impressed with their inferiority (H H Go)

FEEDING STUFFS, the materials on which animals feed, may be (i) grass or other growing crops eaten in the fresh condition, (ii) the same preserved for winter use by drying or ensiling, (iii) seeds, or products made from seeds, (iv) miscellaneous products of various industries dealing with plant or animal materials

Class (i) includes such materials as pasture grass, rotation grasses and leguminous crops, rape, mustard, cabbage, kale, turnips, swedes and mangolds They are characterized by a high content of water—70 to 90% Of their dry matter, about 40 to 60% is soluble carbohydrate, 20 to 30% fibre, 8 to 20% protein or other nitrogenous substances, and 5 to 10% ash On account of their high water content they are known as succulents Those which consist mainly of green leaves supply an abundance of vitamins

Class (ii) Permanent and temporary grass is usually preserved by air drying which converts it into hay Grass should be cut for hay before the flowers set seed, otherwise much of the nutritive material is removed from the leaves and stems and stored in the seeds These are lost in haymaking and the resulting hay is fibrous and indigestible When the seeds are allowed to ripen and removed in threshing, as is the case with the cereals and many other crops, the remaining leaves and stems are called straw Hay and straw are bulky feeding stuffs of low nutritive value They are commonly called roughages

Other green crops, *e g* , oats sown together with vetches, beans or peas, are often cut green and preserved by compression into a silo after being cut into short lengths in a chaff cutter This process is known as ensilage, and the product as silage (*q v*)

Class (iii) includes such materials as the cereal grains and their products, the leguminous grains, and the residues which remain after the removal of oil from oil-seeds, *e g* , linseed, cotton-seed, palm kernels, copra, etc Oil-seed residues vary considerably in value according to the method of manufacture In some cases the husk is removed from the seeds before the oil is separated The residue is then said to be decorticated It contains comparatively little indigestible fibre and its nutritive value is relatively high When the oil is removed simply by pressure, the residue still contains from 5 to 10% of oil, which raises its nutritive value If the oil is extracted by chemical means, the residue may contain as little as 1% of oil and the nutritive value is correspondingly decreased The feeding stuffs in this class contain, on the whole, not more than from 10 to 15% of water, and not more than 7 to 8% of fibre Their content of nutritive materials is therefore high and they are known as concentrated feeding stuffs, or simply concentrates

Class (iv) comprises a number of industrial residues, some derived from plants, others from animals. A typical example is fish meal, the dried and ground refuse from the fish-curing industry It should be made from white fish comparatively free from oil, and should not contain more than 4% of salt Fish meal containing more than 4 or 5% of oil is liable to give a fishy taint to the flesh, milk or eggs of animals fed on it

Dried blood, dried and ground meat and bone residues are other examples of feeding stuffs of animal origin Separated milk, buttermilk and whey are valuable additions to the diet of growing pigs, commonly used on farms where they are produced Dried yeast, a waste product of the brewing industry, dried sugar-beet pulp and molasses from the sugar factories, are examples of plant waste products used for feeding animals

All the four classes mentioned above are commonly described as "straight" feeding stuffs, which implies that they are composed of one easily recognized article There is, however, a very large trade in feeding stuffs manufactured by mixing together or compounding several articles Many of them are good, some are bad They are, however, a stumbling-block to the progressive farmer who wishes to work out rations for his animals on a modern basis, because, their make-up being unknown and perhaps variable, it is not possible to estimate their real nutritive value

Composition and Use of Feeding Stuffs.—Animals require a certain quantity of nutritive material per day which must contain (1) a certain quantity of protein for repair of the muscles and other working parts of the body, (ii) a certain quantity of energy-forming materials such as carbohydrates and oils to provide the power to enable them to carry on their normal vital functions The minimum quantity required for these purposes is called the *maintenance ration* An animal fed on a bare maintenance ration remains at constant weight and produces nothing, neither growth, nor work, nor milk

If production is desired, a *production ration* must be given in addition to the maintenance ration, and the amount of the production ration must be estimated in proportion to the amount which it is desired to produce This method of computing rations has been in general and successful use amongst progressive dairy farmers for some years Information is now available for computing rations for growth and fattening on a similar basis

It is obvious that the weight of a feeding stuff is not a measure of its nutritive value Ten pounds of mangolds containing 90% of water are evidently of less nutritive value than 10 lb of linseed cake containing only 10% of water A better measure of nutritive value is obtained by making a chemical analysis to determine the percentages of nutrients—proteins, commonly known as albuminoids or flesh formers, oils or fats, and carbohydrates, and this is the method approved by the Fertilizers and Feeding Stuffs Act, which regulates the sale of feeding stuffs

Percentages of nutrients as determined by chemical analysis do not accurately measure nutritive value, for all the nutrients found by analysis are not digestible, and only that portion of the nutrients which is digested is of value to the animal Moreover, even the sum of the digestible nutrients in a feeding stuff does not measure accurately its real nutritive value It must be discounted for the nutrients used up during the processes of digestion and absorption Kellner first showed 40 years ago how to estimate the real net nutritive value of feeding stuffs by finding how much starch was required to produce in the body of an ox as much fat as was produced by the consumption of 100 lb of the feeding stuff He called this figure the starch equivalent of the feeding stuff Armsby has more recently arrived at similar results by a totally different method He expresses his figures for net nutritive value as calories of net energy When expressed in the same units Armsby's figures agree reasonably well with Kellner's Kellner's starch equivalents are the generally accepted measure of nutritive value in this country Armsby's figures for net energy are in general use in the United States

To compute a ration for an animal it is necessary to know —

1. The live weight of the animal, because the maintenance ration depends on the live weight being proportional to the square of the cube root of the live weight
2. The amount of growth or milk which it is desired that the animal should produce
3. The amount of starch equivalent required to produce unit weight or volume of product; *e g.*, 1 lb. of live-weight increase, or 1 gal of milk

4 The maximum capacity of the animal's appetite, usually stated in lb of dry matter per day or per week

5 The minimum weight of protein required to keep the working parts of the body in repair, and to provide for growth of working parts in a young animal or for making milk in a milking animal

Approximate data for the above so far as they have been ascertained are tabulated below for cattle, sheep and pigs No data are available for the relation between food consumption and work, because there is no practicable method of measuring the work done by a horse or other draught animal

From these data the ration in terms of starch equivalent is then computed from the equation —

Ration = maintenance ration + gain in live weight × weight of starch equivalent required to make 1 lb gain + gal milk × weight of starch equivalent required to make 1 gal milk

Having computed the ration in lb of starch equivalent the next step is to calculate the proportion in which the available feeding stuffs must be mixed in order to include within the limits of the animal's appetite the necessary weight of starch equivalent The weight of digestible protein in the mixture must then be calculated for comparison with the minimum weight shown in the table If found too low the ration must be adjusted by substituting a feeding stuff rich in protein for part of it If a little too high, no harm as a rule will result

In the case of young growing pigs and heavy milking cows it is desirable to calculate the amount of ash in the ration, and it may be necessary to supplement the ration with a mineral mixture If the ration contains a fair proportion of fresh green food no anxiety need be felt about the risk of deficiency in vitamins, indeed there is in general small risk of vitamin deficiency among farm animals

The data for computing rations are as follows

CATTLE—GROWTH AND FATTENING

Live weight	Appetite, in dry matter per day	Maintenance ration in starch equivalent per day	Minimum requirement of digestible protein per day
cwt	lb	lb	lb
5	14½	4	1¼
6	17	4½	1¼
7	19	5	1½
8	20½	5½	1½
9	22	6	1½
10	23½	6½	1½
11	25	7	1½
12	26½	7½	1½
13	28	7¾	1½
14	29½	8¼	1½
15	31	8½	1½
16	32½	8¾	1½

Age	Condition	Requirement for 1 lb increase in live-weight lb starch equivalent
Years.		
Under 2	Store	2
	Fresh	2¼
About 2	Store	2¼
	Fresh	2½
Over 2	Store	2½
	Fresh	2¾
	Half fat	3
	Nearly fat	4

MILKING

Appetite, especially of heavy milkers, higher than that of other cattle of similar weight

Maintenance ration, as for other cattle of similar weight

Minimum requirement of digestible protein, exclusive of that required for milk production, ·75 lb per day

Production requirement per gal of average milk, 2·5 lb starch equivalent including ·55 lb digestible protein

SHEEP—GROWTH AND FATTENING

Live weight	Appetite in dry matter per week	Maintenance ration in starch equivalent per week	Minimum requirement of digestible protein per week
lb	lb	lb	lb.
50	11	5 6	1 3
60	13	6 3	1 4
70	15	6 9	1 5
80	17	7 5	1 6
90	19	8 2	1 7
100	20	8 9	1 8
110	21	9 4	1 8
120	22½	10 0	1 8
130	24	10·5	1 8
140	25	11 0	1 8
150	26½	11 5	1 8
160	28	12 0	1 8

Age.	Condition	Requirements for 1 lb increase in live-weight lb starch equivalent
Months		
Under 3	Store	1
2–6	Store	1¼
6 7	Store	2
7 8	Store	2¼
8 9	As winter fattening progresses	2½
9–10		2¾
10–11		3¼
11–12		3¾

EWES SUCKLING LAMBS

Appetite, higher than that of other sheep of same weight

Maintenance ration, as for sheep of similar weight

Production requirement, per ewe per week, 3 lb starch equivalent including 1 lb digestible protein for each gallon of milk per week

PIGS—GROWTH AND FATTENING

Live weight	Appetite—as meal	Maintenance ration—as meal	Minimum requirement of digestible protein	Production requirement per lb live-weight increase—as meal
lb	lb	lb	lb	lb
50	2½	1 5	3	7
100	4½	2 9	5	1 0
150	5¼	3 3	6	1 5
200	7	3 6	6	2 0
250	7¾	3 8	7	3 0
300	8½	4 1	7	3 5

See T B Wood, *Animal Nutrition* (1924), also *Rations for Live Stock* and *Report of Departmental Committee on Rationing of Dairy Cows,* published by the Ministry of Agriculture (T B W)

FEELING, PSYCHOLOGY OF. The word "feeling" is as one psychologist has remarked, a "psychological maid of all work" A thing "feels" hot, sharp, brittle or clammy, while we ourselves "feel" tired, hungry, happy or irritable Even in psychology the term has been hard worked in many directions But in the vast majority of modern writers it is used with special reference to one only of the three kinds of process into which mental life is now usually classified—that part which deals with "feeling" in the narrower sense, as distinct from "knowing" or "wishing" In this sense it is sometimes also called "affection" and is contrasted with "cognition" and "conation" What are the feelings in this sense? Are they unique mental processes or can they be analysed into simpler elements? This is a question which has played a prominent part in psychological discussion On the whole, modern opinion inclines to the view that they are unique The only forms of the opposite view which have any serious influence to-day are those which connect feeling in some way with sensation Three theories of this kind deserve mention

The James-Lange Theory.—(1) According to the first, feeling consists of various obscure and confused experiences, which upon attentive analysis reveal themselves as diffused sensations from various parts of the body It is some such view as this that is implied in the famous James-Lange theory of the emotions—a theory which is held by few if any living psychologists, but which is treated with respect by very many William James, whose brilliant championship is responsible for this respectful attitude, held the view explicitly only as regards the emotions, but C G Lange held it with reference to the feelings generally For a full discussion, *see* JAMES-LANGE THEORY

Pain.—(2) According to the second theory, the sensations in question are of a more specific kind, pleasant feelings can be analysed into a diffused sensation of tickling or a weak sensation of (sexual) "lust", while unpleasantness is nothing else but a low intensity of pain Now the strength of this theory obviously lies in its account of unpleasantness, and linguistic evidence certainly speaks strongly in its favour, for do we not speak of pain as occasioned both by the death of a dear friend and by a blow upon the shin? But there seems little doubt that language here is guilty of a confusion and that the two experiences are of quite a different order and do not merely differ in intensity Physiological evidence indicates that pain has its special end organs in the skin and in the interior of the body, it has its special tract in the spinal cord, and there are probably portions of the body (such as the cornea and the dentine) from which no sensation other than pain can be elicited And yet any sensation, any kind of experience whatsoever, can be disagreeable Unpleasantness cannot therefore be identified with pain, and the strongest support of this theory falls to the ground

The abandonment of this theory has, however, landed English speaking psychologists in a serious terminological difficulty If it is incorrect to speak of unpleasant feeling as "pain," what single substantive word can we employ to designate this kind of feeling as antithetical to "pleasure"? A recent coinage, which we shall here employ, is "unpleasure "

Feeling as an Attribute.—(3) The third theory that connects feeling with sensation can be briefly disposed of It regards feeling not as itself a sensation but as an attribute of sensation, in the same way that quality, intensity or duration are attributes To this theory has been objected that feeling has itself these very attributes, and is not, like them, an ultimate phase of an elementary process Furthermore it is said that feeling is different from the genuine attributes in that these latter are essential to the very existence of sensation (*e g*, a sensation without duration is no sensation), whereas there do exist "indifferent" sensations Although this second argument is capable of being disputed (for it seems possible that delicate introspection might always reveal some degree of feeling), the combined effect of the two objections has proved so strong that the theory of feeling as an attribute of sensation is now seldom seriously advocated

The discussion in the above paragraphs of the view that the feelings have some special relation to sensation has served to clear away certain important preliminary difficulties Returning now to the more widely held view that feeling is a unique mental element, we may ask what further criteria of its uniqueness there are in addition to its unanalysability Many supposed peculiarities of feeling have been noted but those which have withstood criticism with any degree of success may be reduced to four — (i) Feeling may be experienced in connection with any kind of mental process whatsoever, (ii) Feelings have no images corresponding to the image in the sphere of sensation A revived feeling is a fresh feeling, *e.g*, comparable to a fresh perception of an object rather than to an image of that object "in the mind's eye"; (iii) Feelings do not stand in associative relation to one another When they appear to do so, it is only in virtue of the accompanying perceptions and ideas, between which alone do genuinely associative links exist; (iv) Feelings lack clearness in the sense that they tend to disappear if we attend to them This has been much disputed but recent searching experiments by A Wohlgemuth seem to show that this is strictly true But a word of caution is needed. If we attend to a whole affective experience, we increase the feeling, concentration on an aching tooth only makes the pain less tolerable, but if we succeed in attending to the *feeling* itself (as distinct from the other aspects of the total experience) we find that the feeling tends to vanish even as we grasp it

Accepting provisionally the current view of feeling as an elementary process, how many kinds of feeling are there? The great majority of contemporary psychologists hold that there are only two—pleasure and unpleasure Some others however have refused to admit that there are so few, and at first sight we might well be inclined to agree with them Can the very varied and manifold feelings that we experience in toothache, in intense fatigue, in winning a game, in falling in love, or in leaping from a burning house, really be reduced to these two simple kinds? Most psychologists hold that they can, and that the seeming variety is due either to differences in the attributes of the feeling (*e g*, their intensity and duration), or to differences in the accompanying ideas, sensations or wishes, and not to differences in the quality of the feelings themselves One theory of a contrary kind has however attained sufficient celebrity to necessitate a mention. This is the so-called tri-dimensional theory of Wilhelm Wundt, according to which there are not two but six kinds of feelings, arranged in three pairs of opposites as follows —Pleasure—unpleasure, excitement—calm, tension—relaxation Although early experiments brought some evidence in favour of this theory, later work has shown fairly conclusively that the two last named pairs are not elementary and unanalysable, as are the members of the first pair, but correspond rather to different strengths of conation and different intensities of muscular strain, and to combinations of these with pleasure and unpleasure

According to the most generally accepted view then, pleasure and unpleasure are the only kinds of feeling, pleasures and unpleasures, moreover, do not differ qualitatively among themselves Such apparent differences are entirely due to the varying cognitive and conative events that accompany them

RELATION OF FEELING TO OTHER MENTAL PROCESSES

"Bound" and "Free" Feelings.—This brings us to the difficult subject of the relation between feeling on the one hand and cognition and conation on the other As regards cognition, perhaps the most important fact to bear in mind is that there may exist all degrees of closeness in the relation between a feeling and the accompanying precepts or ideas At the one extreme there are feelings which are intimately "bound" to a single definite sensation —so much that we tend to regard them as "objective" in the sense that they seem to belong more to the external object producing the sensation than to our inner "self", as when we say "That deep blue sky is lovely," or "That treacle tart is delicious" At the other extreme are feelings which are relatively "free" in the sense that they do not seem to have a special relationship to any particular sensations or ideas, feelings which we regard as definitely "subjective" and belonging to the self These latter feelings are relatively persistent and often form a background upon which the more fleeting parts of our experience come and go When the persistence is strong, such feelings may be designated *"moods"* But though a mood may have no specially intimate connection with any one idea or precept, it tends to colour everything so long as it lasts, so that the same ideas may seem pleasant or unpleasant according as we are in a happy or unhappy mood Moods are thus very important factors in determining the relative amounts of pleasure and unpleasure in our life.

Let us start with a consideration of the field of the emotions What are the "emotions" and how do they differ from feelings? Unfortunately there is as yet no generally accepted use of the term emotion among psychologists, but all modern writers seem agreed that emotions have, unlike feeling, a special relationship to some particular kind of conation. Pleasure and unpleasure may, as we have seen, be aroused in connection with any kind of experience Emotions are only aroused under more specific circumstances, and each particular emotion stands in connection with a particular tendency to action; as is easily seen in the case of the more definite and pronounced emotions, such as fear and anger. William McDougall, to whom we owe perhaps more than to any

other author for clarification of thought on this subject, holds that there is a "primary" emotion corresponding to each of the chief instincts, the emotions corresponding in specificity to the specificity of the correlated instinct, that the relative emotion to some extent inevitably accompanies the operation of an instinct and that "secondary" emotions are formed by the blending of two or more primary emotions, when two or more instincts are simultaneously at work. A F Shand, chiefly owing to a narrower conception of instinct, holds that each emotion is correlated not with one but with several instincts, while James Drever and a considerable number of quite recent writers maintain that the term emotion is better reserved for the stronger affective states which result from the blocking of an instinctive tendency when it cannot be easily or quickly gratified. There is likewise no complete agreement as to what are the primary emotions, and the reader must be referred to the text-books for the various views on this subject.

Shand (and following him McDougall) is responsible for introducing the concept of another class of so-called "emotions"—"prospective" and "retrospective," "emotions of desire" or "derived emotions." These are complex states in which cognitive, conative and affective elements are all strongly marked. Those in the "prospective" group relate to desires whose fulfilment (or non-fulfilment) is anticipated in the future. In order of decreasing anticipation of fulfilment they are —confidence, hope, anxiety, despondency, despair. The "retrospective" group is more difficult to classify, but it certainly includes regret, remorse and grief. McDougall correctly draws attention to the fact that these "emotions" are not emotions in the strict modern sense, inasmuch as they may be aroused in connection with *any* conative tendency whatsoever. It would be better in many ways to call them "feelings of desire."

Emotions, like feelings, tend to persist longer than the perceptions and ideas that arouse them, and thus they also may form moods, such as the timorous mood, the irritable mood, the tender mood, etc. Such a mood—"a resonating echo of the emotion"—is most easily brought about when the emotion (and its corresponding instinctive tendency) is denied free expression. It is in this way that conation as well as feeling contributes to the formation of moods.

In recent years our knowledge of the physiological basis of emotion has considerably widened—particularly as to the part played by the autonomic nervous system and by the ductless glands. The work of Walter B. Cannon and his coadjutors has shown for instance that the more violent emotions of fear and anger are specially associated with the central or "sympathetic" division of the autonomic nervous system, and that the action of this division tends generally to be antagonistic to the functions of the upper ("cranial") and lower ("sacral") divisions, the first of which is principally connected with nutrition and the more reposeful states, the second with the functions of excretion and reproduction. We thus see something of the neurological basis of certain psychological antagonisms such as those between fear and eupepsia on the one hand and fear and sexual emotion on the other, which everyday life discloses and which have been emphasised in recent medicine. Furthermore the "sympathetic" division works in intimate relationship with the adrenal glands. The secretion of these glands produces physiological changes which are of use in flight, combat and other circumstances involving great exertion; it increases the amount of blood sugar and quickens the heart-beat (thus favouring muscular effort) and increases the coagulability of the blood (thus reducing loss of blood if wounded). It seems certain that other ductless glands such as the thyroid and the intestital (puberty or sex) glands have also an important influence on our emotions (and therefore also on our moods), and probably there is a brilliant future for the study of our emotional life along the converging lines of psychology, neurology and chemistry.

"Hedonic" and "Hormic" Theories.—Granted the distinction we have made between (the more generally aroused) feelings and (the more specifically conative) emotions, we are still left with the general problem of how feeling is related to conation. It is almost universally recognised that somewhere in this relationship lies the key to the understanding of the true nature and function of feeling itself. It is round this relationship therefore that the chief theories of feeling have clustered. These theories are—as often happens in such a case—for the most part complementary rather than mutually exclusive. There is, however, one point at issue which is from the theoretic point of view rather fundamental; is conation determined by feeling or feeling by conation? Do we want things because they are pleasant (and try to avoid them because they are unpleasant), or are they pleasant because we want them (and unpleasant because we try to avoid them)? These two opposing views have been conveniently called by McDougall the "hedonic" and the "hormic" theories respectively. At first sight the hedonic theory that our desires are determined by our feelings may seem more in accordance with common sense, and indeed it has seemed to many of the earlier psychologists plainly evident that we are constantly endeavouring to secure pleasure and avoid unpleasure. But the great majority are now inclined to believe that the opposite view is the more correct. It is obvious that a great number of our feelings are directly conditioned by the success or failure of our conations both as regards the major and the minor ends of life. Careful study of many cases seems to show that this relation between pleasure and successful conation on the one hand and unpleasure and unsuccessful conation on the other hand is invariable, whereas the relation of feeling to the cognitive elements is variable; a perception or idea may be pleasant, indifferent or unpleasant, according to the conative tendencies operative at the moment (*e.g.*, the sight and smell of food may be very welcome if we are hungry, but most distasteful if we have just risen from an ample meal).

The chief difficulty of the "hormic" theory is concerned with the "objective" feelings accompanying sensation, and, as McDougall has recently shown, many psychologists who elsewhere hold this doctrine, wittingly or unwittingly fall back upon the "hedonic" view when dealing with feelings of this kind. And indeed, we may well be excused for thinking they are right, for the unpleasantness of a severe pain (to take the most striking case of all) seems at first sight to be inherently and inevitably connected with the pain itself and to have nothing to do with our conative attitude towards it. Some modern psychologists, however, have maintained that even the most intense pain can cease to be unpleasant if we can welcome and embrace it instead of trying to put an end to it.

The factors which obstruct conation in the attainment of its end and thus give rise to unpleasure, are, to use Stout's classification, of two main kinds—the material and the formal. The material consists in the nature of our perceptions or ideas themselves, the indication that they give that something in the external world prevents the satisfaction of our desires. If I want to enter a house but my visual and tactile perceptions tell me that the door is locked and that I have not got the key, or if I want to get to a certain town by to-morrow morning but my knowledge of the train service tells me that this is impossible—these are simple examples of material obstacles, here my cognitions frustrate my conations and are unpleasant. But if I remember that the key is under the scraper, or that by hiring a motor car I can get to the town by morning, the obstacles are removed and the corresponding ideas are pleasant.

"Pleasure" and "Reality" Principles.—It is to be noted that the ideas telling us that our desires can be fulfilled may be just as pleasant as the perceptions telling us they are being fulfilled; the thought of getting to town by motor car may be as gratifying as the actual perception of the town when I arrive there. Indeed so dependent is human affective life upon ideational, as distinct from perceptual conditions, that a very great proportion of our feelings are determined by anticipated or recollected, rather than perceived, good or evil. Our desires can be gratified not only in reality but in "imagination," and where there are serious external obstacles, gratification is more easily obtained through imagination than through perception. It is true, our most fundamental physiological needs cannot be permanently satisfied in this way, for

> Who can
> Cloy the hungry edge of appetite
> By bare imagination of a feast?

Nevertheless in the case of many less urgent desires, the pleasures of imagination often make amends for the difficulties of reality—so much so that we are perhaps only too willing to accept them as a permanent substitute for "real" gratification Of recent years psycho-analysis has thrown a vivid light upon the importance of this enjoyment without reference to reality Sigmund Freud has indeed distinguished two principles in mental functioning, the "pleasure principle," which takes no account of outer reality and in which gratification is obtained by simple imagination, and the "reality principle," in which satisfaction of desire is sought in the real world at the cost of a temporary increase of displeasure

The "formal" obstacles to the anticipated attainment of the ends of conation are due to the imperfect or inharmonious function of our own bodies or minds, as when we fail in some delicate adjustment through lack of manual dexterity, or fail to find the solution of a problem owing to confused thought Here again psycho-analysis has greatly enriched our knowledge, by showing the importance of "conflict" in our mental life

Many of our desires are incompatible, hence to gratify one is to frustrate another, and frustration necessarily occasions suffering Mental conflict is indeed a very obvious cause of unpleasure and has been recognized as such in one form or another by many previous psychologists, notably by Herbart, though as a rule these earlier writers, in accordance with the general tendency of psychological thought in their time, laid more stress on cognitive and less on conative factors than is now done One modern author (F C Bartlett) has gone so far as to consider that all unpleasure is due to conflict and not to simple frustration The more general view, however, is that conflict only causes unpleasure indirectly through the frustration of conations, and that therefore, the more harmonious and integrated our personality, the greater our chances of happiness

The "Super-Ego."—One exceptionally important "formal" factor in connection with conflict is the influence exercised by the moral or quasi-moral standards associated with the idea of "self"—the "self-regarding sentiment" in McDougall's terminology, the "super-ego" in Freud's (though these two concepts are by no means entirely synonymous) There are certain standards of achievement and conduct which alone we consider worthy of ourselves (though not for the most part by conscious and deliberate formulation), and whenever we fall short of these standards and ideals there is frustration of the very powerful conative tendencies organized within this super-ego If there is too wide a difference between the standard required by the super-ego and the kind of gratification which our instincts insistently demand, there may be a continuous struggle between the two sets of forces, with perpetual or alternate frustration on one side or the other If the super-ego predominates, there is frustration of instinctive desire of such a kind as frequently gives rise to neurosis, with all the suffering that this entails, if the super-ego is overcome, it, as it were, seeks vengeance by causing the person to despise himself, self-contempt and self-reproach (and—as we may add—self-punishment) from this cause being one of the most potent causes of human misery. A more tolerant super-ego may in many ways permit of greater happiness, though a permanent and complete overthrow of the super-ego would be incompatible with social conduct and with the adaptation to social reality that civilization demands The two extreme conditions can be studied in the complementary mental disorders of mania (where all inhibition, self-criticism and control seem to have been abandoned, and successive thoughts and impulses are left to jostle one another as best they can), and melancholia (where inhibition and self-criticism are so oppressive that there is little scope for anything but thoughts of self-reproach and self-abasement)

The "Tension" Theory.—Since, according to the "hormic" theory, feeling essentially depends upon conation, further light may be thrown upon feeling by a consideration of the ultimate nature of conation itself; in fact the theory of feeling is intimately linked with the theory of conation During the last few years a considerable number of authors have (more or less independently) advocated what in effect may be regarded as a combined theory of feeling and conation This may be briefly called the "tension" theory It holds that the ultimate aim of conation is to get rid of tension, whether caused by external or by internal stimulation, and that pleasure accompanies the diminution, unpleasure the increase of tension

Biological and Physiological Theories.—Besides these psychological or psycho-physical theories of feeling, there are also theories of a more biological or physiological nature The biological theories are all variants on the theme that pleasure occurs under conditions which are favourable to the organism, unpleasure under conditions which are unfavourable There is pretty general agreement as to the fundamental correctness of this view, but it is also agreed that the correlation implied is far from being perfect Some pleasant things are harmful and some harmless (or even beneficial) things are unpleasant But, it is maintained, in the majority of such cases the harm or the benefit are not simultaneous with the feeling, but occur in the future, and feeling only indicates present conditions and is no prophet, or at best only becomes one after much experience—racial or individual

Physiological theories are mostly based on the phenomena of fatigue, nutrition and dissimilation Thus H R Marshall's theory asserts that "Pleasure is produced by the use of surplus stored force in the organ determining the content, and pain is determined by the reception of a stimulus to which the organ is incapable of reacting completely Indifference occurs when the action is exactly equalized to the stimulus" According to the theory of Alfred Lehmann, pleasure occurs when $\frac{\text{Assimilation}}{\text{Dissimilation}} = 1$, the intensity of pleasure increasing with simultaneously increasing values of A and D, while unpleasure occurs when $\frac{A}{D} < 1$, increasing with the decrease of the value $\frac{A}{D}$. The difficulty of these theories is (here once again) to account for the exciting pleasures and for the fact that pleasures may be tiring In any case, however, all such theories are at present mere speculations lacking all detailed verification

Since feeling can accompany any kind of mental process, it has often been argued that there is no cerebral centre for feeling; indeed, such a view is implied in the two above-mentioned physiological theories in their present form But, as Wohlgemuth has pointed out, the position now most frequently adopted that feeling is an elementary mental process, combined with the further usual assumption that elementary mental processes have definitely corresponding brain centres, compels us to suppose that some such centre exists Physiological and neurological evidence (particularly the clinical researches of Sir Henry Head and his co-workers) points rather strongly to the thalamus being such a centre, though in the past numerous other parts of the brain have been suggested (mostly on very insufficient evidence)

METHODS AND PROBLEMS

"Expression" and "Impression" Methods.—Experimental Psychology has devised various methods for the more accurate qualitative and quantitative investigation of the feelings and of their conditions and effects, and a good many of the already mentioned conclusions have been obtained by the use of such methods, though vast problems still await research It has become customary to classify these methods into two main groups, the "expression" and "impression" methods respectively In the expression method, feeling is studied through its physiological concomitants, muscular contractions, pulse, blood pressure, breathing, volume of a limb and electrical resistance being the physiological expressions that have been most frequently measured. Of these the observation of changes in electrical resistance (the psycho-galvanic reflex) has on the whole shown itself most fruitful in results, though there is still much uncertainty as to the ultimate physiological and psychological interpretation of these results; in particular (on the psychological side) as to how far the changes in resistance are correlated with conative or affective experiences. The study of muscular contraction shows the sthenic and asthenic efforts of pleasure and unpleasure respectively, while it has also

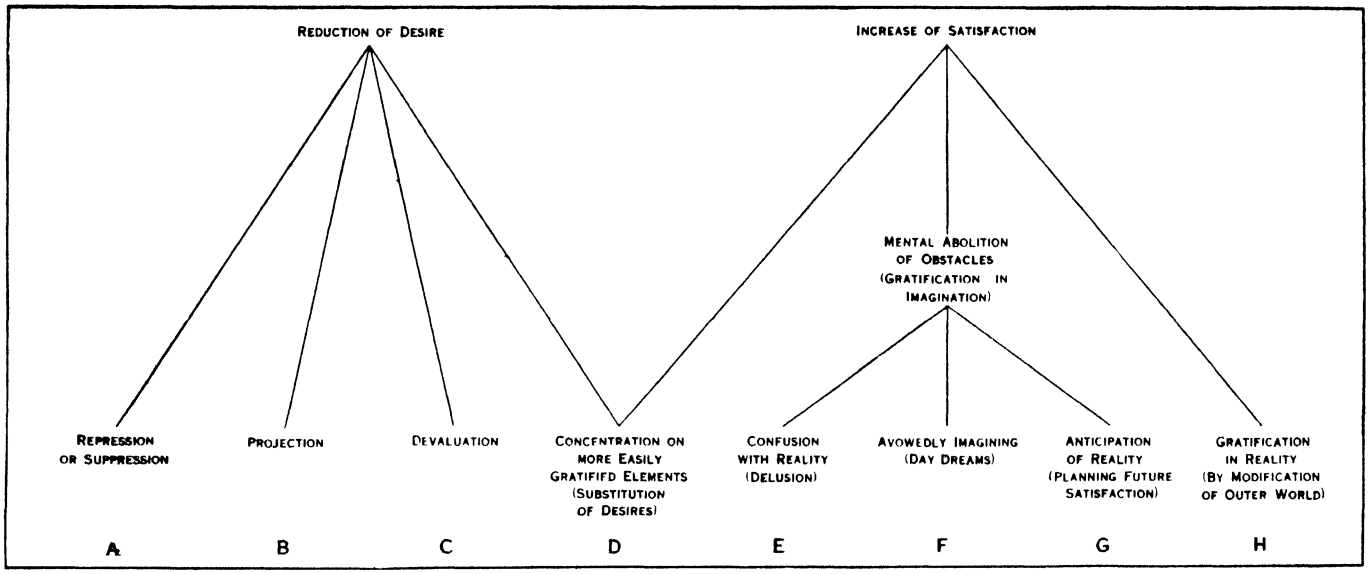

CHART SHOWING THE SCHEME OF POSSIBLE PROCEDURE FROM A NEGATIVE TO A POSITIVE ATTITUDE IN THE GRATIFICATION OF DESIRE

shown that pleasure tends to produce an increase in voluntary extensor movement and a decrease in a voluntary flexor movement of a standard length, together with an increased liability to involuntary extensor movements and a decreased liability to involuntary flexor movements, unpleasure producing precisely opposite effects, an interesting result that is readily understandable if we remember that in joy a man tends to throw out his chest, extend his limbs and generally occupy more space than in the bent and huddled position that is characteristic of sorrow

The impression method dispenses with physiological measurements and relies entirely upon introspective reports upon the feelings produced by experimental stimuli With suitable precautions this method is proving itself surprisingly adequate to deal with many of the difficult problems in the psychology of feeling, and it looks as though we may expect great contributions from it in the near future It has become very clear also that carefully controlled introspection is essential for the proper interpretation of the results obtained by the expression method

"Is Life Worth Living?"—Quantitative methods have recently been applied to the age-old problem of the relative proportions of pleasure and unpleasure that are encountered in ordinary life J C Flugel's observers kept a minute record of their pleasant and unpleasant experiences according to a pre-arranged scale for a period of a month or more—making frequent entries in the course of each day In every record pleasure predominated over unpleasure, the average percentage of the total time passed pleasantly, indifferently and unpleasantly, being 50, 28, 22, respectively, there were however considerable individual differences and there were also indications that those who frequently experienced the more intense feelings were on the whole rather more unhappy than those who seldom had intense feelings As regards the actual nature and occasions of the mental states accompanied by feelings, the descriptions of the four conditions that rank highest as accompaniments of pleasure were (in order) "interest," "joy and elation," "contentment," "pleasant sensations", the corresponding order for unpleasure being "unpleasant sensations," "anxiety and worry," "anger and annoyance," "fatigue"

Applied Hedonics.—In conclusion we may ask, Has psychology thrown any light on the equally ancient practical problem as to how happiness may best be attained? There is little to say definitely, and indeed psychologists have not as yet ventured systematically to attack the problem We can at best only summarize a few scattered results of speculation and research

Scientific psychology, to the small extent that it has dealt with such matters, has amply corroborated a few hoary commonplaces, such as that regarding the importance of bodily health (the "unpleasant sensations" that are the most potent causes of unhappiness in Flügel's results just quoted are largely due to minor ailments) and that which asserts that "a pleasure shared is a pleasure intensified, while a pain shared is a pain relieved" It has however also revealed the great influence of mind over body (indigestion may be due to worry or irritation as well as vice versa) and (above all) the necessity of harmonious organization and cooperation of the various conative trends A vast amount of unhappiness is caused by the conflict of disharmonious tendencies (particularly those connected with the function of the super-ego, as indicated above), and in the study of how harmonious development can be secured lies the chief promise of psychology for human happiness For the rest, if the hormic theory is correct, all pleasure lies in the gratification of conation, all unpleasure in its frustration, so that there are at bottom only two methods available, either to increase the satisfaction of our desires, or to reduce these desires themselves Starting from this foundation we may essay the following very provisional scheme of possible procedures in which scheme there is a continuous transition from a negative to a positive attitude as we move from left to right

A is the method of putting from consciousness, of not thinking about, our desires (either by unconscious "repression" or conscious "suppression") B is the method (shown most clearly in psychopathology) of attributing those desires to someone else C is the classical method of pretending the things we desire are worthless, as by dwelling on the unpleasant aspect of these things or by laughing at ourselves for wanting them D is the useful but sometimes unheroic principle of "take the cash and let the credit go" In the form of "sublimation," however, it plays an essential part in human development In E the wish is father to the thought, here the "pleasure principle" reigns supreme, and the distinction between the wish and its fulfilment is abolished In F the pleasure principle again reigns supreme, but in a strictly reserved territory It is the method of day dreams and (to some extent) of art In G the "fore-pleasure" takes the form of an imaginary satisfaction in anticipation of gratification in reality Hence it is connected to H by a dotted line

With this venturesome effort in classification, which (if it is worth anything) the reader should have no difficulty in filling out in detail, we must bid farewell to this precarious aspect of the subject. The true science of applied hedonics is not yet born

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FEHLING, HERMANN VON (1811–1885), German chemist, was born at Lubeck on June 9, 1811 He worked at Giessen with Liebig, with whom he elucidated the composition of paraldehyde and metaldehyde He was professor of chemistry at Stuttgart from 1839 until his death there on July 1, 1885 His earlier work included an investigation of succinic acid, and the preparation of phenyl cyanide (benzonitrile), the simplest nitrile of the aromatic series Among the analytical methods discovered by him the best known is that for the estimation of sugars by 'Fehling's solution," a solution of copper sulphate mixed with alkali and potassium-sodium tartrate (Rochelle salt)

FEHMARN, an island of the Prussian province of Schleswig-Holstein, in the Baltic, separated from the north-east corner of Holstein by the Fehmarn-Sund, less than a quarter of a mile broad. It is about 120 sq m in area, bare of forest but containing excellent pasture-land, and rears cattle Burg, the chief town, has a population of 3,255

FEHMIC COURTS, certain tribunals which, during the middle ages, exercised a powerful jurisdiction in Germany, and more especially in Westphalia They are best regarded as survivals of ancient Teutonic local courts Their alternative name of "free courts" is due to the fact that all free-born men were eligible for membership and also to the fact that they claimed certain exceptional liberties Their jurisdiction they eventually owed to the emperor, in whose name they exercised the power of life and death The sessions were often held in secret, and these the uninitiated were forbidden to attend, on pain of death. Legend and romance have combined to exaggerate the sinister reputation of the Fehmic courts, but modern historical research has proved that they never employed torture, that their sittings were only sometimes secret, and that their meeting-places were always well known They were, in fact, a survival of an ancient and venerable German institution, and if, during a certain period, they exercised something like a reign of terror over a great part of Germany, the cause of this lay in the condition of the times, which called for some powerful organization to combat the growing feudal anarchy

The system became important after the division of the duchy of Saxony on the fall of Henry the Lion, when the archbishop of Cologne, duke of Westphalia from 1180 onwards, placed himself as representative of the emperor at the head of the Fehme The organization now rapidly spread Every free man, born in lawful wedlock, and neither excommunicate nor outlaw, was eligible for membership Princes and nobles were initiated, and in 1429 even the Emperor Sigismund himself became "a true and proper *Freischoffe* of the Holy Roman Empire." By the middle of the 14th century the sworn associates of the Fehme were scattered in thousands throughout Germany, known to each other by secret signs and pass-words, and all of them pledged to serve the summons of the secret courts and to execute their judgment

The organization of the Fehme was elaborate The head of each centre of jurisdiction (*Freistuhl*) often a secular or spiritual prince, sometimes a civic community, was known as the *Stuhlherr,* the archbishop of Cologne being, as stated above, supreme over all (*Oberststuhlherr*) The actual president of the court was the *Freigraf* (free count) chosen for life by the *Stuhlherr* from among the *Freischoffen,* who formed the great body of the initiated. Of these the lowest rank were the *Fronboten* or *Freifronen,* charged with the maintenance of order in the courts and the duty of carrying out the commands of the *Freigraf* The immense development of the Fehme is explained by the privileges of the *Freischoffen;* for they were subject to no jurisdiction but that of the Westphalian courts, whether as accused or accuser they had access to the secret sessions, and they shared in the discussions of the general chapter as to the policy of the society At their initiation these swore to support the Fehme with all their powers, to guard its secrets, and to bring before its tribunal anything within its competence that they might discover

The procedure of the Fehmic courts was practically that of the ancient German courts generally. The place of session, known as the *Freistuhl* (free seat), was usually a hillock, or some other well-known and accessible spot The *Freigraf* and *Schoffen* occupied the bench, before which a table, with a sword and rope upon it, was placed The court was held by day and, unless the session was declared secret, all freemen, whether initiated or not, were admitted The accusation was in the old German form; but only a *Freischoffe* could act as accuser If the offence came under the competence of the court, *i e*, was punishable by death, a summons to the accused was issued under the seal of the *Freigraf* This was not usually served on him personally, but was nailed to his door, or to some convenient place where he was certain to pass Six weeks and three days' grace were allowed, according to the old Saxon law, and the summons was thrice repeated If the accused appeared, the accuser stated the case, and the investigation proceeded by the examination of witnesses as in an ordinary court of law The judgment was put into execution on the spot if that was possible. The secret court, from whose procedure the whole institution has acquired its evil reputation, was closed to all but the initiated, although these were so numerous as to secure quasi-publicity, and the members present were bound under pain of death not to disclose what took place Crimes of a serious nature, and especially those that were deemed unfit for ordinary judicial investigation—such as heresy and witchcraft—fell within its jurisdiction, as also did appeals by persons condemned in the open courts, and likewise the cases before those tribunals in which the accused had not appeared The accused if a member could clear himself by his own oath unless he had revealed the secrets of the Fehme If he were one of the uninitiated it was necessary for him to bring forward witnesses to his innocence from among the initiated, whose number varied according to the number on the side of the accuser, but 21 in favour of innocence necessarily secured an acquittal The only punishment which the secret court could inflict was death If the accused appeared, the sentence was carried into execution at once, if he did not appear, it was quickly made known to the whole body, and the *Freischoffe* who was the first to meet the condemned was bound to put him to death A knife with the cabalistic letters was left beside the corpse to show that the deed was not a murder

That an organization of this character should have outlived its usefulness and issued in intolerable abuses was inevitable With the growing power of the territorial sovereigns and the gradual improvement of the ordinary process of justice, the functions of the Fehmic courts were superseded, though they were only finally abolished by order of Jerome Bonaparte, king of Westphalia, in 1811 The last *Freigraf* died in 1835

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FEHRBELLIN, a town of Germany, in the republic of Prussia, on the Rhine, 40 m N W from Berlin on the railway to Neu-Ruppin Pop (1925) 1,763 It has some small industries, among them that of wooden shoes Fehrbellin is memorable in history as the scene of the victory (June 18, 1675) of the great elector, Frederick William of Prussia, over the Swedes under Field-Marshal Wrangel

FEHRENBACH, KONSTANTIN (1852–1926) German statesman, chancellor of the Reich, was born at Wellendingen on Jan 11, 1852, the son of an elementary schoolmaster. He was a member of the Baden second chamber (1885–87 and 1901–13), and acted from 1907–1909 as its president. He entered the Reichstag in 1903, was its president in 1918, and presided over the national assembly 1919–20. As soon as the results of the German general election (June 1920) became known the Müller cabinet

resigned, and Fehrenbach became Chancellor with Dr Simons as his foreign secretary Fehrenbach himself was a member of the centre party with leanings towards the left, and was on good terms with the social democrats, on whose forbearance his government, which was in a minority in the Reichstag, depended He conducted negotiations with the Allies at the Spa and London Conferences, 1920–21, and retired on May 4, 1921 in consequence of the failure of the London Conference of March and the consequent ultimatum by the Allies As chairman of the Reichstag group of the centre party from 1924 he exercised considerable influence on politics until his death at Freiburg-im-Breisgau on March 26, 1926

FEIJOA, a small tree (*Feijoa Sellowiana*) of the myrtle family (Myrtaceae), closely related to the guava (*q v*) and often called pineapple guava It is a native of southern Brazil, Paraguay, Uruguay and parts of Argentina, and is cultivated in various mild climates for its highly esteemed fruit The tree grows about 15 ft high and has olive-like leaves, dark green above and silvery-grey beneath, and large white flowers which are purplish-crimson within The oblong fruit, about 2 in long and dull green in colour marked with crimson, has a translucent, melting pulp, with a delicious pineapple flavour When mature the fruits fall, but must be kept in a cool place until sufficiently soft for eating They are made into jam and jelly and are also crystallized The feijoa was introduced into southern Europe in 1890 and about 10 years later was brought to California where it is extensively cultivated The tree requires a dry climate, such as that of southern France and parts of California, it does not thrive in the moist climate of Florida and Cuba It is usually propagated by seeds, which come fairly true to type, but cuttings may be rooted under glass and whip-grafting effected by using seedlings with stems of the thickness of an ordinary lead-pencil Choice varieties are also perpetuated by the layering of low branches

FEIJÓO Y MONTENEGRO, BENITO JERONIMO (1676–1764), Spanish monk and scholar, whose *Teatro crítico* (1726–39) and *Cartas eruditas* (1742–60) uprooted many popular errors, awakened an interest in scientific methods, and caused Feijóo to be justly regarded as the initiator of educational reform in Spain

FEIS CEOIL (fāsh kyōl'), Irish musical festival, founded in 1897 and one of the best-established and most useful institutions in Irish musical life The study and cultivation of Irish music are especially aimed at, but not now, as at first, exclusively, the ultra-particularist policy originally adopted in this respect having been wisely abandoned The festival, which lasts a week, is held annually in Dublin in May, more or less on the lines of the English Competition Festivals Similar competitions are also held at Londonderry and Sligo

FEISUL AL HUSAIN (fī-zōōl'ahl-hōō-sīn) (1885–), king of 'Irāq, was born at Taif, third son of Sharif Husain Feisul descends from Fatimah, only surviving child of the Prophet, through Hasan, her eldest son by marriage with 'Ali Ibn Abi Talib, fourth Amir Al Muminin After the custom of his house, Feisul was sent when only seven days old, to Rahab Palace, the country seat of the Al 'Aun family, in the territory of his clan, Beni 'Abadiyah and their confederates the 'Ataibah Here the boy was raised among the tribesmen, and remained until he was seven In 1893, when Husain was ordered to Constantinople, Feisul accompanied him and was educated privately in that city In 1905 he married his cousin, and returned to the Hejāz in 1909, when his father was appointed Sharif

In 1913 Feisul became deputy for Jiddah and proceeded to identify himself with the Arab National movement He commanded his father's forces in 'Asir in 1914, and was at Mecca on the outbreak of the World War He was posted with the Turkish Governor of Syria in 1915, but escaped to the Hejāz early in the following year, and there played a leading part in the Arab revolt, commanding the Arab forces with Gen Allenby's army until the capture of Aleppo in Oct. 1918 His influence with the tribes did much to keep Husain's tribal levies in the field As Commander-in-Chief of the Arab Army under the Allied Commander-in-Chief he then undertook the administration of the newly-constituted Syrian State, and after attending the Peace Conference in Paris returned to Syria in April 1919 In Sept he again visited Europe and remained until Feb 1920, in the following month he was proclaimed King of Syria, but being unable to come to terms with the French Mandatory power he left Damascus in July 1920 After spending the winter in England he proceeded to 'Irāq as candidate for the throne in June 1921, and was elected king by a plebiscite in which he received 96% of the votes cast For the events of his reign *see* 'IRĀQ

FEITH, RHIJNVIS (1753–1824), Dutch poet, was born of an aristocratic family at Zwolle, the capital of the province Overijssel, on Feb 7, 1753 He was educated at Harderwijk and at the University of Leyden, where he took his degree in 1770 In 1780, in his 27th year, he became burgomaster of Zwolle. His first important production was *Julia,* in 1783, a novel written in emulation of *Werther,* and steeped in *Weltschmerz* and despair This was followed by the tragedy of *Thirsa* (1784); *Ferdinand and Constantia* (1785), another *Werther* novel, and *The Patriots* (1784), a tragedy Bilderdijk and other writers attacked his morbid melancholy, and Johannes Kinker (1764–1845) parodied his novels, but his vogue continued In 1791 he published a tragedy of *Lady Jane Grey,* in 1792 a didactic poem, *The Grave,* in four cantos, in 1793 *Inez de Castro,* in 1796 to 1814 five volumes of *Odes and Miscellaneous Poems,* and in 1802 *Old Age,* in six cantos He died at Zwolle on Feb 8, 1824

His works were collected (Rotterdam, 11 vols) in 1824, with a biographical notice by N G van Kampen

FEJER, GYORGY (1766–1852), Hungarian author, was born on April 23, 1766, at Keszthely (Zala) He studied philosophy at Budapest and theology at Pressburg, obtaining in 1808 a professorship of theology at Budapest university, where in 1824 he was appointed librarian His most important work, *Codex diplomaticus Hungariae ecclesiasticus ac civilis* (1829–44), exceeds 40 volumes, it consists of old documents and charters from AD 104 to 1439 His last works were *A Kunok eredete* (*The Origin of the Huns*) and *A politikai forradalmak okai* (*The Causes of Political Revolutions*), both published in 1850, the latter being suppressed by the Austrian Government on account of its liberal tendencies

See *Magyar Irók · Eletrajz-gyujtemény* (Budapest, 1856), and *A magyar nemzeti irodalomtortènet vázlata* (Budapest, 1861)

FEJERVARY, GEZA, FREIHERR VON (1833–1914), Hungarian statesman, and general, was born on March 15, 1833 He began his career in the army, and was decorated for gallantry at Solferino In 1872 he became State Secretary in the Hungarian ministry of national defence (*Honved*) and minister of national defence in 1884 In 1895 he persuaded the Emperor Francis Joseph to agree to the religious and political reforms of the Wekerle Ministry In 1903 he resigned, together with the prime minister Szell, owing to the rejection of a bill to increase the contingent of recruits, and was appointed captain of the Hungarian Life Guards organized at that time He was appointed premier on June 18, 1905 The parliamentary majority declared that the Fejervary ministry was unconstitutional, and organised a national opposition against it Fejervary nevertheless succeeded in settling these differences by the so-called Pactum, on the basis of which the Wekerle Ministry was formed on April 8, 1906 From this time onwards Fejervary's political activity ceased, and he resumed his military career On the death of Prince Esterhazy, captain of the Hungarian bodyguard, Fejervary was appointed his successor. He died of cancer of the tongue on April 25, 1914

FELANITX or FELANICHE, a town in the island of Majorca, Balearic islands; 7 m inland from its harbour, Puerto Colon, and terminus of a railway from Palma, the capital Pop (1920), 11,353 Felanitx is separated from the Mediterranean by low hills, on one of which stands the monastery of San Salvador. and a little south is the Moorish castle of Santueri, with its remarkable subterranean vaults The town has a pottery industry dating from the 3rd century B C and trades in local wine, almonds, fruit, timber, oil and soap

FELDKIRCH, a small town in the province of Vorarlberg, Austria Situated on the river Ill, a few miles above its confluence

with the Rhine, it is a frontier and customs station of great importance as it commands the route to the east over the Arlberg pass (5,912 ft), and has been the scene of many conflicts for the pass The town is dominated by the old castle of Schattenburg and has a number of old buildings, notably the 15th century parish church, in striking contrast to its modern textile factories where the spinning, weaving and dyeing of cotton is carried on There is a flourishing transit trade both along the east-west route and northwards to Lake Constance Pop (1923) 4,900.

FÉLIBIEN, ANDRÉ (1619–1695), sieur des Avaux et de Javercy, French architect and historiographer, was born at Chartres He was one of the first members (1663) of the Academy of Inscriptions, historiographer to the king, was secretary to the newly founded Academy of Architecture, and keeper of the cabinet of antiques in the palace of Brion To these offices was afterwards added by Louvois that of deputy controller-general of roads and bridges Of his works the best and the most generally known is the *Entretiens sur les vies et sur les ouvrages des plus excellents peintres anciens et modernes* It was republished with several (5 parts, 1666–88, enlarged ed Amsterdam, 1706, and Trévoux, 1725) Félibien wrote also *Origine de la peinture* (1660), *Principes de l'architecture, de la sculpture, de la peinture,* etc (1676–90), and descriptions of Versailles, of La Trappe, and of the pictures and statues of the royal residences He died in Paris on June 11, 1695

His son, Jean François Félibien (*c* 1658–1733), was also an architect who left a number of works on his subject, and a younger son, Michel Félibien (*c* 1666–1719), was a Benedictine of Saint Germain-des-Prés whose fame rests on his *Histoire de l'abbaye royale de S Denys en France*, and his *L'Histoire de la ville de Paris* in 5 vols , a work indispensable to the student of Paris

FELIX, SAINT, of Valois (1127–1212), one of the founders of the order of Trinitarians or Redemptionists, was born in the district of Valois, France, on April 19, 1127 He became a hermit in the forest of Galeresse, where he remained until 1187, when his disciple Jean de Matha (1160–1213) suggested to him the idea of establishing an order of monks who should devote their lives to the redemption of Christian captives from the Saracens Obtaining the sanction of the pope about 1197, they founded the mother house at Cerfroi in Picardy Felix died at Cerfroi on Nov 4, 1212, and is commemorated on Nov 20

FELIX, the name of five popes

Felix I , pope from Jan 269 until his death in Jan 274 His name is given as a martyr in the Roman calendar and elsewhere, but his title to this honour is by no means proved He appears in connection with the dispute in the church of Antioch between Paul of Samosata, who had been deprived of his bishopric by a council of bishops for heresy, and his successor Domnus Paul refused to give way, and in 272 the emperor Aurelian was asked to intervene He ordered the church building to be given to the bishop who was "recognized by the bishops of Italy and of the city of Rome" (Felix) *See* Eusebius, *Hist Acc.* vii. 30 *Liber Pontificalis* t 1, ed Duchesne (1886)

Felix II , antipope, was in 356 raised from the archdeaconate of Rome to the papal chair, when Liberius was banished by the emperor Constantius for refusing to condemn Athanasius In 357 Constantius agreed to the release of Liberius on condition that he signed the semi-Arian creed Constantius also issued an edict to the effect that the two bishops should rule conjointly, but Liberius was received with so much enthusiasm that Felix found it necessary to retire He appears to have retired to Porto where he died in 365 See *Liber Pontificalis* t 1.

Felix III became pope in March 483 His first act was to repudiate the Henoticon, a deed of union, originating, it is supposed, with Acacius, patriarch of Constantinople, and published by the emperor Zeno with the view of reconciling the Monophysites and their opponents in the Eastern church He also addressed a letter of remonstrance to Acacius; but the latter proved refractory, and sentence of deposition was passed against him As Acacius, however, had the support of the emperor, a schism arose between the Eastern and Western churches, which lasted for 34 years Felix died in 492 See *Liber Pontificalis* t 1 His writings are in Migne's *Patrol Lat.* t 58

Felix IV was raised to the papal chair in 526 by the emperor Theodoric The serious riots over his election led him, on his death-bed, to nominate as his successor, the archdeacon Boniface (Pope Boniface II) But this proceeding was contrary to all tradition and roused much opposition Felix built the church of SS Cosimo and Damiano, near the Via Sacra. He died in Sept 530 *See* Letters in Migne: *Patrol. Lat.* t. 65 and *Liber Pontificalis* t. 1.

Felix V , the name taken by Amadeus (1383–1451), duke of Savoy, when elected pope in 1439 Amadeus was born at Chambéry on Dec 4, 1383, and succeeded his father as count of Savoy in 1391 In 1416 the German king Sigismund erected Savoy into a duchy, after this elevation Amadeus added Piedmont to his dominions Then suddenly, in 1434, the duke retired to a hermitage at Ripaille, near Thonon, resigning his duchy to his son Louis (d 1465) In 1439, when Eugenius IV was deposed by the Schismatic council of Basel, Amadeus, although not in orders, was chosen as his successor In the conflict between the rival popes which followed the German king, Frederick IV , sided with Eugenius, and Felix renounced his claim to the pontificate in 1449 in favour of Nicholas V , who had been elected on the death of Eugenius Nicholas appointed Amadeus apostolic vicar-general in Savoy, Piedmont and other parts of his own dominions, and made him a cardinal Amadeus died at Geneva on Jan 7, 1451

FELIX, a missionary bishop from Burgundy, sent into East Anglia by Honorius of Canterbury (630–31) Under King Sigebert his mission was successful, and he became first bishop of East Anglia, with a see at Dunwich, where he died and was buried, 647–8

Bibliography —*See* Bede, *Hist Eccl*, edit C Plummer, II 15, III 18, 20, 25 (1896), *Saxon Chronicle*, edit J Earle and C Plummer, s a 636 (1865) *See* also under March 8th in J Bollandus and G Henschenius, *Acta Sanctorum Bollandiana* (Paris, 1863 etc)

FELIX, of Urgella (*fl* 8th century), Spanish bishop, the friend of Elipandus and the propagator of his views in the great Adoptian Controversy (*see* Adoptianism)

FELIX, ANTONIUS, procurator of Judaea A D 51 or 52 to 60, was a Greek freedman On entering his province he married Drusilla, sister of Agrippa II (Acts xxiv 24), having induced her to leave her husband Azizus, king of Emesa Tacitus' description of Felix is not unjust. "he revelled in cruelty and lust, and wielded the power of a king with the mind of a slave " His rule was marked by disturbances and assassinations Yet his long term of service in Palestine had enabled him to learn something of native customs and law, *cf* St Paul's words in Acts xxiv. 10; Felix had been prefect of Samaria before his appointment to the procuratorship

Bibliography —*See* Josephus, *Ant.* XVIII , vi 6; XX vi 1–3, viii 6–9, *Jewish War* II xii 3 *ff* , xii , 5, 7, Tacitus, *Annals*, XII 54, *Hist.* V 9, Suetonius, *Claudius* 28, Schurer, *The Jewish People in the Time of Jesus Christ*, I ii , pp 174 ff , Ramsay, *St Paul the Traveller*, Commentaries on *Acts*

FELIXSTOWE, a seaside resort in the Woodbridge parliamentary division of East Suffolk, England, 84½ m N E by E from London on a branch of the L N E R. from Ipswich Pop. of urban district (1921) 11,686 (estimated 18 7% excess due to summer visitors) Felixstowe has a frontage both to the North sea and to the estuary of the Orwell opposite Harwich, with which it is connected by L N E R ferry and where there is a small dock for yachts and river shipping The church of St Peter and St Paul, mainly Early English, has traces of Norman in the 12th century nave The sea-wall and promenade, 2 m long, are laid out with public gardens and pavilions, and there is a promenade pier Felixstowe has good golf links, and the open tournament of the East of England lawn tennis championship is held here annually It is the headquarters of the Orwell Corinthian Yacht club, and has connections by steamer with Ipswich (as well as with London, Yarmouth and other coastal resorts in the summer). There is a naval shore wireless station and an R A F seaplane station at Felixstowe Phosphate of lime is dug in the neighbourhood and exported for use as manure The neighbouring village

of Walton is a short distance inland The vicinity has yielded numerous Roman remains, and there was a Roman fort in the neighbourhood (now destroyed by the sea), forming part of the coast defence of the Litus Saxonicum in the 4th century

FELL, JOHN (1625–1686), English divine, son of Samuel Fell, dean of Christ Church, Oxford, was born at Longworth, Berkshire In 1636 he obtained a studentship at Christ Church, and took holy orders (deacon 1647, priest 1649) During the Civil War he bore arms for the king and held a commission as ensign In 1648 he was deprived of his studentship by the parliamentary visitors, and during the next few years he resided chiefly at Oxford with his brother-in-law, Dr T Willis, at whose house opposite Merton College he and his friends Allestree and Dolben kept up the service of the Church of England through the Commonwealth

At the Restoration Fell was made prebendary of Chichester, canon of Christ Church (July 27, 1660), dean (Nov 30), master of St Oswald's hospital, Worcester, chaplain to the king, and D D He filled the office of vice-chancellor from 1666 to 1669, and was consecrated bishop of Oxford in 1676, retaining his deanery *in commendam* Some years later he declined the primacy of Ireland Fell restored in the university the good order instituted by Archbishop Laud, which in the Commonwealth had given place to anarchy and a general disregard of authority He obliged the students to attend lectures, instituted reforms in the performances of the public exercises in the schools, kept the examiners up to their duties, and himself attended the examinations He encouraged the students to act plays He entirely suppressed "*coursing*," *i e*, disputations in which the rival parties "ran down opponents in arguments," and which commonly ended in blows and disturbances Tom Browne, author of the *Dialogues of the Dead*, about to be expelled from Oxford for some offence, was pardoned by Fell on the condition of his translating extempore the 33rd epigram from Martial —

> Non amo te, Sabidi, nec possum dicere quare,
> Hoc tantum possum dicere, non amo te

To which he immediately replied with the well-known lines —

> I do not love thee, Doctor Fell,
> The reason why I cannot tell,
> But this alone I know full well,
> I do not love thee, Doctor Fell [1]

Fell's building operations were numerous In his own college he completed in 1665 the north side of Wolsey's great quadrangle, already begun by his father but abandoned during the Commonwealth, he rebuilt in 1672 the east side of the Chaplain's quadrangle "with a straight passage under it leading from the cloister into the field," occupied now by the new Meadow Buildings, the lodgings of the canon of the 3rd stall in the passage uniting the Tom and Peckwater quadrangles (*c* 1674), a long building joining the Chaplain's quadrangle on the east side in 1677–1678, and lastly the great tower gate, begun in June 1681 on the foundation laid by Wolsey and finished in November 1682, to which the bell "great Tom," after being recast, was transferred from the cathedral in 1683 In 1670 he planted and laid out the Broad Walk He spent large sums of his own on these works, gave £500 for the restoration of Banbury church, erected a church at St Oswald's, Worcester, and the parsonage house at Woodstock at his own expense, and rebuilt Cuddesdon palace Fell disapproved of the use of St Mary's church for secular purposes, and promoted the building of the Sheldonian theatre by Archbishop Sheldon He was treasurer during its construction, presided at the formal opening on July 9, 1669, and was nominated with Wren curator in July 1670. In the theatre was placed the University Press, which now engaged a large share of Fell's energy and attention, and which as curator he practically controlled He published annually one work, generally a classical author annotated by himself, which he distributed to all the students of his college on New Year's day. On one occasion he surprised the Press in printing surreptitiously Aretino's *Postures*, when he seized and destroyed the plates and impressions In 1675 he published the Elzevir text of the Bible, and also gave assistance to John Mill in his critical edition of the New Testament (1707)

Fell himself bore a high reputation as a Grecian, a Latinist and a philologist, and he found time, in spite of his great public employments, to bring out with the collaboration of others his great edition of St Cyprian in 1682, an English translation of *The Unity of the Church* in 1681, editions of *Nemesius of Emesa* (1671), of *Aratus* and of *Eratosthenes* (1672), *Theocritus* (1676), *Alcinous on Plato* (1677), *St Clement's Epistles to the Corinthians* (1677), *Athenagoras* (1682), *Clemens Alexandrinus* (1683), *St Theophilus of Antioch* (1684), *Grammatica rationis sive institutiones logicae* (1673 and 1685), and a critical edition of the New Testament in 1675 The first volumes of *Rerum Anglicarum scriptores* and of *Historiae Britannicae*, etc, were compiled under his patronage in 1684 He had the mss of St Augustine in the Bodleian and other libraries at Oxford generously collated for the use of the Benedictines at Paris, then preparing a new edition of the father

In Nov 1684, at the command of the king, Fell deprived Locke (*q v*), who had incurred the royal displeasure by his friendship with Shaftesbury, and was suspected as the author of certain seditious pamphlets, of his studentship at Christ Church, summarily and without hearing his defence Fell afterwards expressed his regret for the step which he was now compelled to take

Fell, who had never married, died on July 10, 1686, and was buried in the divinity chapel in the cathedral

Fell probably had some share in the composition of *The Whole Duty of Man*, and in the subsequent works published under the name of the author of *The Whole Duty*, which included *Reasons of the Decay of Christian Piety*, *The Ladies' Calling*, *The Gentleman's Calling*, *The Government of the Tongue*, *The Art of Contentment* and *The Lively Oracles given us*, all of which were published in one volume with notes and a preface by Fell in 1684

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FELL, a term with three meanings (1) adj, savage, ruthless, terrible, (2) n, a hill, appearing in place-names and names of hills, *e g*, Scawfell, also a lofty moorland down, (3) verb, to cause to fall, as to fell a tree Fell is also used as a synonym for the felt or hide of an animal, and has special technical uses in connection with mining and weaving

FELLAH (pl Fellahin), Arabic for "ploughman" or "tiller," the word used in Arabic-speaking countries to designate peasantry It is employed especially of the peasantry of Egypt, as opposed to the Arabs of the desert (and even those who have settled on the land), the Turks and the townsfolk Fellah is used by the Arabs as a term of reproach, implying a slavish disposition, the fellahin, however, are not ashamed of the name and may pride themselves on being of good fellah descent, as a "fellah of a fellah." They preserve to some extent the blood of the ancient Egyptians They form the bulk of the population of Egypt and are mainly Mohammedan, though some villages in Upper Egypt are to-day almost exclusively Copt (Christian) Fellahin in the Delta are sometimes lighter than Arabs, while in Upper Egypt the prevailing complexion is dark brown The average fellah is somewhat above medium height, big-boned, of clumsy but powerful build, with head and face of fine oval shape, cheek-bones high, forehead broad, short flattish nose with wide nostrils and black but not woolly hair. The eyebrows are always straight and smooth,

[1] J. T. Browne, *Works* (9th ed by J Drake), iv. 99–100, T. Forde, *Virtus redviva* (1661), 106

never bushy. The mouth is thick-lipped and large but well formed The eyes are large and black, and are remarkable for the closeness of the eyelashes. The women and girls are particularly noted for their graceful and slender figures The men's heads are usually shaved The women are not as a rule closely veiled they generally paint the lips a deep blue, and tattoo a floral device on the chin, sometimes on the forehead and other parts of the body All but the poorest wear necklaces of cheap pearls, coins or gilt disks The men wear a blue or brown cotton shirt, linen drawers and a plain skull-cap, or on occasion the tarbush or fez, round which sometimes a turban is wound, the women wear a single cotton smock The common fellah's home is a mere mud hut, roofed with durra straw Inside are a few mats, a sheepskin, baskets and some earthenware and wooden vessels He lives almost entirely on vegetables, millet bread, beans, lentils, dates and onions Most of the sheikhs are wealthy, and have large houses built of crude brick and whitewashed with lime, with a courtyard, many apartments and good furniture The fellah is laborious and loathes military service, hence voluntary mutilations to avoid conscription were formerly common

FELLENBERG, PHILIPP EMANUEL VON (1771–1844), Swiss educationist, was born on June 27, 1771 at Bern, in Switzerland He purchased in 1799 the estate of Hofwyl, near Bern, intending to make agriculture the basis of a new system which he had projected, for elevating the lower and rightly training the higher orders of the State, and welding them together in a closer union than had hitherto been deemed attainable For some time he carried on his labours in conjunction with Pestalozzi, but incompatibility of disposition soon induced them to separate Fellenberg's scheme at first excited a large amount of ridicule, but gradually pupils came to him from every country in Europe, both for the purpose of studying agriculture and to profit by the high moral training which he associated with his educational system Fellenberg died on Nov 21, 1844

See W von Hamm, *E Fellenberg's Leben und Wirken* (Bern, 1845), and F R Schoeni, *Der Stifter von Hofwyl, Leben und Wirken Fellenberg's* (Schaffhausen, 1874).

FELLING, an urban district in the Jarrow parliamentary division of Durham, England, forming a south-eastern suburb of Gateshead with railway station on the L N E railway Pop (1921) 26,145 Christ Church was built in 1866 The large industrial population is employed in the neighbouring collieries and the various attendant manufactures The council owns the water and gas supplies, together with electric trams, recreation grounds and other municipal enterprises

FELLOE, the outer rim of a wheel, to which the spokes are attached The word is sometimes spelled and usually pronounced "felly" It is a Teutonic word, in O E *felg*, cognate with Dutch *velge*, Ger *Felge;* the original Teutonic root from which these are derived probably meant "to fit together"

FELLOW, by origin a partner or associate, hence a companion, comrade or mate The word from the 15th century has also been applied to any male person, often in a contemptuous or pitying sense The O E *féolage* meant a partner in a business. The word was, therefore, the natural equivalent for *socius,* a member of the foundation of an incorporated college, as Eton, or a college at a university In the earlier history of universities, both the senior and junior members of a college were known as "scholars," but later, as now, "scholar" was restricted to those members of the foundation still *in statu pupillari,* and "fellow" to those senior graduate members who have been elected to the foundation by the corporate body, sharing in the government and receiving a fixed emolument out of the revenues of the college, as at Oxford and Cambridge and Trinity, Dublin At other universities the term is applied to the members of the governing body or to the holders of certain sums of money for a fixed number of years to be devoted to special study or research. By analogy the word is also used of the members of various learned societies and institutions

FELLOWS, SIR CHARLES (1799–1860), British archaeologist, was born at Nottingham, where his family had an estate In 1827 he discovered the modern ascent of Mont Blanc. He travelled in Italy, Greece and the Levant, and many of his sketches were used in illustrating *Childe Harold.* In 1838 he went to Asia Minor, making Smyrna his headquarters. He entered Lycia and explored the Xanthus from the mouth at Patara upwards. Nine miles from Patara he discovered the ruins of Xanthus, the ancient capital of Lycia, and about 15m farther the ruins of Tlos He published his results in *A Journal written during an Excursion in Asia Minor* (1839) and late in 1839, under the auspices of the British Museum, again set out for Lycia, accompanied by George Scharf, who assisted him in sketching This second visit resulted in the discovery of 13 ancient cities, and in 1841 appeared *An Account of Discoveries in Lycia, being a Journal kept during a Second Excursion in Asia Minor* A third visit was made late in 1841, after Fellows had obtained a *firman* by personal application at Constantinople He shipped a number of works of art for England, and in the fourth and most famous expedition (1844) 27 cases of marbles were despatched to the British Museum His chief discoveries were at Xanthus, Pinara, Patara, Tlos, Myra and Olympus. In 1845 he was knighted, and died in London on Nov. 8, 1860

In addition to the works above mentioned, Fellows published the following *The Xanthian Marbles, their Acquisition and Transmission to England* (1843), a refutation of false statements that had been published, *An Account of the Ionic Trophy Monument excavated at Xanthus* (1848), a cheap edition of his two *Journals,* entitled *Travels and Researches in Asia Minor, particularly in the Province of Lycia* (1852), and *Coins of Ancient Lycia before the Reign of Alexander, with an Essay on the Relative Dates of the Lycian Monuments in the British Museum* (1855)

See C. Brown, *Lives of Nottinghamshire Worthies* (1882), pp. 352–353, and *Journ of Roy Geog Soc*, 1861

FELO DE SE, one who murders himself, *i e*, a suicide The technical conditions of murder with one exception apply to this crime Thus, although an attempt to commit suicide is a misdemeanor at English common law, aiding or inciting to suicide is the felony of murder So also is the so-called suicide pact Formerly a suicide was buried on the highway, with a stake driven through the body This was abolished by an act of 1823, which ordered the burial of the body of a person found to be *felo de se* within 24 hours after the coroner's inquest, between the hours of 9 and 12 at night, and without Christian rites of sepulture This act was again superseded in 1882 by the Interments (*Felo de se*) Act, which permits the interment of any *felo de se* in the churchyard or other burial ground of the parish or place in which by the law or custom of England he might have been interred but for the verdict The interment is carried out in accordance with the Burial Laws Amendment Act 1880 (*see* BURIAL)

FELONY. Acts involving forfeiture were styled felonies in feudal law, although they had nothing of a criminal character about them A breach of duty on the part of the vassal, neglect of service, delay in seeking investiture, and the like were felonies, so were injuries by the lord against the vassal In English law, crimes are usually classified as treason, felony, misdemeanour and summary offence Some writers—and with some justice—treat treason merely as a grave form of felony, but owing to legislation in and since the time of William and Mary, the procedure for the trial of most forms of treason differs from that of felony It may be generally stated that a crime is a felony, which, either by common law or by statute is punishable by death and forfeiture of property, or, whatever the punishment, has been declared to be one by act of parliament (*See* CRIMINAL LAW, MISDEMEANOUR; MISPRISION)

The question whether a particular offence is felony or misdemeanour can be answered only by reference to the history of the offence and not by any logical test For instance, killing a horse in an unlicensed place is still felony under a statute of 1786. But most crimes described as felonies are or have been capital offences at common law or by statute, and have also entailed on the offender attaint and forfeiture of goods. A few felonies were not punishable by death, *e g*, petty larceny and mayhem Where an offence is declared a felony by statute, the common law punishments and incidents of trial attach, unless other statutory provision is made.

The principal common law *felonies* were: homicide, rape, larceny (*i.e.*, in ordinary language, theft), robbery (*i.e.*, theft with violence), burglary and kindred offences. Counterfeiting the coin has been made a felony instead of being treason, and forgery of most documents has been made a felony instead of being, as it was at common law, a misdemeanour

The result of legislative changes is that at the present time the chief practical distinctions between felony and misdemeanour are:—

1 That a private person may arrest a felon without judicial authority and that bail on arrest is granted as a matter of discretion and not as of right

2 That on a trial for felony the accused has a right peremptorily to challenge, or object to, the jurors called to try him, up to the number of 20

3. That a felon cannot be tried *in absentia*, and that the jury who try him may not separate during the trial without leave of the court, which may not be given in cases of murder

4 That peers charged with felony are tried by the king in parliament (the House of Lords) or by the court of the lord high steward

In the United States, both the Federal and State statutes define felonies as being the most serious crimes, as distinguished from the lesser crimes or misdemeanours Conviction of a felony may carry with the penalty, imprisonment in the penitentiary instead of a gaol, which is the usual sentence (apart from fines) for those found guilty of misdemeanours However, a gaol sentence often is imposed in the option of the court Conviction for some felonies, such as murder, rape and kidnapping, may mean the death penalty in most States

FELSPAR or **FELDSPAR,** a name applied to a group of minerals of great importance as rock constituents The name "feldspar" was used by Wallerius in his Mineralogy (1747) in the Swedish form feltspat, meaning fieldspar, but it was subsequently written "felspar" by R Kirwan, who erroneously assumed the derivation of the name from *fels*, a rock The corrupt form felspar is now in general use, but in German the old name is preserved in *feldspat* In composition the felspars are alumino-silicates of potassium, sodium, calcium and barium A strontium felspar has been artificially prepared but is unknown in nature According to the symmetry of their crystals, the felspars are divisible into two series, a monoclinic series and a triclinic series

Monoclinic Series	Orthoclase $\left\{\begin{matrix}\text{Sanidine}\\ \text{Adularia}\end{matrix}\right. = \text{Or}$ ($KAlSi_3O_8$ with some solid solution with $NaAlSi_3O_8$)
	Celsian ($BaAl_2Si_2O_8$) = Ce
	Hyalophane (solid solution of $KAlSi_3O_8$ with $BaAl_2Si_2O_8$)
Triclinic Series	Albite ($NaAlSi_3O_8$) = Ab
Plagioclase	Oligoclase, Andesine, Labradorite, Bytownite } Solid solutions of Ab and An
	Anorthite ($CaAl_2Si_2O_8$) = An
	Microcline ($KAlSi_3O_8$)
	Anorthoclase (Cryptoperthite) (Solid solution of $KAlSi_3O_8$ and $NaAlSi_3O_8$)

All felspars show a similarity of crystal form, being often prismatic but flattened parallel to the face (010), or elongated parallel to the axis *a* with small prism faces Anorthoclase has a characteristic habit, the crystals being elongated parallel to the vertical axis, only the faces 110, $1\bar{1}0$ and $\bar{2}01$ being developed All felspars cleave readily parallel to 001 and 010, these making angles of 90° in the monoclinic varieties and oblique angles in the triclinic members. Twinned crystals of felspar are common and the twinning serves to distinguish various members of the group both in hand specimens and by optical methods under the microscope In the monoclinic series the commonest twin laws are the Carlsbad (twin axis *c*), the Manebach (twin plane 001) and the Baveno (twin plane 021). In the triclinic series, in addition to these three laws, multiple twinning of the albite (twin plane 010) and pericline (twin axis *b*) types is very common. These twins are microscopically recognized by the fine striations seen on the cleavage planes 001 (albite and pericline) 010 (pericline).

Pure felspars are colourless, but owing to the presence of minute inclusions or the development of alteration products, most natural felspars are white, pink, yellowish or greenish Some are used as ornamental stones on account of their colour (*see* AMAZON-STONE), others are prized for their pearly opalescence (*see* MOON-STONE) or for their play of iridescent colours (*see* LABRADORITE and AVENTURINE)

With the exception of microcline, anorthoclase and hyalophane, all the felspars have been synthetically prepared Orthoclase, celsian and albite require the use of fluxes for their preparation Anorthite melts sharply at 1,550° C, but the solid solutions of albite and anorthite exhibit a melting interval Felspars readily suffer chemical alteration, the commonest products being kaolin, sericite, various zeolites and calcite In dynamic metamorphism the anorthite-rich plagioclases break up into albite and a group of calcium aluminium silicates including prehnite, zoisite and grossular, this assemblage being referred to as saussurite

Albite is the most stable of the felspars under the action of weathering and is commonly found in detrital sediments Celsian and hyalophane are rare barium—felspars, the latter represented by solid solutions of celsian with orthoclase, the limits being arbitrarily fixed as follows hyalophane $Ce_1Or_2 \rightarrow Ce_1Or_6$, Celsian $Ce_1Or_6 \rightarrow Ce_1Or_2$, barium-orthoclase $Ce_1Or_6 \rightarrow Ce_0Or_1$, Celsian and hyalophane occur rarely as contact minerals in dolomites, notably at Jakobsberg in Sweden and the Binnental in Oberwallis. Tabular crystals of celsian, twinned on the Carlsbad law, have been artificially prepared Celsian melts at a temperature above 1,700° C

The felspars are the most important group of rock-forming minerals They constitute practically 60% of igneous rocks and serve as a basis of classification of these rocks In sediments only the alkali-felspars (orthoclase, microcline, albite and oligoclase) attain any importance as rock constituents, but in metamorphic rocks they are all—with the exception of anorthoclase and the barium felspars—widely distributed Felspar (orthoclase) is used industrially in the manufacture of porcelain and it also forms an important constituent of many ceramic glazes Orthoclase has also been used as a source of potash More detailed information on the individual felspars is given under ALBITE, AMAZON-STONE, ANDESINE, ANORTHITE, ANORTHOCLASE, AVENTURINE, BYTOWNITE, LABRADORITE, MICROCLINE, MOONSTONE, OLIGOCLASE, ORTHOCLASE and PLAGIOCLASE (*q.v.*) (C E T)

FELSITE, in petrology, a term which has long been generally used by geologists, especially in England, to designate fine-grained igneous rocks of acid (or subacid) composition As a rule their ingredients are not determinable by the unaided eye, but they are principally felspar and quartz as very minute particles The rocks are pale-coloured (yellowish or reddish as a rule), hard, splintery, much jointed and occasionally nodular Many contain porphyritic crystals of clear quartz in rounded blebs, more or less idiomorphic felspar, and occasionally biotite; others are entirely fine-grained and micro- or crypto-crystalline; occasionally they show a fluxional banding, they may also be spherulitic or vesicular Those which carry porphyritic quartz are known as quartz-felsites, the term soda-felsites has been applied to similar fine-grained rocks rich in soda-felspar

Although there are few objections to the employment of felsite as a field designation for rocks having the above characters, it lacks definiteness, and has been discarded by many petrologists as unsuited for the exact description of rocks, especially when their microscopic characters are taken into consideration Nevertheless the term is an extremely useful one in field geology, as a preliminary description of rocks; both intrusive and volcanic, whose precise nature can later be determined by the usual petrographical methods in the laboratory

FELSTED or **FELSTEAD,** a village in the Saffron Walden parliamentary division of Essex, England, 10 m. N from Chelmsford, with a station on the Dunmow and Braintree branch of the L N E railway. Pop. (1921), 2,089 Holy Cross church contains a chapel of the Rich family, including an imposing monument to Richard, 1st Baron Rich of Leeze, lord high chancellor (d. 1658),

who in 1564 founded the grammar school from which the present Felsted school descends It became a notable educational centre for Puritan families in the 17th century under Martin Holbeach (1627–49) and his successors, C Glasscock (1650–90), and Simon Lydiatt (1690–1702). John Wallis the mathematician and Isaac Barrow the scholar were educated here, and also four sons of Oliver Cromwell, Robert (d 1639 and buried in Holy Cross church), Oliver, Richard (the Protector), and Henry Under the Rev W S Grignon (1823–1907), the headmaster from 1856 to 1875, the school rapidly took a place among the public schools of the modern English type New buildings were erected in 1864, to which considerable modern additions have since been made

See John Sargeaunt, *History of Felsted School* (1889), and *Alumni Felstedienses*, by R J Beevor, E. T. Roberts and others (1903)

FELT, a fabric produced by the "matting" or "felting" together of fibrous materials such as wools, hairs, furs, etc Most textile fibres (*see* FIBRES) possess the quality of matting to some extent, but wools, furs and some hairs are the only fibres which can be felted satisfactorily It is probable that the quality of felting must be attributed to the scale structure and waviness of the wools, furs and hairs referred to and to the "fibre-stuff" of which they are composed When it is desired to incorporate non-felting fibres in felt cloths, wool or fur must be employed to "carry" them

There are two distinct classes of felts, viz, woven or "thread-structure" felts, and "fibre" or true felts In the manufacture of thread-structure felts, wools possessing the quality of felting in a high degree are naturally selected, carefully scoured so that the felting quality is not seriously damaged, spun into woollen or worsted yarns possessing the necessary fibre arrangement and twist; woven into cloth of such a character that subsequently satisfactory shrinking and felting may be done, and finally scoured, milled in the stocks or machine or both, dyed and finished on the lines of an ordinary woven fabric The lighter styles of woven felts may be composed of a single cloth only, but for the heavier styles two or more cloths are woven, one on top of the other, at one and the same time, arrangements being made to stitch the cloths together during the weaving operation Some special felts are made by cementing or glueing together several layers of fabrics

Fibre felts are exceedingly interesting from the historical point of view It is now generally admitted that the art of weaving preceded that of spinning, and it must further be conceded that the art of felting preceded that of weaving, so that the felt fabric is probably one of the oldest of the various styles of recognized fabrics The inhabitants of the middle and northern regions of Asia seem to have employed felt from time immemorial, as clothing and also as a covering for their habitations Most of the classical writers refer to it and some of them actually describe its manufacture. Felt was also largely employed by the ancients for their hats, outer garments, and sometimes as a species of armour

Fibre Felts.—Fibre felts may be divided into three classes, viz, ordinary felts, hat felts, and impregnated felts As all felts are based upon the ordinary felt, the process of manufacture of this will first be described Of the wools employed the principal are: East Indian, New Zealand crossbreds, and British. Vegetable fibres and silk are also employed, but wool must be used to "carry" them; thus a good felting wool may be made to carry its own weight of cotton, hemp, etc Hairs and furs are principally used in the hat felts Thus beaver felts are made from the fur of the beaver from which the skin has been skilfully cut away by a special apparatus.

The wools used for fibre felts are generally short to medium in lengths, and must have good felting quality and be carefully selected and blended according to the characteristics required in the felt. The order of the manufacturing processes is as follows. Willeying, blending, teasing, scribbling, carding, forming, hardening, milling, carbonizing (if not already carbonized in the wool state), dyeing, tentering and finishing.

The scribbled wool is fed on to the carder, the sliver from which is run full width (50 to 80in) onto the "former" (which consists of a frame carrying an endless cloth of about 40yd long) until a soft batt or lap has been built up sliver by sliver to required thickness and weight

The soft batt is then hardened. There are two kinds of hardening machines—the roller hardner and the plate hardner. The roller hardner consists of a frame carrying steam-heated rollers on which runs an endless heavy wet cloth Working over this cloth are a further number of wood rollers, having an oscillating movement derived from a side shaft with eccentrics The soft batt is carried through the hardner by the wet cloth, and the steam which is generated by the contact of the wet cloth and the steam-heated rollers, passes through the soft batt, while at the same time the oscillating wooden rollers gradually felt the fibres together till the felt is sufficiently strong to stand the following milling process

The plate hardner consists of a bottom steam chest with a wet cloth running over it and a top plate, which has a vibratory movement, which can be raised and lowered, in order that the felt may be passed through All the motions are automatic and the time and throw of the vibratory movement can be varied according to the thickness of the felt being hardened By careful splicings two or more batts may be hardened together, end to end, into one long piece, or they may be hardened together side by side, thus forming one piece of double width, or two or more batts may be hardened together, one on top of the other, this making one thick piece In the hardening process, the felting which takes place affects the thickness very considerably, and not the area, but in the subsequent milling process the area is affected very considerably, sometimes as much as 50%, but the thickness is not altered much

The hardened felt not having any warp or weft is still comparatively weak, and must be handled very carefully in the preliminary milling stages, or damaged places will occur The hardened felt is now brought in contact with a fulling or milling agent, such as soap, weak acid or weak alkali The first milling is usually done in the fulling stock, where the felt cloth is continually hammered, and the fibres become interlocked closer and closer together until the required length and width have been obtained, and a cloth of considerable strength produced The milling process may be finished in the fulling stock, or, according to the kind of felt being produced, it may be finished in the milling machine

The following processes, viz, dyeing, tentering and finishing, are similar to those used in woollen cloth manufacture, and so do not require to be further explained here

Variation for Use.—According to the purpose for which fibre felts are required, the variation is very great in weight, quality, hardness and thickness In weight from 4 oz per sq yd to 35 lb per sq yd, in quality from the finest merino to cow hair, in hardness from a soft padding felt to the hardest metal polishing felt, and in thickness from $\frac{1}{32}$in to 4in

Some of the uses to which felts are put are saddlery, seatings, carpets, surrounds and underfelts, table felts, shoe and slipper felts, mattress felts, chest preservers, shoulder pads, engineering and motor car felts, antevibration, heat insulating and sound deadening felts, railway and shipbuilding felts, grinding and polishing felts for metal, marble and plate glass, packing felts, gun wad felts, piano and organ felts, filter felts, lithographic and printers' felts, felts for paper-making machines, etc

Impregnated felts such as ship sheathing and roofing felts are not true felts In this case a batt made from jute or flax waste is impregnated and held together with a waterproof solution, the basis of which is tar bitumen or resin Some roofing felts are made from thick porous paper impregnated with a waterproof solution

Hat felts may be divided into two classes, viz, those made from wool and fur respectively Wool "bodies" used for the lower quality hats are manufactured in the same way as ordinary felts, but the "shape" upon which the film issuing from the carder is built up takes the form of a double cone and thus approximates to the shape of the two hats ultimately formed. The shape is further controlled and developed in the fulling or felting operation. In the fur hat felts an air-blast is employed to carry the finely separated fibres on to the shape required, upon which shape the fibres are held in position by suction until the required thickness is obtained. The structure is then hand hardened, further developed and "stiffened," *i.e*, impregnated with certain stiffening agents

according to requirements. If desirable the exterior fibres blown on to any shape may be of a different material from the body fabric. (A. F. B.)

FELTHAM, OWEN (d 1668), English moralist, was the son of Thomas Feltham or Felltham of Mutford, Suffolk The date of his birth is given variously as 1602 and 1609. He is famous chiefly as the author of a volume entitled *Resolves, Divine, Moral and Political,* containing one hundred short and pithy essays, to which in later issues he appended *Lusoria,* a collection of 40 poems Feltham attacked Ben Jonson in an ode shortly before the aged poet's death, but contributed a flattering elegy to the *Jonsonus Virbius* in 1638 In 1652 he published the results of a visit to Flanders under the title of *A Brief Character of the Low Countries* He died at Great Billing early in 1668 To the middle classes of the 17th century he seemed a heaven-sent philosopher and guide, and was only less popular than Francis Quarles.

Eleven editions of the *Resolves* appeared before 1700 Later editions by James Cumming (1806, much garbled, has account of Feltham's life and writings) and O Smeaton in "Temple Classics" (1904)

FELTON, CORNELIUS CONWAY (1807–1862), American classical scholar, was born on Nov 6, 1807, in West Newbury (Mass) He graduated at Harvard College in 1827, and after teaching in the high school at Geneseo (N Y), he became tutor at Harvard in 1829, university professor of Greek in 1832 and Eliot professor of Greek literature in 1834 In 1860 he succeeded James Walker as president of Harvard, which position he held until his death, at Chester (Pa), on Feb 26, 1862 Dr Felton edited many classical texts and made several translations His annotations on Wolf's text of the *Iliad* (1833) and his *Greece, Ancient and Modern* (2 vols , 1867), were, perhaps, his outstanding works

FELTON, JOHN (*c.* 1595–1629), assassin of the 1st duke of Buckingham (*q v*), served in the expedition to Cadiz in 1625, and probably in the expedition to Ré in 1627 He had personal as well as political grievances against Buckingham, whom he stabbed to death at an audience at Portsmouth on Aug 23, 1628 He was tried on Nov 27th, pleaded guilty and was hanged the next day

FELTRE (anc *Feltria*), a town and episcopal see of Venetia, Italy, province of Belluno, 20 m W S W of Belluno by rail, situated on an isolated hill, 885 ft above sea-level Pop (1921) 6,300 (town), 19,031 (commune) The Palazzo del Consiglio, now a theatre, is attributed to Palladio At one end of the chief square of the town, the Piazza Maggiore, is the cistern by which the town is supplied with water, and a large fountain Various remains of the ancient Feltria have been found from time to time ("Campanile" in *Notizie degli Scavi,* 1924, 149 *sqq*) It lay on the road (Via Claudia) from Opitergium to Tridentum

FELUCCA, a type of vessel used in the Mediterranean as coasters or fishing-boats. It is a long, low, and narrow undecked vessel, built for speed, and propelled by oars or sails. The sails are lateen-shaped and carried on one or two masts placed far forward (*see* BOAT)

FEMALE, the correlative of male, the sex which performs the function of conceiving and bearing as opposed to the begetting of young. The word in Middle English is *femelle,* adopted from the French from the Lat *femella,* diminutive of *femina,* a woman The present termination is due to a connection in ideas with "male " In various mechanical devices the receiving part is often known as the "female," as for example in the "male" and "female screw." The O Fr *feme,* modern *femme,* occurs in legal phraseology in *feme covert,* a married woman, *i.e* , one protected or covered by a husband, and in *feme sole,* one not so protected, a widow or spinster. (*See* WOMEN and HUSBAND AND WIFE)

FEMERELL or **FUMERELL,** the old English term given to the lantern in the ridge of a hall roof for the purpose of letting out the smoke from the central hearth

FEMINISM: *see* WOMEN IN THE TWENTIETH CENTURY; WOMEN, LEGAL POSITION OF; WOMEN'S SUFFRAGE; WOMEN, EDUCATION OF; WOMEN IN HISTORY; WOMEN'S CLUBS, GENERAL CONFEDERATION OF

FENCES: *see* HEDGES AND FENCES; WIRE; WIRE MANUFACTURES

FENCIBLES. In the 18th century in Great Britain, fencibles were regular troops, consisting of cavalry and infantry, raised for home service only, and for the duration of the war They differed from the local militia which were raised by counties and were only liable to serve in their own county except in case of rebellion or invasion The first fencible corps raised in Great Britain was in Argyleshire in 1759 Several others were raised in 1778–9 (*See* further MILITIA, VOLUNTEERS)

FENCING. From its general meaning of the art of defence or offence with the sword, the word "fencing" has become restricted to the art and science of those regulated and artificial conditions which govern single combat, in countries where the duel is still in favour, or competition between two or several persons in countries where swordsmanship is rather a sport than a necessity. But all its teaching is based upon those inevitable principles of practical perfection which emerge when life or death may be decided by the movements of a blade, and the gradual emergence of a deadly simplicity out of archaic complications must be traced in the history of the various forms of the sword itself The science of fencing first became visible after gunpowder had destroyed the knight in heavy armour and the whole arsenal of armour-cracking weapons began to disappear Yet it was long before the sword became anything save an implement for heavy downright strokes with edge Gaps in the harness of the more lightly-clad soldier first suggested concentration of attack upon unprotected portions of his body By slow degrees it was discovered that, though the edge might always be useful, the point got home far more quickly At length the sword became not merely an offensive weapon but a shield as well, men fought with one hand only, rejecting the dagger that had once served, in the other, as a protection Only when the duel had ceased to be anything like the social necessity it remained almost everywhere until the end of the 18th century, was the crowning miracle of the riposte invented, by which the lighter sword-blade not merely turned aside the hostile point but, in one continued phase of movement, replied to the enemy with a thrust that followed almost instantaneously upon the frustration of his original attack

It was natural that countries which permitted duelling should pay far more attention to fencing than those nations which settled personal quarrels by other means But good swordsmanship had for so long been a distinctively gentlemanly accomplishment in the English-speaking countries that the fencing taught by Angelo in London was never wholly forgotten even when the swords his first pupils always wore had become the mere decorative adjunct of the soldier on parade or the courtier at some royal ceremony Before the 19th century had closed, the London Fencing Club became the centre of a small but influential and enthusiastic band of amateurs, who brought the best professional teachers from France and who, at last, dared to enter an English team for the International Fencing Tournament which was held in Paris in 1903.

From that date fencing has grown and flourished on both sides of the Atlantic, and the development of all the possibilities of the épée (which is the French duelling-sword with a button on the point) has introduced a form of sport which takes its due place in the Olympic Games and other international meetings, which is becoming more and more popular every year; which can be enjoyed out of doors or under cover, at any hour of the day or night, and almost at any age The three weapons are the foil, which is wholly conventional and meant to furnish the foundation of true swordsmanship; the épée, which uses the point alone and can score a hit on any part of the opponent's anatomy, and the sabre, in its light Italian form, which combines the beauties of both point and edge. These three weapons are separately described under their several headings, as are such almost obsolete survivals as Quarterstaff, singlestick and cane-fencing

Anglo-American Contests.—The Olympiad of 1920, with its apparently inevitable squabbles and bickerings, resulted in a special rapprochement between the teams of the United States and

Great Britain and started the competition between the two nations for the Thompson trophy. The first meeting was held in America during Nov. 1921, and resulted in a victory for the United States by 25 points to 21, but Great Britain turned the tables in the summer of 1923. E. Seligman distinguished himself by reaching the final pool of the foil championship in the Olympic Games of 1924 in Paris, when he had to retire owing to a strain, after beating the winner. He also qualified for the second round of the sabre championship and Captain R. Dalglish, R N., also did well; while C. H. Biscoe reached the semi-final pool of the épée championship. In these same Olympic events, the United States were well represented by Bloomer, Boyce, Calnan, Jeter, Breed, Milner, Gignoux, Macpherson, Lyon and Costner.

In 1923 two Grands Assauts d'Armes were held at the Hotel Cecil and the Grocers' Hall, London, and one in 1924 at the Royal Automobile Club, London. In these many of the most distinguished continental fencers took part, both amateur and professional, including A. Massard, M.C., L Gaudin, R L. Heide, C Lafontan, A Pope, Aldo Nadi, E. Tack, F. de Smedt, J Rossignol and many others. In 1927, Professor Tassart arranged another at the New Prince's Galleries, Piccadilly, when were seen Henri Hostalier, Raymond Flacher, Emile Cornic, Roger Ducret and Professor René Haussy

BIBLIOGRAPHY.—The bibliography of fencing is a copious subject; but it is completely dealt with by Carl A Thimm, *A Bibliography of Fencing and Duelling* (1896) For French works more especially *see* Vigeant, *La Bibliographie de l'escrime*, and *Ma Collection d'escrime*. For Italian books, Gelli, *Bibliografia generale della scherma* For Spain and Portugal, Leguina, *Libros de esgrima españoles y portugueses*. Both M Vigeant's and Cav. Gelli's works deal with the subject generally but their entries are only critical, or even tolerably accurate, in the case of books belonging to their own countries Concerning the history of the art, Egerton Castle's *Schools and Masters of Fence* (1884), Hutton's *The Sword and the Centuries*, and Letainturier-Fradin's *Les Joueurs d'épée à travers les âges*, cover the ground As typical exponents of the French and Italian schools respectively may be mentioned here Prévost, *La Théorie de l'escrime*, (this is the work which was adopted in the Badminton volume on Fencing), and Parise, *Trattato teoricopratico della scherma* French school: L. Rondelle, *Foil and Sabre* (Boston, 1892); C. Prévost *"Fencing,"* in the *Encyclopaedia of Sport* (1901); Edward Breck, *Fencing* (New York, 1906). Italian school· S. de Frae, *Istruzione per la scherma*, etc. (1885); F. Masiello, *La Scherma italiana di spada e di sciabola* (Florence, 1887). *See* also H. A. C. Dunn, *Fencing* (1924).

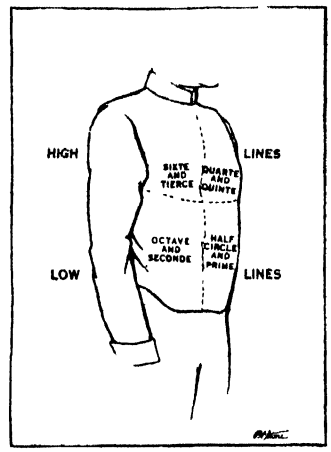
Épée.—Among the older works on the history and practice of the small-sword, or épée, are the following W. H. Gent (Sir William Hope, afterwards baronet), *The Scots Fencing-Master, or Compleat Small-swordsman* (Edinburgh, 1687), and several other works by the same author, of later date, for which *see* Egerton Castle, *Schools and Masters of Fence;* P. G. F. Girard, *Nouveau traité de la perfection sur le fait des armes* (1736); M. Angelo, *L'ecole des armes* (London, 1763); M. Danet, *L'Art des armes* (1766–1767); Nicolas Demeuse, *Nouveau traité de l'art des armes* (Liège, 1778).

More modern are la Böessière, Jr, *Traité de l'art des armes* (1818); A. Grisier, *Les Armes et le duel* (1847); Bazancourt, *Les Secrets de l'épée* (1862); J. Jacob and Emil André, *Le Jeu de l'épée* (1887); Ambroise Baudry, *L'Escrime pratique au XIXe siècle;* A. Spinnewyn and Paul Manoury, *L'Escrime à l'épée* (1898); C Newton-Robinson, "The Revival of the Small-sword," in the *Nineteenth Century and After* (London, January 1905); Dr. Edom, *Nouveau Traité de l'épée*, privately published (Paris, 1908), C. de Bazancourt, *Secrets of the Sword* (1908), and, most important of all, J. Joseph-Renaud, *Méthode d'escrime à l'épée*, privately published (Paris, 1909).

Sabre.—Infantry Sword Exercise (British War Office, London, 1896), practically the system of Masiello; L Barbasetti, *La Scherma per la sciabola* (Vienna, 1898); a German translation of the foregoing, *Das Säbelfechten* (Vienna, 1899); Gustav Hergsell, *Die Fechtkunst* (Vienna, 1892). For the old-style sabre *see* Alfred Hutton, *Cold Steel* (London, 1889); R. G. Allanson Winn and C. Phillips Wolley, *Broadsword and Singlestick*, "All England" series (London, 1898); L. Rondelle, *Foil and Sabre* (Boston, 1892), an exposition of the French military system. *See* also, Leon Bertrand, *Cut and Thrust* (1927). For Sabre-fencing for cavalry *see* Alfred Hutton, *The Cavalry Swordsman* (London, 1867); A. Alessandri and Émile André, *L'Escrime du sabre à cheval* (Paris, 1895). For German basket-sabre and schläger, *Die deutsche Hiebfechtschule fur Kork- und Glockenrapier* (Leipzig, 1887), published by the association of German academic fencing-masters; L. C. Roux, *L'Escrime dans les universités allemandes* (Paris, 1885), a French exposition of the German student fencing. *Quarter-Staff*, by T. A. McCarthy (London, 1883). *See* also CANE-FENCING, ÉPÉE DE COMBAT, QUARTER STAFF, SABRE-FENCING, SINGLESTICK.

(A. R. H.)

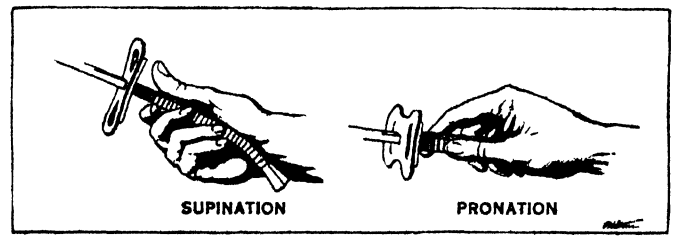
United States.—Fencing in the United States is experiencing rapid expansion as a popular sport in the schools, colleges and universities as well as in various fencing clubs. The art always has been followed by a few devotees. For many years it was kept alive mainly by being part of the curriculum at the U.S Military Academy at West Point, N.Y., and the U.S. Naval Academy at Annapolis, Md As an organized sport it dates from 1891, when the Amateur Fencers League of America was organized. This league has supervised amateur fencing as a sport since that time. It is a member of the Federation Internationale d'Escrime Intercollegiate fencing is supervised by the Intercollegiate Fencing Association with 15 colleges and universities as members. This association works in close harmony with the Amateur Fencers League



IMAGINARY LINES OF ENGAGEMENT
Attacks and parries are given names identifying them with the spot hit; e.g., a thrust at the sixte line is called a thrust in sixte; a parry, at the same section, with hand in supination, is called parry of sixte or, with hand in pronation, parry of tierce

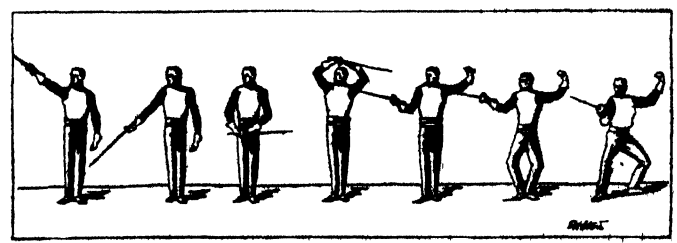
Outside of institutions of learning, the art and sport of fencing is fostered by fencing clubs where the services of excellent European *maîtres d'armes* may be had. These clubs exist mainly in the eastern cities of New York, Philadelphia and Boston and in the west coast cities of San Francisco and Los Angeles A number of excellent European fencing masters have come to the United States and have done much to spread the sport and improve the quality of fencing

The United States has been represented in fencing in the Olympic Games; but its teams have been defeated by those of



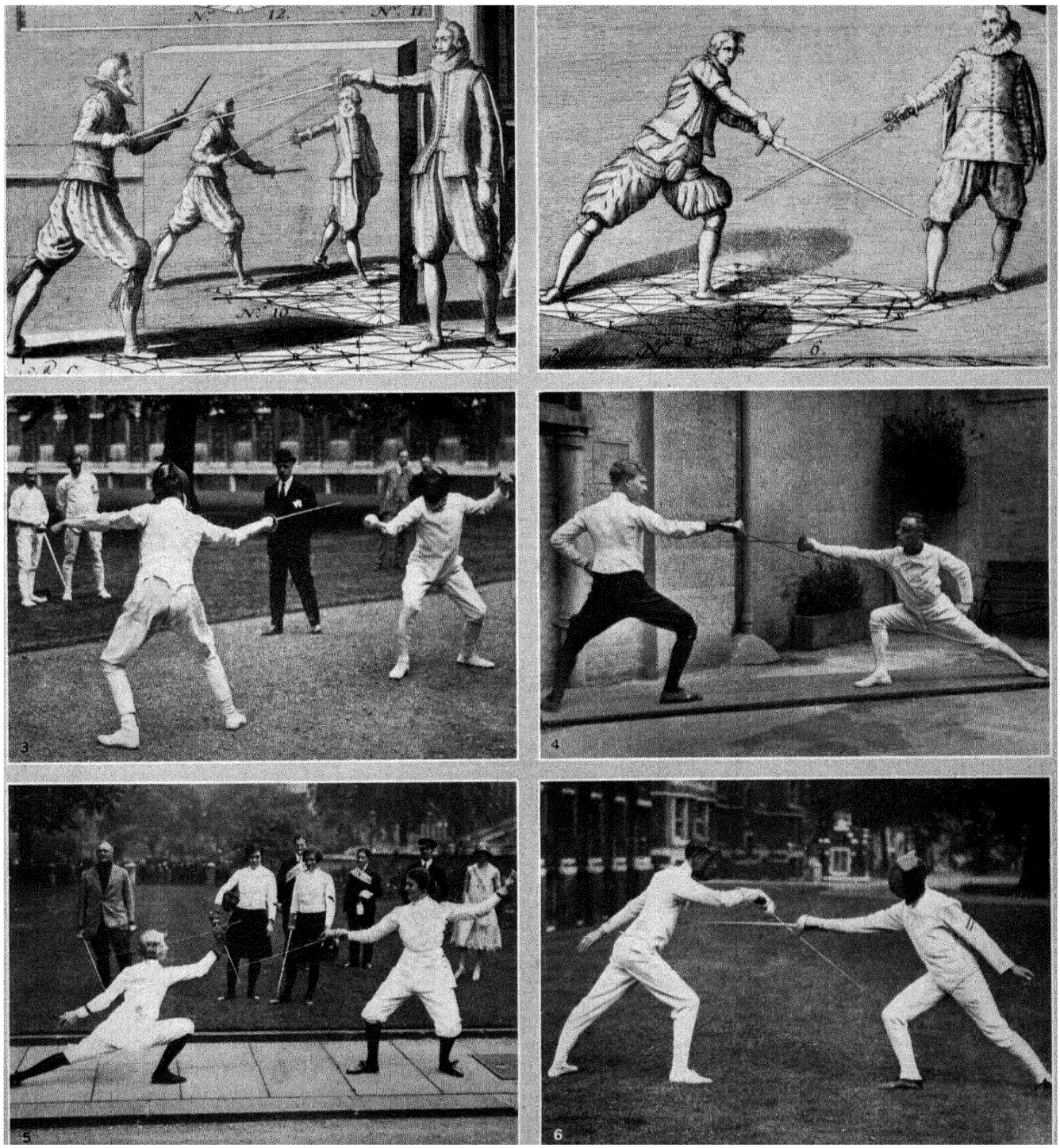
THE TWO MOST FREQUENTLY USED METHODS OF HOLDING THE FOIL
In the method known as supination the fingers should be closed around handle without overlapping thumb, which must not touch hilt. When the foil is held in pronation, the thumb comes closer to fingers, and back of hand is turned up

France, Italy and Hungary. At the Seventh Olympiad in Antwerp, Belgium, in 1920, the United States team won third place in the foil team competition, defeating all other nations except France and Italy. This is the only occasion on which the United States



THE SEVEN MOVEMENTS NECESSARY FOR COMING ON GUARD

has been an Olympic point winner in team fencing. At the Ninth Olympiad, in Amsterdam, Holland, in 1928, the American fencers in the individual competitions made their best showing in the history of the Olympic Games. Lieut. G. C. Calnan, U.S.N., won third place in the individual *épée* championship of the world. Dr. Allen Milner reached the finals in the same weapon, as did Joseph Levis in the individual foil competition. The skill of American fencers is constantly increasing and American teams



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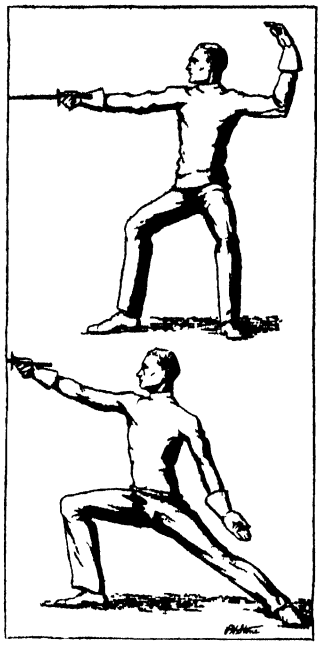
FENCING, MODERN AND XVI CENTURY

1. The long weapons and the geometrical designs of Spanish fencing-masters of the sixteenth century. A circle was inscribed in a square intersected by chords, and pupils were instructed by this mathematical diagram
2. Two-handed sword against rapier in a match. The Italian rapier, a straight two-edged sword used chiefly for thrusting, took the place of the broadsword when the use of armour was discontinued and the heavier weapon was no longer required
3. A "duel" in the Epée Championship, Lincoln's Inn, London, showing the "epee," of which the point alone is used
4. Parrying an attack at flank with sabre. This weapon in its light Italian form combines the uses of point and edge
5. Ladies showing the "Grand Salute" with foils, a courtesy at the beginning of a match
6. A winning thrust in practice. The object of a fencing-match today is to touch one's opponent while parrying his thrusts

furnish strong competition for the best European teams.

After the Seventh Olympiad of 1920 there were instituted the British-American matches for the Robert M. Thompson Perpetual Trophy. These matches have created a stimulus for the growth of the art and serve as the occasion for friendly rivalry and sportsmanlike relations between British and American fencers. They are held alternately in the United States and England. The Americans were victorious in 1921 and 1926, when the matches were held in the United States. The British won in London in 1923. (H. BRE.)



EXTENSION AND LUNGE

Assume the position of On Guard, then extend right arm quickly, hand and foil being on line with shoulder. Now straighten left leg and advance right foot to about twice its length at right angles to the left

HOW TO FENCE

Foil Fencing.—The target is limited to the bust, which is divided by four imaginary lines varying according to the position of the hand. There are two principal lines, one vertical and one horizontal, which cross each other at the place where the foil is held. For a right-handed fencer the inside-high line or left-high line is the space to left of vertical line and above horizontal line; inside-low line or left-low line is the space at left of vertical and below horizontal line, outside-high line or right-high line is space at right of vertical line and above horizontal line, outside-low line or right-low line is the space at right of vertical line and below horizontal line For a left-handed fencer it is just the opposite For each section there are two parries The parries are direct or circular (counter) The direct parry wards off the opponent's thrust in the same line as the attack was made The circular parry counter-wards off the opponent's thrust in the opposite line the attack was made by means of a circular movement

There are two parries for each line In one the hand is held in supination, in the other in pronation. There are eight parries, each having its counter.

High-line right —
- Tierce: Hand in pronation at height of chest towards right, foil pointed at opponent's eyes
- Sixte. Hand in supination at height of chest towards right, foil pointed at opponent's eyes

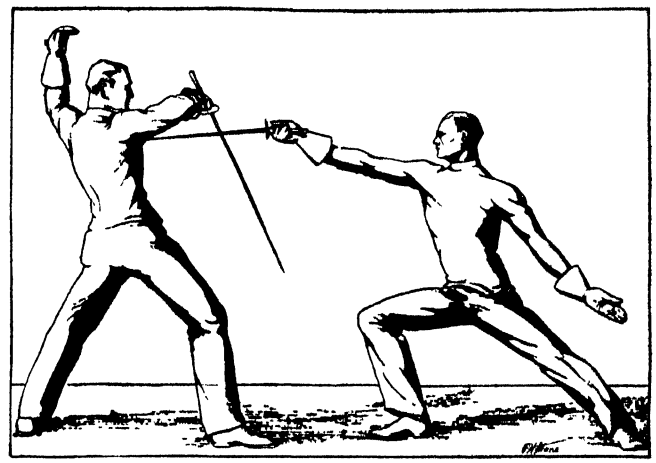
High-line left.—
- Quinte· Hand in pronation at height of chin towards left, foil pointed at opponent's waist
- Quarte· Hand in supination at height of chest towards left, foil pointed at opponent's eyes

Low-line right:—
- Seconde. Hand in pronation at height of waist, towards right, foil pointed at opponent's groin.
- Octave. Hand in supination at height of waist towards right, foil pointed at opponent's groin.

Low-line left.—
- Prime: Hand in pronation at height of waist towards left, foil pointed to left and above hand
- Septime: Hand in supination at height of chest towards left, foil pointed at groin.

In executing all these parries the hand must not travel beyond the body.

In the on guard position the legs and arms are bent, ready for quick action, whether for attack or for defence. The attack is the ensemble of movements by which one tries to touch an opponent, and of which the last is called "coup" (hit) and consists in bringing the point of the foil squarely on the opponent's body. The attack is made by lunging, marching or running (*flèche*). The lunge immediately follows the extension of the arm and consists of bringing the forward foot forward and at the same time straightening the other leg, the foot remaining in place. The march consists in bringing the forward foot forward to be followed immediately by the other one, retaining the on guard position. In the running attack or flèche one brings the back foot

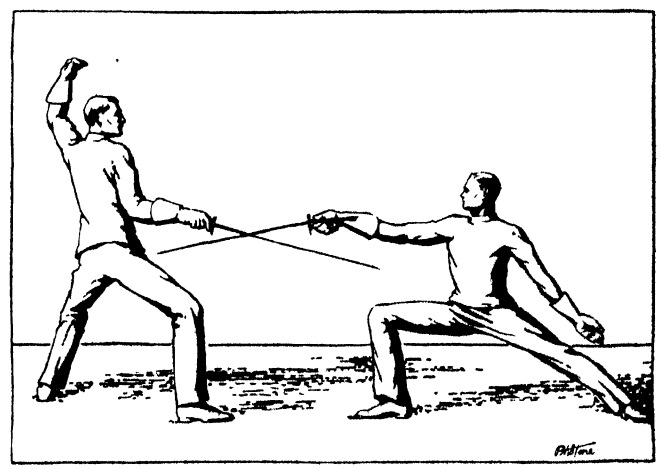


PARRY OF PRIME, AN EFFECTIVE GUARD FOR LEFT SIDE

The parry of prime is used in covering both high and low lines. It is made from guard by moving hand toward the left shoulder, dropping point down sharply and turning back of hand upward and outward as far as possible

in front of the other one, and so on The march and the flèche can be done backwards by reversing the movements.

With the foil an attack correctly executed must be parried or else completely evaded The attack is correct when the arm is properly extended before the lunge or advance. The feint is the semblance of an attack and is done by extending the arm without trying to touch, its aim being to make the adversary try to parry this movement, and then to deceive the intended parry The false attack is a feint with a displacement of the body and has the same purpose as the feint The attack may be simple (when not preceded by a feint) or composed (when preceded by one or many feints or by a bind on the blade) The attack on the blade, or bind, is the action (beat, press or shove aside) of removing the

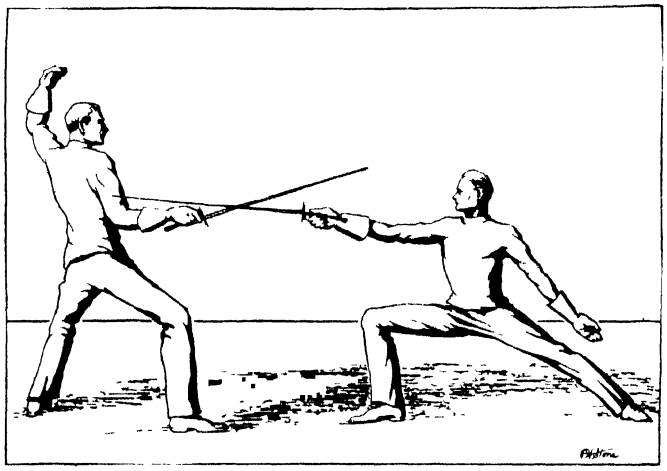


PARRY OF SECONDE, TO GUARD LOWER RIGHT-HAND SIDE

With a slight but quick downward movement of the hand, catch adversary's blade and turn it aside. The foil is held in pronation

opponent's blade when in a threatening position, also to open the line. The bind is a movement by which one brings the opponent's blade from the high-line to the low-line, the low-line being the target and vice-versa. There are three simple attacks: straight thrust, disengage and the cut-over. In the straight thrust one touches the opponent in the same line as one is engaged in. The disengage is carried in another line than the one one is engaged in, by passing the tip of the blade under the opponent's blade. The cut-over is a disengage, executed by passing the point of the foil above the opponent's blade at the same time flexing slightly

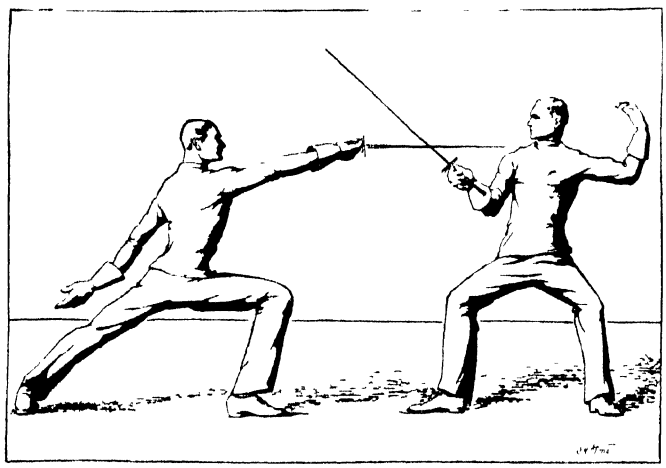
the arm The composed attack ends always by one of the aforementioned attacks The riposte follows the parry and is done by extending the arm without moving the body, or by any other combinations of attack The counter-riposte follows the parry of the riposte and can be made on the lunge or any of the other riposte combinations The attack on preparation starts from complete immobility and surprises the opponent on his preparation



PARRY OF TIERCE, FOR GUARDING UPPER RIGHT-HAND SIDE
Move foil quickly across body from left to right, sweeping aside adversary's blade and protecting right breast

of attack The time-thrust is at the same time a parry and a riposte The stop-thrust stops the opponent on his advance The "remise" is a time-thrust on a riposte or on a counter-riposte The redoublement is a second attack after the first one has been parried without riposting

Épée or Duelling Sword.—There are no conventions in fencing with this weapon The touches are valid on any part of the body. The space between the feet when on guard is less than with the foil, but the arm is more extended The defensive work consists generally of time-thrusts and stop-thrusts The attacks are simpler than with the foil and generally with binds on the



PARRY OF QUARTE, FOR GUARDING LEFT-HAND SIDE OF BODY
This is the most important parry and is more used than any of the others. It is executed by moving blade toward the left until the forte encounters the foible of adversary's foil and throws it aside. Fingers and wrist should be used as much as possible

blade. The parries and ripostes, etc , are the same as for the foil

Sabre Fencing.—The target is limited to the upper part of the body. The touches are made mostly by cuts instead of thrusts, the cuts being. head-cut, right and left cheek-cut, flank-cut, the banderole (cut from the left shoulder to the waist) and the cut on the cuff The thrusts are made the same way as with the foil, but are generally limited to simple attacks The movements are wider and far more spectacular than those of the other weapons The attacks are usually made by attacks on the blade with advance so as to gather speed (R Pt)

FEN COUNTY: *see* Fens.

FENDER, a metal guard or defence as for a motor car or fire place In the latter instance when the open hearth with its log burning upon fire-dogs or andirons (*qq v*) was replaced by the closed grate, the fender was devised as a finish to the smaller fire-places, and as a safeguard against the dropping of cinders upon the wooden floor, which was now much nearer to the fire Fenders are usually of steel, brass or iron, solid or pierced Those made of brass in the latter part of the 18th and the earlier part of the 19th centuries are by far the most elegant and artistic They usually had three claw feet, and the pierced varieties were often cut into arabesques or conventional patterns The modern fender is much lower and is often little more than a curb

FÉNELON, FRANÇOIS DE SALIGNAC DE LA MOTHE (1651–1715), French writer and archbishop of Cambrai, was born at the château of Fénelon in Périgord on Aug 6 1651 His father, Pons, comte de Fénelon, was a country gentleman of ancient lineage, large family and small estate He was educated at home and at the neighbouring University of Cahors In 1666 he came to Paris, under charge of his father's brother Antoine, marquis de Fénelon, and in 1669 he entered the college of Saint Sulpice He contemplated a missionary journey to the Levant, but the plan was vetoed, and he remained at Saint Sulpice till 1679, when he was made "superior" of a "New Catholic" sisterhood in Paris—an institution devoted to the conversion of Huguenot ladies In the winter of 1685, just after the revocation of the edict of Nantes, Fénelon was put at the head of a mission to the Protestants of Saintonge To Fénelon such employment was clearly uncongenial, but if he employed bribery and espionage among his proselytes, his general conduct was kindly and statesmanlike But neither in his actions nor in his writings is there the least trace of that belief in liberty of conscience ascribed to him by 18th-century philosophers

Meanwhile the marquis de Fénelon had introduced his nephew into the devout section of the court, dominated by Mme de Maintenon He became a favourite disciple of Bossuet, and at the bishop's instance undertook to refute certain metaphysical errors of Father Malebranche In the philosophical *Treatise on the Existence of God*, which he wrote for the purpose, Fénelon rewrote Descartes in the spirit of St Augustine More important were his *Dialogues on Eloquence*, pleading for greater simplicity and naturalness in the pulpit, and urging preachers to take the scriptural, natural style of Bossuet as their model, rather than the coldly analytic eloquence of his great rival, Bourdaloue His *Treatise on the Education of Girls* was probably the most influential of all Fénelon's books, and guided French ideas on the question all through the 18th century It holds a most judicious balance between the *précieuses*, enthusiasts for the "higher" education of their sex, and the heavy Philistines, who thought that the less girls knew the better they were likely to be Fénelon sums up in favour of the cultivated housewife, his first object was to persuade the mothers to take charge of their girls themselves, and bring them up to be suitable wives and mothers in their own generation

The Royal Tutor.—In 1689 Fénelon was gazetted tutor to the duke of Burgundy, eldest son of the dauphin, and eventual heir to the crown The character of this strange prince has been drawn once for all by Saint-Simon Brilliant, passionate to the point of mania, but utterly weak and unstable, he was capable of developing into a saint or a monster, but quite incapable of becoming an ordinary human being. Fénelon transformed him into a devotee, exceedingly affectionate, earnest and religious, but woefully lacking in tact and common sense. Fénelon's tutorship ended with his disgrace in 1697, before the pupil was 15

The abiding result of his tutorship is a code of carefully graduated moral lessons—the *Fables*, the *Dialogues of the Dead* (a series of imaginary conversations between departed heroes), and finally *Télémaque*, where the adventures of the son of Ulysses in search of a father are made into a political novel with a purpose. Not, indeed, that Fénelon meant his book to be the literal paper Constitution some of his contemporaries thought it. Like other

Utopias, it is an easy-going compromise between dreams and possibilities Its object was to broaden Burgundy's mind, and ever keep before his eyes the "great and holy maxim that kings exist for the sake of their subjects, not subjects for the sake of kings" Here and there Fénelon's work is prophetic of the age of Rousseau—in the fervid denunciation of war, the belief in nature and the fraternity of nations He has a truly 18th-century belief in paternal government Mentor proposes to "change the tastes and habits of the whole people, and build up again from the very foundations" Fénelon is on firmer ground when he leads a reaction against the "mercantile system" of Colbert, or insists on the importance of agriculture Valuable and far-sighted as were these ideas, they fitted but ill into the scheme of a romance Seldom was Voltaire wider of the mark than when he called *Télémaque* a Greek poem in French prose But although no single feature of the book is Greek, there hangs round it a moral fragrance only to be called forth by one who had fulfilled the vow of his youth, and learnt to breathe, as purely as on "the double summit of Parnassus," the very essence of the antique

Mme. Guyon.—*Télémaque* was published in 1699 Four years before, Fénelon had been appointed archbishop of Cambrai, one of the richest benefices in France Soon afterwards, however, came the great calamity of his life In the early days of his tutorship he had met the Quietist apostle, Mme Guyon (*q v*), and had been struck by her ideas These he developed along lines of his own, where Christian Neoplatonism curiously mingles with theories of chivalry and disinterestedness, borrowed from the *précieuses* of his own time His mystical principles are set out at length in his *Maxims of the Saints*, published in 1697 Here he argues that the more love we have for ourselves, the less we can spare for our Maker Perfection lies in getting rid of selfhood altogether—in never thinking of ourselves, or even of the relation in which God stands to us The saint does not love Christ as *his* Redeemer, but only as *the* Redeemer of the human race Bossuet (*q v*) attacked this position as inconsistent with Christianity Fénelon promptly appealed to Rome, and after two years of bitter controversy his book was condemned by Innocent XII in 1699 One of the results of the quarrel was Fénelon's banishment from court, for Louis XIV had ardently taken Bossuet's side Fénelon was exiled to his diocese, and during the last 18 years of his life he was only once allowed to leave it

Even Saint-Simon allows that his episcopal duties at Cambrai were perfectly performed His diocese was administered with great strictness, and yet on broad and liberal lines Saint-Simon bears the same witness to his government of his palace There he lived with all the piety of a true pastor, yet with all the dignity of a great nobleman With all its luxuries, his house remained a true bishop's palace, breathing the strictest discipline and restraint And of all this chastened dignity the archbishop was himself the ever-present, ever-inimitable model—in all that he did the perfect churchman, in all the high-bred noble, in all things, also, the author of *Télémaque*

The blot on this ideal existence was his persecution of the Jansenists (*see* JANSENISM) Fénelon's theories of life were different from theirs; and they had attacked his *Maxims of the Saints*, holding that visionary theories of perfection were ill-fitted for a world where even the holiest could scarce be saved To suppress the Jansenists he was even ready to strike up an alliance with the Jesuits, and force on a reluctant France the doctrine of papal infallibility His time was much better employed in fitting his old pupil, Burgundy, for a kingship that never came. Louis XIV seldom allowed them to meet, but for years they corresponded, this exchange of letters became still more frequent in 1711, when the wretched dauphin died and left Burgundy heir-apparent to the throne Fénelon now wrote a series of memorable criticisms on the government of Louis XIV. Much more clearly than most men, he saw that the Bourbons were tottering to their fall.

In 1712 Burgundy died, and with him died all his tutor's hopes of reform. From this moment his health began to fail, though he mustered strength enough to write the *Letter to the French Academy* (1714), a series of general reflections on the literary movement of his time. As in his political theories, the critical element is much stronger than the constructive Fénelon was feeling his way away from the rigid standards of Boileau to "a Sublime so simple and familiar that all may understand it" But some of his methods were remarkably erratic, he was anxious, for instance, to abolish verse, as unsuited to the genius of the French In other respects, however, he was far before his age The 17th century had treated literature as it treated politics and religion, each of the three was cooped up in a water-tight compartment by itself. Fénelon was one of the first to break down these partition-walls, and insist on viewing all three as products of a single spirit, seen at different angles

A few weeks after the *Letter* was written, Fénelon met with a carriage-accident On Jan 7, 1715, he died at the age of 63. Fénelon has been made by turns into a sentimentalist, a mystical saint, an 18th century *philosophe*, an ultramontane churchman and a hysterical hypocrite And each of these views, except the last, contains an element of truth More than most men, Fénelon "wanders between two worlds—one dead, the other powerless to be born" He came at a time when the characteristic ideas of the 17th century—the ideas of Louis XIV, of Bossuet and Boileau—had lost their savour, and before another creed could arise to take their place Hence, like most of those who break away from an established order, he seems by turns a revolutionist and a reactionary Such a man expresses his ideas much better by word of mouth than in the cold formality of print, and Fénelon's contemporaries thought far more highly of his conversation than his books Saint-Simon has left a portrait of Fénelon as he appeared about the time of his appointment to Cambrai—tall, thin, well-built, exceedingly pale, with a great nose, eyes from which fire and genius poured in torrents, a face curious and unlike any other, yet so striking and attractive that, once seen, it could not be forgotten There were to be found the most contradictory qualities in perfect agreement with each other—gravity and courtliness, earnestness and gaiety, the man of learning, the noble and the bishop But all centred in an air of high-bred dignity, of graceful, polished seemliness and wit—it cost an effort to turn away one's eyes

BIBLIOGRAPHY —The best complete edition of Fénelon was brought out by the abbé Gosselin of Saint Sulpice (10 vols, 1851) Gosselin also edited the *Histoire de Fénelon*, by Cardinal Bausset (4 vols, 1850). Modern authorities are E de Broglie, *Fénelon à Cambrai* (1885), P Janet, *Fénelon* (1892), L Crouslé, *Bossuet et Fénelon* (2 vols., 1894); J Lemaître, *Fénelon* (1910) In English there are *Fénelon, his Friends and Enemies*, by E K Sanders (1901), and *François de Fénelon*, by Lord St Cyres (1906), *see* also the *Quarterly Review* for Jan 1902, and M Masson, *Fénelon et Madame Guyon* (1907)

FENESTELLA, Roman historian and encyclopaedic writer, flourished in the reign of Tiberius If the notice in Jerome be correct, he lived from 52 B C to A D 19 (according to Pliny, N H XXXIII, 35 B C–A D 36) Taking Varro for his model, Fenestella represented the new style of historical writing which discussed curious incidents and customs of political and social life, and literary history He was the author of an *Annales*, probably from the earliest times down to his own days The fragments indicate the great variety of subjects discussed. the origin of the appeal to the people (*provocatio*); the use of elephants in the games, the wearing of gold rings, the introduction of the olive tree, the material for making the toga, the cultivation of the soil, details as to the lives of Cicero and Terence The work was much used by Pliny the elder, Asconius Pedianus (the commentator on Cicero), Nonius, and the philologists

Fragments in H Peter, *Historicorum Romanorum fragmenta* (1883); *see* also monographs by L. Mercklin (1844) and J Poeth (1849); M Schanz, *Geschichte der rom Litt.* ed 2 (1901), Teuffel, *Hist. of Roman Literature*, p. 259. A work published under the name of L Fenestella (*De magistratibus et sacerdotus Romanorum*, 1510) is really by A D Fiocchi, canon and papal secretary, and was subsequently published as by him (under the latinized form of his name, Floccus), edited by Aegidius Witsius (1561)

FENESTRAL, a frame on which oiled paper or thin cloth was strained to keep out wind and rain when windows were not glazed.

FENESTRATION, an architectural term applied to the arrangement of windows on the outside walls of a building, more

especially when they constitute its chief architectural embellishment.

FÊNG HUANG, one of the four symbolical creatures which in Chinese mythology are believed to keep watch and ward over the Celestial Empire It was begotten by fire, was born in the Hill of the Sun's Halo, and its body bears inscribed on it the five cardinal virtues It has the breast of a goose, the hind-quarters of a stag, a snake's neck, a fish's tail, a fowl's forehead, a duck's down, the marks of a dragon, the back of a tortoise, the face of a swallow, the beak of a cock, is about six cubits high, and perches only on the wu-tung tree Its appearance heralds an age of universal virtue The name is Chinese for "phoenix"

FENG-TIEN: *see* MANCHURIA

FÊNG YÜ-HSIANG (1880–), Chinese military leader, was born in Chaohsien in the province of Anhwei, and is generally known as "the Christian General" from his early adoption of Christianity of a Baptist and Evangelical type His education and training were purely military, and he saw active service under Chao Êrh-fêng in Tibet in 1909 In 1912 he was in Sianfu in the 20th Division under the command of Lu Yung-hsiang, whose daughter he married At the Revolution he had attained the rank of major and was at Shanhaikwan, from there he was promoted brigade commander in the army controlling Chihli and the capital His acceptance of, and consistent adherence to, Republican principles date from this period and have formed a salient feature of his subsequent career Under Wu Pei-fu he took part in the defeat of the Anfu Group, and thereafter re-organized his famous 11th Division

General Feng obtained his first independent command early in 1921 when his Division was despatched into Shensi to restore order in that province, and in August, upon the death of the military governor, he was given the acting appointment Both as Tuchun of Shensi, and in Honan, to which province he was transferred in the following year, Feng and his troops earned the highest encomiums The complete suppression of banditry, the discouragement of poppy cultivation, extensive road construction works, and an effort to re-establish honesty in public accounts, were among the measures standing to his credit, while strict discipline and an active if somewhat "corybantic" display of Christian practices in his army were evidence of his zeal for good administration

In Oct 1922 he attended a military conference with Tsao Kun and Wu Pei-fu at Paoting, and shortly afterwards his Division was transferred to Peking, where its disciplined efficiency and the strength of purpose of its commander, made their influence felt In the spring of 1923 Feng was appointed, by mandate of President Li Yuan-hung, commissioner of frontier defence for the North-West, but owing to the unstable political position in the capital he deferred taking up his new duties With his assistance Li was driven from office in June by Tsao Kun, and upon the latter's assumption of the presidency, Feng addressed a memorial to him appealing for reforms in the administration. During the ensuing year he became convinced of Tsao Kun's inability to form a stable government and he opposed the resumption of the war against Chang Tso-lin By a *coup de main* he descended upon Peking, causing the defeat and flight of Wu, and in co-operation with Chang he installed Tuan Chi-jui as "Chief Executive," thereafter leaving for the North-West In Kalgan, Suiyuan and Paotowchen, his administrative gifts again found scope Colonization plans for Mongolia, ruthless suppression of lawlessness, and other measures making for peaceful development marked his stay He had depended for ammunition and military equipment upon German importations via Urga, and in March 1926 he visited Moscow, returning in August He was now formally enrolled as an adherent of the Kuomintang, and his co-operation with the Nationalist allies throughout 1927, although his troops were but slightly engaged, conduced to the success of the campaign

FENIANS or FENIAN BROTHERHOOD, the name of a modern Irish-American revolutionary secret society, founded in America by John O'Mahony (1816–1877) in 1858 The name was derived from *fiann, féinne*, the legendary band of warriors in Ireland led by Find Mac Cumhaill (*see* FINN MAC CUMHAIL) After the collapse of William Smith O'Brien's attempted rising in 1848, O'Mahony, who was concerned in it, escaped abroad, and about 1858 established, in the United States, the "Fenian Brotherhood," whose members bound themselves by an oath of "allegiance to the Irish Republic, now virtually established," and swore to take up arms when called upon and to yield implicit obedience to their superior officers The organization was modelled on that of the French Jacobins at the Revolution, and it had ramifications in every part of the world, the "Fenians," as they soon came to be generally called, being found in Australia, South America, Canada, and above all, in the United States, as well as in the large centres of population in Great Britain such as London, Manchester and Glasgow It is, however, noteworthy that Fenianism never gained much hold on the tenant-farmers or agricultural labourers in Ireland The movement was denounced by the priests of the Catholic Church

After a convention held at Chicago under O'Mahony's presidency in Nov 1863 the movement began to show signs of life About the same time the *Irish People,* a revolutionary journal, was started in Dublin by James Stephens At the close of the American Civil War, in 1865, numbers of Irish who had borne arms flocked to Ireland, and the plans for a rising matured The Government, well served as usual by informers, now took action In Sept 1865 the *Irish People* was suppressed, and several of the more prominent Fenians were sentenced to terms of penal servitude, though Stephens, through the connivance of a prison warder, escaped to France The Habeas Corpus Act was suspended in 1866, a considerable number of persons were arrested, and some small disturbances were suppressed by the police

In the United States the Fenian Brotherhood made open plans for a raid into Canada The command was entrusted to John O'Neill, who crossed the Niagara river at the head of some 800 men on June 1, 1866, and captured Fort Erie But large numbers of his men deserted, and at Ridgeway the Fenians were routed by a battalion of Canadian volunteers On June 3 the remnant surrendered to the American warship "Michigan" A second raid, in 1870, was equally unsuccessful, Henri Le Caron, "Inspector-general of the Irish Republican Army," being a secret agent of the English Government An attempt at insurrection in 1867 in South and West Ireland and Lancashire had also been frustrated by an informer, John Joseph Corydon On Sept 18, 1867, when Thomas J Kelly and Capt Deasy, two prisoners arrested during this "rebellion," were being conveyed through Manchester from the court-house, the prison van was attacked by Fenians and in the scuffle Police-sergeant Brett was shot dead Condon, Allen, Larkin, Maguire and O'Brien, who had taken a prominent part in the rescue, were arrested All five were sentenced to death; but Condon, who was an American citizen, was respited at the request of the United States Government, his sentence being commuted to penal servitude for life, and Maguire was granted a pardon Allen, Larkin, and O'Brien were hanged on Nov 23, and are frequently referred to as the "Manchester Martyrs" In the same month, one Richard Burke, a Fenian agent, was lodged in Clerkenwell prison in London While he was awaiting trial a wall of the prison was blown down by gunpowder, the explosion causing the death of 12 persons, and the maiming of some 120 others For this Michael Barrett suffered the death penalty In 1870, Michael Davitt (*q v*) was sentenced to 15 years' penal servitude for participation in the Fenian conspiracy; and before he was released the name Fenian had become practically obsolete, though the "Irish Republican Brotherhood" and other organizations in Ireland and abroad carried on the same tradition. (*See* IRELAND, *History*)

FENN, GEORGE MANVILLE (1831–1909), English author, known as the writer of a number of boys' books of considerable popularity. His journalistic work included many contributions to *Chambers' Journal* and *Cassel's Magazine,* of which he became editor in 1870. He was also the author of several novels and plays.

FENNEC, the name applied to several desert-dwelling species of fox, characterized by the great length of the ears and small size The true fennec (*Vulpes zerda*) inhabits North Africa and is pale in colour with a short, black-tipped tail. South of the

Zambezi the group reappears, being represented by the ass-fox (*V cama*), a dark-coloured, long-tailed species. The northern fennec (*V. famelicus*) is intermediate between the fennecs and typical foxes. (*See* Fox.)

FENNEL, *Foeniculum officinale,* a perennial plant of the family Umbelliferae, from 2 to 3 or (when cultivated) 4ft. in height, having leaves three or four times pinnate, with numerous linear or awl-shaped segments, and glaucous compound umbels of about 15 or 20 rays, with no involucres, and small yellow flowers, the petals incurved at the tip. The fruit is laterally compressed, five-ridged, and has a large single resin-canal or "vitta" under each furrow The plant appears to be of south European origin, but is now met with in various parts of Britain and temperate Europe generally, and western Asia The dried fruits of cultivated plants from Malta have an aromatic taste and odour, and are used for the preparation of fennel water, valued for its carminative properties The shoots of fennel are eaten blanched, and the seeds are used for flavouring



FROM "MEDIZINAL PLANZEN"

FENNEL (FOENICULUM OFFICINALE), AN AROMATIC PLANT, SHOWING HABIT OF GROWTH AND FLOWERS IN COMPOUND CLUSTERS

Giant fennel is the name applied to *Ferula communis,* a member of the same family, and a fine herbaceous plant, native in the Mediterranean region, where the pith of the stem is used as tinder Hog's or sow fennel is the species *Peucedanum officinale,* another member of the Umbelliferae

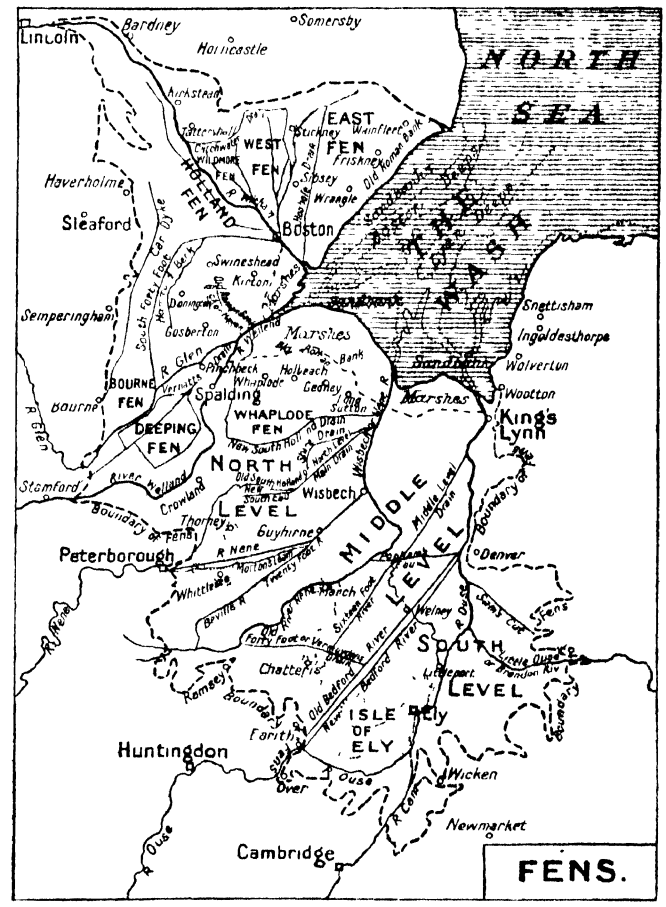
FENNER, DUDLEY (*c* 1558–1587), English puritan divine, was born in Kent and educated at Cambridge University but becoming an adherent of the presbyterian Thomas Cartwright (1535–1603), had to leave without taking his degree He followed Cartwright to Antwerp, and preached to the English congregation there The leniency shown by Archbishop Grindal encouraged him to return to England, and he became curate of Cranbrook in 1583 In the same year, however, he was suspended and imprisoned for refusing to sign an acknowledgment of the queen's supremacy and of the authority of the Prayer Book and articles After his release he became chaplain in the Reformed church at Middleburgh His works rank among the best expositions of the principles of puritanism, *see* list in Cooper's *Athenae Cantabrigienses* (Cambridge, 1858–61).

FENNY STRATFORD, a market town in the Buckingham parliamentary division of Buckinghamshire, England, 47¾ m N.W. by N of London on the Bedford branch of the L M S railway Pop of civil parish (1921) 4,305 It lies in an open valley on the west (left) bank of the Ouzel, where the great north-western road from London, the Roman Watling Street, crosses the stream, and is 1 m E of Bletchley junction. The church of St. Martin was built (1730) on the site of an older church at the instance of Browne Willis, an eminent antiquary (d. 1760), buried here; but the building has been greatly enlarged A custom instituted by Willis on St Martin's Day (Nov 11), and still observed, includes a service in the church, the firing of some small cannon called the "Fenny Poppers," and other celebrations

FENRIR or **FENRIS,** in Scandinavian mythology, a water-demon in the shape of a huge wolf, was the offspring of Loki and the giantess Angurboda He grew so large that the gods, in fear, had him chained up He broke the first two chains The third, a magic bond made of the sound of a cat's footsteps, a man's beard, the roots of a mountain, a fish's breath and a bird's spittle, held him until Ragnarok (Judgment Day), when he escaped and swallowed Odin but was slain by Vidar, the latter's son.

FENS, a district in the east of England, possessing a distinctive history and peculiar characteristics. It lies west and south of the Wash, in Lincolnshire, Huntingdonshire, Cambridgeshire and Norfolk, and extends over more than 70 m in length (Lincoln to Cambridge) and some 35 m in maximum breadth (Stamford to Brandon in Suffolk), its area being considerably over half a million acres. Although low and flat, and seamed by innumerable water-courses, the entire region is not, as the Roman name of *Metaris Aestuarium* would imply, a river estuary, but a bay of the North sea, silted up, of which the Wash is the last remaining portion Hydrographically, the Fens embrace the lower parts of the drainage-basins of the rivers Witham, Welland, Nene and Great Ouse; and against these streams, as against the ocean, they are protected by earthen embankments, 10 to 15 ft high. As a rule the drainage water is lifted off the Fens into the rivers by means of steam-pumps, formerly by windmills

General History.—In very early days there is reason to believe that the whole fenland consisted of forest, but Sir Robert Cotton discovered at Conington in Lincolnshire the skeleton of a sea-fish lying six feet below the ground (*See* Sir William Dugdale, *History of Imbanking and Drainage,* 1662) Oak, ash, fir and nut trees, buried in the soil, canoes and flat-bottomed rafts found several feet below the natural beds of rivers; prehistoric beasts and reptiles dug up in a perfect state of preservation; all point to the existence of diverse forms of life before an historic period Then came a great sea-quake which caused immense tidal waves to sweep over the area, transforming it into a vast lake After a time the water did not flow wholly over the land



as the muddiness of the stream produced a sandy settlement; silt formed and checked the usual flowing of the tides.

EARLY ATTEMPTS AT DRAINAGE

According to fairly credible tradition, the first systematic attempt to drain the Fens was made by the Romans. They dug a catchwater drain (as the artificial fenland water-courses are called), the Caer or Car dyke, from Lincoln to Ramsey (or, according to Stukeley, as far as Cambridge), along the western edge of the Fens, to carry off the precipitation of the higher districts which border the fenland, and constructed alongside the Welland and on the seashore earthen embankments, of which some 150 m

survive S. H. Miller is disposed to credit the native British inhabitants of the Fens with having executed certain of these works The Romans also carried causeways over the country. After their departure from Britain in the first half of the 5th century the Fens fell into neglect, and despite the preservation of the woodlands for the purposes of the chase by the Norman and early Plantagenet kings, and the unsuccessful attempt which Richard de Rulos, chamberlain of William the Conqueror, made to drain Deeping fen, the fenland region became almost everywhere waterlogged, and relapsed to a great extent into a state of nature In addition to this it was ravaged by serious inundations of the sea, for example, in the years 1178, 1248 (or 1250), 1288, 1322, 1335, 1467, 1571 Yet the fenland was not altogether a wilderness of reed-grown marsh and watery swamp At various spots, more particularly in the north and in the south, there existed islands of firmer and higher ground, resting generally on the boulder clays of the Glacial epochs and on the inter-Glacial gravels of the Palaeolithic age In these isolated localities members of the monastic orders (especially at a later date the Cistercians) began to settle after about the middle of the 7th century. At Medeshampstead (*ie*, Peterborough), Ely, Crowland, Ramsey, Thorney, Spalding, Peakirk, Swineshead, Tattershall, Kirkstead, Bardney, Sempringham, Bourne and numerous other places, they made settlements and built churches, monasteries and abbeys In spite of the incursions of the predatory Northmen and Danes in the 9th and 10th centuries, and of the disturbances consequent upon the establishment of the Camp of Refuge by Hereward the Wake in the fens of the Isle of Ely in the 11th century, these scattered outposts continued to shed rays of civilization across the lonely Fenland down to the dissolution of the monasteries in the reign of Henry VIII Then they, too, were partly overtaken by the fate which befell the rest of the Fens; and it was only in the end of the 18th and the beginning of the 19th century that the complete drainage and reclamation of the Fen region was finally effected Attempts on a considerable scale were indeed made to reclaim them in the 17th century, and the work as a whole forms one of the most remarkable chapters of the industrial history of England

A larger work than these, however, was the drainage of the fens of the Nene and the Great Ouse, comprehending the wide tract known as the Bedford level This district took name from the agreement of Francis, earl of Bedford, the principal landholder, and 13 other adventurers, with Charles I. in 1634, to drain the level, on condition of receiving 95,000 ac of the reclaimed land A partial attempt at drainage had been made (1478–90) by John Morton, when bishop of Ely, who constructed Morton's Leam, from Peterborough to the sea, to carry the waters of the Nene, but this also proved a failure. An act was passed, moreover, in 1602 for effecting its reclamation, and Lord Chief Justice Popham (whose name is preserved in Popham's Eau, south-east of Wisbech) and a company of Londoners began the work in 1605; but the first effectual attempt was that of 1634 The work was largely directed by the Dutch engineer Cornelius Vermuyden, who had begun work in the Fens in 1621, and was knighted in 1628

Three years after the agreement of the earl of Bedford and his partners with the king, after an outlay of £100,000 on the part of the company, the contract was annulled, on the fraudulent plea that the works were insufficient; and an offer was made by King Charles to undertake its completion on condition of receiving 57,000 ac in addition to the amount originally agreed on This unjust attempt was frustrated by the breaking out of the civil war; and no further attempt at drainage was made until 1649, when the parliament reinstated the earl of Bedford's successor in his father's rights After an additional outlay of £300,000, the adventurers received 95,000 ac of reclaimed land, according to the contract, which, however, fell far short of repaying the expense of the undertaking In 1664 a royal charter was obtained to incorporate the company, which still exists, and carries on the concern under a governor, six bailiffs, 20 conservators, and a commonalty, each of whom must possess 100 ac. of land in the level, and has a voice in the election of officers. The conservators must each possess not less than 280 ac., the governor and bailiffs each 400 ac The original adventurers had allotments of land according to their interest of the original 95,000 ac ; but Charles II , on granting the charter, took care to secure to the crown a lot of 12,000 ac, out of the 95,000, which, however, is held under the directors, whereas the allotments are not held in common, though subject to the laws of the corporation The level was divided in 1697 into three parts, called the North, Middle, and South levels —the second being separated from the others by the Nene and Old Bedford rivers

These attempts failed owing to the determined opposition of the native fenmen ("stilt-walkers"), whom the drainage and appropriation of the unenclosed fenlands would deprive of valuable and long-enjoyed rights of commonage, turbary (turf-cutting), fishing, fowling, etc Oliver Cromwell is said to have put himself at their head and succeeded in stopping all the operations. When he became Protector, however, he sanctioned Vermuyden's plans, and Scottish prisoners taken at Dunbar, and Dutch prisoners taken by Blake in his victory over Van Tromp, were employed as the workers Vermuyden's system, however, was exclusively Dutch, and while perfectly suited to Holland it did not meet all the necessities of East Anglia He confined his attention almost exclusively to the inland draining and embankments, and did not provide sufficient outlet for the waters themselves into the sea

Holland and other Fens on the west side of the Witham were finally drained in 1767, although not without much rioting and lawlessness, and a striking account of the wonderful improvements effected by a generation later is recorded in Arthur Young's *General View of the Agriculture of the County of Lincoln* (London, 1799) The East, West and Wildmore fens on the east side of the Witham were drained in 1801–07 by John Rennie, who carried off the precipitation which fell on the higher grounds by catchwater drains, on the principle of the Roman Car dyke, and improved the outfall of the river, so that it might the more easily discharge the fen water which flowed or was pumped into it The Welland or Deeping fens were drained in 1794, 1801, 1824, 1837 and other years Almost the only portion of the original wild Fens now remaining is Wicken fen, which lies east of the river Cam and south-east of the isle of Ely

PRESERVATION OF THE RIVERS

The Fen Rivers.—The preservation of the Fens depends in an intimate and essential manner upon the preservation of the rivers, and especially of their banks The Witham, known originally as the Grant Avon, also called the Lindis by Leyland (*Itinerary*, vol vii), and in Jean Ingelow's *High Tide on the Lincolnshire Coast*, is some 80 m long, and drains an area of 1,079 sq m It owes its present condition to engineering works carried out in the years 1762–64, 1865, 1881, and especially in 1880–84 In 1500 the river was dammed immediately above Boston by a large sluice, the effect of which was not only to hinder free navigation up to Lincoln (to which city sea-going vessels used to penetrate in the 14th and 15th centuries), but also to choke the channel below Boston with sedimentary matter The sluice, or rather a new structure made in 1764–66, remains; but the river below Boston has been materially improved (1880–84), first by the construction of a new outfall, 3 m. in length, whereby the channel was not only straightened, but its current carried directly into deep water, without having to battle against the often shifting sandbanks of the Wash, and secondly, by the deepening and regulation of the river-bed up to Boston The Welland, which is about 70 m. long, and drains an area of 760 sq m., was made to assume its present shape and direction in 1620, 1638, 1650, 1794 and 1835 and following years The most radical alteration took place in 1794, when a new outfall was made from the confluence of the Glen (30 m. long) to the Wash, a distance of nearly 3 m The Nene, 90 m long, and draining an area of some 1,077 sq m . was first regulated by Bishop Morton, and it was further improved in 1631, 1721, and especially, under plans by Rennie and Telford, in 1827–30 and 1832. The work done from 1721 onward consisted in straightening the lower reaches of the stream and in directing and deepening the outfall. The Ouse (*q.v.*)

or Great Ouse, the largest of the fenland rivers, seems to have been deflected, at some unknown period, from a former channel connecting via the Old Croft river with the Nene, into the Little Ouse below Littleport; and the courses of the two streams are now linked together by an elaborate network of artificial drains, the results of the great engineering works carried out in the Bedford level in the 17th century. The old channel, starting from Earith, and known as the Old West water, carries only a small stream until, at a point above Ely, it joins the Cam The salient features of the plan executed by Vermuyden for the earl of Bedford in the years 1632–53 were as follows taking the division of the area made in 1697–98 into (i.) the North level, between the river Welland and the river Nene, (ii) the Middle level, between the Nene and the Old Bedford river (which was made at this time, *i.e.*, 1630), and (iii) the South level, from the Old Bedford river to the south-eastern border of the fenland In the North level the Welland was embanked, the New South Eau, Peakirk drain, and Shire drain made, and the existing main drains deepened and regulated In the Middle level the Nene was embanked from Peterborough to Guyhirn, also the Ouse from Earith to Over, both places at the south-west edge of the fenland, the New Bedford river was made from Earith to Denver, and the north side of the Old Bedford river and the south side of the New Bedford river were embanked, a long narrow "wash," or overflow basin, being left between them, several large feeding-drains were dug, including the Forty Foot or Vermuyden's drain, the Sixteen Foot river, Bevill's river, and the Twenty Foot river; and a new outfall was made for the Nene, and Denver sluice (to dam the old circuitous Ouse) constructed In the South level Sam's cut was dug and the rivers were embanked Since that period the mouth of the Ouse has been straightened above and below King's Lynn (1795–1821), a new straight cut made between Ely and Littleport, the North Level Main drain and the Middle Level drain constructed, and the meres of Ramsey, Whittlesey (1851–52), etc, drained and brought under cultivation A considerable barge traffic is maintained on the Ouse below St Ives, on the Cam up to Cambridge, the Lark and Little Ouse, and the network of navigable cuts between the New Bedford river and Peterborough The Nene, though locked up to Northampton, and connected from that point with the Grand Junction canal, is practically unused above Wansford, and traffic is small except below Wisbech

The effect of the drainage schemes has been to lower the level of the fenlands generally by some 18 in., owing to the shrinkage of the peat consequent upon the extraction of so much of its contained water; and this again has tended, on the one hand, to diminish the speed and erosive power of the fenland rivers, and, on the other, to choke up their respective outfalls with the sedimentary matters which they themselves sluggishly roll seawards

The Wash.—From this it will be plain that the Wash (*q.v.*) is being silted up by riverine detritus The formation of new dry land, known at first as "marsh," goes on, however, but slowly During the centuries since the Romans are believed to have constructed the sea-banks which shut out the ocean, it is computed that an area of not more than 60,000 to 70,000 ac has been won from the Wash, embanked, drained and brought more or less under cultivation The greatest gain has been at the direct head of the bay, between the Welland and the Great Ouse, where the average annual accretion is estimated at 10 to 11 lineal feet On the Lincolnshire coast, farther north, the average annual gain has been not quite 2 ft.; whilst on the opposite Norfolk coast it has been little more than 6 in annually On the whole, some 35,000 ac were enclosed in the 17th century, about 19,000 ac. during the 18th, and about 10,000 ac. during the 19th century

Previous to the drainage of the Fens, ague, rheumatism and other ailments incidental to a damp climate were widely prevalent, but at the present day the Fen country is as healthy as the rest of England; indeed, there is reason to believe that it is conducive to longevity.

Historical Notes.—The earliest inhabitants of this region of whom we have record were the British tribes of the Iceni confederation; the Romans, who subdued them, called them Coriceni or Coritani In Saxon times the inhabitants of the Fens were known (*e.g.*, to Bede) as Gyrvii, and are described as traversing the country on stilts In the end of the 18th century those who dwelt in the remoter parts were scarcely more civilized, being known to their neighbours by the expressive term of "Slodgers" These rude fen-dwellers have in all ages been animated by a tenacious love of liberty Boadicea, queen of the Iceni; Hereward the Saxon, who defied William the Conqueror; Cromwell and his Ironsides, are representative of the fenman's spirit at its best The fen peasantry showed a stubborn defence of their rights, not only when they resisted the encroachments and selfish appropriations of the "adventurers" in the 17th century, but also in the Peasants' Rising of 1381, and in the Pilgrimage of Grace in the reign of Henry VIII So long as the Fens were unenclosed and thickly studded with immense "forests" of reeds, and innumerable marshy pools and "rows" (channels connecting the pools), they abounded in wild fowl, being regularly frequented by various species of wild duck and geese, godwits, cranes, bitterns, herons, swans, ruffs and reeves Vast numbers of these were taken in decoys (for descriptions of these *see* Oldfield, Appendix, pp 2–4, of *A Topographical and Historical Account of Wainfleet* [London, 1829]; and Miller and Skertchly, *The Fenland,* pp 369–375) and sent to the London markets At the same time equally vast quantities of tame geese were reared in the Fens, and driven by road to London to be killed at Michaelmas The waters, too, abounded in fresh-water fish, especially pike, perch, bream, tench, rud, dace, roach, eels and sticklebacks The soil of the reclaimed Fens is of exceptional fertility, being almost everywhere rich in humus, which is capable not only of producing very heavy crops of wheat and other corn, but also of fattening live-stock with peculiar ease Of the crops peculiar to the region it must suffice to mention the old British dye-plant woad, which is still grown on a small scale in two or three parishes immediately south of Boston; hemp, which was extensively grown in the 18th century, but is not now planted; and peppermint, which is occasionally grown, *e.g.*, at Deeping and Wisbech In the second half of the 19th century the Fen country acquired a certain celebrity in the world of sport from the encouragement it gave to speed skating Whenever practicable, championship and other racing meetings are held, chiefly at Littleport and Spalding The little village of Welney, between Ely and Wisbech, has produced some of the most notable of the typical Fen skaters, *e.g.*, "Turkey" Smart and "Fish" Smart

Apart from fragmentary ruins of the former monastic buildings of Crowland, Kirkstead and other places, the Fen country is especially remarkable for the size and beauty of its parish churches, mostly built of Barnack rag from Northamptonshire While in the possession of such buildings as Ely cathedral and the parish church of Walpole St Peter's—the finest specimen of Perpendicular architecture in Britain—other districts must be considered equally rich in ecclesiastical architecture Using these fine opportunities, the Fen folk have for many years cultivated the science of campanology

Dialect.—Owing to the comparative remoteness of their geographical situation, and the relatively late period at which the Fens were definitely enclosed, the Fenmen have preserved several dialectal features of a distinctive character, not the least interesting being their close kinship with the classical English of the present day E E Freeman (*Longman's Magazine,* 1875) reminded modern Englishmen that it was a native of the Fens, "a Bourne man, who gave the English language its present shape." This was Robert Manning, or Robert of Brunne, who in or about 1303 wrote *The Handlyng Synne*

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FENTON, EDWARD (d. 1603), English navigator, son of Henry Fenton and brother of Sir Geoffrey Fenton (*q.v.*), was born in Nottinghamshire In 1577 he sailed, in command of the "Gabriel," with Frobisher's second expedition for the discovery of the north-west passage, and in 1578 he was second in command in Frobisher's third expedition, in the "Judith" In 1582 he was put in charge of an expedition which was to sail round the Cape of Good Hope to the Moluccas and China, and to obtain any knowledge of the north-west passage that was possible without hindrance to his trade. The voyage was a failure He spent his time quarrelling with his officers, and only reached Brazil In 1588 he had command of the "Mary Rose," one of the ships of the fleet that was formed to oppose the Armada. He died 15 years later. (*See* Hakluyt's *Voyages*, Vol. iv)

FENTON, ELIJAH (1683–1730), English poet, was born at Shelton, near Newcastle-under-Lyme He graduated from Jesus college, Cambridge, in 1704, and became a schoolmaster Fenton is remembered as the coadjutor of Alexander Pope in his translation of the *Odyssey*. He was responsible for the first, fourth, 19th and 20th books, for which he received £300 He produced an edition of Milton, with a life (1725), which went through an amazing number of editions, also one of Waller (1729). Other works of his were *Oxford and Cambridge Miscellany Poems* (1707), *Miscellaneous Poems* (1717), and *Mariamne*, a tragedy (1723) He died at East Hampstead, Berkshire, on July 16, 1730 He was buried in the parish church and his epitaph was written by Pope

See W W. Lloyd, *Elijah Fenton, his Poetry and Friends* (1894); W. H Hulme, *Two Early Lives of Milton* (1924)

FENTON, SIR GEOFFREY (*c* 1539–1608), English writer and politician, was the son of Henry Fenton, of Nottinghamshire. He was brother of Edward Fenton the navigator He is said to have visited Spain and Italy in his youth, possibly he went to Paris in Sir Thomas Hoby's train in 1566, for he was living there in 1567, when he wrote *Certaine tragicall discourses written oute of Frenche and Latin*, a free translation of François de Belleforest's French rendering of Matteo Bandello's *Novelle*. Fenton's other works are as follows: *Monophylo* (1572), *Golden Epistles gathered out of Guevarae's workes as other authors . .* (1575), *Historie of Guicciardin, translated out of French by G F.* (1579), and a number of Protestant tracts Through Lord Burghley he obtained, in 1580, the post of secretary to the new lord deputy of Ireland, Lord Grey de Wilton He held the secretaryship until the end of his life by the favour of Elizabeth, whom he kept informed of the activities of her other servants in Ireland Under James I. he had to share the post with Sir Richard Coke Fenton died in Dublin on Oct 19, 1608, and was buried in St Patrick's cathedral He had two children, a son, Sir William Fenton, and a daughter, Catherine, who in 1603 married Richard Boyle, 1st earl of Cork

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FENTON, LAVINIA (1708–1760), English actress, was probably the daughter of a naval lieutenant named Beswick, but she bore the name of her mother's husband Her first appearance was as Monimia in Otway's *Orphans*, in 1726 at the Haymarket. She then joined the company of players at the theatre in Lincoln's Inn Fields She made her greatest success as Polly Peachum in *The Beggar's Opera* Hogarth's picture shows her in one of the scenes, with the duke of Bolton in a box She ran away with Charles Paulet, 3rd duke of Bolton, a man much older than herself, who, after the death of his wife in 1751, married her. She died on Jan 24, 1760.

See C. E Pearce, *Polly Peachum* (1913).

FENTON, parish; Stoke-on-Trent county, municipal and parliamentary borough, Staffordshire, England Pop. (1921) 26,714. In 1910 it amalgamated with neighbouring towns to form the municipal borough of Stoke-on-Trent (*q v*) which in 1925 became a city

FENUGREEK, in botany, *Trigonella Foenum-graecum* (so called from the name given to it by the ancients, who used it as fodder for cattle), a leguminous herb similar in habit and in most characters to species of *Medicago*. The leaves are formed of three obovate leaflets, the middle one of which is stalked; the flowers are solitary, or in clusters of two or three, and have a campanulate, 5-cleft calyx The pods are many-seeded, cylindrical or flattened, and straight or only slightly curved Fenugreek is indigenous to south-eastern Europe and western Asia, and is cultivated in the Mediterranean region, parts of central Europe, in Morocco, and largely in Egypt and in India It bears a sickle-shaped pod, containing from 10 to 20 seeds, from which 6% of a foetid, fatty and bitter oil can be extracted by ether. In India the fresh plant is employed as an esculent The seed is an ingredient in curry powders, and is used for flavouring cattle foods.

FENWICK, ETHEL GORDON (Mrs. Bedford Fenwick) (1857–), English nurse and journalist, was born at Spynie House, Morayshire, on Jan 26, 1857 In 1881 she was appointed matron of St. Bartholomew's hospital, London She married a gynaecologist, Dr Bedford Fenwick, and devoted herself to the work of organizing and raising the status of the nursing profession by State registration An act of Parliament for this purpose was passed in 1919 Mrs Fenwick became, in 1893, honorary editor of *The British Journal of Nursing*, and was a prominent member of the Society of Women Journalists She founded the Royal British Nurses' Association in 1887, the International Council of Nurses in 1899, and was president of the National Council of Nurses of Great Britain, a constituent part of the International Council Mrs. Fenwick was also president of the British College of Nurses.

FENWICK, SIR JOHN (*c.* 1645–1697), English conspirator, son of Sir William Fenwick, was a strong partisan of King James II, and on the accession of William III began at once to plot against the new king, for which he underwent a short imprisonment in 1689. He publicly insulted Queen Mary in 1691, and it is practically certain that he was implicated in the schemes for assassinating William which came to light in 1695 and 1696 After the seizure of his fellow-conspirators, Robert Charnock and others, he went into hiding, but was arrested in June, 1696 To save himself he offered to reveal all he knew about the Jacobite conspiracies; but his confession was a farce, being confined to charges against some of the leading Whig noblemen, which were damaging, but not conclusive. Sufficient evidence of treason was doubtful, but the Whigs secured the passage through parliament of a bill of attainder Fenwick was beheaded in London on Jan 28, 1697

FEOFFMENT, in English law, during the feudal period, the usual method of granting or conveying a freehold or fee (*see* FIEF and FEE) The essential elements were *livery of seisin* (delivery of possession), which consisted in formally giving to the feoffee on the land a clod or turf, or a growing twig, as a symbol of the transfer of the land, and words by the feoffor declaratory of his intent to deliver possession to the feoffee with a "limitation" of the estate intended to be transferred This was called livery *in deed*. Livery *in law* was made not on but in sight of this land, the feoffor saying to the feoffee, "I give you that land, enter and take possession" Livery in law, in order to pass the estate, had to be perfected by entry by the feoffee during the joint lives of himself and the feoffor. It was usual to evidence the feoffment by writing in a charter or deed of feoffment, but writing was not essential until the Statute of Frauds By the Real Property Act 1845 all corporeal hereditaments were declared to be *in grant* as well as *livery, i e*, they could be granted by deed without livery. (*See* REAL PROPERTY.)

FERAE NATURAE, the name given to wild, as distinguished from domestic animals, including game, deer, etc. which are not regarded as legal property unless confined A person having such in his possession is responsible for any damage caused by them. Certain rights may be obtained by the owner of the property if the animals habitually resort to his land, as well as the privilege of hunting them. *See* GAME LAWS.

FER-DE-LANCE (*Lachesis lanceolatus*), a poisonous American snake allied to the copperhead and bushmaster (*qq v*). Reaching a length of 7 ft. it resembles a rattlesnake (*q v*) in appearance, but without the "rattle" of the latter, and is found almost throughout Central and South America Its bite is usually fatal. The fer-de-lance feeds on rats and other small animals

FERDINAND, a name borne at various times by European sovereigns and princes (Span. *Fernando* or *Hernando;* Ital *Ferdinando* or *Ferrante;* in O.H G. *Herinand,* "brave in the host")

FERDINAND (1577–1650), elector and archbishop of Cologne, son of William V., duke of Bavaria, was born on Oct 7, 1577. He was educated by the Jesuits at the university of Ingolstadt, and in 1595 became coadjutor archbishop of Cologne He became elector and archbishop in 1612 on the death of his uncle Ernest, whom he also succeeded as bishop of Liége, Munster and Hildesheim He supported the league founded by his brother Maximilian I, duke of Bavaria, and wished to involve the leaguers in a general attack on the Protestants of north Germany The duke refused to accede to his brother's wish, but, in spite of these temporary differences, Ferdinand sent troops and money to the assistance of the league when the Thirty Years' War broke out in 1619 In 1647 he joined his brother Maximilian in concluding an armistice with France and Sweden at Ulm Ferdinand came into conflict with the citizens of Liege; and when the peace of Westphalia freed him from his enemies, he was able to crush the citizens and deprive them of many privileges Ferdinand died at Arnsberg on Sept 13, 1650, and was buried in the cathedral at Cologne

FERDINAND I. (1793–1875), emperor of Austria, eldest son of Francis I. and of Maria Theresa of Naples, was born at Vienna on April 19, 1793 In his boyhood he suffered from epileptic fits, but as his health improved he was not excluded from the succession. In 1830 his father caused him to be crowned king of Hungary In 1831 he was married to Anna, daughter of Victor Emmanuel I of Sardinia. The marriage was barren When Francis I died on the 2nd of March 1835, Ferdinand was recognized as his successor, but his incapacity was so notorious that the conduct of affairs was entrusted to a council of state, consisting of Prince Metternich (*q v*) with other ministers, and two archdukes, Louis and Francis Charles They composed the *Staatsconferenz,* the ill-constructed and informal regency which led the Austrian dominions to the revolutionary outbreaks of 1846–49. (*See* Austria-Hungary) The emperor, who was subject to fits of actual insanity, and in his lucid intervals was weak and confused in mind, was a political nullity His popular name of *Der Gutige* (the kindly man) expressed as much derision as affection Ferdinand had artistic and musical taste In the presence of the revolutionary troubles, which began with agrarian riots in Galicia in 1846, and then spread over the whole empire, he was helpless. He was compelled to escape from the disorders of Vienna to Innsbruck on May 17, 1848 He came back on the invitation of the diet on Aug. 12, but soon had to escape once more from the mob of students and workmen who were in possession of the city. On Dec. 2 he abdicated at Olmutz in favour of his nephew, Francis Joseph. He lived under the supervision of doctors and guardians at Prague till his death on June 29, 1875.

See Krones von Marchland, *Grundriss der oesterreichischen Geschichte* (Vienna, 1882), which gives an ample bibliography.

FERDINAND I. (1503–1564), Roman emperor, was born at Alcalá de Henares on March 10, 1503, his father being Philip the Handsome, son of the emperor Maximilian I, and his mother Joanna, princess of Castile and Aragon In April 1521 the emperor granted to him the archduchies and duchies of upper and lower Austria, Carinthia, Styria and Carniola, adding soon afterwards the county of Tirol and the hereditary possessions of the Habsburgs in south-western Germany. About the same time Ferdinand was appointed to govern the duchy of Württemberg, which had come into the possession of Charles V.; and in May 1521 he was married at Linz to Anna (d 1547), a daughter of Ladislaus, king of Hungary and Bohemia. In 1521 also he was made president of the council of regency (*Reichs-regiment*), appointed to govern Germany during the emperor's absences, and the next five years were occupied with imperial business, in which he acted as his brother's representative, and in the government of the Austrian lands.

In Austria and the neighbouring duchies Ferdinand sought at first to suppress the reformers and their teaching, a policy which increased his difficulties in quelling risings in the districts under his rule after the Peasant's War broke out in 1524 In August 1526 his childless brother-in-law, Louis II, king of Hungary and Bohemia, was killed at the battle of Mohacs, and the archduke at once claimed both kingdoms, both by treaty and by right of his wife He was chosen king of Bohemia in October 1526, and crowned at Prague in the following February. But in Hungary John Zapolya, supported by the national party and soon afterwards by the Turks, offered a sturdy resistance. Although Ferdinand was chosen king at Pressburg in December 1526, and after defeating Zapolya at Tokay was crowned at Stuhlweissenburg in November 1527, he was unable to take possession of the kingdom. The Bavarian Wittelsbachs, incensed at not securing the Bohemian throne, were secretly intriguing with his foes; the French, after assisting spasmodically, made a formal alliance with Turkey in 1535, and Zapolya was a very useful centre for the enemies of the Habsburgs A truce made in 1533 was soon broken, and the war dragged on until 1538, when by the treaty of Grosswardein, Hungary was divided between the claimants. The kingly title was given to Zapolya, but Ferdinand was to succeed. Meanwhile, in January 1531, he had been chosen king of the Romans, or German king, at Cologne He had earned this honour by his loyalty to his brother, Charles V, whom he had represented at several diets In religious matters the king was now inclined to steer a middle course, and in 1532 he agreed to the religious peace of Nuremberg, receiving in return from the Protestants some assistance for the war against the Turks In 1534, however, Philip, landgrave of Hesse, and his associates had succeeded in conquering Wurttemberg on behalf of its exiled duke, Ulrich (*q v.*), and neither Charles nor Ferdinand could send much help to their lieutenants. They were consequently obliged to consent to the treaty of Cadan, made in June 1534, by which the German king recognized Ulrich as duke of Wurttemberg though under Austrian suzerainty.

In Hungary the peace of 1538 was not permanent. When Zapolya died in July 1540 a powerful faction refused to admit Ferdinand's right of succession, and put forward Zapolya's young son John Sigismund as a candidate The cause of John Sigismund was espoused by the Turks and by Ferdinand's other enemies. The king repeatedly sought to make peace with the sultan, but his envoys were haughtily repulsed In 1544, however, a short truce was made This was followed by others, and in 1547 one was concluded for five years, but only on condition that Ferdinand paid tribute for the small part of Hungary which remained in his hands. The struggle was renewed in 1551 and was continued in the same desultory fashion until 1562, when a truce was made which lasted during the remainder of Ferdinand's lifetime During the war of the league of Schmalkalden in 1546 and 1547 the king had taken the field primarily to protect Bohemia, and after the conclusion of the war he put down a rising in this country with some rigour. About 1546 he began to take up a more independent position in imperial politics Although Charles had crushed the league of Schmalkalden he had refused to restore Wurttemberg to Ferdinand, and he gave further offence by seeking to secure the succession of his son Philip, afterwards king of Spain, to the imperial throne. In 1551 Ferdinand agreed that Philip should be his own successor. Events caused these plans to be dropped, but there was a rift between the brothers. During the short war between the emperor and Maurice, elector of Saxony, in 1552 Ferdinand's attitude was lukewarm. He negotiated the treaty of Passau with Maurice in 1552, and in 1555 after the conduct of imperial business had virtually been made over to him, and harmony had been restored between the brothers, he was responsible for the religious peace of Augsberg Early in 1558 Charles abdicated and on March 24, Ferdinand was crowned at Frankfort The emperor's short reign was mainly spent in seeking to settle the religious differences of Germany, and in efforts to prosecute the Turkish war

more vigorously. Although he held firmly to the Roman Catholic Church he sought to obtain tangible concessions to her opponents; but he refused to conciliate the Protestants by abrogating the clause concerning ecclesiastical reservation in the peace of Augsburg, and all his efforts to bring about reunion were futile, though he secured the privilege of communion in both kinds from Pius IV for the laity in Bohemia and in various parts of Germany. In November 1562 he obtained the election of his son Maximilian as king of the Romans, and died in Vienna on July 25, 1564 His family had consisted of six sons and nine daughters

Ferdinand sought to consolidate his Austrian lands, reformed the monetary system in Germany, and reorganized the Aulic council (*Reichshofrat*). Less masterful but more popular than his brother, whose character overshadows his own, he was just and tolerant, a good Catholic and a conscientious ruler

See the article on CHARLES V. and its bibliography, also HUNGARY F B von Bucholtz, *Geschichte der Regierung Ferdinands des Ersten* (Vienna, 1831–1838), K Oberleitner, *Österreichs Finanzen und Kriegswesen unter Ferdinand I* (Vienna, 1859), E Rosenthal, *Die Behördenorganisation Kaiser Ferdinands, I* (Vienna, 1887), and W. Bauer, *Die Anfange Ferdinands I* (Vienna, 1907).

FERDINAND II. (1578–1637), Roman emperor, was the eldest son of Charles, archduke of Styria (d 1590), and a grandson of the emperor Ferdinand I Born at Gratz on July 9, 1578, he was trained by the Jesuits, finishing his education at the university of Ingolstadt, and became the pattern prince of the counter-reformation In 1596 he undertook the government of Styria, Carinthia and Carniola, and after a visit to Italy began an organized attack on Protestantism which under his father's rule had made great progress in these archduchies About 1615 it was agreed that Ferdinand, who already had two sons by his marriage with his cousin Maria Anna (d 1616), daughter of William V, duke of Bavaria, should succeed Matthias in the elective kingdoms of Hungary and Bohemia and should be the next German emperor (*See* HABSBURG *Genealogy*) The elder archdukes renounced their rights in the succession, the claims of Philip III and the Spanish Habsburgs were bought off by a promise of Alsace, and the emperor consented to his supersession during his lifetime in Hungary and Bohemia In 1617 Ferdinand, who was just concluding a war with Venice, was chosen king of Bohemia, and in 1618 king of Hungary; but his election as German king, or king of the Romans, delayed owing to the anxiety of Melchior Klesl (*q v*) to conciliate the Protestant princes, had not been accomplished when Matthias died in March 1619 Before this event, however, an important movement had begun in Bohemia The Bohemian Protestants suddenly realized that their religious, and possibly their civil liberties, were seriously menaced by the choice of Ferdinand as king They declared Ferdinand deposed, and elected the elector palatine of the Rhine, Frederick V, in his stead, and the struggle between the rivals was the beginning of the Thirty Years' War At the same time Bethlen Gabor, prince of Transylvania, invaded Hungary, while the Austrians rose and joined the Bohemians, but having seen his foes retreat from Vienna, Ferdinand hurried to Frankfort, where he was chosen emperor on Aug 28, 1619

To deal with the elector palatine and his allies the new emperor allied himself with Maximilian I, duke of Bavaria, and the Catholic League, who drove Frederick from Bohemia in 1620, while Ferdinand's Spanish allies devastated the Palatinate Peace having been made with Bethlen Gabor in December 1621, the emperor could turn his attention to crushing the Protestants In 1623 the Protestant clergy were expelled from Bohemia; in 1624 all worship save that of the Roman Catholic church was forbidden; and in 1627 an order of banishment against all Protestants was issued A new constitution made the kingdom hereditary in the house of Habsburg, gave larger powers to the sovereign, and aimed at destroying Bohemian nationality A fresh rising in Austria was put down by the aid of the Bavarians in 1627, and Ferdinand could fairly claim that in his hereditary lands at least he had rendered Protestantism innocuous.

The renewal of the Thirty Years' War in 1625 was caused mainly by the emperor's vigorous championship of the cause of the counter-reformation in northern and north-eastern Germany. (*See* THIRTY YEARS' WAR) In March 1629 Ferdinand and his advisers felt themselves strong enough to take the important step towards which their policy in the Empire had been steadily tending Issuing the famous edict of restitution, the emperor ordered that all lands which had been secularized since 1552, the date of the peace of Passau, should be restored to the church, and prompt measures were taken to enforce this decree The result was the outbreak of the third period of the war The comparative failure of the imperial arms was due, in the initial stages of the campaign, to Ferdinand's weakness in assenting in 1630 to the demand of Maximilian of Bavaria that Wallenstein should be deprived of his command; and also to the genius of Gustavus Adolphus, and in its later stages to his insistence on the second removal of Wallenstein, and to his complicity in the assassination of the general (*see* WALLENSTEIN) The peace of Prague, concluded in 1635, marks the definite failure of Ferdinand to crush Protestantism in the Empire, as he had already done in Austria and Bohemia The emperor, however, refused to allow the inhabitants of his hereditary dominions to share in the benefits of the peace During these years Ferdinand had also been menaced by the secret or open hostility of France The last important act of the emperor was to secure in 1636 the election of his son Ferdinand as king of the Romans A few weeks afterwards, on Feb 15, 1637, the emperor died at Vienna, leaving, in addition to the king of the Romans, a son Leopold William (1614–1662), bishop of Passau and Strasbourg

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FERDINAND III. (1608–1657), Roman emperor, was the elder son of the emperor Ferdinand II, and was born at Gratz on July 13, 1608 Educated by the Jesuits, he was crowned king of Hungary in December 1625, and king of Bohemia two years later, and soon began to take part in imperial business Wallenstein, however, refused to allow him to hold a command in the imperial army The young king was appointed the successor of the famous general when he was deposed in 1634, and as commander-in-chief of the imperial troops, he was nominally responsible for the capture of Regensburg and Donauworth, and the defeat of the Swedes at Nordlingen Having been elected king of the Romans, or German king, at Regensburg in Dec 1636, Ferdinand became emperor on his father's death in the following February, and showed himself anxious to put an end to the Thirty Years' War But he was reluctant to grant religious liberty to the Protestants, and anxious to act in unison with Spain In 1640 he had refused to entertain the idea of a general amnesty suggested by the diet at Regensburg, but in 1648 he assented to the treaty of Westphalia (*q v*) Owing to Ferdinand's insistence the Protestants in his hereditary dominions did not obtain religious liberty at this settlement After 1648 the emperor was engaged in carrying out the terms of the treaty and ridding Germany of the foreign soldiery In 1656 he sent an army into Italy to assist Spain in her struggle with France, and he had just concluded an alliance with Poland to check the aggressions of Charles X of Sweden when he died on April 2, 1657 Ferdinand was a scholarly and cultured man, an excellent linguist and a composer of music His first wife was Maria Anna (d. 1646), daughter of Philip III of Spain, by whom he had three sons. Ferdinand, who was chosen king of the Romans in 1653, and who died in the following year; Leopold, who succeeded his father on the imperial throne; and Charles Joseph (d 1664), bishop of Passau and Breslau, and grand-master of the Teutonic order The emperor's second wife was his cousin Maria (d 1649), daughter of the archduke Leopold; and his third wife was Eleanora of Mantua (d. 1686) His musical works, together with those of the emperors Leopold I. and Joseph I., have been published by G Adler (Vienna, 1892–1893).

See M Koch, *Geschichte des deutschen Reiches unter der Regierung Ferdinands III.* (Vienna, 2 vols., 1865–66).

FERDINAND I. (1373–1416), king of Aragon, called "of Antequera," was the son of John I of Castile by his wife Eleanor, daughter of the third marriage of Peter IV of Aragon As infante of Castile Ferdinand had played an honourable part When his brother Henry III died at Toledo, in 1406, the cortes was sitting, and the nobles offered to make him king in preference to his nephew John Ferdinand declined As co-regent of the kingdom with Catherine, widow of Henry III and daughter of John of Gaunt by his marriage with Constance, daughter of Peter the Cruel, Ferdinand proved a good ruler As king of Aragon his short reign of two years left him little time to make his mark. Having been bred in Castile, where the royal authority was, at least in theory, absolute, he showed himself impatient under the checks imposed on him by the *fueros*, the chartered rights of Aragon and Catalonia His most signal act as king was to aid in closing the Great Schism in the Church by agreeing to the deposition of the antipope Benedict XIV, an Aragonese He died at Ygualada in Catalonia on April 2, 1416

FERDINAND, MAXIMILIAN KARL LEOPOLD MARIA (1861–), king of Bulgaria, fifth and youngest son of Prince Augustus of Saxe-Coburg and Gotha, was born on Feb 26, 1861 In 1879 he travelled with his brother Augustus to Brazil, and the results of their botanical observations were published at Vienna, 1883–1888, under the title of *Itinera Principum S Coburgi* Ferdinand was a lieutenant in an Austrian hussar regiment when he was elected prince of Bulgaria, on July 7, 1887, in succession to Prince Alexander, who had abdicated in 1886 He assumed the government on Aug 14, 1887, but Russia for a long time refused to acknowledge the election, and he was accordingly exposed to frequent military conspiracies, connived at by the Russian Government The firmness and vigour with which he met all attempts at revolution were at length rewarded, and his election was confirmed in March 1896 by the Porte and the Great Powers On April 20, 1893 he married Marie Louise de Bourbon (d 1899), eldest daughter of Duke Robert of Parma The prince adhered to the Roman Catholic faith in which he had been brought up, but his son and heir, the young Prince Boris, was received into the Orthodox Greek Church on Feb. 14, 1896 with the Tsar, Nicholas II, as godfather. This event marked a real *rapprochement* with Russia In 1908 Ferdinand married Eleanor (b 1860), a princess of the house of Reuss. Later in the year, in connection with the Austrian annexation of Bosnia-Herzegovina and the crisis with Turkey, he proclaimed the independence of Bulgaria, and took the title of king or tsar (*See* BULGARIA, and EUROPE. *History*)

King Ferdinand in 1911 was the instigator of the Balkan league between Bulgaria, Serbia, Greece and Montenegro, which was formed in 1912 and enabled these four states to declare war against Turkey that same year This pact provided for the future division of the Balkan peninsula, reserving to the arbitration of the emperor of Russia the solution of any doubtful claims The war started in Oct 1912, before the conclusion of the Treaty of Ouchy, which put an end to the Italo-Turkish War (Oct. 15) Under the command of King Ferdinand, the Bulgarian army dealt the most rapid and decisive blows to the enemy; victorious on the battlefields of Kirk Kilisse and Lule Burgas, and having conquered most of Macedonia and Thrace, it started on the open road to Constantinople Europe grew alarmed, the Great Powers brought about the armistice of Dec. 3, 1912, and the London conference, which started on Dec. 13

These discussions, however, ceased abruptly, and military operations were resumed on Feb. 3, 1913. The Bulgarian armies attacked at Gallipoli and Chatalja, and after a gallant siege entered Adrianople on March 26, 1913. However, the Treaty of London which followed did not sanction these victories, and its decisions instead of inaugurating peace, provoked a war between the Balkan States, which began on June 30, 1913, by a simultaneous attack of the Serbs and Bulgarians. The former allies became bitter rivals, Rumania and Turkey joining Montenegro, Greece and Serbia against Bulgaria, who, finding herself closed in by four enemies at once, was forced after a few weeks of brave but useless resistance, to submit unconditionally to the victors' terms The Treaty of Bucharest, signed on Aug 10, 1913, annihilated in one stroke the brilliant results obtained through the heroism of the Bulgarian armies in 1912–3 It deprived Bulgaria of all her conquests including the town of Silistra and part of the Dobruja and gave to the Serbians and Greeks the province of Macedonia for which Bulgaria had made all the sacrifices of the first Balkan War This treaty was the principal cause of Bulgaria's participation in the World War on the side of Germany It explains the resentment of King Ferdinand and his government against the other Balkan States Had the Allied Powers in 1914 guaranteed the revision of the Treaty of Bucharest, Bulgaria would have co-operated with them, but as they failed to do so, Germany was able, by illusory promises, to induce Bulgaria, who felt she had been unjustly treated, to fight for the German cause These German manoeuvres did not succeed at once, for King Ferdinand began by proclaiming the neutrality of Bulgaria in Nov 1914

During May 1915 the Bulgarian Government sounded the four Great Powers, with regard to the fulfilment of Bulgaria's legitimate claims in Macedonia As no concrete answer was returned, King Ferdinand turned to Germany, where his application was received with great cordiality Berlin made lavish promises at once German envoys hurried to Bulgaria, with a view to persuading the King and the Government to conclude a military alliance with Germany The desire for revenge against Serbia, Greece and Rumania inspired Ferdinand to bind Bulgaria to the Central Powers On Sept 21, 1915 he gave the order for general mobilisation, though his Government advised armed neutrality In view of this equivocal situation Russia sent an ultimatum to Bulgaria on Oct 4, 1915, which was succeeded by formal declarations of war against Bulgaria on the part of Serbia, France, Great Britain and Italy Bulgaria was definitely in the German camp; under General Gekoff, commander-in-chief, her armies were victorious on most of the battlefields of Macedonia, Thrace and Rumania, in 1915, 1916 and 1917, against the Serbs, and against the Rumanians The Kaiser, the king of Saxony and the king of Wurttemberg all paid official visits to King Ferdinand at Sofia However, in Sept. 1918, the Bulgarian army, discouraged by innumerable hardships, was defeated at Dobropole, Macedonia, by the Allied troops This was the sign for a general retreat. An armistice was signed at Salonika on Sept. 30 which ended the war between Bulgaria and the Allies After this catastrophe King Ferdinand abdicated in favour of his son Boris on Oct 4, 1918 and left Sofia the same evening for Coburg where he has lived since in retirement (A. ST)

FERDINAND I. (1423–1494), also called Don Ferrante, king of Naples, the natural son of Alphonso V of Aragon and I. of Sicily and Naples, was born in 1423 He succeeded his father on the throne of Naples in 1458, but Pope Calixtus III declared the line of Aragon extinct and the kingdom a fief of the church. The new pope, Pius II, recognized Ferdinand, but John of Anjou decided to try to regain the throne conquered by his ancestors, and invaded Naples Ferdinand was severely defeated by the Angevins and the rebels at Sarno in July 1460, but with the help of Alessandro Sforza and of the Albanian chief, Skanderbeg, he re-established (1464) his authority in the kingdom In 1480 the Turks captured and sacked Otranto, but in the following year it was retaken by Ferdinand's son Alphonso, duke of Calabria An attempt at revolt on the part of the nobles in 1485 was crushed; many of the nobles, notwithstanding Ferdinand's promise of a general amnesty, were afterwards treacherously murdered at his express command He died in Jan. 1494.

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FERDINAND II. (1469–1496), king of Naples, was the grandson of the preceding, and son of Alphonso II. Alphonso abdicated in his son's favour in 1495, on the approach of Charles

VIII of France Ferdinand was unable to defend the city, where there was a strong party hostile to the dynasty. He fled to Ischia, but when the French king left Naples with most of his army, in consequence of the formation of an Italian league against him, he returned and defeated the French garrisons; and the Neapolitans, irritated by the conduct of the French occupation, received him back with enthusiasm With the aid of the great Spanish general, Gonzalo de Cordova, he drove out the invaders He died on Sept 7, 1496

For authorities *see* under FERDINAND I of Naples; for the exploits of Gonzalo de Cordova *see* H P del Pulgar, *Crónica del gran capitano don Gonzalo de Cordoba* (new ed, Madrid, 1834)

FERDINAND IV. (III of Sicily, and I of the Two Sicilies) (1751–1825), king of Naples, third son of Don Carlos of Bourbon (afterwards Charles III of Spain), king of Naples and Sicily, was born in Naples on Jan 12, 1751 When his father ascended the Spanish throne in 1759, Ferdinand, in accordance with the treaties forbidding the union of the two crowns, succeeded him as king of Naples, under a regency presided over by the Tuscan Bernardo Tanucci, who neglected the young king's education, and left him to indulge in his liking for low life. Ferdinand's minority ended in 1767, and his first act was the expulsion of the Jesuits In 1768 he married Maria Carolina, daughter of the empress Maria Theresa The queen secured the dismissal of Tanucci, and with the help of Sir John Acton (*q v*), who eventually became prime minister, sought independence of the Spanish connection and a *rapprochement* with England and Austria From the day of the execution of her sister Marie Antoinette, the queen lived in terror of revolution and Naples joined the coalition against France in 1793 For the history of Ferdinand's intervention in the revolutionary war, the establishment of the Parthenopean republic at Naples, and the savage reaction after the recapture of Naples by the army of brigands and gaol-birds under Cardinal Ruffo, *see* NAPLES *History* Ferdinand had to flee to Sicily in 1806, where he reigned under British protection while Joseph Bonaparte ruled in Naples. Lord Bentinck, the British resident in Sicily, procured the queen's exile to Austria, and Ferdinand allowed his son Francis (afterwards Francis I of the Two Sicilies) to act as regent in Sicily

He returned to Naples after the fall of Napoleon, and proclaimed the kingdom of the Two Sicilies. He was now completely subservient to Italy Ruthless repression of all Liberal opinion favoured the spread of the secret society of the Carbonari (*q v.*) After the revolt of Gen. Pepe (1820) Ferdinand granted a paper constitution, thus securing the help of his Neapolitan subjects in quelling an insurrection in Sicily. The success of the military revolution in Naples alarmed the Powers of the Holy Alliance Ferdinand was invited to the congress of Laibach (*q.v.*) to explain the situation His cynical repudiation at Laibach of the constitution he had granted made conciliation in Naples hopeless An Austrian army occupied Naples, and Pepe was defeated The parliament was now dismissed, and Ferdinand inaugurated an era of savage persecution, supported by spies and informers, against the Liberals and Carbonari, the Austrian commandant in vain protesting against the savagery which his presence alone rendered possible.

Ferdinand died on Jan. 4, 1825 Few sovereigns have left behind so odious a memory. His whole career is one long record of perjury, vengeance and meanness, unredeemed by a single generous act, and his wife was a worthy helpmeet and actively co-operated in his tyranny.

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FERDINAND I. (1345–1383), king of Portugal, sometimes referred to as *el Gentil* (the Gentleman), son of Pedro I of Portugal, was born on Oct 31, 1345, at Coimbra and succeeded his father in 1367 On the death of Pedro of Castile in 1369, Ferdinand, as great-grandson of Sancho IV. by the female line became one of the claimants for the throne of Castile (*see* SPAIN *History*), thus involving himself in disastrous wars between 1370 and 1382, when peace was made at Badajoz, it being stipulated that Beatrix, the heiress of Ferdinand, should marry King John of Castile, and thus secure the ultimate union of the crowns Ferdinand left no male issue when he died at Lisbon on Oct 22, 1383, and the direct Burgundian line, which had been in possession of the throne since Count Henry (about 1112), became extinct

FERDINAND I. (1865–1927), KING OF RUMANIA, was born Aug 24, 1865 at Sigmaringen, Prussia, the second son of Prince Leopold of Hohenzollern-Sigmaringen As Charles I had no son it was decided that the succession should be continued in the family of Prince Leopold, and Prince Ferdinand, Charles's nephew, became Crown Prince of Rumania and heir presumptive to the Rumanian throne in March, 1889 Prince Ferdinand took a great interest in military questions and organized the Rumanian Army on modern lines He was commander-in-chief of the Rumanian armies during the Bulgarian campaign of 1913. On Jan 10, 1893 he married Princess Marie, eldest daughter of the duke of Edinburgh, duke of Saxe-Coburg-Gotha. Six children were born of the marriage.

When Ferdinand ascended the throne on Oct 11, 1914, he realized that an armed intervention in the cause of Rumania's national unity was unavoidable A Hohenzollern by birth, he in due course declared war on his native country As a consequence he was disowned by the Hohenzollern family When Bucharest was occupied by General Mackensen, King Ferdinand and the Royal family withdrew with the Government and the army into Moldavia. There he endured with the rest of the population a most appalling period of anxiety, sickness and want The Bolshevist revolution and the collapse of the Russian armies came as a crowning misery But the Rumanian Army, headed by King Ferdinand, repulsed the German attack at Mărăşeşti, thus saving the rest of the country from invasion. In 1918 the provinces of Bessarabia, Bucowina, Transylvania and the Banat had become united with Rumania, and on Oct 15, 1922 King Ferdinand was crowned, at Alba Julia, king of all Rumanians

Two most important reforms, the agrarian reform and the inauguration of universal suffrage, were enacted under Ferdinand's reign. The expropriation of large estates and their conversion into small holdings did much to guarantee the peaceful development of an agricultural country such as Rumania King Ferdinand was the first landlord to hand over his estates to his peasant-soldiers It was also due to his initiative that the thorny Jewish question was solved by the grant of full civil and military rights to the Rumanian-born Jews In Dec 1925 Ferdinand's eldest son, Charles, renounced his claims to the throne, and Charles's son, Michael, became heir apparent. Ferdinand died on July 20, 1927 (*see* also RUMANIA).

FERDINAND I. (d 1065), *El Magno* or "the Great," king of Castile, son of Sancho III of Navarre, was put in possession of Castile in 1028, on the murder of the last count, as the heir of his mother Elvira, daughter of a previous count of Castile. He married Sancha, sister and heiress of Bermudo, king of Leon, and on the latter's death in battle at Tamaron (1038) took possession of Leon by right of his wife. He was recognized in Spain as emperor in 1056 The use of the title was resented by the emperor Henry IV. and by Pope Victor II., as implying a claim to the headship of Christendom, and as a usurpation on the Holy Roman empire. It did not, however, mean more than that Spain was independent of the empire, and that the sovereign of Leon was the chief of the princes of the peninsula. Although Ferdinand had grown in power by a fratricidal strife with Bermudo of Leon, and though in 1054 he defeated and killed his brother Garcia of Navarre at Atapuerca, he was counted a

pious king, on account of his victories over the Mohammedans, with which he began the period of the great reconquest. Ferdinand died on June 24, 1065, in Leon,—having laid aside his crown and royal mantle, dressed in the frock of a monk and lying on a bier, covered with ashes, which was placed before the altar of the church of Saint Isidore He left three sons, Sancho, Alphonso and Garcia, who divided the kingdom until the murder of Sancho and the imprisonment of Garcia, when Alphonso reigned over the whole as Alphonso VI

FERDINAND II., king of Leon only (d 1188), was the second son of Alphonso VII. and of Berenguela, of the house of the counts of Barcelona. On the division of the kingdoms which had obeyed his father (1157), he received Leon, which he ruled for 30 years. During the minority of his nephew Alphonso VIII of Castile he endeavoured to impose himself on the kingdom as regent. On the west he was in more or less constant strife with Portugal, which was in process of becoming an independent kingdom He extended his dominions southward in Estremadura at the expense of the Moors

FERDINAND III. (1199–1252), *El Santo,* or "the Saint," king of Castile, son of Alphonso IX of Leon, and of Berengaria, daughter of Alphonso VIII. of Castile, ranks among the greatest of the Spanish kings The marriage of his parents, who were second cousins, was dissolved as unlawful by the pope, but the legitimacy of the children was recognized Till 1217 he lived with his father in Leon In that year the young king of Castile, Henry, was killed by accident Berengaria renounced the crown in her son's favour. Alphonso of Leon considered himself tricked, and the young king had to begin his reign by a war against his father and a faction of the Castilian nobles. His own ability and the remarkable capacity of his mother proved too much for the king of Leon and his Castilian allies Ferdinand married Beatrice, daughter of the emperor Philip (of Hohenstaufen), and followed her advice both in prosecuting the war against the Moors and in the steps which she took to secure his peaceful succession to Leon on the death of his father in 1231 After the union of Castile and Leon by law in that year he began the series of campaigns which ended by reducing the Mohammedan dominions in Spain to Granada Cordova fell in 1236, and Seville in 1248 The king of Granada did homage to Ferdinand, and undertook to attend the cortes when summoned. The king was a severe persecutor of the Albigenses, and his formal canonization by Pope Clement X in 1671 was due as much to his orthodoxy as to his crusading He revived the university first founded by his grandfather Alphonso VIII, and placed it at Salamanca By his second marriage with Joan (d 1279), daughter of Simon, of Dammartin, count of Ponthieu, by right of his wife Marie, Ferdinand was the father of Eleanor, the wife of Edward I of England

FERDINAND IV., *El Emplazado* or "the Summoned," king of Castile (d 1312), son of Sancho IV, El Bravo, and his wife Maria de Molina, succeeded to the throne when a boy of six His minority was a time of anarchy. He owed his escape from the violence of competitors and nobles, partly to the tact and courage of his mother, and partly to the citizens of Avila, who gave him refuge within their walls He died suddenly in his tent at Jaen when preparing for a raid into the Moorish territory of Granada, on Sept. 7, 1312 His only son succeeded him as Alphonso XI.

FERDINAND V. of Castile and Leon, and II. of Aragon ("the Catholic") (1452–1516), was the son of John I. of Aragon by his second marriage with Joanna Henriquez, of the family of the hereditary grand admirals of Castile, and was born at Sos in Aragon on March 10, 1452 His marriage in 1469 to his cousin Isabella of Castile (heiress of Henry IV. of Castile) was dictated by the desire to unite his own claims to the crown with hers When the king died in 1474 he made an attempt to procure his own proclamation as king without recognition of the rights of his wife. Isabella asserted her claims firmly, and at all times insisted on a voice in the government of Castile. But though Ferdinand had sought a selfish political advantage at his wife's expense, he was well aware of her ability and high character, and their views in government were identical. The king cared for nothing but dominion and political power, and he played a great part in Europe. His share in establishing the royal authority in all parts of Spain, in expelling the Moors from Granada, in the conquest of Navarre, in forwarding the voyages of Columbus, and in contending with France for the supremacy in Italy, is dealt with elsewhere (*see* SPAIN: *History*) His character explains the most ungracious acts of his life, such as his breach of his promises to Columbus, his distrust of Ximenez and of the Great Captain He feared that Ximenez and the Great Captain would become too independent, and watched them in the interest of the royal authority. He is said to have boasted that he had deceived Louis XII of France twelve times, it is, in any case, certain that when Ferdinand made a treaty, or came to an understanding with any one, the contract was generally found to contain implied meanings favourable to himself which the other contracting party had not expected. The worst of his character was prominently shown after the death of Isabella in 1504 He claimed the regency of Castile in the name of his insane daughter Joanna, without regard to the claims of her husband Philip of Habsburg The hostility of the Castilian nobles baffled him for a time, but on Philip's death (1506) he reasserted his authority His second marriage with Germaine of Foix in 1505 had apparently been contracted in the hope that by securing an heir male he might punish his Habsburg son-in-law Aragon did not recognize the right of women to reign, and would have been detached together with Catalonia, Valencia and the Italian states if he had had a son On this occasion Ferdinand allowed passion to obscure his political sense, and lead him into acts which tended to undo his work of national unification. As king of Aragon he abstained from inroads on the liberties of his subjects which might have provoked rebellion A few acts of illegal violence are recorded of him—as when he caused a notorious demagogue of Saragossa to be executed without form of trial. His arrangement of the convention of Guadalupe, which ended the fierce Agrarian conflicts of Catalonia, was wise and profitable to the country, though it was probably dictated by a wish to weaken the landowners by taking away their feudal rights Ferdinand died at Madrigalejo in Estremadura on Feb. 23, 1516

The lives of the kings of this name before Ferdinand V. are contained in the chronicles, and in the *Anales de Aragon* of Zurita, and the *History of Spain* by Mariana. Both deal at length with the life of Ferdinand V.

See W H Prescott, *History of the Reign of Ferdinand and Isabella* (1887); J. H. Mariéjol, *L'Espagne sous Ferdinand et Isabelle* (Paris, 1892)

FERDINAND VI., king of Spain (1713–1759), second son of Philip V, founder of the Bourbon dynasty, by his first marriage with Maria Luisa of Savoy, was born at Madrid on Sept. 23, 1713, and succeeded his father in 1746. His father's second wife, Elizabeth Farnese, looked upon her stepson as an obstacle to the fortunes of her own children The hypochondria of his father left Elizabeth mistress of the palace Ferdinand was married in 1729 to Maria Magdalena Barbara, daughter of John V of Portugal For the events of his reign *see* SPAIN. *History*, and ENSENADA, *Cenon de Somodevilla* The death of his wife Barbara broke his heart. Between the date of her death in 1758 and his own on Aug 10, 1759, he fell into a state of melancholy bordering on madness

See William Coxe, *Memoirs of the Kings of Spain of the House of Bourbon,* vol iv (1815), Count of Fernan Nuñez, *Vida de Carlos III.* ed. Morel Fatio and Don A. Paz y Melia (1898).

FERDINAND VII., king of Spain (1784–1833), eldest son of Charles IV., king of Spain, and of his wife Maria Luisa of Parma, was born at the palace of San Ildefonso near Balsain in the Somosierra hills, on Oct. 14, 1784. On March 17, 1808 he succeeded to the throne by the forced abdication of his father, but was shortly afterwards taken prisoner by Napoleon He was released in 1814 (*see* SPAIN *History*) and returned to find that while Spain was fighting for independence in his name a new world had been born of foreign invasion and domestic revolution. He came back to assert the ancient doctrine that the sovereign authority resided in his person only, and repudiated the impracticable constitution made by the cortes in 1814 without his consent He proved himself, however, incapable of governing or of

choosing reliable advisers, and was influenced by the lowest intriguers The autocratic powers of the Grand Alliance, though forced to support him as the representative of legitimacy in Spain, watched his proceedings with disgust and alarm When the inevitable revolt came in 1820 he grovelled to the insurgents as he had done to his parents and was imprisoned by them until 1823 On the invasion by France in that year the revolutionary party carried Ferdinand to Cadiz, and he continued to make promises of amendment till he was free Then, in violation of his oath to grant an amnesty, he revenged himself for three years of coercion by killing on a scale which revolted his "rescuers" and against which the duke of Angoulême, powerless to interfere, protested by refusing the Spanish decorations offered him for his services During his declining years Ferdinand's energy abated After his fourth marriage in 1829 with Maria Christina of Naples by whom he had two daughters, he was persuaded by his wife to confirm Charles IV 's revocation of the Salic Law of Philip V, which gave a preference to all the males of the family in Spain When Ferdinand died at Madrid on Sept 29, 1833, his daughter Isabella II was proclaimed queen, and her mother acted as regent

King Ferdinand VII kept a diary during the troubled years 1820–23, which has been published by the count de Casa Valencia

See D E de K Vays, *Historia de la vida y reinado de Ferdinand VII* 3 vols (1842) Miñano, *Histoire de la Révolution d'Espagne*, 1820–23 (2 vols, 1824), P Zancada, *El Sentido Social de la revolución de 1820 Revista contemporénea* (1903)

FERDINAND II. (1810–1859), nicknamed King Bomba, king of the Two Sicilies, son of Francis I, was born at Palermo on Jan. 12, 1810 In 1832 he married Cristina, daughter of Victor Emmanuel I, king of Sardinia, and shortly after her death in 1836 he took for a second wife Maria Theresa, daughter of the archduke Charles of Austria After his Austrian alliance the bonds of despotism were more closely tightened, there were various abortive attempts at insurrection, in 1837 there was a rising in Sicily in consequence of the outbreak of cholera, and in 1843 the Young Italy Society organized a series of isolated outbreaks The expedition of the Bandiera brothers (*q v*) in 1844, was followed by cruel sentences on the rebels In Jan 1848 a rising in Sicily was the signal for revolutions all over Italy and Europe, it was followed by a movement in Naples, and the king granted a constitution which he swore to observe. Serious disturbances broke out in the streets of Naples on May 15, the king withdrew his promise and dissolved the national parliament on March 13, 1849 He retired to Gaeta to confer with various deposed despots, and the Austrian victory at Novara (March 1849) strengthened his determination to return to a reactionary policy. Sicily was subjugated by General Filangieri, and the chief cities were bombarded, an expedient which won for Ferdinand the epithet of "King Bomba." In 1851 the political prisoners of Naples were calculated by Mr. Gladstone in his letters to Lord Aberdeen (1851) to number 15,000 (probably the real figure was nearer 40,000), and the scandalous reign of terror, and the abominable treatment of the prisoners led France and England to make diplomatic representations to the king, but without success. An attempt was made by a soldier to assassinate Ferdinand in 1856 He died on May 22, 1859, just after the declaration of war by France and Piedmont against Austria, which was to result in the collapse of his kingdom and his dynasty He was bigoted, cruel, mean, treacherous, though not without a certain *bonhomie*.

Bibliography —See *Correspondence respecting the Affairs of Naples and Sicily, 1848–1849, presented to both Houses of Parliament by Command of Her Majesty*, May 4, 1849; *Two Letters to the Earl of Aberdeen*, by the Right Hon W. E Gladstone, 1st ed, 1851 (an edition published in 1852 and the subsequent editions contain an *Examination of the Official Reply of the Neapolitan Government*); N. Nisco, *Ferdinando II. il suo regno* (Naples, 1884); H. Remsen Whitehouse, *The Collapse of the Kingdom of Naples* (1899); R de Cesare, *La Caduta d' un Regno*, vol i. (Città di Castello, 1900), which contains a great deal of fresh information, but is badly arranged and not always reliable. *See* also M. Schipa, *Il regno di Napoli al tempo di Carlo di Borbone* (1904).

FERDINAND III. (1769–1824), grand duke of Tuscany, and archduke of Austria, second son of the emperor Leopold II., was born on May 6, 1769 On his father becoming emperor in 1790, he succeeded him as grand duke of Tuscany. Ferdinand was one of the first sovereigns to enter into diplomatic relations with the French republic (1793), and although, a few months later, he was compelled by England and Russia to join the coalition against France, he concluded peace with that power in 1795, and by observing a strict neutrality saved his dominions from invasion by the French, except for a temporary occupation of Livorno, till 1799, when he was compelled to vacate his throne, and a provisional Republican government was established at Florence Shortly afterwards the French arms suffered severe reverses in Italy, and Ferdinand was restored to his territories; but in 1801, by the peace of Lunéville, Tuscany was converted into the kingdom of Etruria, and he retired to Vienna He obtained in 1802 the electorship of Salzburg, which he exchanged by the peace of Pressburg in 1805 for that of Wurzburg In 1806 he was admitted as grand duke of Wurzburg to the confederation of the Rhine. He was restored to the throne of Tuscany after the abdication of Napoleon in 1814, but had again to vacate his capital for a short time in 1815, when Murat proclaimed war against Austria After Waterloo he remained in undisturbed possession of his grand duchy The restoration in Tuscany was not accompanied by the reactionary excesses which characterized it elsewhere, and a large part of the French legislation was retained His prime minister was Count V Fossombroni (*q v*) The mild rule of Ferdinand, his solicitude for the welfare of his subjects, his enlightened patronage of art and science, his encouragement of commerce, and his toleration render him an honourable exception to the generality of Italian princes of his time He died in June 1824, and was succeeded by his son Leopold II (*q v*)

Bibliography —A von Reumont, *Geschichte Toscanas* (Gotha, 1877), and "Federico Manfredini e la politica Toscana nei primi anni di Ferdinando III." (in the *Archivo Storico Italiano*, 1877), Emmer, *Erzherzog Ferdinand III, Grossherzog von Toskana* (Salzburg, 1871), C Tivaroni, *L'Italia durante il dominio francese*, ii 1–44 (Turin, 1889), and *L'Italia durante il dominio austriaco*, ii 1–18 (Turin, 1893). *See* also under Fossombroni, Vittorio, and Capponi, Gino

FERDINAND, duke of Brunswick (1721–1792), Prussian general field marshal, was the fourth son of Ferdinand Albert, duke of Brunswick, and was born at Wolfenbuttel on Jan. 12, 1721 In his twentieth year he was made chief of a newly-raised Brunswick regiment in the Prussian service He was present in the battles of Mollwitz and Chotusitz. In succession to Margrave Wilhelm of Brandenburg, killed at Prague (1744), Ferdinand received the command of Frederick the Great's *Leibgarde* battalion, and distinguished himself at Sohr (1745) During the ten years' peace he was in the closest touch with the military work of Frederick the Great, who sought to make the guards battalion a model of the whole Prussian army. Ferdinand became one of the king's most intimate friends In the first campaign of the Seven Years' War Ferdinand commanded one of the Prussian columns which converged upon Dresden, and in the operations which led up to the surrender of the Saxon army at Pirna (1756), and at the battle of Lobositz, he led the right wing of the Prussian infantry In 1757 he distinguished himself at Prague, and he served also in the campaign of Rossbach. Shortly after this he was appointed to command the allied forces which were being organized for the war in western Germany He found this army dejected by a reverse and a capitulation, yet within a week of his taking up the command he assumed the offensive, and thus began the career of victory which made his European reputation as a soldier. His conduct of the five campaigns which followed (*see* Seven Years' War) was naturally influenced by the teachings of Frederick, whose pupil the duke had been for so many years Ferdinand, indeed, approximated more closely to Frederick in his method of making war than any other general of the time Yet his task was in many respects far more difficult than that of the king. Frederick was the absolute master of his own homogeneous army, Ferdinand merely the commander of a group of contingents, and answerable to several princes for the troops placed under his control In 1758 he fought and won the battle of Crefeld, several marches beyond the Rhine, but so advanced a position he could not well maintain, and he fell back to the

Lippe. He resumed a bold offensive in 1759, only to be repulsed at Bergen (near Frankfort-on-Main). On Aug 1 of this year Ferdinand won the brilliant victory of Minden (*q.v.*) Vellinghausen, Wilhelmsthal, Warburg and other victories followed, and Frederick, hard pressed in the eastern theatre of war, owed much of his success in an almost hopeless task to the continued pressure exerted by Ferdinand in the west He was promoted field marshal in November 1758

Ferdinand exerted himself to compensate those who had suffered by the Seven Years' War, devoting to this purpose most of the small income he received from his various offices and the rewards given to him by the allied princes The estrangement of Frederick and Ferdinand in 1766 led to the duke's retirement from Prussian service, but there was no open breach between the old friends, and Ferdinand visited the king in 1772, 1777, 1779 and 1782 After 1766 he passed the remainder of his life at his castle of Veschelde, where he became a patron of learning and art, and a great benefactor of the poor He died on July 3, 1792

See Von Westphalen, *Geschichte der Feldzuge des Herzogs Ferdinands von Braunschweig-Luneburg* (5 vols, Berlin, 1859–1872), also authorities for SEVEN YEARS' WAR

FERENTINO, a town and episcopal see of Italy, province of Frosinone (anc *Ferentinum,* to be distinguished from Ferentum or Ferentinum in Etruria), 48 m E S E by rail from it Pop (1921) 7,776 (town) 15,212 (commune) It is picturesquely situated on a hill 1,290 ft above sea-level, and still possesses considerable remains of ancient fortifications The lower portion of the outer walls is built of roughly hewn blocks of limestone, above this in places is walling of rectangular blocks of tufa Two gates, the Porta Sanguinaria (with an arch with tufa voussoirs), and the Porta S Maria, a double gate constructed entirely of rectangular blocks of tufa, are preserved Outside this gate is the tomb of A Quinctilius Priscus, a citizen of Ferentinum, with a long inscription cut in the rock

The acropolis has massive retaining walls similar to those of the lower town At the eastern corner, under the present episcopal palace, a projecting rectangular terrace is supported by walls of quadrilateral blocks of limestone arranged almost horizontally, while upon the level thus formed a building of rectangular blocks of local travertine was raised A projecting cornice bears two inscriptions of the period of Sulla, recording its construction by two censors (local officials), and in the interior there is an inscription of the same censors over one of the doors, and another over a smaller external side door The windows lighting these chambers come immediately above the cornice, and the wall continues above them again The whole of this construction probably belongs to one period The cathedral occupies a part of the level top of the ancient acropolis, it was reconstructed on the site of an older church in 1099–1118, the interior was restored to its original form in 1902 It contains a fine canopy in the "Cosmatesque" style The Gothic church of S. Maria Maggiore, in the lower town (13th–14th century), has a very fine exterior The Romans captured Ferentinum, the chief city of the Hernici, in 364 B C It took no part in the rising of 306 B C. The inhabitants became Roman citizens after 195 B C It lay just above the Via Latina and, being a strong place, served for the detention of hostages Horace praises its quietness, and it does not appear much in later history (T A)

See Ashby, *Rom Mitteil* xxiv (1909), 1 *sqq*

FERENTUM or FERENTIS, an ancient town of Etruria, about 6 m N of Viterbo and 3½ m E of the Via Cassia It was the birthplace (A D 32) of the emperor Salvius Otho, was destroyed in the 11th century, and is now entirely deserted It occupied a ridge running from east to west, with deep ravines on three sides There are some remains of the city walls, and of various Roman structures, including some baths, of which the most important is the theatre The stage front is still standing, it is pierced by seven openings with flat arches It has recently been well restored, and fitted for use for theatrical representation The necropolis was on the hill called Talone on the north-east A tomb of the Republican period with several sarcophagi of the gens Salvia, no doubt ancestors of the emperor Otho, has been found there.

FERETORY, in architecture, the enclosure or chapel within which the shrine or bier-shaped tomb was placed

FERGHANA, (1) A range of mountains in Asiatic Russia, branching off about lat 41° N and long 75° E from the Tian Shan range, and rising to altitudes of 12,000 feet or more

(2) The name given to the rich and fertile valley lying south of this range and north of the Alai mountains, and opening out towards the south west The climate is dry and warm, with an average temperature of 68° F in March, rising rapidly to 95° through June, July and August Snow and frost occur in December and January, when the temperature may fall to −4° F No rain falls during the 5 months following April, and the valley owes its fertility to irrigation from the rivers Naryn and Karadarya, which unite near Namangan to form the Syr-darya or Jaxartes river On the right bank of the Syr-darya, from Namangan to Khojent, are vast expanses of barren shifting river sand, a menace to the fertile, irrigated areas, upon which they encroach under the influence of the south west wind The chief crop is cotton, wheat, millet, maize and rice take the next place Fruits, especially apricots, are widely cultivated and there are numerous vineyards The area under lucerne is increasing Silkworm breeding is dying out, probably through the increasing intensity of cotton cultivation and manufacture The extension of the Transcaspian railway into Ferghana (1899), and the opening of the Orenburg–Tashkent railway (1906) gave a great impetus to trade and helped to develop the cotton growing industry In northern Ferghana a rubber-producing euphorbia and other medicinal and aromatic herbs are found The Ferghana valley has had an eventful history, its fertility has always proved attractive and the Khojent pass made it vulnerable to invaders It was overrun by Arabs in A D 719 In the 9th and 10th centuries it was ruled by the Persian Samanid dynasty, while in the 12th century, it became subject to Kara-Kitai, the fore-runner of Jenghiz Khan, who later conquered it Tamerlane conquered it later on In 1513 the Uzbeks expelled Baber, the last descendant of Tamerlane, and until about 1770 the separate cities and clans had each its own Bek, or ruler From that time until its conquest by Russia, it was ruled by the Khans of Khokand In 1876 it became part of a much larger unit called Ferghana, which was created as a province of Russian Turkistan, with new Marghelan (now Ferghana) as its administrative centre Since the fall of the Tsarist régime, the valley has become part of the Uzbekistan S S R, though for a time it was an independent Soviet province Irrigated areas are essentially dependent upon law and order for their productivity, not only because of the need for equable distribution of water to the cultivators, but also because of the constant care and labour necessary to preserve the channels in good order and to prevent bogging or salting of the land Ferghana consequently suffered severely during the war and civil war of 1914 onwards, and the cotton and other harvests are still below the 1913 level The Soviet government hopes to introduce modern methods of irrigation and agriculture, but capital is not yet forthcoming, and the cultural level of the population is not such as to make the introduction of scientific methods easy *See* also UZBEK REPUBLIC

(3) A town formerly known as New Marghelan or Skobelev (after the Russian general M D Skobelev *q v*) It is situated in the Khokand district of the Uzbekistan S S R, in lat 40° 32′ N long 71° 48′ E, in the south-east of the Ferghana valley It was built by the Russians, after their conquest of the Khanate of Khokand, ten miles south east of the old town of Marghelan, and became the administrative centre for the Ferghana province of the former Russian Turkistan A branch line links it with the Khokand-Andijan railway, and it has an electric power station and two cotton factories Pop (1926) 11,910

FERGUS FALLS, a city of western Minnesota, U S.A., 170m. N W. of Minneapolis, on the Red river of the North, the county seat of Otter Tail county It is served by the Great Northern and the Northern Pacific railways, and by motor bus lines The population was 7,581 in 1920 (70% of foreign birth or foreign parentage, largely Scandinavian) and was estimated

locally at 8,500 in 1928 Situated in the "park region" of the State, the city has great natural beauty, enhanced by boulevards, shaded streets and well kept lawns It is the seat of a State hospital for the insane (1887), of Park Region college (Norwegian Lutheran, 1892), and of Northwestern college (Swedish Lutheran, 1901) There is a hydro-electric plant, and various manufacturing industries Permanent settlement dates from 1866 The village was incorporated in 1872, and became a city in 1881

FERGUSON, ADAM (1723–1816), Scottish philosopher and historian, was born at Logierait, Perthshire, and educated at Perth grammar school and the University of St Andrews In 1745, he was appointed deputy chaplain of the 43rd (afterwards the 42nd) regiment (the Black Watch), and at the battle of Fontenoy (1745) he fought in the ranks Having abandoned the clerical profession, in 1757 he succeeded David Hume as librarian to the faculty of advocates, but soon became tutor in the family of Lord Bute

In 1759 Ferguson was appointed professor of natural philosophy at Edinburgh, and in 1764 of "pneumatics" (mental philosophy) "and moral philosophy." Subsequently his chief publications were *Essay on the History of Civil Society* (1767), an anonymous pamphlet on the American revolution (1776), and a *History of the Progress and Termination of the Roman Republic* (1783), which passed through several editions After resigning his professorship in 1785, he devoted himself to the revision of his lectures, which he published (1792) as *Principles of Moral and Political Science* He died at St Andrews on Feb 22, 1816

Ferguson's ethical speculations were carefully criticized by Cousin (*see* his *Cours d'histoire de la philosophie morale au dix-huitième siècle*, pt ii, 1839–40). "We find in his method the wisdom and circumspection of the Scottish school, with something more masculine and decisive in the results The principle of *perfection* is a new one, at once more rational and comprehensive than benevolence and sympathy, which in our view places Ferguson as a moralist above all his predecessors"

See *Biographical Sketch* by J. Small (1864); *Public Characters* (1799–1800); Chambers's *Biographical Dictionary of Eminent Scotsmen;* J. McCosh, *The Scottish Philosophy* (1875).

FERGUSON, ROBERT (*c* 1637–1714), British conspirator and pamphleteer, called the "Plotter," was a son of William Ferguson (d 1699) of Badifurrow, Aberdeenshire He became vicar of Godmersham, Kent, from which living he was expelled by the Act of Uniformity in 1662 In 1680 he wrote "A letter to a Person of Honour concerning the 'Black Box,'" in which he supported the claim of the duke of Monmouth to the crown against that of the duke of York, he also claimed the authorship of the pamphlet "No Protestant Plot" (1681), parts of which are usually ascribed to Shaftesbury Ferguson was deeply implicated in the Rye House plot, and fled to Holland with Shaftesbury in 1682, returning to England early in 1683. For his share in another plot against Charles II he was outlawed Ferguson took a leading part in organizing Monmouth's rising of 1685 He drew up the manifesto against James II, escaping to Holland after the battle of Sedgemoor He landed in England with William of Orange in 1688, and received a sinecure appointment in the Excise Ferguson was soon in correspondence with the exiled Jacobites He shared in all the plots against the life of William, but although he was several times arrested on suspicion, he was never brought to trial He died in great poverty in 1714, leaving behind him a great and deserved reputation for treachery It has been suggested that Ferguson was a spy, and that his frequent escapes from justice were due to official connivance

See James Ferguson, *Robert Ferguson, the Plotter* (Edinburgh, 1887), which gives a favourable account of Ferguson

FERGUSON, SIR SAMUEL (1810–1886), Irish poet and antiquary, was born at Belfast He was educated at Trinity college, Dublin, was called to the Irish bar in 1838, and was made Q.C. in 1859, but in 1867 retired from practice upon his appointment as deputy-keeper of the Irish records He was knighted in 1878. His two masterpieces, "The Forging of the Anchor," one of the finest of modern ballads, and the humorous prose extravaganza of "Father Tom and the Pope," appeared in *Blackwood's Magazine.* He published *Lays of the Western Gael* in 1865, *Poems* in 1880, and in 1872 *Congal,* an attempt to revivify the heroic age of Ireland in an epic poem. He died at Howth on Aug 9, 1886. His most important antiquarian work, *Ogham Inscriptions in Ireland, Wales, Scotland,* was published in 1887.

See *Sir Samuel Ferguson in the Ireland of his Day* (1896), by his wife, Mary C Ferguson; also an article by A. P. Graves in *A Treasury of Irish Poetry in the English Tongue* (1900), ed. Stopford Brooke and T. W Rolleston, and J O'Hagan, *Poetry of Sir Samuel Ferguson* (1887).

FERGUSSON, JAMES (1808–1886), Scottish writer on architecture, was born at Ayr on Jan 22, 1808. His father was an army surgeon During ten years spent in manufacturing indigo in India he collected material for his *Rock-cut Temples of India* (1845) His real monument is his *History of Architecture* (1865, later edition revised by R Phenè Spiers), which is a standard work He died in London on Jan 9, 1886

FERGUSSON, ROBERT (1750–1774), Scottish poet, son of Sir William Fergusson, was born in Edinburgh He was educated at Dundee Grammar school and St Andrew's and became a copying clerk in a lawyer's office in Edinburgh In 1771 he began to contribute poems to Ruddiman's *Weekly Magazine.* He was a member of the Cape Club, celebrated in his poem "Auld Reekie," the members of which used to meet at a tavern in Craig's Close He was severely injured in the head by a fall, and died at Darien House asylum on Oct 16, 1774 His poems were collected a year before his death, and are interesting for their influence on Burns, whose "Holy Fair," for instance, is modelled on Fergusson's "Leith Races" Burns himself put up the memorial stone on Fergusson's grave in 1787

See D Irving, *Lives of the Scottish Poets* (1804), R Chambers, *Biographical Dictionary of Eminent Scotsmen* (1835), *The Poems of Robert Fergusson, with a sketch of the author's life by Robert Aitken* (1916), *The Poetical Works of Robert Fergusson, with a biographical introduction by R Ford* (Paisley, 1917).

FERGUSSON, SIR WILLIAM, BART (1808–1877), British surgeon, was born at Prestonpans, East Lothian, on March 20, 1808 He was a pupil at Edinburgh of the anatomist Robert Knox (1791–1862) whose demonstrator he was appointed at the age of twenty In 1836 he succeeded Robert Liston as surgeon to the Edinburgh Royal infirmary, and went to London in 1840 as professor of surgery in King's college, and surgeon to King's College hospital Fergusson revived the operation for cleft-palate, which for many years had fallen into disrepute, and invented a special mouth-gag for the same He also devised many other surgical instruments, chief among which, and still in use to-day, are his bone forceps, lion forceps and vaginal speculum In 1866 he was created a baronet He died in London on Feb 10, 1877 Fergusson introduced the practice of "conservative surgery," by which he meant the excision of a joint rather than the amputation of a limb He was the author of an admirable historical work, *The Progress of Anatomy and Surgery in the Nineteenth Century* (1867), and of a *System of Practical Surgery* (1842), which went through several editions

FERINGHI or **FERINGHEE,** an Asiatic term for a European originally used in a purely geographical sense (Persian, *Farangi,* Frank) but now generally carrying a hostile significance The combatants on either side during the Indian Mutiny called each other Feringhies and Pandies

FERISHTA, MOHAMMED KASIM (*c.* 1570–*c.* 1611), Persian historian, was born at Astrabad, on the shores of the Caspian Sea In 1589 Ferishta removed to Bijapur, where he spent the remainder of his life under the immediate protection of the shah Ibrahim Adil II., who engaged him to write a history of India At the court of this monarch he died about 1611. In the introduction to his work a *résumé* is given of the history of Hindostan prior to the times of the Mohammedan conquest, and also of the victorious progress of the Arabs through the East. Ferishta is reputed one of the most trustworthy of the Oriental historians, and his work still maintains a high place as an authority. Several portions of it have been translated into English; but the best as well as the most complete translation is that published by General J. Briggs under the title of *The History of the Rise of the Mahometan Power in India* (London, 1829, 4 vols. 8vo).

FERMANAGH, a county of Ireland, in the province of Ulster, bounded north-west by Donegal, north-east by Tyrone, east by Monaghan, and south to west by Cavan and Leitrim The area is 417,912 ac , or about 653 sq miles The county lies chiefly in the basin of the Erne, which divides it into two nearly equal sections The surface is hilly and, especially round Lough Erne, is picturesque. The climate, though moist, is healthy The chief mountains are Cuilcagh (2,188 ft) and Tiltinbane (1,949), partly in Leitrim and Cavan, Belmore (1,312), west of Enniskillen, Glenkeel (1,223), Shean North (1,135), rising from Lough Erne, Tappaghan (1,122) in the north, Dooharn (1,255) and Carnmore (1,034) on the east of the loughs Tossett or Toppid and Turaw (Tooraw) mountains on the west form striking features in the scenery But the most distinguishing features are the Upper and Lower Loughs Erne, stretching from south-east to north-west These lakes are expansions of the river Erne, which enters the county from Cavan, flows through Upper Lough Erne, past Enniskillen and through Lower Lough Erne, on its way to the Atlantic at Ballyshannon At Belleek it forms a considerable waterfall, and is here notable for good salmon fishing Trout are taken in most of the loughs, and pike of great size in the Loughs Erne The western boundary takes in a small portion of Lough Melvin, and Upper and Lower Loughs Macnean (or Lough Nilly) lie on the Cavan border. Various streams feed the two principal loughs There are chalybeate and sulphur springs At Belcoo, near Enniskillen, there is a well in local repute for its cure of paralytic and other diseases, and 4 m N W , at a place called "the Daughton," are natural caves

This county includes in the north an area of gneiss from Donegal and a metamorphic region from Tyrone A fault divides the latter from the Old Red Sandstone that spreads south Limestone forms fine scarps on the south side of Lower Lough Erne, capped by beds regarded as the Yoredale series The scenery about Loughs Macnean rises in similarly scarped hills to the summit of Cuilcagh The "Marble Arch" cave near Florencecourt, with its emerging river, is a characteristic subterranean waterway in the limestone. Higher Carboniferous strata form highlands north-east and south-west of Upper Lough Erne

Fermanagh is chiefly a pastoral and agricultural county There are pottery works at Belleek Three branches of the G N railway—from Clones, from Londonderry via Omagh, and from Bundoran—meet at Enniskillen The Sligo, Leitrim and Northern Counties railway, connecting with the southern and western systems, also runs to Enniskillen, and the Clogher Valley light railway connects with the G N railway at Maguiresbridge

Population and Administration.—The population (57,985 in 1926) has shown a steady decrease (by emigration) at every census since 1841, when it was nearly 100,000 larger In 1911 56% were Roman Catholics, 34% Church of Ireland, 25% were Irish-speaking The county is divided for administrative purposes into the urban district of Enniskillen (pop [1926] 4,883) and rural districts of Enniskillen (17,795), Irvinestown (13,846) and Lisnaskea (21,461)—the two last having absorbed the former rural districts of Belleek and Clones in 1921 The county council consists of 22 councillors, presided over by a chairman and vice-chairman Fermanagh is in the Northern Ireland circuit, with assizes at Enniskillen, the county town, and quarter sessions at Enniskillen and Newtown Butler, and has 13 petty sessional districts. The Poor Law unions run with the neighbouring counties, except Leitrim In addition to the places named, Kesh, Lack, Derrygonnelly and Lisbillard have markets and fairs. Irvinestown and Lisnaskea also have a monthly flax market Under the Government of Ireland Act, 1920, the county was united with Co. Tyrone in returning two members to parliament Ecclesiastically it falls within the two dioceses of Clogher and Kilmore (both Protestant and Roman Catholic).

History.—By the ancient Irish the district was called *Feormagh-Eanagh,* or the "country of the lakes", and also Magh-uire, or "the country of the waters " A large portion was occupied by the *Guarii,* the ancestors of the MacGuires or Maguires, a name still common Another derivation refers the name to a tribe of the *Fir Monach* that settled here in the 3rd century, while the old baronies of Clankelly and Clanawley refer to other ancient Irish clans Fermanagh was formed into a county on the shiring of Ulster in 1585 by Sir John Perrot, and was included in the scheme of colonization of James I , the Plantation of Ulster In 1689 battles were fought between William III 's army and the Irish under Macarthy (for James II), at Lisnaskea and Newtown Butler In various places may be seen the ruins of ancient castles, Danish raths or encampments, and tumuli, in the last of which urns and stone coffins have been found, with other early Irish and ecclesiastical ruins on some of the small islands in Lower Lough Erne Of these the chief is Devenish island, near Enniskillen (*q v*), with its ruined abbey, stone cross and one of the finest examples of a round tower in the country

FERMAT, PIERRE (1601–1665), French mathematician, was born on Aug 17, 1601, at Beaumont-de-Lomagne near Montauban In his youth, with Pascal, he made discoveries about the properties of numbers, on which he later built his method of calculating probabilities. His book *De maximis et minimis* caused a dispute with Descartes His brilliant researches in the theory of numbers entitle him to rank as the founder of the modern theory. They were made, and in 1670 published by his son, in the form of notes on Diophantus Other theorems were published in his *Opera Varia,* and in John Wallis's *Commercium epistolicum* (1658). He also studied the reflection of light (*q v*) and enunciated his *principle of least time* For *Fermat's Last Theorem* see below

Fermat was a councillor for the parliament of Toulouse, distinguished both for legal knowledge and for strict integrity of conduct He was also an accomplished general scholar and linguist He died at Castres, near Toulouse, on Jan 12, 1665

The *Opera mathematica* of Fermat were published at Toulouse, in 2 vols folio, 1670 and 1679 The *Oeuvres* of Fermat, including not only the *Opera mathematica,* but his correspondence with Descartes, Pascal and others, were edited by P Tannery and C Henry (Paris, 1891–94).

FERMAT'S LAST THEOREM, a statement which is famous in the history of mathematics, namely that there do not exist integers x, y and z, none of which being zero, which satisfy

$$x^n+y^n=z^n, \qquad (1)$$

n being a given integer > 2 It was first given by Fermat who wrote, about the year 1637, upon the margin of his copy of the works of Diophantus, "I have discovered a truly remarkable proof which this margin is too small to contain " He did not publish his proof, however, and no complete demonstration has as yet been discovered

The theorem was proved by Euler for $n=3$ and 4 To prove it in general, it is then not difficult to see that it is sufficient to demonstrate the impossibility of

$$x^l+y^l+z^l=0 \qquad (2)$$

in non-zero integers x, y and z for any odd prime $l > 3$ This was proved by Legendre in 1823 for $l=5$, and later by Lebesgue for $l=7$ These proofs excited great interest among the mathematicians of the time and many efforts were made to extend them to other values of l, a number of them resulting in errors For example, the celebrated mathematicians Lamé and Cauchy published many results concerning (2) which were based on assumptions later proved false. The discussion and study of these mistakes led to the formulation, by Kummer, of one of the most powerful and fruitful concepts which has ever been introduced into mathematics, *i e* , the notion of *ideal* numbers By means of this idea Kummer was able to prove (in 1850) that (2) is impossible in integers x, y and z, none zero, for all primes l for which none of the numerators of the Bernoulli numbers (*q.v.*) B_a, $a=1, 2, \ldots, (l-3)/2$, is divisible by l, where $B_1=1/6$, $B_2=1/30$, etc Primes l of this character are called *regular* By extensive numerical computations he found that the only primes less than 100 which are not regular are 37, 59 and 67, and in a later article published in 1874 he obtained results from which it may be inferred that the only primes which are not regular between the limits 100 and 166 are 101, 103, 131, 149 and 157. In the year 1857 Kummer published another memoir in which he concluded after a long and complicated procedure that (2) is

impossible under three assumptions concerning the nature of the algebraic field defined by ζ where $\zeta = e^{2i\pi/l}$ He finds, again by the use of extensive numerical computations, that these three assumptions are satisfied for $l=37$, 59 and 67, and hence that (2) is impossible for all primes $l<100$

In papers published recently by H S Vandiver several errors were pointed out in the arguments employed by Kummer in his paper of 1857 and the necessary corrections were made The latter's extensive numerical computations concerning the regular and non-regular primes l which are less than 100 and which we have already referred to, have not all been checked, however, by other writers If we assume they are all correct then (2) has been proved impossible for all primes $l<100$ For the statement of later results we shall divide the discussion into two cases If in (2), x, y and z are prime to each other and to l, this condition will be referred to as case I of Fermat's last theorem; if x, y and z are prime to each other and one of them is divisible by l, the condition will be called case II of the theorem We shall also confine ourselves to mentioning only those criteria for the solution of (2) which do not involve in their enunciation the theory of algebraic numbers

Legendre published in 1823 the following theorem due to Sophie Germain —If there exists an odd prime p such that the congruence

$$u^l+v^l+w^l\equiv 0 \pmod{p} \qquad (3)$$

has no set of integral solutions u, v and w, each not divisible by p, and such that l is not the residue of the lth power of any integer modulo p, then (2) has no solutions x, y and z, each prime to l By means of this result Sophie Germain proved that (2) is impossible in case I for all primes $l<100$

In 1857 Kummer proved that if (2) is satisfied in case I then

$$B_n\left[\frac{d^{l-2n}\log(x+e^v y)}{dv^{l-2n}}\right]_{v=0}\equiv 0 \pmod{l}, \qquad (4)$$

$n=1, 2, \ldots, (l-3)/2$, where B_n is, as before, the nth Bernoulli number and the other symbol designates the result obtained by taking the $(l-2n)$th derivative with respect to v of the logarithm of $x+e^v y$, where e is the Napierian base, and setting $v=0$ In 1905, Mirimanoff showed that the criteria (4), with the others obtained from them by replacing x by z, etc , are equivalent to

$$\frac{B_{l-i}}{2} f_i(t) \equiv 0 \pmod{l}, \qquad (4a)$$

$i=3, 5, \ldots, l-2$; $-t=x/y, y/x, x/z, z/x, y/z, z/y$,

$$f_i(t)=\sum_{k=1}^{l-1} k^{i-1} t^k, \qquad (4b)$$

and added the criterion

$$f_{l-1}(t)\equiv 0 \pmod{l}$$

for the solution of (2) in case I The criteria (4a) and (4b) are now generally referred to as the Kummer criteria

In 1908 Dickson, using Sophie Germain's theorem, proved that (2) is impossible in case I for all primes $l<7{,}000$ Wieferich, in 1909, by the use of (4a) and (4b) proved that, if (2) is possible in case I, then $2^{l-1}\equiv 1 \pmod{l^2}$, and in 1910 Mirimanoff obtained, on the same assumption, $3^{l-1}\equiv 1 \pmod{l^2}$, Furtwängler in 1912 proved that, if (2) is satisfied in case I and r is a factor of x or of x^2-y^2, where $x^2-y^2\equiv 0 \pmod{l}$, then $r^{l-1}\equiv 1 \pmod{l^2}$. This result includes those of Wieferich and Mirimanoff just referred to In the year 1925 Beeger found that the only primes $l<14{,}000$, for which $2^{l-1} \pmod{l^2}$ are $l=1{,}093$ and $l=3{,}511$, the case $l=1{,}093$ having been previously noted by Meissner Using these results with those of Dickson he concludes that (2) is impossible in integers x, y and z prime to l, for all primes $l<14{,}000$ H S Vandiver obtained in 1926 the theorem that, if there exists an odd prime $p=1+ml$, such that $m<10l$ and

$$u^l+v^l+w^l\equiv 0 \pmod{p},$$

has no set of integral solutions u, v, w, each not divisible by p, then (2) has no solution in case I. He also proved (1925) that if (2) is satisfied in case I. then

$$f_i(t)\, f_{l-i}(t)\,(l^{1-t}\equiv 0 \pmod{l}$$

$i=1, 2, \ldots, l-1$; t having the same meaning as in (4a).

As to case II of the theorem, *i e*, when one of the integ x, y and z in (2) is divisible by l, no result has been publish which is known to represent an advance over Kummer's resu in his memoir of 1857 In general, as to the present attitu towards Fermat's last theorem, there is evident among matl maticians a growing opinion that it is not true In particul several specialists in the theory of numbers think that it is qu possible that there exist odd prime integers l and integers x, y a z prime to each other, $z\equiv 0 \pmod{l}$ such that

$$x^l+y^l+z^l=0$$

However, in case I , everything indicates that it is true, althou it has not been proved That it has not been proved for this c is one of the most amazing facts in present-day mathematics, a for this reason alone the great celebrity of the theorem is perha justified Also the many attempts to solve it by competent matl maticians have led to a number of remarkable developments number theory, including very abstract conceptions and profou results, arrived at only after long chains of reasoning In 19 the Wolfskehl prize of 100,000 marks, for the first demonstrati of the theorem was established This led to the publication of se eral thousand erroneous "proofs" by individuals who were, i the most part, not at all equipped mathematically to cope w the problem

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FERMENTATION. Fermentation seen in the making bread, in wine making and brewing is the classical example the change brought about in materials containing starch or sug by the action of yeast In the case of wine making, brewing a the making of bread, the fundamental chemical changes are t same, for starch must first be transformed into sugar before can be fermented in the accepted sense of the word, that is say, before it can undergo the decomposition into alcohol and c bon dioxide which is the essence of alcoholic fermentation T yeast decomposing the sugar gives rise to carbon dioxide gas whi first saturates the fluid or fills the interstices of the solid T excess of gas escapes, causing a frothing and bubbling of t liquor, but in most fermented materials some of the carbonic a gas remains and is partly responsible for the exhilarating a pleasing properties of the fluid The rising of dough is due to t pressure generated by carbon dioxide gas, and this action is c served in an accelerated manner when the bread is first put in the oven The rate at which the dough rises or is fermented c pends upon several factors such as the temperature, and t amount of salt present, so that by varying such factors t baker is able to hold the process under control

Yeast is now known to be a living material, and the spores germs of yeast are to be found everywhere adherent to the pa ticles of dust in the air Consequently any sugary material expos to the air quickly becomes fermented Prior to the discovery such germs in the atmosphere the ferment or leaven was suppos either to have been produced spontaneously, generated as it we within the material itself by some occult force, or else to have be derived from pre-existing yeast from time immemorial This last view was nearer the truth, for it conceived of yeast as somethi akin to life Indeed when questioned as to the origin of the Kepl ferment, which is analogous to yeast, Mohammedans in the Ca casus to this day will declare that the first grains of Kephir we put there by Allah And is not, in the New Testament, the co parison of the Kingdom of Heaven, made at one time to a see and at another time to leaven?

It would be fallacious, therefore, to imagine because of t materialistic tendencies of the alchemists, that humanity h never had any conception of yeast as a living thing, or of fe mentation as a process akin to life.

The alchemists, however, mixed up all sorts of phenomena,

he strength of superficial analogies, and applied the name fermen- ation to any change accompanied by an evolution of gas, as, for xample, the action of acids on chalk or soda, or the formation of froth or scum on metals when calcined The philosopher's stone as supposed to set up a fermentation in the base metals and give se to the noble metals In short, fermentation was any sort of oiling or bubbling set up in a cauldron or crucible (Latin *Fer- ere*, to boil)

The Antiquity of the Art of Fermentation.—It is impossi- le to place any date to the antiquity of the art of fermentation, nd much that passes at the present time as novel was known to ie ancients The addition of preservatives to wine, or the appli- ation of heat to fermented liquors to prevent their subsequent eterioration, for which many patents were taken out immediately fter Pasteur's demonstration of the microbic cause of disease wine, were practices well known to the Greeks and the Romans, nd probably at still more remote times

Pliny tells us that wine was liable to become vinegar during a oyage, but that such wines as withstood the voyage were actually iore mature than they would have been in the same time on land le points out the necessity of leaving a space between jars of ine in a cellar, to prevent "contagion" He gives also an interest- ig description of the preparation of a medicinal wine called *ios* meaning life Pliny praises this wine, as justly reputed to are many diseases It should be prepared, he says, by gathering ie grapes in the sunshine which follows rain, turning the grapes ily, twice or thrice before crushing, and subsequently maturing ie wine in the sun In the absence of rain, the indications were to xpose the grapes still longer to the sun, presumably to destroy ie impurities which the rain would have washed away

Belon writes that wines of Crete were always brought to the oil prior to exportation

Columelle, apparently the most reliable of the early writers on is subject, indicates how wine may be prevented from alteration y a preliminary heating of the grape juice (must), and the nportance of adding water from a well in the same district as iat of the vineyard to replace the water lost by evaporation This riter recognizes also that the best wines are such as do not require ny treatment, for, as he says, that which can please without any esort to artifice is superior to all

Ideas of Fermentation at the Beginning of the 19th Cen- ury.—Such ancient practices, however, hardly found any echo the ideas of the 18th and early 19th century Vitalism was in isrepute, the microscope had not been perfected, and its revela- ons were but little credited, chemistry had just made rapid rides to the front, and organic chemistry, through the masterful ork especially of Liebig and Wohler, had become established as ie sure way to a study of physiology, medicine and agriculture ny attempt to introduce vague and unknown causes, as for ex- mple a possible influence of microscopic forms of life in the rocess of fermentation, was considered retrograde and branded s vitalistic

It was thought that the classical way to treat the subject of rmentation was as Lavoisier had treated it, namely to study the iemical changes, but to leave the question of the nature of the rment strictly alone A theory due to Georg Stahl (1697) was dvocated by Berzelius (1843) and Liebig about the same time iebig's idea was much the same as that of Stahl, namely that a rment was an albuminoid substance in the act of decomposing, id hence in a condition of internal or molecular vibration, and iat this vibration could be communicated to other materials, caus- ig them thus to ferment Berzelius' idea was less committal For im it sufficed that the presence of the ferment caused the de- omposition to be set up in the material and he did not specify ything as to the internal condition of the ferment itself Ber- elius introduced the term catalytic action, to express the idea iat the ferment did not really take a part in the changes in any iemical sense, but acted by contact.

Liebig had certainly strong evidence that certain changes analo- ous to fermentation could occur in the absence of life. Bitter lmonds crushed with a little water underwent a change, which d to the decomposition of a sugar compound (glucoside), with the liberation of sugar, prussic acid, and an aromatic principle which gives to the almonds a most characteristic odour This de- composition did not occur if the almonds were boiled with water for a few minutes. The change was therefore brought about ap- parently by some agency very analogous to a ferment which was also destroyed by heat. Liebig and Wohler showed, however, that destroying the life in the almonds did not prevent the action of this ferment-like principle, for they could precipitate the active substance by means of concentrated alcohol, and isolate it as a white amorphous powder still possessing the ability to decompose the glucoside

And another very remarkable fact tended to strengthen the then current views that fermentation could be explained without invok- ing the idea of the intervention of life This was the discovery made by Edmund Davy (1820) that finely divided platinum, sometimes called spongy platinum or platinum black, could by its mere contact with alcohol or alcohol vapour produce acetic acid, which was known to be the acid produced from wine in the ordinary process of vinegar fermentation The platinum black, in contact with alcohol, became spontaneously red hot, and remained glowing as long as alcohol vapour was present

The various above-mentioned considerations, however, repre- sented rather isolated pieces of information than any definite knowledge as to the nature of fermentation, and it was by no means sure that there was any real connection, for example, be- tween the soluble ferment which Liebig obtained from almonds, and the classical process of alcoholic fermentation, which, after all, in view of its vast practical importance in industry, was really the type of fermentation by which all others were to be judged

The Revelations of the Microscope.—There can be no doubt that we must look to the invention by Leewenhoek (1680) of a microscope powerful enough to render visible the structure of the material known from time immemorial as associated with fer- mentation, namely yeast, or leaven, as the milestone which marks the progress of mankind towards a knowledge of the meaning of fermentation Leewenhoek observed the structure of yeast but did not recognize that it was living The honour of this latter discovery fell to Cagniard de la Tour (1837), and to F Kutzing (1837), who observed the budding of the yeast cells and recog- nized it as a vegetative act, and to T Schwann (1839) who was the first to recognize the formation of yeast spores These observa- tions did not, however, receive the attention which they merited, and their essential connection with the phenomenon of fermenta- tion was stoutly denied by J V. Liebig (1839), whose reputation stood so high that his condemnation sufficed almost to discredit the facts

When the facts of the biologist were denied by the chemist, there was clearly no prospect of agreement or decision unless someone could come forward who might be authorized to speak in the name of both sciences Only the rarest genius could at such a time have occupied such a position The genius was found in Louis Pasteur Pasteur opened the eyes of mankind to a new world of living things, the world of microscopic life Such micro- scopic beings, he proved, could live upon mineral matter, using for body building and as a source of energy the simplest forms of carbon compounds such as alcohol, acetic acid or sugar, while ammonia sufficed as a source of nitrogen Each type of fermenta- tion was shown to be correlated with the life of some special microscopic organism, multiplying with incredible velocity Fer- mentation, putrefaction and the slow process of combustion by which dead organic matter is resolved into mineral matter, at that time designated spontaneous combustion, were all shown to be caused by the agency of microbes, and to cease when the life was destroyed Pasteur foresaw disease as the outcome of a failure of plant or animal to resist the attacks of inimical forms of micro- scopic life ever present in the dust of the atmosphere, in soil, water or as a contamination of food

It would be impossible to enter here into the great variety of fermentations which Pasteur studied, and it will be better to con- fine our attention to one case, namely alcoholic fermentation set up by yeast, for this will serve as an example for all other types.

The contribution made by Pasteur to our knowledge of alcoholic

fermentation, can, however, be better appraised if we first resume what was known of the matter before he began This can be done briefly, for it does not amount to much

Facts Known About Alcoholic Fermentation Prior to the Work of Pasteur.—Of facts definitely established before Pasteur came upon the scene, we have the following Lavoisier (1793) regarded alcoholic fermentation as a chemical change, in which the yeast was a mere agent which, in a quantitative study of the changes, could be ignored He showed that the amount of alcohol and carbon dioxide gas produced in the course of the fermentation weighed the same as the sugar used at the beginning of the experiment, and he used this result to announce his far-reaching generalization, that nothing is ever lost or destroyed, but that matter only undergoes change of form Actually there were errors in Lavoisier's experimental work, but the deductions were correct, and were soon supported on theoretical grounds by Gay-Lussac This investigator also showed that oxygen was necessary for the commencement of the fermentation He placed grapes in a closed tube over mercury, and introduced various gases before crushing the grape. No fermentation followed unless air or oxygen was allowed to enter the tube The elementary composition of yeast had also been determined by Dumas (1828), and the general analysis of main constituents had been made by Payen (1839), and Mitscherlich (1835), who gives the composition of the ash of beer yeast, and also by the careful work of Schlossberger (1844) who distinguishes the composition of top and bottom yeast

Colin (1825) had found that the best medium for the "growth" of yeast was an extract by hot water of the yeast itself, and the albuminous nature of yeast was generally recognized, though the origin of the albuminous matter was not understood, the general view being that it must have arisen by the decomposition of pre-existing animal or vegetable matter

Thenard (1803) emphasized the importance of not confusing alcoholic fermentation with other processes, and taught that yeast was the cause of the fermentation He likewise took up an independent position with regard to the fate of the yeast during fermentation. Liebig taught that during fermentation the yeast underwent decomposition (this was, of course, essential to his theory), and that the evidence of the decomposition was the formation of ammonia in the solution, for all albuminous substances were known to yield ammonia on decomposition Thenard, however, was in doubts as to whether ammonia was formed, as he himself did not find it in appreciable amount The yeast likewise did not appear always to lose weight during the fermentation, though sometimes it appeared to do so

The fact should also be mentioned that traces of products other than alcohol and carbon dioxide had been detected in the fermented fluid and were supposed to be derived from sugar, in particular, acetic acid and lactic acid The amounts produced were so small, however, that it could not be considered proved that these materials truly had been derived from the sugar They might have arisen from the nitrogenous matter present in the solution

Pasteur's Studies in Alcoholic Fermentation.—Pasteur admitted that the idea of the living cause of fermentation was a preconceived one with him, but it was strengthened towards a conviction by the consideration that the amyl alcohol produced as a by-product in fermentation was different from amyl alcohol produced synthetically in the laboratory, the latter was optically, and hence structurally symmetric, the former asymmetric He then discovered the fact that racemic ammonium tartrate which is itself optically inactive, is decomposed by a mould such as *Penicillium glaucum*, in such a way that the solution develops optical properties The observation instrument or polarimeter lets through light vibrating in one plane only, and may be set by crossing the prisms, so that no light vibrating in this plane can come through The solution examined at the beginning of the experiment under these conditions appears in complete darkness, but as the fermentation progresses light appears, for it is now transmitted through the solution in another plane, owing to the development in the solution of an optically asymmetric substance. What actually has happened in this case is that one of the two optically opposite tartrates which are constituents of the racemic tartrate has been consumed or fermented by the fungus, leaving the other therefore exhibiting its optically asymmetric property. The remarkable fact, therefore, that in the process of fermentation one type of structure was selected and the other rejected, indicated to Pasteur that the relation between the ferment and the substance which it fermented was of the most intimate kind, and convinced him that nothing but life could be responsible for such a preferential treatment of molecules. This led to the view that each type of fermentation must be correlated with a specific organism, and Pasteur set to work to find the organisms.

In rapid succession he discovered the organisms responsible for the formation of lactic acid, butyric acid and acetic acid, as well as certain other organisms which, like the butyric acid organism, he found could act in the complete absence of air, which led to the distinction of aerobic and anaerobic forms of life. The main issue, however, was that of the part played by yeast in the alcoholic fermentation Few people took the attitude of Liebig of denying absolutely that yeast was alive, but many denied that the life of the yeast and the process of fermentation were connected in any essential way, while others stated that the yeast acted only after it was dead, in common with any other albuminous matter, as was postulated by the theory of Stahl, modified by Liebig

Pasteur showed that Liebig's theory of fermentation set up by decomposing albuminous matter was utterly untenable Liebig cited the alleged evidence that ammonia was produced by the decomposition of the yeast Pasteur demonstrated that no ammonia was formed during alcoholic fermentation, but on the contrary a large amount was absorbed by the yeast and synthesized into its protoplasm Pasteur found he could actually grow yeast on a purely artificial medium made of various salts, with ammonia as a source of nitrogen, and with sugar as a source of carbon, and he offered to show Liebig a kilogram of pure white yeast produced exclusively out of these materials from an amount of yeast originally as large as a pin's head The Academy offered to defray the cost of Liebig's visit to Paris But Liebig was obstinate and refused the offer The production of a kilogram of pure yeast out of sugar and salts and ammonia was masterful evidence and left very little of Liebig's theory of fermentation set up by decomposition

Pasteur next concerned himself with the origin of yeasts and traced them to the atmospheric dust He showed that all the germs or spores of these microscopic organisms causing fermentation, putrefaction and analogous changes, existed in the air, in amount varying with the place, the altitude, the temperature and the season, and by ingeniously filtering the air through guncotton, and dissolving the guncotton in ether, he isolated the germs from the air, and was able to examine them under the microscope and prove by experiment their respective properties

Following up the classical experiment of Gay-Lussac which appeared to demonstrate that fermentation could not take place without air, Pasteur was led to recognize that oxygen was needed for the germination of the yeast spores, but that for the process of reproduction by budding it was not essential, and a close study of the behaviour of yeast under varying conditions of aeration revealed the remarkable fact that yeast could at one time behave as an aerobe and at another time as an anaerobe In the presence of air the growth was very vigorous, much more so than in the absence of air, but on the other hand fermentation as measured by the production of alcohol was much in abeyance, while conversely, when the yeast was deprived of air, growth was not so abundant, but fermentation very much more vigorous Here, thought Pasteur, is the long-sought secret of fermentation, the yeast, and in fact, any organism deprived of the free oxygen of the atmosphere, will react with substances such as sugar dissolved in the medium, in the effort to obtain from them their oxygen of combination, and in proportion as an organism can succeed in obtaining oxygen in this way it will be capable of setting up fermentation. All tissues of plants or animals might thus produce alcoholic fermentation for a brief fraction of time, and some by a gradual development of this faculty would become ferments, either facultative or permanent anaerobes

It may be thought that Pasteur went too far in thus denoting fermentation *Vie sans air*, yet as A. J. Brown (1892) pointed out, exception could not be taken to the view if into the words with which Pasteur summarises his theory, we read the meaning that that part of the life of the yeast which is most closely correlated with the phenomenon of alcoholic fermentation can take place in the absence of air, or to be precise, oxygen

One final point in regard to the chemistry of alcoholic fermentation should be mentioned by way of definitely recording the fact that Pasteur regarded the change set up in sugar by yeast as more complicated than had been stated by Lavoisier Pasteur was at pains repeatedly to point out that accompanying the main change of sugar to alcohol and carbon dioxide there was always a formation in definite proportion, amounting to about 2% of the sugar fermented, of two substances, glycerine and succinic acid These were formed even when sugar was the only source of carbon, and must therefore have been derived from the sugar. The constant production of these substances, albeit in small amount, revealed to Pasteur the essential complexity of the fermentative act, and later progress has substantiated fully his view

Their logical sequence is such an instructive feature of Pasteur's researches, that it would be wrong not to point out how the researches on fermentation led to the investigation of disease in wine and vinegar, and how from the conception of epidemics of yeast and other benign organisms, Pasteur was led to the conception of the cause of epidemic disease in plants, in animals and man

Progress Since the Time of Pasteur.—It was generally felt both by physiologists and chemists that the idea of fermentation ought to include digestion and the action of many principles extracted from plants, as, for example, emulsin which Liebig and Wohler had extracted from bitter almonds, and which was able to decompose the glucoside amygdalin, and that some conception of the action of the immediate cause of fermentation must be found which did not invoke the idea of life A bridge, in other words, was required between the life phenomena on the one hand, and the physicochemical phenomena on the other Something to reconcile the extremes of Pasteur's idea that life was everything, and Liebig's idea that life was nothing in the phenomena Claude Bernard (1878) felt the matter so strongly, yet not wishing to hurt Pasteur's feelings, that he secretly devoted the last few years of his life in a vain effort to prove the presence of a soluble ferment in yeast Pasteur, he said, is right, but he does not see far enough, and almost his last words to d'Arsonval were: "Fermentation must be freed from the vitality of the cell"

A reconciliation was found in the idea of enzymes, these being the agencies by which living matter brings about fermentation, using the word in the broad sense of including nearly all chemical changes brought about by living matter which are capable of being independently studied M Traube (1858) had put forward this idea, and Naegelis' theory (1879) was an attempt at a sort of physicochemical expression of the idea of the relation of the living cell to the material on which it acted, through the intermediary of the enzyme. But the real evidence was obtained by E. Fischer and E. Buchner Fischer (1895) found that the specificity in action which Pasteur had observed for the mould *Penicilium glaucum*, in fermenting racemic ammonium tartrate could be paralleled by a similar behaviour of soluble ferments or enzymes, and that a soluble ferment or enzyme extracted from yeast, namely invertase, could act on one type of sugar derivative but not on another. Buchner (1897) made one of the greatest steps in the history of fermentation by discovering that, under great pressure, a juice could be expressed from yeast, which was free from yeast cells, and therefore presumably no longer living, but which, nevertheless, was able to act quite effectively in setting up alcoholic fermentation. The views of those who held that fermentation was independent of life have, therefore, to a certain extent been shown to have been justified. On the other hand, it is quite clear that since the enzymes are themselves the product of the living organism, Pasteur's position remains unassailed. It is also important to remember that the name enzyme is given to a material derived from the living cell, which has never been isolated as an individual chemical compound. No pure enzyme has ever been obtained, nor have we at present the least idea whether any of the enzyme preparations at present known are even approximately pure. Nevertheless, the idea of enzymes has undoubtedly helped greatly to a better conception of the mechanism of fermentation

Fermentation has, in common parlance, come to have two meanings; on the one hand it refers to alcoholic fermentation, which on account of its great industrial importance, overshadows all other types of fermentation, and, on the other hand, it refers to a large variety of changes which occur in connection with animal and plant life, and which are especially of interest to the physiologist, the microbiologist, the pathologist and the physician Academically speaking, however, these phenomena all come under one head Ambiguity will be avoided if we use the word fermentation to describe the whole process set up by the living cells, the growth and multiplication of the cells, accompanied by fermentation, and the formation of the enzymes within the cells, as well as the decomposition set up in the medium by their agency either in, around or outside the cells, while we reserve the word enzyme action to describe the individual fermentative acts, when dissociated from the living organism, or considered, even for purposes of discussion, as acting independently of the life of the cell. Thus, fermentation implies co-ordinated enzyme action, though any one or more enzyme actions may not amount to fermentation

The chief advance in the chemistry of alcoholic fermentation, in recent years, has been made by Harden (1905) who showed that prior to its decomposition into alcohol and carbon dioxide, the molecule of sugar combines with phosphoric acid In other words, that there is a synthesis prior to the decomposition The work of C Neuberg (1918) should also be mentioned, for he has succeeded in diverting the normal course of fermentation by yeast, into other channels, with the production, for example, of glycerine and acetaldehyde, the latter having been already detected and recognized as of importance in connection with the theory of fermentation

Yeasts, bacteria and moulds are now being utilized on a commercial scale for various types of fermentation leading to the production of useful substances, as, for example, hydrogen, acetone, glycerine, as well as to obviate the use of acids in the digestion of cellulose or the "saccharification" of starch

The technical biological side of fermentation, especially as regards its application in brewing and wine making, owes a very great deal to the work of Hansen, for it was he who applied first to the industry the methods of J Lister and R. Koch, in order to obtain pure yeasts For Hansen found that not only did bacteria lead to contamination in the brewery, but certain varieties of yeasts (wild yeasts) were also harmful, and it was therefore necessary to isolate pure yeasts, and begin the fermentation with these. The method has had wide application, and has revolutionized both brewing and wine making. In wine making, for example, it is now possible by a proper choice of yeast, to modify at will the bouquet of the wine.

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FERMO, a town and archiepiscopal see of the Marches, Italy (anc *Firmum Picenum*), province of Ascoli Piceno, on a hill with a fine view, 1,046 ft above sea-level, on a branch from Porto S Giorgio on the Adriatic coast railway Pop (1921) 23,304 (commune) The summit of the hill was occupied by the citadel until 1446 It is crowned by the cathedral, reconstructed in 1227 by Giorgio da Como, the fine façade and campanile of this period still remain, the beautiful rose-window over the main door dates from 1348 Against the side of the hill was built the Roman theatre, scanty traces of an amphitheatre also exist Remains of the city wall, of rectangular blocks of limestone, may be seen just outside the Porta S Francesco, the mediaeval battlemented walls superposed on it are picturesque The church of S Francesco has a good tower and choir in brickwork of 1240 Under the Dominican monastery is a very large Roman reservoir in two storeys, belonging to the imperial period, divided into many chambers, at least 24 on each level, each 30 by 20 ft, for filtration The piazza contains the Palazzo Comunale, restored in 1446, with a statue of Pope Sixtus V in front of it Porto S Giorgio has a fine castle of 1269, blocking the valley which leads to Fermo

The ancient Firmum Picenum was founded as a Latin colony in 264 B C, after the conquest of the Picentes, as the local headquarters of the Roman power, to which it remained faithful It was originally governed by five quaestors It was made a colony with full rights after the battle of Philippi, the 4th legion being settled there It lay at the junction of roads to Pausulae, Urbs Salvia and Asculum, being connected with the coast road by a short branch road from Castellum Firmanum (Porto S Giorgio) In the 10th century it became the capital of the *Marchia Firmana* In 1199 it became a free city, and remained independent until 1550, when it became subject to the papacy.

FERMOY, market town of Co Cork, on the river Blackwater, 21 m N E of Cork by road Pop of urban district (1926), 4,510 It is a centre for salmon and trout fishing Trade is in flour and agricultural produce The Glen of Araglin was once noted for its ironworks

FERN, a name often used to denote the whole botanical class of Pteridophyta, including both the true ferns, Filicales, by far the largest group of this class in the existing flora, and the fern-like plants, Equisetales, Lycopodiales, etc (*see* PTERIDOPHYTA)

FERNALD, MERRITT LYNDON (1873–), American botanist, was born at Orono, Me, on Oct 5, 1873, and graduated at Harvard university in 1897 From 1895 to 1902 he served as assistant at the Gray herbarium, Harvard He then became instructor and, in 1905, assistant professor, of botany In 1915 he was made Fisher professor of natural history Thirty seasons of active field exploration in New England, the Maritime Provinces, Quebec, Newfoundland and Labrador, made him an authority on the distribution and relationships of the flora of northeastern America, concerning which he wrote numerous botanical papers and monographs In 1925 he published *Persistence of Plants in Unglaciated Areas of Boreal America*, a critical study demonstrating that the numerous arctic-alpine species found in unglaciated parts of the Gaspé peninsula, Magdalen islands, the Long range of Newfoundland and the Torngat mountains of Labrador, but elsewhere occurring no nearer than the Cordilleran areas of western America and the Arctic archipelago, are survivals of the pre-glacial flora of boreal America With B L Robinson he was the co-editor of the 7th edition of *Gray's New Manual of Botany* (1908)

FERNANDEZ, ALVARO, one of the leading Portuguese explorers of the earlier 15th century, the age of Henry the Navigator. He was brought up in the household of Prince Henry, and while still "young and audacious" took an important part in the discovery of "Guinea" When the great expedition of 1445 sailed for West Africa he was entrusted by his uncle, João Gonçalvez Zarco, with a caravel, under injunctions to devote himself to discovery Fernandez outstripped all other servants of the prince at this time After visiting the mouth of the Senegal, rounding Cape Verde and landing in Goree (?), he pushed on to the "Cape of Masts" (Cabo dos Matos or Mastos, so called from its tall spindle-palms), probably between Cape Verde and the Gambia, the most southerly point till then attained Next year (1446) he returned, and coasted on to a bay 110 leagues "south" (*i e*, S S E) of Cape Verde, little short of Sierra Leone This record was not broken till 1461, when Sierra Leone was sighted and named A wound received from a poisoned arrow compelled Fernandez to return to Portugal

See Gomes Eannes de Azurara, *Chronica de . . . Guiné*, chs lxxv, lxxxvii, João de Barros, *Asia*, Decade I, bk i, chs xiii, xiv

FERNANDEZ, DIEGO, a Spanish adventurer and historian of the 16th century Born at Palencia, he was educated for the church, but about 1545 he embarked for Peru, where he served in the royal army under Alonzo de Alvarado, and became chronicler of Peru He wrote a narrative of the insurrection of Francisco Hernandez Giron, of the rebellion of Gonzalo Pizarro, and of the administration of Pedro de la Gasca The work, *Primera y segunda parte de la Historia del Piru* (Seville, 1571), was dedicated to Philip II It is the fullest and most authentic record existing of the events it relates

A notice of the work will be found in W H Prescott's *History of the Conquest of Peru* (new ed, 1902)

FERNANDEZ, JOHN (*João, Joam*), Portuguese traveller of the 15th century He was perhaps the earliest of modern explorers in the upland of West Africa, and a pioneer of the European slave- and gold-trade of Guinea We first hear of him (before 1445) as a captive of the Barbary Moors in the western Mediterranean, while among these he acquired a knowledge of Arabic, and probably conceived the design of exploration in the interior of the continent whose coasts the Portuguese were now unveiling In 1445 he volunteered to stay in Guinea and gather what information he could for Prince Henry the Navigator; with this object he accompanied Antam Gonçalvez to the "River of Gold" (Rio d'Ouro, Rio de Oro) in 23° 40′ N, where he landed and went inland with some native shepherds He stayed seven months in the country, which lay just within Muslim Africa, slightly north of Pagan Negroland (West Sudan); he was taken off again by Antam Gonçalvez at a point farther down the coast, near the "Cape of Ransom" (Cape Mirik), in 19° 22′ 14″; and his account of his experiences proved of great interest and value, not only as to the natural features, climate, fauna and flora of the south-western Sahara, but also as to the racial affinities, language, script, religion, nomad habits and trade of its inhabitants These people—though Mohammedans, maintaining a certain trade in slaves, gold, etc, with the Barbary coast (especially with Tunis), and classed as "Arabs," "Berbers" and "Tawny Moors"—did not then write or speak Arabic In 1446 and 1447 John Fernandez accompanied other expeditions to the Rio d'Ouro and other parts of West Africa in the service of Prince Henry He was personally known to Gomes Eannes de Azurara, the historian of this early period of Portuguese expansion; and from Azurara's language it is clear that Fernandez' revelation of unknown lands and races was fully appreciated at home

See Azurara, *Chronica de . . . Guiné*, chs. xxix., xxxii, xxxiv., xxxv., lxxvii, lxxviii., xc., xci., xciii

FERNANDEZ, JUAN (fl. *c.* 1570), Spanish navigator and discoverer. By putting out from the coast, and so avoiding the prevailing southerly winds and gaining the help of the trade winds, he sailed from Callao to Chile in 30 days, which resulted in his arrest for sorcery. In 1563 he discovered the islands which bear

his name He endeavoured to found a colony there, which was a failure; hence the goats which Alexander Selkirk found there In 1574 he discovered St Felix and St Ambrose islands, and in 1576, in the southern ocean, he is said to have sighted Easter island, as well as a continent which, if the story, not generally accepted, is believed, was probably Australia or New Zealand

See J. L. Arias, *Memoir recommending to the king the conversion of the new discovered islands* (in Spanish, 1609, Eng trans. 1773), A de Ulloa, *Relacion del Viaje,* bk II, ch. IV (1748, Eng trans. 1813), Alexander Dalrymple, *An Historical Collection of the several Voyages and Discoveries in the South Pacific Ocean* (1769–71)

FERNANDEZ, LUCAS (1474?–1542), Spanish dramatist and disciple of Encina (*q v*) He is best represented by his religious play, *Auto de la Pasión* (1514)

FERNANDINA, a city of Florida, U S A, 36m N E of Jacksonville, on Amelia island (22m long by ½ to 1½m wide), a port of entry and the county seat of Nassau county It is served by the Seaboard Air Line railway and by steamers The population was 3,078 in 1925 (State census), of whom 1,541 were negroes The commerce of the harbour (321,184 tons in 1927, valued at $4,797,300) consists largely of exports of phosphate rock to European ports, domestic receipts of fish and wood and domestic shipments of petroleum products, shrimp and other sea-foods The harbour was known to the early explorers of Florida, and the island (called Guale) was continuously occupied by Europeans from 1567, when Menendez built a fort there It has been under eight flags When Georgia was founded Oglethorpe placed a military guard on the island, and named it Amelia About 1762 it was noted for the large indigo plantation of Lord Egmont, and here in 1787, after Florida had been ceded back to Spain, the English settlers embarked for the West Indies The village of Old Fernandina, about 1m from the present city, was laid out by the Spanish in 1808 During the period of the embargo and non-importation acts preceding the war of 1812, the island was a centre for smuggling For this reason it was invaded and Fernandina was captured by General George Matthews in 1812 In 1817 it was seized by Gregor MacGregor, a filibuster who had aided the revolting Spanish provinces of South America, and later in the same year by Louis Aury, an adventurer from Texas, who took possession in the name of the Republic of Mexico Aury was expelled in 1818 by U S troops, who held Fernandina in trust for Spain until Florida was finally ceded to the United States in 1821 The Amelia island lighthouse was established in 1836 In 1861 Ft Clinch, at the entrance to the harbour, was seized by the Confederates and was a centre of blockade-running until captured in 1862 by a Federal naval force. The city was incorporated in 1859

FERNANDO DE NORONHA (*Fernão de N*), an island in the South Atlantic, 125m from the coast of Brazil to which country it belongs, in 3°50′ S, 32°25′ W It is about 7m long and 1½m. wide, and some other islets lie adjacent to it Its surface is rugged, and it contains a number of rocky hills from 500 to 700ft high, and one peak towering to the height of 1,089ft It is formed of basalt, trachyte and phonolite, and the soil is very fertile. The climate is healthy It is defended by forts, and serves as a place of banishment for criminals from Brazil The next largest island of the group is about a mile in circumference, and the others are small barren rocks The population is about 2,000, all males, including some 1,400 criminals, and a garrison of 150. Communication is maintained by steamer with Pernambuco The island takes its name from its Portuguese discoverer (1503), the count of Noronha.

FERNANDO PO or **FERNANDO POO,** a Spanish island on the west coast of Africa, in the Bight of Biafra, about 20 m from the mainland, in 3° 12′ N and 8° 48′ E It is of volcanic origin, related to the Cameroons system of the adjacent mainland, is the largest island in the Gulf of Guinea, is 44 m. long from N N E. to S.S W., about 20 m. broad, and has an area of about 810 sq. miles The shores are steep and rocky and the coast plain narrow. This plain is succeeded by mountain slopes which culminate in the cone of Clarence peak or Pico de Santa Isabel (9,369 ft.), in the north-central part of the island. The Misterio peak in the south is 8,600 feet There are numerous other peaks between 4,000 and 6,000 ft high. The mountains contain craters and crater lakes, and are covered, most of them to their summits, with forests. Torrential streams run down the intervening valleys The forest trees include oil palms and tree ferns, but there are many varieties, embracing ebony, mahogany and the African oak The undergrowth is dense, it includes the sugar-cane and cotton and indigo plants The fauna includes antelopes, monkeys, lemurs, the civet cat, porcupine, pythons and green tree-snakes, crocodiles and turtles The mean temperature on the coast is 78° F and varies little In the higher altitudes there is considerable daily variation While the lowlands are very unhealthy, the climate at 2,000 ft. and above is fairly good and in the south temperate The average annual rainfall is about 100 in ; July to October are the wettest months

Population.—In addition to some 500 Europeans, mostly Spaniards, the pop (1920) 23,000 consists of the Bubis or Bube (formerly also called Ediya), who occupy the interior, and the coast dwellers, a mixed race, descended from negro slaves, or free negroes who settled in the island, with a strong admixture of Portuguese and Spanish blood, and known to the Bubis as "Portos"—a corruption of Portuguese The Bubis are of Bantu stock and early immigrants from the mainland Physically they are a finely developed race, light brown in colour They are extremely jealous of their independence and unwilling to take service with Europeans In their primitive condition they are found only in the south, their chief settlement being in the Moka plateau They wear very little clothing, but adorn wrists and ankles with bangles made of ivory, shells, beads or grass. They use wooden weapons but stone axes and knives were in use as late as 1858. Their villages are built in the hills, their houses are rectangular, with numerous fireplaces and sometimes with three or four doors They make good pottery Hunters and fishers, the Bubis are also fair agriculturalists Owing however to in-breeding, an addiction to strong wines, and the ravages of sleeping sickness the Bubis are slowly dying out The staple foods generally are millet, rice, yams and bananas

The principal settlement is Santa Isabel, otherwise known as Port Clarence (pop 1,400), a safe and commodious harbour on the north coast

In Santa Isabel resides the governor of Spanish Guinea, as the Spanish islands in the Gulf of Guinea and, on the mainland, the Muni River settlement, are collectively called In its graveyard are buried Richard Lander and several other explorers of West Africa The chief industry until the close of the 19th century was the collection of palm oil, since then cocoa has become the main product for export

History.—The island was discovered towards the close of the 15th century by a Portuguese navigator called Fernãodo Po, who, struck by its beauty, named it Formosa, but it soon came to be called by the name of its discoverer, though some authorities maintain that another Portuguese seaman, Lopes Gonsalves, was before him The years 1469, 1471 and 1486 are variously given as those of the date of the discovery A Portuguese colony was established in the island, which together with Annobon was ceded to Spain in 1778 The first attempts of Spain to develop the island failed and in 1827, with the consent of Spain, the administration was taken over by Great Britain, the British "superintendent" having a Spanish commission as governor By the British Fernando Po was used as a naval station for the ships engaged in the suppression of the slave trade The British headquarters were named Port Clarence and the adjacent promontory Cape William, in honour of the duke of Clarence (William IV) In 1844 the Spaniards reclaimed the island, refusing to sell their rights to Great Britain. They hoisted the Spanish flag, appointing a British resident, John Beecroft, governor During the British occupation a considerable number of Sierra Leonians, West Indians and freed slaves settled in the island, and English became and remains the common speech of the coast peoples. In 1858 a Spanish governor was sent out, and the Baptist missionaries who had laboured in the island since 1843 were compelled to withdraw. The Jesuits who succeeded the Baptists were also expelled, but mission and educational work is now carried on

by other Roman Catholic agencies, and (since 1870) by the Primitive Methodists. In 1879 the Spanish government recalled its officials, but a few years later when the partition of Africa was being effected, they were replaced and a number of Cuban political prisoners were deported thither. Very little was done to develop the resources of the island until after the loss of the Spanish colonies in the West Indies and the Pacific, when Spain turned her attention to her African possessions Cocoa plantations were started In 1900 the Spaniards gave France, in return for territorial concessions on the mainland, the right of pre-emption over the island and her other West African possessions

The administration of the island is in the hands of a governor-general, assisted by a council, and responsible to the Direccion General de Colonias y Protectorados, a department in the Presidencia del Consejo (Prime Minister's Office) at Madrid The governor-general has under his authority the sub-governors of the other Spanish possessions in the Gulf of Guinea, namely, the Muni River Settlement, Corisco and Annobon (*qq v*). None of these possessions is self-supporting The metropolis contributes two and a half million pesetas (£100,000) p a to their expenses In 1926 a special credit of 26,000,000 pesetas was set aside to develop the resources of the islands and mainland territories, to be spent in a period of ten years The programme includes the construction of roads, harbours, hospitals, schools, health organization, telephones and telegraphs and an agricultural school with model farms

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FERNIE, a town in the east Kootenay district of British Columbia. Pop (1921) 4,343. It is on the Crow's Nest branch of the Canadian Pacific railway and on the Canadian National railway at the junction of Coal Creek with the Elk river, and has extensive coal mines There are about 500 coke ovens, sawmills, railway shops, a brewery, a foundry, machine shops, etc.

FEROZEPUR or **FIROZPUR,** a town and district of British India, in the Punjab The town is a railway junction, and is situated about 4 m. from the present south bank of the Sutlej. Pop (1921) 54,351. The arsenal is the largest in India, and Ferozepur is the headquarters of a brigade British rule was first established at Ferozepur in 1835, when, on the failure of heirs to the Sikh family who possessed it, a small territory 86 m in extent became an escheat to the British government, and the present district has been gradually formed around this nucleus. The strategic importance of Ferozepur was at this time very great; and when, in 1839, Captain (afterwards Sir Henry) Lawrence took charge of the station as political officer, it was the outpost of British India in the direction of the Sikh power. Ferozepur accordingly became the scene of operations during the first Sikh War. The Sikhs crossed the Sutlej in December 1845, and were defeated successively at Mudki, Ferozeshah, Aliwal and Sobraon, after which they withdrew into their own territory, and peace was concluded at Lahore. At the time of the Mutiny an unsuccessful attempt was made to seize the magazine, which was held by the Europeans.

Ferozepur has rapidly advanced in material prosperity of late years, and is now a very important seat of commerce, trade being mainly in grain.

The DISTRICT OF FEROZEPUR comprises an area of 4,286 sq m. and had in 1921 a population of 1,098,248. The surface is level, with the exception of a few sand-hills in the south and south-east. The country consists of two distinct tracts, that liable to annual fertilizing inundations from the Sutlej, and the upland tract. The only river is the Sutlej, which runs along the north-western boundary. The principal crops are wheat, barley, millet, gram, pulses, oil-seeds, cotton, tobacco, etc. The other important towns and seats of commerce are Fazilka (pop 13,829), Dharmkot (5,560), Moga (14,145), and Muktsar (10,539). Owing principally to the dryness of its climate, Ferozepur has the reputation of being an exceptionally healthy district In September and October, however, after the annual rains, the people suffer a good deal from remittent fever The district is watered by the Sirhind canal and by canals from the Sutlej, known as the Grey canals from their original founder Col Grey These latter have now been merged in the Lower Sutlej Irrigation Scheme.

FEROZESHAH, a village in the Punjab, India, notable as the scene of one of the chief battles in the first Sikh War. The battle immediately succeeded that of Mudki, and was fought on Dec 21 and 22, 1845 During its course Sir Hugh Gough, the British commander, was over-ruled by the governor-general, Lord Hardinge, who was acting as his second in command. (*See* SIKH WARS) At the end of the first day's fighting the British had occupied the Sikh position, but had not gained an undisputed victory On the following morning the battle was resumed, and the Sikhs were reinforced by a second army under Tej Singh; but through cowardice or treachery Tej Singh withdrew at the critical moment, leaving the field to the British In the course of the fight the British lost 694 killed and 1,721 wounded, the vast majority being British troops, while the Sikhs lost 100 guns and about 5,000 killed and wounded

FERRABOSCO or **FERABOSCO,** the name of a family of musicians of Italian origin settled in England in the 16th century The father, DOMENICO MARIA (1513–1574) was choirmaster at Bologna and at the Basilicana Vaticana, Rome, and then a singer in the Papal chapel He wrote madrigals and motets

His son ALFONSO (d 1588), madrigalist, settled in England before 1567, when he received a pension from the Queen, and became intimate with William Byrd He returned to Italy in later life, and died at Turin His madrigals were printed at Venice in 1587 He was highly esteemed in England, and Peacham, in his *Compleat Gentleman*, says that "in judgment and depth of skill he was inferior unto none" Many of his madrigals and motets found their way into English collections, such as Yonge's *Musica Transalpina*, Leighton's *Teares and Lamentacions*

His son ALFONSO (d 1628) lutanist and composer, was born and died at Greenwich He was one of the king's musicians for the violin under James I. He wrote the music for five masques by his friend Ben Jonson between 1605 and 1609. He was music master to Prince Henry and then to Prince Charles (Charles I), and, when Charles came to the throne, became "composer of the king's music" He published a book of *Ayres* (1609), containing songs written for Jonson's masques, and *Lessons for 1, 2 and 3 viols* (1609)

His son, also named ALFONSO (d. *c.* 1660), succeeded (1628) his father as a viol player in the king's band. He and his brother Henry jointly held the post of musician in ordinary to the king. Both the brothers died before July 4, 1661. John Ferrabosco, organist at Ely cathedral, who died in 1682, belonged to the same family.

FERRAR, NICHOLAS (1592–1637), English theologian, was born in London in 1592 and educated at Clare Hall, Cambridge, graduating in 1610 In 1618 he became actively connected with the Virginia Company When, in 1623, it was deprived of its patent he entered parliament, but, soon deciding to devote himself to a religious life, he purchased the manor of Little Gidding, Huntingdonshire, where he organized a small religious community. Here, in 1626, Ferrar was ordained a deacon by Laud, and declining preferment, he lived an austere, almost monastic life of study and good works He died on Dec. 4, 1637, and the house was despoiled and the community broken up ten years later. There are extant a number of "harmonies" of the Gospel, printed and bound by the community, two of them by Ferrar himself. One of the latter was made for Charles I on his request, after a visit in 1633 to see the "Arminian Nunnery at Little Gid-

ding." Little Gidding is described in Shorthouse's *John Inglesant.*

FERRAR, ROBERT (*c.* 1500–1555), bishop of St. David's and martyr, born of a Yorkshire family, is said to have studied both at Cambridge and Oxford before he became a canon regular of St. Augustine. He accompanied Bishop Barlow on his embassy to Scotland in 1535 and became prior of St. Oswald's at Nostell, near Pontefract. At the dissolution of the monasteries he married and is said to have been Cranmer's chaplain. In the reign of Edward VI, Ferrar enjoyed high favour and was made (1548) bishop of St. David's, where he had much trouble with his chapter. He had some differences with the King's Council; the complaints of the chapter were therefore listened to and the bishop was summoned to London to answer a charge of *praemunire* and imprisoned.

As soon as the heresy laws were re-established under Mary, Ferrar was sent down to be tried by his successor at St. David's He was burnt at the stake at Carmarthen on March 30, 1555.

See the admirable and exhaustive article by T. F. Tout in the *Dict. Nat. Biog*

FERRARA, a city and archiepiscopal see of Emilia, Italy, capital of the province of Ferrara, 30 m. N N E of Bologna, situated 30 ft above sea-level on the Po di Vomano, a branch channel of the main stream of the Po, which is 3½ m. N. Pop (1921) 65,022 (town), 107,618 (commune) The town has broad streets and numerous palaces, which date from the 16th century, when it was the seat of the court of the house of Este, and had, it is said, 100,000 inhabitants

The most prominent building is the square castle of the house of Este, in the centre of the town, a brick building surrounded by a moat, with four towers It was built after 1385 and partly restored in 1554–1570; the pavilions on the top of the towers date from the latter year Near it is the hospital of S Anna, where Tasso was confined during his attack of insanity (1579–1586) The Palazzo del Municipio, rebuilt in the 18th century, was the earlier residence of the Este family. Close by is the cathedral of S Giorgio, consecrated in 1135, when the Romanesque lower part of the main façade and the side façades were completed. It was built by Guglielmo degli Adelardi (d 1146), who is buried in it. The upper part of the main façade, with arcades of pointed arches, dates from the 13th century, and the portal has recumbent lines and elaborate sculptures above The interior was restored in the baroque style in 1712–18 The campanile, in the Renaissance style, dates from 1451–93 Opposite the cathedral is the Gothic Palazzo della Ragione, in brick (1315–1326), now the law-courts A little way off is the free university It has faculties of law, medicine and natural science (with 204 students in all), the library has valuable MSS., including part of that of the *Orlando Furioso* and letters by Tasso Of the other churches S Francesco, S. Benedetto, and S Maria in Vado are all good early Renaissance buildings. The numerous early Renaissance palaces, often with good terra-cotta decorations, form quite a feature of Ferrara, few towns of Italy have so many of them though they are mostly comparatively small in size Among them may be noted those in the N. quarter (especially the four at the intersection of its two main streets), which was added by the duke, Ercole I. in 1492–1505, from the plans of Biagio Rossetti. The finest of these is the Palazzo de' Diamanti, so called from the diamond points into which the blocks of stone with which it is faced are cut. It contains the municipal picture gallery, with a large number of pictures of artists of the school of Ferrara To the later 15th century are due famous frescoes in the Palazzo Schifanoia, built by the Este family. The simple house of Ariosto, in which he died in 1532, lies farther west The best 16th century masters of the Ferrara school were Lorenzo Costa (1460–1535), and Dosso Dossi (1479–1542), the most eminent of all.

The origin of Ferrara is uncertain, and probabilities are against the supposition that it occupies the site of the ancient Forum Alieni It was probably a settlement formed by the inhabitants of the lagoons at the mouth of the Po. It appears first in a document of Aistulf of 753 or 754 as a city in the exarchate of Ravenna. After 984 we find it a fief of Tedaldo, count of Modena and Canossa, nephew of the emperor Otho I. It afterwards made itself independent, and in 1101 was taken by siege by the countess Matilda At this time it was mainly dominated by several great families, among them the Adelardi

In 1146 the property of Guglielmo Adelardi passed, as the dowry of his niece Marchesella, to Azzolino d'Este After considerable struggles Azzo Novello was nominated perpetual podestà in 1242; in 1259 he took Ezzelino of Verona prisoner in battle His grandson, Obizzo II. (1264–1293), succeeded him, and the pope nominated him captain-general and defender of the states of the Church; and the house of Este was from henceforth settled in Ferrara Borso received the fiefs of Modena and Reggio from the emperor Frederick III as first duke in 1452 (in which year Girolamo Savonarola was born here), and in 1470 was made duke of Ferrara by Pope Paul II Ercole I. (1471–1505) and his son Alfonso I (m Lucrezia Borgia) carried on war with Venice In 1509 he was excommunicated by Julius II, and attacked the pontifical army in 1512 outside Ravenna, which he took Gaston de Foix (*q v*) fell in the battle With the succeeding popes Alfonso was able to make peace He was the patron of Ariosto from 1518 onwards His son Ercole II (duke, 1534–59) married Renata, daughter of Louis XII of France His son Alfonso II married Barbara, sister of the emperor Maximilian II He raised the glory of Ferrara to its highest point, and was the patron of Tasso and Guarini, favouring, as the princes of his house had always done, the arts and sciences For its majolica *see* CERAMICS He had no legitimate male heir, and in 1597 Ferrara was claimed as a vacant fief by Pope Clement VIII The town remained a part of the states of the Church, the fortress being occupied by an Austrian garrison from 1832 until 1859, when it became part of the kingdom of Italy

A considerable area within the walls of Ferrara is unoccupied by buildings, especially on the north, where the handsome Renaissance church of S Cristoforo, with the cemetery, stands, but modern times have brought a renewal of industrial activity Knitted goods and shawls are made Ferrara is on the main line from Bologna to Padua and Venice, and has branches to Ravenna, Poggio Rusco (for Suzzara), Cento and Comacchio At Pontelagoscuro, which is within the commune of Ferrara, is a railway bridge over the Po and a large soap and candle factory

See G Agnelli, *Ferrara e Pomposa* (Bergamo, 1902), E. G Gardner, *Dukes and Poets of Ferrara* (London, 1904), K Chledowski, *Der Hof von Ferrara* (1919), Arti Grafiche

FERRARA-FLORENCE, COUNCIL OF. The council of Ferrara and Florence was the culmination of a series of futile mediaeval attempts to reunite the Greek and Roman churches. The emperor, John VI Palaeologus, had been advised by his experienced father to avoid all serious negotiations, as they had invariably resulted in increased bitterness; but John, in view of the rapid dismemberment of his empire by the Turks, felt constrained to seek a union The situation was, however, complicated by the strife which broke out between the pope (Eugenius IV) and the oecumenical council of Basel Both sides sent embassies to the emperor at Constantinople, as both saw the importance of gaining the recognition and support of the East, for on this practically depended the victory in the struggle between papacy and council for the supreme jurisdiction over the church (*see* BASEL, COUNCIL OF) The Greeks, fearing the domination of the papacy, were at first more favourably inclined toward the conciliar party; but the astute diplomacy of the Roman representatives, who have been charged by certain Greek writers with the skilful use of money and of lies, won over the emperor With a retinue of about 700 persons, entertained in Italy at the pope's expense, he reached Ferrara early in March 1438, and in the following month the Union Synod was solemnly inaugurated on the 9th of April 1438. After several months of negotiation, it seemed for several reasons advisable to transfer the council to Florence. There ensued long debates and negotiations on the *filioque*, in which Markos Eugenikos, archbishop of Ephesus, spoke for the irreconcilables; but the Greeks under the leadership of Bessarion, archbishop of Nicaea, and Isidor, metropolitan of Kiev, at length made a declaration on the *filioque* (4th of June), to which all save Markos Eugenikos subscribed On the next topic of importance, the

primacy of the pope, the project of union nearly suffered shipwreck, but here a vague formula was finally constructed which, while acknowledging the pope's right to govern the church, attempted to safeguard as well the rights of the patriarchs On the basis of the above-mentioned agreements, as well as of minor discussions as to purgatory and the Eucharist, the decree of union was drawn up in Latin and in Greek, and signed on the 5th of July by the pope and the Greek emperor, and all the members of the synod save Eugenikos and one Greek bishop who had fled, and on the following day it was solemnly published in the cathedral of Florence

The council, however, desirous of negotiating unions with the minor churches of the East, remained in session for several years, and seems never to have reached a formal adjournment The decree for the Armenians was published on the 22nd of November 1439; they accepted the *filioque* and the Athanasian creed, rejected Monophysitism and Monothelitism, agreed to the developed scholastic doctrine concerning the seven sacraments, and conformed their calendar to the Western in certain points On the 26th of April 1441 the pope announced that the synod would be transferred to the Lateran, but before leaving Florence a union was negotiated with the Oriental Christians known as Jacobites The *Decretum pro Jacobitis,* published on the 4th of February 1442, is, like that for the Armenians, of high dogmatic interest, as it summarizes the doctrine of the great mediaeval scholastics on the points in controversy The decree for the Syrians, published at the Lateran on the 30th of September 1444, and those for the Chaldeans (Nestorians) and the Maronites (Monothelites), published at the last known session of the council on the 7th of August 1445, added nothing of doctrinal importance Though the direct results of these unions were the restoration of prestige to the absolutist papacy and the bringing of Byzantine men of letters, like Bessarion, to the West, the outcome was on the whole disappointing Of the complicated history of the "United" churches of the East it suffices to say that Rome succeeded in securing but fragments, though important fragments, of the greater organizations As for the Greeks, the union met with much opposition, particularly from the monks, and was rejected by three Oriental patriarchs at a synod of Jerusalem in 1443, and after various ineffective attempts to enforce it, the fall of Constantinople in 1453 put an end to the endeavour. As Turkish interests demanded the isolation of the Oriental Christians from their western brethren, and as the orthodox Greek nationalists feared Latinization more than Mohammedan rule, a patriarch hostile to the union was chosen, and a synod of Constantinople in 1472 formally rejected the decisions of Florence

BIBLIOGRAPHY —*See* article ORTHODOX EASTERN CHURCH, references to literature by Tschackert in Herzog-Hauck, *Realencyklopadie,* vol vi 45 ff , W Norden, *Das Papsttum und Byzanz* (1903), M Creighton, *History of the Papacy during the Period of the Reformation,* vol ii. 173 *sqq* and the general Church Histories under reference to the Greek Church

FERRARI, GAUDENZIO (*c* 1480–1546), Italian painter of the Lombard school, was born at Valduggia, Piedmont, then in the duchy of Milan His mother was a member of the Vincio family of Varallo, and her name is used in the signatures of his early works. Lomazzo, who must have been a lad at the time of Gaudenzio's death, and who as a pupil of one of Gaudenzio's pupils was certainly well informed, says that he studied at Milan under Stefano Scotto, a painter of whom little is known, and then under Bernardino Luini He was also influenced by Bramantino. Before going to Milan he may have studied at Vercelli, which seems to have been an artistic centre of followers of the original Lombard school, who here continued in their local traditions, while Leonardo da Vinci's influence was revolutionizing art at Milan Although Gaudenzio is not so well known as other masters of the Italian Renaissance, and has not received the appreciation which he deserved owing to the circumstance that his chief work was executed in fresco in remote country districts, he was undoubtedly the leading artist of the Lombard-Piedmontese school. Giovanni Morelli says of him: "He does not possess the charm of Luini, neither is his work so finished, but he occupied a far higher place in all that regards invention, dramatic life and pictorial gift. He loses his equilibrium sometimes owing to his fiery temperament and becomes affected and baroque; his large compositions are often overcrowded with figures; at his best, however, he need not fear comparison with even Raphael" Lomazzo went so far as to place him seventh among the chief painters of Italy

His early work was done chiefly at Varallo, where he painted frescoes in the chapel of St Margaret in the church of Santa Maria delle Grazie (*c* 1508), and a screen across that church representing 21 scenes from "the Life of Christ" (1513) He also undertook the decoration of the chapels which were being built on the Sacro Monte, a task which occupied him at intervals for many years In 1510 and 1511 he painted an ancona for the church of Santa Maria at Arona, in 1514 he worked at Novara on the altarpiece of San Gaudenzio, which established his fame, and secured him further commissions at Novara and Morbegno In 1528 he settled at Vercelli and there painted for the church of St. Christopher an altarpiece (1529) and frescoes representing scenes from "the Life of St Mary Magdalene" (1530 to 1532) and from "the Life of the Virgin" (1532–34) In 1535 he was at Saronno decorating the cupola of the church of Santa Maria dei Miracoli with the fresco of "a Choir of Angels" After spending two more years at Varallo, he went to Milan in 1539 where he painted various frescoes in the churches of Santa Maria delle Grazie, della Passione, etc He died in Milan on Jan 31, 1546 During the last period he employed as assistants Bernardino Lanino, Fermo Stella, G B della Cerva G Giovenone was one of his pupils Gaudenzio combined painting and modelling to a certain extent by the use of gesso in his early frescoes to represent metal in armour and trappings In his decorations for the chapels of the Sacro Monte at Varallo he made an ambitious attempt to wield the two arts with one intention by placing coloured terra cotta groups against a frescoed background Further important works of the master, who was a prolific worker, are to be found in the national collections of London, Paris, Berlin, Milan, Turin and Bergamo, in the cathedrals of Como and Casale Monferrato, and in the churches of Bergamo, Bellagio, Buto Arsizio and Canobbio, and the fine "Nativity" of Dorchester house, sold at Christie's auction rooms A good many of Gaudenzio's drawings and cartoons are to be found in the Royal library at Turin and the Biblioteca Albertina

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FERRARI, GIUSEPPE (1812–1876), Italian philosopher, historian and politician, was born at Milan on March 7, 1812, and died in Rome on July 2, 1876 After studying law at Pavia, he edited the works of Vico, prefaced by an appreciation (1835). He then went to France and, in 1839, produced his *Vico et l'Italie,* followed by *La Nouvelle Religion de Campanella* and *La Théorie de l'erreur* In 1840 he was made professor of philosophy at Rochefort, and in 1842 was transferred to Strasbourg Owing to trouble with the clergy, he returned to Paris and published *Idées sur la politique de Platon et d'Aristote,* a defence of his theories From 1849 to 1858 he devoted himself exclusively to writing, publishing *Les Philosophes Salariés, Machiavel juge des révolutions de notre temps* (1849), *La Federazione repubblicana* (1851), *La Filosofia della rivoluzione* (1851), *L'Italia dopo il colpo di Stato* (1852), *Histoire des révolutions, ou Guelfes et Gibelins* (1858; Ital. trans, 1871–73) In 1859 he returned to Italy, opposed Cavour, and upheld federalism against the policy of a single Italian monarchy. He held chairs of philosophy at Turin, Milan and Rome, and was made senator in May 1876 His other works include *Histoire de la raison d'état, La China e l'Europa, Corso d' istoria degli scrittori politici italiani* A sceptic and phenomenalist in philosophy, a revolutionist in politics, Ferrari was admired as an orator and as a writer.

See Marro Macchi, *Annuario istorico italiano* (Milan, 1877); A. Mazzoleni, *Giuseppe Ferrari* (Milan, 1877), C. Werner, *Die ital. Philosophie des 19 Jahrh* vol 3 (Vienna, 1885); P. Nicoli, *La Mente di G Ferrari* (1902); *Le Più Belle Pagine di G Ferrari* (Milan, 1927).

FERRARI, PAOLO (1822–1889), Italian dramatist, was born at Modena on April 5, 1822. In 1852 he made his reputation as a playwright with *Goldoni e le sue sedici commedie* Among numerous later plays his comedy *Parini e la satira* (1857) had great success Ferrari may be regarded as a follower of Goldoni and was a brilliant master of stagecraft He died on March 9, 1889, at Milan His collected plays were published in 1877–80

See N. de Bellis, *Il Teatro di Paolo Ferrari Saggio critico* (1922), P C Ferrigni, *Il Teatro di Paolo Ferrari nella critica di Yorick* (Milan, 1922).

FERRÉ, CHARLES THÉOPHILE (1845–1871), chief of police of the Paris Commune, was until March 1871 one of the lesser known followers of L A Blanqui (*q v*) He was elected to the Commune for the 18th arrondissement, polling the very high figure of 13,784 votes Together with Raoul Rigault, a man as young as himself, he was placed in charge of the police Like Marat of the French Revolution, Ferré of the Commune has been invested with the reputation of a monster of terrorism The department of the police was not, indeed, very wisely run, arrests were made widely, haphazardly and clumsily, but the Commune was at least protected from internal trouble Ferré always supported the most violent motions, in particular (after the shooting of Duval) a motion declaring that the hostages in the hands of the Commune would be executed if the Government troops killed any more Communard prisoners This decree was not carried out until after the Government troops had broken into Paris, when, ascertaining that they were now again shooting Communard prisoners, Ferré ordered the execution of the hostages, including Archbishop Darboy At his trial before the court-martial he defended his action and defied the court He was shot at Satory on Nov. 28, 1871.

See P Larousse, *Dictionnaire du XIXe siècle*, s v "Ferré" (1872), G Da Costa, *La Commune Vécue* (1901), R W Postgate, *Out of the Past* (1922), A Dayot, *La Guerre, La Siège, La Commune d'après les peintures, gravures, photographies, sculptures, médailles, autographes, et objets du temps* (1901) (*See* also COMMUNE)

FERREIRA, ANTONIO (1528–1569), Portuguese poet, was a native of Lisbon, his father was employed in the house of the duke of Coimbra at Setubal, and the poet was educated at the University of Coimbra, where he eventually became a professor The sonnets forming the First Book in his collected works date from 1552 and contain the history of his early love for an unknown lady The sonnets in the Second Book were inspired by D Maria Pimentel, whom he afterwards married, and they are marked by that chastity of sentiment, seriousness and ardent patriotism which characterized the man and the writer He was intimate with princes, nobles and the most distinguished literary men of the time, and became the foremost representative of the classical school On Oct 14, 1567 he became *Disembargador da Casa do Civel*, and had to leave the quiet of Coimbra for Lisbon His verses tell how he disliked the change, and how the bustle of the capital, then a great commercial emporium, made him sad and almost tongue-tied for poetry He died of plague in Lisbon on Nov. 29, 1569, having stayed there doing his duty when others fled.

Horace was his favourite poet and his admiration of the classics made him disdain the popular poetry of the Old School (*Escola Velha*) represented by Gil Vicente His national feeling would not allow him to write in Latin or Spanish, like most of his contemporaries, but his Portuguese is as Latinized as he could make it, and he even calls his poetical works *Poemas Lusitanos* Ferreira wrote the Terentian prose comedy, *Bristo*, at the age of 25 (1553), and dedicated it to Prince John in the name of the university It is neither a comedy of character nor manners, but its *vis comica* lies in its plot and situations The *Cioso*, a later product, may almost be called a comedy of character. *Castro* is Ferreira's most considerable work, and, in date, is the first tragedy in Portuguese, and the second in modern European literature.

The *Castro* was first printed in Lisbon in 1587, and it is included in Ferreira's *Poemas*, published in 1598 by his son It has been translated by Musgrave (1825), and the chorus of Act I appeared again in English in the *Savoy* for July 1896 It has been done into French and German. The *Bristo* and *Cioso* first appeared with the comedies of Sá de Miranda in 1622 There is a good modern edition of the Complete Works of Ferreira (2 vols, Paris, 1865) *See* Castilho, *Antonio Ferreira* (3 vols, Rio, 1865), which contains a full biographical and critical study with extracts

FERREL'S LAW is to the effect that "If a body moves in any direction on the earth's surface, there is a deflecting force arising from the earth's rotation, which deflects it to the right in the northern hemisphere and to the left in the southern hemisphere" This law was enunciated by William Ferrel, an American scientist, who was responsible for a number of papers, of which his *Essay on Winds and Currents of the Ocean* (1856) is probably the best known (*See* METEOROLOGY)

FERRERO, GUGLIELMO (1871–), Italian journalist and author, was born at Portici, near Naples on July 31, 1871. At an early age he joined the staff of the Radical semi-republican *Secolo* of Milan He travelled abroad considerably, and made a reputation by his books *L'Europa giovane* (1897) and *Il Militarismo* (1898; Engl tr, 1902) Later he studied Roman history, and in 1902 published his *Grandezza e decadenza di Roma*, which established his fame as historian among the general public rather than among scholars In politics a Radical Democrat, on the outbreak of the World War he was an ardent supporter of the Allied cause, which he identified with that of democracy, and advocated Italian intervention After the war he published numerous articles and several books in Italy and abroad, inspired by forebodings of imminent catastrophe for Italy and the world Among these is *Da Fiume a Roma* (1923), also published in English under the title *Four Years of Fascism* (1924)

FERRERS, the name of a great Norman-English feudal house, derived from Ferrières-St -Hilaire, to the south of Bernay, in Normandy Its ancestor Walkelin was slain in a feud during the Conqueror's minority, leaving a son Henry, who took part in the Conquest and held a great fief in the midlands He established his chief seat at Tutbury Castle, Staffordshire, on the Derbyshire border, and founded there a Cluniac priory His eldest son succeeded to Ferrières, and, according to Stapleton, he was ancestor of the Oakham house of Ferrers, whose memory is preserved by the horseshoes hanging in the hall of their castle. Robert, a younger son of Henry, inherited his vast English fief, and, for his services at the battle of the Standard (1138), was created earl of Derby by Stephen He appears to have died the next year

The earls seem to have been styled indifferently earls of Derby or Nottingham (both counties then forming one shrievalty) or of Tutbury, or simply (de) Ferrers

William, the 3rd earl, joined in the great revolt of 1173, when he fortified his castles of Tutbury and Duffield and plundered Nottingham, which was held for the king On his subsequent submission his castles were razed He died at the siege of Acre, 1190 His son William, the 4th earl, attacked Nottingham on Richard's behalf in 1194 He was confirmed by king John in the earldom of Derby, 1199. With his brother-in-law the earl of Chester, and with William Marshal, earl of Pembroke, whose daughter married his son, he acted in securing the succession of the young Henry, joining in the siege of Mountsorrel and the battle of Lincoln. In 1227 he was one of the earls who rose against Henry III on behalf of his brother Richard and made him restore the forest charters, and in 1237 he was one of the three counsellors forced on the king by the barons He died in 1247

Robert, 6th and last earl, his grandson, succeeded as a minor in 1254 He was one of the five earls summoned to Simon de Montfort's parliament, though, on taking the earl of Gloucester's part, he was arrested by Simon On the king's triumph, he was compelled to forfeit his castles and seven years' revenues In 1266 he revolted on his own estates in Derbyshire, but was defeated at Chesterfield by Henry "of Almain," deprived of his earldom and lands and imprisoned In 1269, he agreed to pay £50,000 for restoration, and to pledge all his lands save Chartley and Holbrook for its payment As he was not able to find the money, the lands passed to the king's son, Edmund.

The earl's son John succeeded to Chartley, a Staffordshire estate long famous for the wild cattle in its chase, and was summoned

as a baron in 1299, though he had joined the baronial opposition in 1297 On the death, in 1450, of the last Ferrers lord of Chartley, the barony passed with his daughter to the Devereux family and then to the Shirleys, one of whom was created Earl Ferrers in 1711 The barony has been in abeyance since 1855.

The line of Ferrers of Groby was founded by William, younger brother of the last earl, who inherited from his mother Margaret de Quinci her estate of Groby in Leicestershire, and some Ferrers manors from his father On the death of William, Lord Ferrers of Groby, in 1445, the barony passed with his granddaughter to the Grey family and was forfeited with the dukedom of Suffolk in 1554 A younger son of William, the last lord, married the heiress of Tamworth Castle, and his line was seated at Tamworth till 1680, when an heiress carried it to a son of the first Earl Ferrers From Sir Henry, a younger son of the first Ferrers of Tamworth, descended Ferrers of Baddesley Clinton, seated there in the male line till towards the end of the 19th century The line of Ferrers of Wemme was founded by a younger son of Lord Ferrers of Chartley, who married the heiress of Wemme, Co. Salop, and was summoned as a baron in her right; but it ended with their son

Higham Ferrers, Northants, and Woodham Ferrers, Essex, take their names from this family It has been alleged that they bore horseshoes for their arms in allusion to Ferrières (*i e*, iron-works), but when and why they were added to their coat is a moot point.

See Dugdale's *Baronage*, J R. Planche's *The Conqueror and his Companions;* G E C(okayne)'s *Complete Peerage, Chronicles and Memorials* (Rolls Series), T Stapleton's *Rotuli Scaccarii Normanniæ*, H Norris, *Baddesley Clinton, with account of the family of Ferrers* (1897).

FERRERS, LAURENCE SHIRLEY, 4TH EARL (1720–1760), the last nobleman in England to suffer a felon's death, was born on Aug 18, 1720 In 1758 his wife obtained a separation from him for cruelty The Ferrers estates were then vested in trustees, an old family steward, Johnson, being appointed receiver of rents On Jan 18, 1760, Johnson called at the earl's mansion at Staunton Harold, Leicestershire, when Lord Ferrers shot him Ferrers was tried for murder by his peers in Westminster Hall He pleaded insanity, but was found guilty On May 5, 1760, dressed in a light-coloured suit, embroidered with silver, he was taken in his own carriage from the Tower of London to Tyburn and there hanged. It has been said that as a concession to his order the rope used was of silk

See Peter Burke, *Celebrated Trials connected with the Aristocracy in the Relations of Private Life* (London, 1849); Edward Walford, *Tales of our Great Families* (London, 1877); Howell's *State Trials* (1816), xix. 885–980.

FERRER Y GUARDIA, FRANCISCO (1859–1909), Spanish educationist, was born at Abella, and was originally a railwayman After the collapse of the Spanish republic he went to Paris in 1886 and became converted to Socialism About 1899 a legacy enabled him to return to Spain and propagate his views He was especially keen on substituting secular for clerical education, and it was through this, and through his own school, the Escuela Moderna in Barcelona, that he became an international figure Among those employed at his school was Morral, and Ferrer was in 1906 charged with complicity in his attempt to assassinate the king After he had been imprisoned for a year the charge was dismissed On Sept 1, 1909, he was again arrested and charged, despite his opposition to violence, with complicity in the outbreak at Barcelona in the previous July He was tried by court martial on Sept. 9, and shot on Sept 12 The methods of the court and the character of the evidence admitted gave rise to an international agitation of protest The execution was widely regarded as a judicial murder. In 1912 the Spanish supreme military council admitted that, contrary to the evidence offered at the trial, no act of violence could be traced to Ferrer, and ordered the restoration of his property

See Prof. Simarro, *El Proceso Ferrer*, and Francisco Ferrer, *The Modern School* (Eng. trans 1913).

FERRET, a domesticated breed of the wild polecat (*Putorius foetidus*), which it resembles in size, form and habits, and with which it interbreeds It differs in the colour of its fur, which is usually yellowish-white, and of its eyes, which are pinky-red. The "polecat-ferret" is a brown breed, apparently the product of the above-mentioned cross The ferret attains a length of about 14in, exclusive of the tail, which measures 5in. It is employed in destroying rats and other vermin, and in driving rabbits from their burrows The ferret is remarkably prolific, the female bringing forth two broods annually, each numbering from six to nine young. Pliny states it was employed in his time in rabbit-hunting.

The ferret should be kept in dry, clean, well-ventilated hutches, and fed twice daily on bread, milk, and meat, such as rabbits' and fowls' livers. When used to hunt rabbits it is provided with a muzzle or with a cope, made by looping and knotting twine about the head and snout, in order to prevent it killing its quarry As the ferret enters the hole, the rabbits flee before it, and are shot as they break ground A ferret's hold on its quarry is as obstinate as that of a bulldog, but can easily be broken by pressure of the thumb just above the eyes Only full-grown ferrets are "worked to" rats Several are used at a time and without copes, as rats are fierce fighters

See N Everitt, *Ferrets* (1897).

FERRI, CIRO (1634–1689), Roman painter, the chief disciple and successor of Pietro da Cortona He was born in the Roman territory At an age a little past 30, he completed the painting of the ceilings and other internal decorations begun by his instructor in the Pitti palace, Florence He also co-operated in or finished several other works by Pietro, both in Florence and in Rome Of his own independent productions, the chief is an extensive series of scriptural frescoes in the church of S Maria Maggiore in Bergamo; also a painting (rated as Ferri's best work) of St Ambrose healing a sick person, the principal altarpiece in the church of S Ambrogio in Rome He executed also a large amount of miscellaneous designs, such as etchings and frontispieces for books, and he was an architect besides Ferri was appointed to direct the Florentine students in Rome, and Gabbiani was one of his leading pupils He died in Rome on Sept 13, 1689

FERRI, LUIGI (1826–1895), Italian philosopher, was born at Bologna on June 15, 1826 Educated at the Ecole Normale in Paris, he lectured in the colleges of Evreux, Dieppe, Blois, Toulouse, Annecy and Casal-Montferrat, and became head of the education department under Mamiani in 1860 In 1863 he became professor of philosophy at the Istituto di Perfezionamento at Florence, and, in 1871, in the University of Rome. He is known especially as an historian of philosophy. His original work is eclectic, combining the psychology of his teachers, Jules Simon, Saisset and Mamiani, with the idealism of Rosmini and Gioberti. His chief works are *Studii sulla coscienza; Il Fenomeno nelle sue relazioni con la sensazione; Della idea del vero; Della filosofia del diritto presso Aristotile* (1855), *Il Genio di Aristotile* (1866); *La Psicologia di Pomponazzi* (1877), *Essai sur l'histoire de la philosophie en Italie au XIXe siècle* (1869), and *La Psychologie de l'association depuis Hobbes* (1883)

FERRIER, SIR DAVID (1843–1928), British neurologist, was born on Jan 13, 1843, at Aberdeen. He was educated at his native town, at Heidelberg, where he turned from the study of philosophy to that of medicine, and at Edinburgh where he took his M B in 1868 Ferrier was successively lecturer on physiology at the Middlesex hospital, London (1870–72), professor of forensic medicine at King's college (1872–89), professor of neuropathology (1889–1928), physician to King's College hospital and physician to the National hospital for the paralysed and epileptic, in Queen square. He was knighted in 1911.

While practising his profession, Ferrier devoted himself to the research on the physiology of the brain, especially on the localization of cerebral functions and the removal of tumours. His early epoch-making papers on this subject, which appeared from 1873–76, and his important work, entitled *Functions of the Brain* (1876, 2nd ed 1886), at once secured for him the attention of the scientific world By persistent experiments, Ferrier raised the vague speculations concerning cerebral functions into the definite modern science of neurology. He died in London on March 19, 1928

His *Croonian Lectures on Cerebral Localisation* appeared in 1890

and his *Regional Diagnosis of Cerebral Disease* in 1910.

FERRIER, JAMES FREDERICK (1808–1864), Scottish metaphysician, was born in Edinburgh on June 16, 1808 He studied at Edinburgh and Oxford, and subsequently at Heidelberg. In 1842 he was appointed professor of civil history at Edinburgh and in 1845 professor of moral philosophy and political economy at St Andrews, where he remained till his death on June 11, 1864.

His first contribution to metaphysics was a series of articles in *Blackwood's Magazine* (1838–39), entitled *An Introduction to the Philosophy of Consciousness* Among Ferrier's succeeding articles the chief were *The Crisis of Modern Speculation* (1841), *Berkeley and Idealism* (1842), and an important examination of Hamilton's edition of Reid (1847), which contains a vigorous attack on the philosophy of common sense

Ferrier's mature *Institutes of Metaphysics* (1854) attempts to employ the method of Spinoza, strict demonstration All the errors of natural thinking or phenomenalism, which philosophy must correct, fall under one or other of three topics.—Knowing and the Known, Ignorance, and Being. The problems of knowing and the known are treated in the "Epistemology or Theory of Knowing" Along with whatever any intelligence knows it must, as the ground or condition of its knowledge, have some cognizance of itself. Object+subject, thing+me, is the only possible knowable; hence the only independent universe which any mind can think of is the universe in synthesis with some *other* mind or *ego*.

The leading contradiction which is corrected in the "Agnoiology or Theory of Ignorance," the section which Ferrier regarded as most original, is that there can be an ignorance of that of which there can be no knowledge. Ignorance is a defect which can only concern that which is knowable *i e* some-object-*plus*-some-subject

The "Ontology or Theory of Being," the final division, contains a discussion of the origin of knowledge, in which Ferrier traces all perplexities and errors to the assumption of the absolute existence of matter He concludes that the only true real and independent existences are minds-together-with-that-which-they-apprehend, and that the one strictly necessary absolute existence is a supreme, infinite and everlasting mind in synthesis with all things

A complete edition of Ferrier's philosophical writings including the noticeable *Lectures on Greek Philosophy*, was published in 1875. *See* also E. S. Haldane, *J F Ferrier* (Edinburgh, 1899).

FERRIER, PAUL (1843–1920), French dramatist, was born at Montpellier on March 29, 1843, and he died at Nouan-le-Fuzelier on Sept 11, 1920 One of Ferrier's greatest triumphs was the production with Fabrice Carré of *Joséphine vendue par ses soeurs* (1886), an *opéra bouffe* with music by Victor Roger His opera libretti include *La Marocaine* (1879), music of J Offenbach; *Le Chevalier d'Harmental* (1896) after the play of Dumas père, for the music of A Messager; *La Fille de Tabarin* (1901), with Victorien Sardou, music of Gabriel Pierné

FERRIER, SUSAN EDMONSTONE (1782–1854), Scottish novelist, born in Edinburgh on Sept 7, 1782, was the daughter of James Ferrier, at one time one of the clerks of the court of session with Sir Walter Scott

Susan Ferrier's first novel, *Marriage* (1818), was begun in concert with a friend, Miss Clavering, but this lady wrote only a few pages It was followed in 1824 by *The Inheritance*, a better constructed and more mature work; and the last and perhaps best of her novels, *Destiny*, appeared in 1831 All these novels were published anonymously With their clever portraiture of contemporary Scottish life and manners, and even recognizable caricatures of some social celebrities of the day, they could not fail to become popular north of the Tweed. Many were the conjectures as to the authorship of the novels In the *Noctes Ambrosianae* (Nov. 1826) James Hogg is made to mention *The Inheritance*, and adds, "which I aye thought was written by Sir Walter, as weel's *Marriage*, till it spunked out that it was written by a leddy." Scott himself gave Susan Ferrier a very high place indeed among the novelists of the day. In his *Tales of My Landlord* he calls her his "sister shadow," the still anonymous author of "the very lively work entitled *Marriage*" Lively, indeed, all her works are, written in clear, brisk English, and with an inexhaustible fund of humour Her books portray the society in which she lived, caricaturing with terrible exactness its hypocrisy, boastfulness, greed, affection and undue subservience to public opinion Yet she wrote less to reform than to amuse In this she is less like Maria Edgeworth than Jane Austen Maria Edgeworth was more of a moralist; her wit is not so involuntary, her caricatures not always so good-natured But Jane Austen and Susan Ferrier were genuine humorists, and with the latter especially a keen sense of the ludicrous was always dominant. Her humorous characters are always her best But if she was not a moralist, neither was she a cynic, and her wit, even where it is most caustic, is never uncharitable

Susan Ferrier lived at Morningside House and in Edinburgh for more than twenty years after the publication of her last work Lockhart describes her visit to Scott in May 1831 She died on Nov 5, 1854, in Edinburgh. She left among her papers a short unpublished article, entitled "Recollections of Visits to Ashestiel and Abbotsford" This is her own very interesting account of her long friendship with Sir Walter Scott It contains some impromptu verses written by Scott in her album at Ashestiel

See Sir G B S Douglas, *The Blackwood Group* (Famous Scots Series, 1897), *Memoir and Correspondence of Susan Ferrier*, collected by John Ferrier, ed. J A Doyle (1898)

FERRO-CONCRETE. Ferro-concrete or reinforced concrete is a combination of fine concrete with embedded steel bars adapted to structural purposes The concrete element is an artificial stone-like material of excellent durability which offers great resistance to crushing or compressive stress, but has relatively small tensile strength Mild steel bars, on the other hand, have great tensile strength and when provided in suitable quantity and correct location can be utilized to make good the deficiency of the concrete in that respect Construction in ferro-concrete is therefore based on the combination of the two materials according to scientific principles whereby they co-operate in sustaining safely the loads and stresses to which the structure is exposed

The first operation in the execution of a ferro-concrete structure consists in the forming and supporting in correct position of a set of external moulds of timber or sheet metal which reproduce the form of the members or parts to be constructed The next step is the placing and fixing of the system of steel reinforcing bars within or on the moulds, which are then filled with soft concrete newly mixed The steel reinforcement thus becomes embedded in the concrete which gradually hardens and forms the general binding material of the system After the lapse of a setting period of a few days or weeks the moulds are removed and the finished concrete is exposed Such construction is adapted to an infinite variety of purposes in engineering and building construction and is now preferred for many purposes for which wood and steel were formerly considered appropriate It has great advantages over wood in respect of strength and durability and is much superior in fire-resisting qualities to both wood and bare steelwork In most circumstances, too, the steel bars in ferro-concrete are efficiently protected by the cement against corrosion

See CONCRETE (J Wr)

FERROL, a city of north-west Spain, province of Corunna; 41 m. by rail N E. of the city of Corunna; on the Bay of Ferrol, an inlet of the Atlantic ocean Pop (1920) 30,350 Ferrol ranks with Cartagena and San Fernando, near Cadiz, as one of the principal naval stations of Spain The town, beautifully situated on a headland on the north shore of the bay, is concealed by rocky hills from view from the sea Its fine, natural harbour, one of the best in Europe, and the largest in Spain, except those of Vigo and Cartagena, is deep and safe; but the entrance is a narrow strait about 2 m long, which admits only one vessel at a time, and is commanded by powerful modern batteries and forts on either side of the bay Ferrol has extensive shipbuilding yards and a large arsenal basin, with workshops and foundries, and two dry docks. Across a broad inlet west of the headland lies the submarine base of La Graña. Since the 1908 decree for bringing the Spanish navy up to date, considerable constructional work has gone on in the dockyards Local industries are mainly connected with the building or refitting of naval vessels Owing to the competition of

Corunna, at so short a distance, and in the past to the lack of railway communication, Ferrol is not a first class commercial port. It is now connected by rail with Betanzos, and in 1928 a line was under construction from Gijon; but the exports are insignificant, consisting mainly of pit-props, and the chief imports are coal, cement, timber, iron and machinery, for use in the shipping industries

Ferrol was a mere fishing village until, in 1726, Charles IV. chose it as the site for a naval arsenal, and Ferdinand VI (1746–1759) later set up shipbuilding yards here In 1799 the British made a fruitless attempt to capture it, but on Nov 4, 1805, they defeated the French fleet in front of the town, which they compelled to surrender Delivered by treachery to the French on Jan 27, 1809, it was vacated by them on July 22 After a month's blockade Ferrol surrendered to the French on Aug 27, 1823

FERROMAGNETISM, the kind of magnetism associated with iron, nickel, cobalt, alloys of these metals, some compounds of iron, and some compounds and alloys of manganese. These substances are the *ferromagnetic* substances and exhibit marked magnetic properties, *e g*, they are easily magnetized, they acquire a high value of magnetization in extremely small magnetic fields (*See* MAGNETISM *Ferromagnetism*)

FERRUCCIO or **FERRUCCI, FRANCESCO** (1489–1530), Florentine captain He served in the *Bande Nere* in various parts of Italy, earning a reputation as a daring fighter and somewhat of a swashbuckler When Pope Clement VII and the emperor Charles V decided to reinstate the Medici in Florence, they made war on the Florentine republic, and Ferruccio was appointed Florentine military commissioner at Empoli, where he showed great daring and resource by his rapid marches and sudden attacks on the Imperialists Early in 1530 Volterra had thrown off Florentine allegiance and had been occupied by an Imperialist garrison, but Ferruccio surprised and recaptured the city During his absence, however, the Imperialists captured Empoli by treachery, thus cutting off one of the chief avenues of approach to Florence Ferruccio then attempted a diversion by attacking the Imperialists in the rear and started from Volterra for the Apennines. But at Pisa he was laid up for a month with a fever —a misfortune which enabled the enemy to get wind of his plan and to prepare for his attack At the end of July Ferruccio left Pisa at the head of about 4,000 men, and although the besieged in Florence, knowing that a large part of the Imperialists under the prince of Orange had gone to meet Ferruccio, wished to cooperate with the latter by means of a sortie, they were prevented from doing so by their own traitorous commander-in-chief, Malatesta Baglioni Ferruccio was defeated on Aug 3 at Gavinana; he himself was wounded and captured Maramaldo out of personal spite despatched the wounded man with his own hand Nine days later Florence surrendered Ferruccio was one of the great soldiers of the age, and his enterprise is the finest episode of the last days of the Florentine republic. (*See* also under FLORENCE and MEDICI.)

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FERRULE, a small metal cap or ring holding parts of a rod, etc., together, or giving strength to weakened materials, or especially, when attached to the end of a stick or umbrella, for preventing wearing or splitting (Fr *virole* from Lat. diminutive *viriae,* bracelets, *cf.* also Lat. *ferrum,* iron). "Ferrule" must be distinguished from "ferule" or "ferula," properly the Latin name of the "giant fennel." From the use of the stalk of this plant as a cane or rod for punishment comes the application of the word to many instruments used in chastisements, particularly a short flat piece of wood or leather, shaped somewhat like the sole of a boot, and applied to the palm of the hand; the pain inflicted is exceedingly sharp and immediate, but the effects are momentary. The word is sometimes applied to the ordinary cane as used by schoolmasters.

FERRY, JULES FRANÇOIS CAMILLE (1832–1893), French statesman, was born at Saint Dié (Vosges) on April 5, 1832 He studied law, was called to the bar at Paris, and contributed to the *Temps* He attacked the empire with great violence, directing his opposition especially against Baron Haussmann, prefect of the Seine Elected republican deputy for Paris in 1869, he protested against the declaration of war with Germany, and on Sept 6, 1870 was appointed prefect of the Seine by the government of national defence He administered Paris during the siege, and after the Commune was obliged to resign (June 5, 1871). From 1872–1873 he was minister in Athens, but returned to the chamber as deputy for the Vosges, and became one of the leaders of the republican party. He was a member of the first republican ministry formed under W H Waddington on Feb 4, 1879, and continued in the ministry until March 30, 1885, except for two short interruptions, first as minister of education and then as minister of foreign affairs He was twice premier (1880–81 and 1883–1885). Two important works are associated with his administration, the non-clerical organization of public education, and the beginning of the colonial expansion of France He reorganized the committee of public education (law of Feb 27, 1880), and proposed a regulation for the conferring of university degrees, which, though rejected, aroused violent polemics because the 7th article took away from the unauthorized religious orders the right to teach He finally succeeded in passing the great law of March 28, 1882, which made primary education in France free, non-clerical and obligatory In higher education the number of teachers doubled under his ministry After the military defeat of France by Germany in 1870, he formed the idea of acquiring a great colonial empire, not to colonize it, but for the sake of economic exploitation He directed the negotiations which led to the establishment of a French protectorate in Tunis (1881), prepared the treaty of Dec 17, 1885 for the occupation of Madagascar, directed the exploration of the Congo and of the Niger region; and above all he organized the conquest of Indo-China The excitement caused at Paris by an unimportant reverse of the French troops at Lang-son caused his downfall (March 30, 1885), but the treaty of peace with China (June 9, 1885) was his work After the resignation of President Grévy (Dec 2, 1887), he was a candidate for the presidency of the republic, but the radicals refused to support him, and he withdrew in favour of Sadi Carnot The violent polemics directed against him caused a madman to attack him with a revolver, and he died from the wound on March 17, 1893 The chamber of deputies voted him a state funeral

See Edg. Zevort, *Histoire de la troisième République,* A. Rambaud, *Jules Ferry* (Paris, 1903).

FERRY, a place where boats ply regularly across a river or arm of the sea for the conveyance of goods and persons. In law the right of ferrying persons or goods across a particular river or strait, and of exacting a reasonable toll for the service, belongs, like the right of fair and market, to the class of rights known as franchises (*see* FRANCHISE) Its origin must be by statute, royal grant or prescription It is wholly unconnected with the ownership or occupation of land, so that the owner of a ferry need not be proprietor of the soil on either side of the water over which the right is exercised He is bound to maintain safe and suitable boats ready for the use of the public, and to employ fit persons as ferrymen As a correlative of this duty he has a right of action, not only against those who evade or refuse payment of toll when it is due, but also against those who disturb his franchise by setting up a new ferry, so as to diminish his custom, unless a change of circumstances, such as an increase of population near the ferry, justify other means of passage, whether of the same kind or not. (*See* also WATER RIGHTS; SHIP. *Ferry Steamers, Train Ferries.*)

FERRY-BOAT, a boat used for ferrying passengers and vehicles (*see* FERRY). The floor plan of the large, modern ferry-boat is roughly divided into five parts. The inner section is devoted to power; two surrounding passages running the length of the boat hold one or two lines of vehicles; while the two outer sections are arranged as cabins for passengers, one serving as a smoking room, and one as a ladies' cabin. Many have two decks, with a closed cabin and a promenade on the upper.

FERSEN, FREDRIK AXEL, COUNT VON (1719–1794), Swedish politician, entered the Swedish Life Guards in 1740, and from 1743 to 1748 was in the French service (*Royal-Suédois*), where he rose to the rank of brigadier At the diet of 1755–56 he was elected *landtmarskalk*, or marshal of the diet, and from henceforth, till the revolution of 1772, led the Hat party (*see* SWEDEN: *History*). In 1756 he defeated the projects of the court for increasing the royal power; but, after the disasters of the Seven Years' War, gravitated towards the court again and contributed, by his energy and eloquence, to uphold the tottering Hats for several years On the accession of the Caps to power in 1766, Fersen assisted the court in its struggle with them by refusing to employ the Guards to keep order in the capital when King Adolphus Frederick, driven to desperation by the demands of the Caps, publicly abdicated, and a seven days' interregnum ensued At the ensuing diet of 1769, when the Hats returned to power, Fersen was again elected marshal of the diet, but he made no attempt to redeem his pledges to the crown prince Gustavus, as to a very necessary reform of the constitution, which he had made before the elections, and thus involuntarily contributed to the subsequent establishment of absolutism

When Gustavus III. ascended the throne in 1772, and attempted to reconcile the two factions by a composition which aimed at dividing all political power between them, Fersen consented to open negotiations with the Caps, and was the principal Hat representative on the abortive composition committee During the revolution of Aug 1772, Fersen remained a passive spectator of the overthrow of the constitution, and was one of the first whom Gustavus summoned to his side after his triumph Yet his relations with the king were never cordial. There was a slight collision between them as early as the diet of 1778; but at the diet of 1786 Fersen boldly led the opposition against the king's financial measures (*see* GUSTAVUS III) which were consequently rejected. At the diet of 1789 Fersen marshalled the nobility around him for a combat *à outrance* against the throne and that, too, at a time when Sweden was involved in two dangerous foreign wars, and national unity was absolutely indispensable This tactical blunder materially assisted the secret operations of the king He and 20 of his friends of the nobility were arrested (Feb 17, 1789) and the opposition collapsed Fersen was speedily released, but henceforth kept aloof from politics, surviving the king two years His *Historiska Skrifter*, a record of Swedish history, mainly autobiographical, during the greater part of the 18th century, is excellent as literature, but somewhat unreliable as an historical document

See C G Malmstrom, *Sveriges politiska Historia* (Stockholm, 1855–65), R N Bain, *Gustavus III* (1895), C T Odhner, *Sveriges politiska Historia under Gustaf III's Regering* (Stockholm, 1885, etc.), F A Fersen, *Historiska Skrifter* (Stockholm, 1867–72).

FERSEN, HANS AXEL, COUNT VON (1755–1810), Swedish statesman, was educated at home, and at the military schools of Brunswick, Turin and Strasbourg In 1779 he entered the French military service (*Royal-Bavière*), accompanied General Rochambeau to America as his adjutant, distinguished himself during the war with England, notably at the siege of Yorktown, 1781, and in 1785 was promoted to be *colonel propriétaire* of the regiment *Royal-Suédois*. The queen, Marie Antoinette, was especially attracted by his grace and wit and it is possible that he would have passed his life at Versailles, but for a hint from his own sovereign, then at Pisa, that he desired him to join his suite. He accompanied Gustavus III in his Italian tour and returned home with him in 1784. Fersen went with his regiment to Finland in 1788, but in the autumn of the same year returned to France, where Gustavus required an agent thoroughly in the confidence of the French royal family, and sufficiently able and audacious to help them in their desperate straits. Before the end of 1790 Fersen had to admit that the cause of the French monarchy was hopeless so long as the king and queen of France were captives in their own capital Finding the requisite funds he made the arrangements for their flight to Varennes, and was the coachman of the *fiacre* which drove the royal family from the Carrousel to the Porte Saint-Martin.

In 1791, Fersen was sent to Vienna to induce the emperor Leopold to accede to a new coalition against revolutionary France, but he soon realized that the Austrian court meant to do nothing, and was transferred to Brussels, where he could be of more service. In Feb. 1792, he reached Paris with counterfeit credentials as minister plenipotentiary to Portugal On Feb. 13, he had three interviews with the royal family, but returned to Brussels on the 27th, having accomplished nothing. In 1797 Fersen was sent to the congress of Rastatt as the Swedish delegate, but in consequence of a protest from the French government, was not permitted to take part in it.

During the regency of the duke of Sudermania (1792–96) Fersen, like all the other Gustavians, was in disgrace; but, on Gustavus IV. attaining his majority in 1796, he was reinstated in all his offices and dignities In 1801 he was appointed *Riksmarskalk* (=earl-marshal) On the outbreak of the war with Napoleon, Fersen accompanied Gustavus IV. to Germany to assist him in gaining fresh allies. He prevented Gustavus from invading Prussia in revenge for the refusal of the king of Prussia to declare war against France, and during the rest of the reign was in semi-disgrace, though generally a member of the government when the king was abroad

Fersen stood aloof from the revolution of 1809. (*See* SWEDEN. *History*.) His sympathies were entirely with Prince Gustavus, son of the unfortunate Gustavus IV, and when the newly elected successor to the throne, prince Christian Augustus of Augustenburg, died suddenly in Skåne in May 1810, the report spread that he had been poisoned, and that Fersen and his sister, the countess Piper, were accessories When the prince's body was conveyed to Stockholm on June 20, 1810, and Fersen, in his official capacity as *Riksmarskalk*, received it at the barrier and led the funeral cortège into the city, he was attacked by the mob In order to save him, two officers volunteered to conduct him to the senate house and there place him in arrest But when he appeared on the steps, the crowd rushed on him and kicked and trampled him to death, while the troops, drawn up in the Riddarhus Square, made no effort to rescue the Riksmarskalk.

See R M Klinckowström, *Le Comte de Fersen et la cour de France* (1877; Eng ed entitled, *Diary and Correspondence of Count Axel Fersen*, 1902), R. N Bain, *Gustavus III*, vol ii. (1895); P. Gaulot, *Un Ami de la reine* (1892), F. F Flach, *Grefve Hans Axel von Fersen* (Stockholm, 1896), E. Tegner, *Gustaf Mauritz Armfelt*, vol. iii. (Stockholm, 1883–87); O. G de Heidenstam, *Marie-Antoinette, Fersen and Barnave; leur Correspondance* (1913, Eng. trs, 1926).

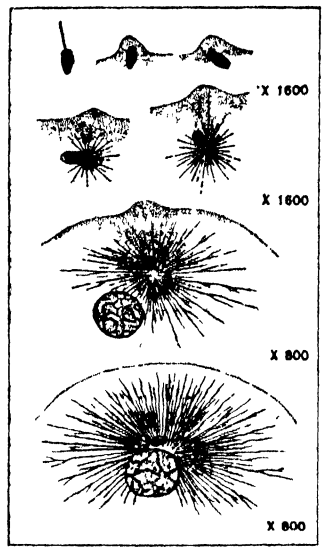
FERTILIZATION. Before the eggs of most animals and plants can begin their development it is necessary that they should unite with specialized cells derived from the body of a male organism This union is the essential characteristic of fertilization. In all higher animals and in all flowering plants the union of the gametes occurs within the body of the mother organism, but in many other instances, *e g*, most fishes, ferns, the eggs and spermatozoa, or the latter alone, are shed into water and fertilization occurs in this medium.

In animals, the male cell or spermatozoon is typically small in size and consists of three main parts: (i) the head, composed almost exclusively of the nucleus, (ii) the middle piece, (iii) the tail, which being vibratile, provides the means whereby the cell propels itself rapidly through the medium in which fertilization occurs All these three parts play an essential rôle in fertilization. As a rule spermatozoa do not move as long as they lie within the organs of the male's body; they only begin to swim with intense activity when shed into the medium containing the eggs, and even then their active life is limited to a very short period of time, varying from a few minutes in the case of a fish to two days in that of mammals.

The ripe unfertilized egg, on the other hand, is a peculiarly inert cell until after a spermatozoon has rendered it fertile. As it leaves the ovary of oviparous animals, the egg contains all the raw materials and most of the mechanism requisite for the formation of a complete embryo, and the accumulated yolk from which this embryo is formed often renders the egg a large and conspicuous object.

The process by which a spermatozoon is incorporated into the

substance of an egg is most conveniently studied in animals in which fertilization takes place outside the body of the female parent. The simplest and perhaps the best examples are provided by many species of sea-urchins (Echinoidea) which shed their gametes, in large numbers, into the surrounding sea water. If ripe eggs and spermatozoa are mixed together in a drop of sea water it can be seen (under the low powers of the microscope) that the presence of the eggs exerts a powerful stimulus on the male cells, causing them to swim with greatly increased vigour and rapidity. This effect is due to an exudation from the eggs (fertilin) which ceases to be produced as soon as the eggs have actually united with spermatozoa. Contact between egg and spermatozoon is, in animals, not due to mutual attraction but is the result of chance collisions between the stationary egg and the motile male cells In some plants, *e g*, ferns, the female system appears to secrete malic, tartaric, or other acid which attracts the spermatozoa towards the eggs



FROM WILSON, "THE CELL IN DEVELOPMENT AND HEREDITY" (MACMILLAN)

FIG 1 —ENTRANCE AND ROTATION OF THE SPERM-HEAD AND FORMATION OF THE SPEAR-ASTER IN THE SEA URCHIN (TOXOPNEUSTES)

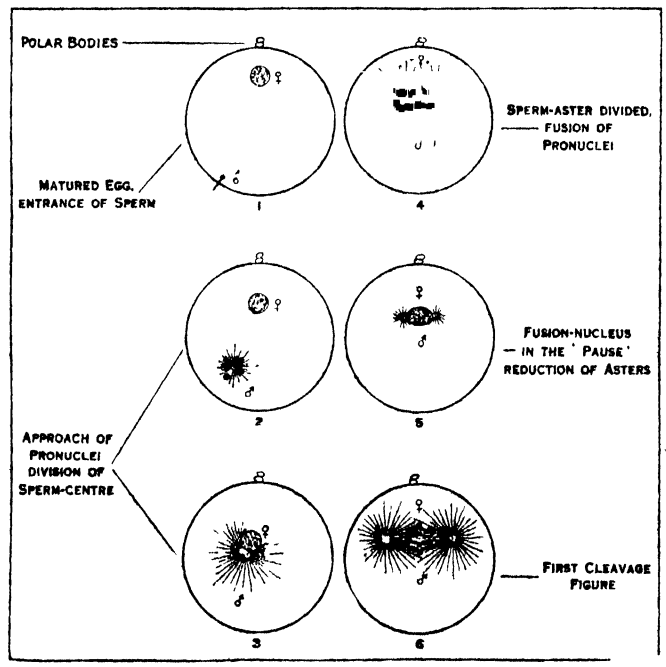
As soon as a spermatozoon strikes the surface of the egg it begins to burrow rapidly through the gelatinous coat by which the female gamete is surrounded In this way many spermatozoa may reach the cortex of a single egg, but only one takes part in the essential act of fertilization. In some cases the unfertilized egg is surrounded by a tough membranous capsule (as in the salmon) so that the spermatozoa can only reach the egg through a special aperture in the capsule known as the micropyle In such forms fertilization must occur at the base of the micropyle, whereas in other types it may usually occur at any point on the egg's surface

The initial phase of fertilization occurs when the head of the effective spermatozoon becomes attached to the surface of the egg. From this moment onwards the inertia of the egg is lost, it begins to respire actively and the whole cycle of growth and development starts In many cases a visible change occurs at the egg surface whereby a fertilization membrane is formed, thus enclosing the egg within a spherical container considerably larger than the egg The actual incorporation of the spermatozoon into the egg is due to the activity of the latter rather than to that of the spermatozoon. At the point of contact beween the cells a small cone-like protrusion forms on the egg surface, and in this fertilization-cone the male cell gradually becomes embedded The cone then subsides and the spermatozoon is thereby drawn into the egg The vibratile tail of the sperm, so essential for effecting contact with the egg loses its power of movement as soon as the head is attached to the female cell; subsequent to this it often degenerates or is lost both sperm head and middle piece enter the substance of the egg.

Shortly after the subsidence of the fertilization cone, the male elements (middle piece and nucleus) rotate about their own axis so that the middle piece instead of being directed towards the periphery of the egg is now nearer to the centre than is the male nucleus Both structures move towards the egg nucleus which in turn moves up to meet them. During this movement significant changes occur in both nucleus and middle piece of the spermatozoon The former considerably enlarges in size and eventually becomes almost identical in appearance with the egg nucleus. The middle piece of the spermatozoon which is at first a more or less compact structure soon becomes the centre of a series of rays, which are known as the male aster Some authorities believe that the normal cleavage of an egg cell is made possible by the incorporation into the cell of this male aster. Another aster is believed to be associated with the female nucleus, so that in a fertilized egg the two astral bodies necessary for normal cleavage are both present By the time the female and male nuclei have come into contact the radiations of the male aster extend throughout the whole egg The nuclei now fuse together to form a zygote nucleus, the radiations from the aster fade away and the process of fertilization is complete From this point onward the zygote nucleus proceeds to undergo mitotic division and the phenomena of segmentation and development follow in their normal sequence. (*See* CYTOLOGY and EMBRYOLOGY.) The nucleus of the spermatozoon does not appear to be necessary for the initiation of development, but on the other hand it introduces into all the cells of the developing embryo one complete set of the hereditary factors transmitted by the male parent in its chromosomes.

In the majority of cases an egg can only be fertilized by a spermatozoon if both cells are derived from organisms belonging to the same species Cases of hybridization are, however, not uncommon, but in almost every case the offspring of such matings are themselves sterile, *e g*, mules, certain hybrid moths, pheasants In some cases the failure to obtain hybrid forms is due to an inability of the egg and spermatozoon to unite, whilst in others the foreign spermatozoa having fertilized the eggs give rise to embryos which die at an early stage of development (many bony fishes). An interesting case of natural sterility is provided by some species of hermaphrodite animals (Ascidians). These animals produce both eggs and spermatozoa which, although they mature at the same time, will not unite unless the eggs are derived from one individual and the spermatozoa from another. Similar cases of self-sterility are known among plants.

The reproductive power of an animal depends on three important factors. (1) The number of eggs and spermatozoa which the parents produce, (2) the chances which are provided for an active spermatozoon to reach a fertilizable egg, (3) the chances of a newly fertilized egg completing its development into an adult organism In many of the lower animals and plants there is no close proximity between the sexes at the moment of liberation of the gametes. Very large numbers of eggs and spermatozoa are shed into the surrounding medium, and fertilization depends solely on chance collisions, although there is often a tendency for a large number of both sexes to shed their gametes at the same moment or in response to a certain set of external conditions, *e g*, a particular phase of the tide, or of the moon. A somewhat



FROM WILSON, "THE CELL IN DEVELOPMENT AND HEREDITY" (MACMILLAN)

FIG 2 —FERTILIZATION (SEA URCHIN TYPE) AND BEGINNING OF FIRST CLEAVAGE (DIAGRAMMATIC)

later phase in the evolution of the fertilization mechanism is reached by those animals, *e.g.*, many fish, in which the male and female individuals come into very close proximity before shedding their generative cells. Thus a male salmon sheds its spermatozoa over eggs which have just been deposited in a depression made by the female fish on the gravelly river bed. Even under these conditions, many eggs escape fertilization and better results are obtained by removing ripe fish from the water and "stripping" them of their gametes; these are then mixed together, and the whole mass submerged in water. In all cases of oviparous animals considerable wastage occurs unless the chances of fertilization are high and unless the developing eggs are protected from external accident and predatory organism This wastage is largely avoided when fertilization is effected within the body of the female parent, and in such cases the causes of infertility are not easy to analyse In mammals the most likely causes of infertility appear to be (i) inability of the spermatozoa to move with sufficient activity, (ii) mechanical obstructions which prevent the passage of the sperm into the Fallopian tubes where fertilization occurs, (iii) absence of fertilizable eggs in the female tract at a time when motile spermatozoa are present, (iv) inability of the fertilized egg to pass into the uterus and there attach itself normally

Artificial Parthenogenesis.—In some animals notably sea-urchins, the eggs may be readily induced to develop without fusion with a male gamete If such eggs are exposed to solution of certain chemical substances (chloroform, saponin, butyric acid) in sea water, the egg surfaces undergo precisely the same visible changes as occur immediately after contact with a spermatozoon In order that the eggs, so activated, should develop into larvae it is necessary, as a rule, to expose them subsequently to sea water containing an abnormally high concentration of salts or other osmotically active substances After this, the eggs develop normally when replaced in pure sea water It seems probable that the treatment with concentrated sea water induces in the egg the formation of an aster, comparable to that which develops from the middle piece of the spermatozoon

The only vertebrate egg which has yet been induced to develop parthenogenetically is that of the frog In this case development is initiated by puncturing the surface of the egg with a very fine needle, and no further treatment is required It is claimed that an aster develops near the puncture (*See* PARTHENOGENESIS)

Fertilization in Plants.—In plants the essential union of male and female nuclei is fundamentally the same as in animals In terrestrial types the male gametes are not capable of autonomous movement but form part of the pollen grains, which are carried to the female system of the flower by wind or other external agency. Communication between the male generative cell and the female egg is effected by means of the pollen tube which grows from the pollen grain and penetrates into the embryo-sac in which the egg cell is situated. (*See* ANGIOSPERMS; FERTILIZATION)' (J GR.)

FERTILITY AND FECUNDITY. Fertility is the power to beget living offspring; fecundity that of the individual to produce functional gametes (marrying cells, sex-cells, in the higher animals' ova and sperms) The reproductive rate of a mating or of a generation is determined both by the fecundity of the individuals composing it and by the fertility of their matings.

Fecundity is affected by factors which determine or influence

(1) *The number of gametes available at the time of fertilization.* In certain forms the female is monotocous (producing one young at a birth), only one ovum being extruded from the ovary and becoming available for fertilization at each period of "heat." In others she is polytocous, several or many extruded ova being available for synchronous fertilization by the abundant sperm In both forms the ripening of the ova and the number extruded are conditioned by environmental factors As a general rule, the average number of offspring in a litter in any species of mammals is inversely proportional to the average size of the animals of that species. In ungulates, twins are exceptional The sow, however, is remarkable in having very large litters In small mammals and rodents large litters are the rule, but the bats are exceptional, only one young ordinarily being produced at a time, doubtless to avoid extra weight when flying. Broadly speaking those species in which the gestation period exceeds six months produce but one young at a time and the number of teats is an approximate indication of the average size of the litter. In a general way, fecundity is in direct relation to the chances of death, those species which have many enemies produce many eggs but there are numerous exceptions to this rule The initial fecundity gradually waxes to a climax and thereafter gradually wanes In polytocous animals the first litter as a rule is relatively smaller as are those which are born towards the end of the reproductive life of the individual. In the fowl the greatest fecundity is exhibited during the first year and diminishes rapidly and progressively thereafter. It is probable that artificial selection is the cause of this antedating of the peak of fecundity in the fowl. Increased nourishment is followed by an increase in the number of ova shed in the polytocous forms, *e.g.*, the effects of "flushing" (special feeding) in sheep Insufficient food and especially a deficiency of the accessory food substances, vitamins B and E (*see* VITAMIN) lead to an imperfect production or to the non-production of gametes by both male and female The number of sperms is an important factor in efficient fertilization, for a certain concentration is required in the rabbit Ordinarily, spermatozoa are present in amply sufficient numbers in the male ejaculate Hammond (1925) found that in the case of the male rabbit repeated intercourse was followed by no reduction in fertility, though the periods between copulations became increased Lloyd Jones and Hays (1918), however, found that excessive intercourse led to a reduction both in pregnancies and in litter size

(2) *The frequency of ovulation* There are monoestrous forms in which the female has but a single oestrous cycle within one sexual season, and polyoestrous in which she has two or more. Since fertilization can only occur during the oestrous cycle the reproductive rate is limited by the frequency of these cycles. In most wild mammals the male experiences a sexual season as well as the female and generative activity is entirely restricted to such times. In man and most domesticated animals, however, the male is capable of sexual intercourse at all seasons, though an increased sexual activity may be evidenced at certain times of the year Since in the human female there is no restricted sexual season fertilization can occur at all times throughout the year. Long continued lactation would seem commonly to exert an inhibitory influence on the oestrous cycle In the pig, early weaning leads to a more frequent recurrence of oestrous cycles and an increased number of litters

(3) *The length of life of the individual and the length of its reproductive phase* Longevity is an hereditary character. Fecundity is exhibited during the period of life between puberty and senescence. The total number of opportunities for fertilization is influenced by hereditary and environmental factors which affect the time of attainment of puberty, the time of the onset of the climacteric, and the length of life The protection and sanitation of domestication and civilization can prolong life and delay the decline of reproductive vigour

(4) *The functional ability of the gametes.* The gametes of the mule and of other interspecific hybrids are in the great majority of cases inherently imperfect and incapable of fusing in proper fertilization Commonly the sterility in these cases is due to irregularities in the mechanism of division of the germ-cells and in some to the fact that the chromosome number and form of the two parental forms are widely different (*see* CYTOLOGY). Poisons, toxins and X-rays can render the gametes imperfect. The intra-abdominal undescended testis (*e.g.*, in so-called "rigs" in horses) cannot proceed to the elaboration of functional sperm for this cannot occur at a temperature as high as that within the body. Certain wild animals when removed from their natural habitat and kept in captivity become partially or completely sterile even though kept in a healthy condition and in their native countries. For reasons as yet unknown the generative system fails to discharge its functions: there is either an absence of sexual desire or an inability to elaborate functional gametes Some normal stimulus to sexual activity, possibly a psychological one,

is lacking

Fertility.—The union of the gametes and the proper development of the resulting individual is embarrassed or prevented by factors which affect

(1) *The act of sexual congress, e g*, homosexuality, intersexuality and other structural, physiological and psychological anomalies

(2) *The actual union of the gametes after efficient congress.* For reasons as yet unknown, certain individuals are infertile *inter se* but when mated with other individuals beget offspring In human societies a differential fertility-rate distinguishes the social grades The average size of the family among the relatively socially unsuccessful is on the whole greater than that of the successful Much of this difference is due to differences in the exercise of control, abstinence, and the use of contraceptives It has not yet been demonstrated that any of it is due to a differential fecundity distinguishing the social grades

(3) *The ante-natal nurture of the offspring* Hereditary and environmental factors can bring about the death of the embryo and foetus *in utero*. In polytocous forms the number of fertilized ova is frequently in excess of the nutrition available for them with the result that atrophy and absorption of the surplus embryos and foetuses occur In other cases the death of the offspring is due to the action of hereditary *lethal* factors (*see* HEREDITY) An instance of such lethal factors is that which eliminates the homozygous yellow mouse The mating yellow×yellow invariably yields yellows and greys in the ratio 2 1 Such yellows are constitutionally heterozygous the homozygous yellow dies *in utero* as the result of the action of the hereditary factor for yellow present in duplicate Haemophilic (bleeder) female children are comparatively rare: it is thought that the homozygous haemophilic usually dies early in pregnancy; only the female can carry the factor for this sex-linked character in duplicate (*see* HEREDITY) An examination of the sex-ratio among new-born children, still-births and abortions, reveals the fact that during intra-uterine life and parturition more males than females succumb The male is constitutionally less able to withstand unfavourable conditions

(4) *The post-natal viability of the individual* The same hereditary and environmental factors as those which operate ante-natally are responsible for the fact that more males than females succumb during the ante-pubertal period During the age group 10–15 years more females than males die, a reflection of the dangers that beset the onset of puberty in the female. (*See* REPRODUCTION)

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FERTILIZERS. The words fertilizer and manure denote any substance that increases the productiveness of the soil, but in scientific agricultural literature the word fertilizer is confined to materials prepared artificially that supply nutrients to the plant, the word manure being more generally applied to substances like farmyard manure and lime that improve the soil in other ways besides supplying nutrients Both groups will be dealt with in this article (*See* also SOIL; FEEDING STUFFS; GRASS AND GRASSLAND; and the further list of headings under AGRICULTURAL ARTICLES) The use of farmyard manure is probably as old as agriculture itself Its discovery was already mythical in Roman times, and its properties and particularly those of composts were known in great detail to the Arabs and are fully described in their 10th century text book, *Kitab al-Falahah*, with some gruesome detail, as when the writer, in emphasizing the value of blood as manure says, quite calmly, "the best of all is human blood " Lime was known from ancient times to the Celtic peoples and wood ashes both to them and to the Arabs. The older treatises in agriculture give much information also about substances like waste wool, bones, etc.

In the first 40 years of the 19th century chemists and botanists began studying the phenomena of plant growth and by 1844 the labours of Théodore de Saussure and other plant physiologists of the Geneva school, of Justus von Liebig in Germany, and of J B Lawes and J H Gilbert at Rothamsted had shown that all these substances fell into five groups, containing as their respective fertilizing constituents one or more of the following, namely, (1) nitrogen, (2) phosphorus, (3) potassium, (4) organic matter (mainly cellulosic material), and (5) calcium oxide. Of these the first three could be supplied from sources not previously drawn upon by farmers, and they could be manufactured into products easy to transport and to handle on the farm. These manufactured products became known as "artificial manures," or "artificial fertilizers," since shortened to "artificials." Their introduction into farming was in large part due to the enterprise of J B Lawes (*q.v.*) of Rothamsted, who in 1843 set up the first fertilizer factory and at Rothamsted afforded the first and still one of the most complete demonstrations of their value. They greatly improved the agricultural production of the time and played no small part in enabling Europe in general and England in particular to maintain the rapidly increasing population They are now used all over the world in increasing quantities, not only to increase crop yields, but also to modify the composition or habit of growth of the crop so as to enable it better to withstand adverse conditions The five groups will be dealt with in the order set out above

(1) NITROGENOUS FERTILIZERS

In natural conditions a nitrate, probably calcium nitrate, is the source from which plants derive their nitrogen, but the changes in the soil are such that sodium or potassium nitrates are equally serviceable Further, ammonia is rapidly oxidized to nitrate in the soil, hence ammonium salts, or any other compounds rapidly converted into ammonia, also supply nitrogen for plants So far as is known, the ammonia is not generally assimilated direct, although some plants can do this certain micro-organisms in the soil are so active, however, that the ammonia is converted into nitrate before the plant takes it up. The nitrogenous fertilizers are

Nitrates. sodium (the most used), calcium (increasingly used), potassium (used only in horticulture)
Ammonium salts· sulphate (the most usual), phosphate (coming into use); chloride (valuable for certain crops)
Substances easily converted into ammonia· Calcium cyanamide (most used); urea (coming into use)

Effects of Nitrogenous Fertilizers.—Nitrogen starvation is characterized by stunted growth and sickly yellow colour of the leaf, the yellowing and dying being general all over the leaf, as distinct from the effect of potash starvation where the dying is from the tip and edges inwards. Addition of nitrate causes rapid improvement in its colour and growth F. G Gregory, working with barley, has shown that only the leaf area increases and not the assimilation rate, in contradistinction with phosphate and potassium, both of which increase the efficiency as well as the leaf area

Greater quantities of nitrate lead to the development of large dark green leaves which are often crinkled, soft, sappy, and liable to insect and fungus pests, possibly because of the thinning of the walls or changes in tissues or in composition of the sap C R Hursch shows that the amount of sclerenchyma is reduced in proportion to the collenchyma in the wheat plant, thus favouring the attack of *Puccinia graminis*, the mycelium of which can develop only in the collenchyma

A further effect of a large supply of nitrogen relative to other nutrients is a retardation of ripening Seed crops like barley that are cut dead ripe are not supplied with much nitrate, but oats, which are cut before being quite ripe, can receive larger quantities All cereal crops, however, produce too much straw if the nitrate supply is excessive, and the straw does not commonly stand up well, but is beaten down or "lodged" by wind and rain Swede and potato crops also produce more leaf, but not proportionately more root or tuber, as the nitrogen supply increases; no doubt the increased root would follow, but the whole process is sooner or later stopped by the advancing season—the increased root does, in fact, follow in the case of the later-growing man-

gold. Tomatoes, again, produce too much leaf and too little fruit if they receive excess of nitrate On the other hand, crops grown solely for the sake of their leaves are wholly improved by increased nitrate supply growers of cabbages have learned that they can not only improve the size of their crops by judicious applications of nitrates, but they can also impart the tenderness and bright green colour desired by purchasers.

Sources.—Prior to the World War, Chile was the main source of nitrate of soda, and coal of sulphate of ammonia These were the two chief nitrogenous fertilizers Synthetic fertilizers were obtainable, the industry having been founded as a result of Sir William Crookes's impressive address at the British Association in 1898, but they played only an insignificant part in farm practice During the war, extensive factories for the preparation of ammonia or nitrate from atmospheric nitrogen were erected in Central Europe, and since the war in other countries also

Three processes are used in the fixation of atmospheric nitrogen (*q v*) The arc process, yielding calcium nitrate, is almost limited to Norway, where water-power is abundant, the cyanamide process, used in Switzerland and other countries possessing water-power or coal, and a catalytic process, now becoming the most popular, usually a modification of the Haber process, which yields ammonia convertible into any of four compounds the chloride by combining the process with the manufacture of soda; the sulphate by reaction with gypsum, nitric acid by oxidation, or urea by other processes The net result of all these activities is to give the farmer two new nitrogenous fertilizers which he never had before the war, namely ammonium chloride and urea, and to increase enormously the total amount of fertilizers obtainable Some idea of the position now, as compared with pre-war days, can be gathered from the following table of the world's output in the years 1903, 1912 and 1926–7

World's Production of Nitrogen Compounds in Thousands of Metric Tons (2,000 lb) of Pure Nitrogen

	(000's omitted)		
	1903	1912	1926–27
Chile nitrate	247	449	119 6
Sulphate of ammonia by-product	121	277	340 3
Fixation industry			
Arc process (nitrate of lime)	Nil	11	81
Cyanamide	Nil	20	180
Sulphate of ammonia	Nil	Nil	300
Other nitrogen compounds	Nil	Nil	133 4
	368	757	1,237 5

Further large increases in production are foreshadowed both in Germany and in Britain. in Germany the Stickstoff Syndikat, and in Britain, Nitram Ltd., controls the situation The British works are at Billingham, near Stockton-on-Tees, owned by Synthetic Ammonia and Nitrates Ltd, a part of Imperial Chemical Industries Ltd, and are expanding rapidly.

Sodium Nitrate, usually called nitrate of soda, comes wholly from the rainless regions of Tarapacà and Antofagasta in the north of Chile, where it forms deposits near the surface of the soil The deposits occur in detached areas stretching over a wide range; in spite of the large annual consumption there still remains a vast supply for the future. The crude nitrate is excavated by a process of trenching; it is then crushed, purified by recrystallization and put up in bags for the market Recently, improved methods for extraction have been introduced, such as those of Gibbs, Butler, etc, in place of the older Shank's system still in use among many of the companies.

Nitrate of soda is very quick acting as a fertilizer and can be taken up immediately by the plant. It finds application in two cases: (1) in case of emergency, when young plants are suffering through the attack of a pest, or in cold weather; (2) in ordinary practice as a top dressing for the crop. It causes increases of practically all crops grown in Great Britain; the dressing applied varies from 1 cwt. per acre, suitable for wheat in spring or grass laid for hay, to 10 cwt. per acre used on the valuable early cabbage and broccoli crops in Cornwall.

Nitrate of soda readily washes out of the soil and must therefore not be applied until it is needed

Nitrate of Lime.—This is made both in Norway and in Germany. The production in recent years averages 160,000 tons per annum, practically all of which is taken in Europe, consumption outside being negligible. It is used on wheat, oats, hay, barley, forage crops, sugar beet, cabbage and mangolds The problem of transport and storage was at one time a difficulty but is now largely overcome In north Europe, Scotland, and the northern counties of England special bags are used, but in the warmer and moister midland and southern counties barrels are better.

The older Norwegian nitrate of lime contained 13% of nitrogen, modern German material contains 15·5%; there is an English product, called "Nitrochalk," one grade of which contains 10%, the other 15 5%

Sulphate of Ammonia.—Until recently this was made wholly from coal. This still remains an important source, but the synthetical processes now produce nearly as much, and will soon produce more Until recently sulphate of ammonia has always contained free acid, not more than about 0 05%, insufficient to affect the soil though sometimes enough to rot the bags, make the sample rather sticky and prevent it drilling easily The method of preparation has now been improved so that it turns out a "neutral" sulphate containing less than 0 02% of acid which can be dried better and therefore is slightly more concentrated than the old substance it contains 21·1% of nitrogen or 25¾% ammonia against 20 8% nitrogen or 25¼% ammonia The chemical is very easy to drill, can be stored easily and is entirely free from stickiness. For home use it is excellent In the export trade it has shown an unexpected tendency to cake, a disadvantage that can now apparently be overcome. Great Britain is the chief exporting country and the United States comes second; Spain, Japan, Java and France are the chief importing countries

Sulphate of ammonia is used on all crops in Britain, particularly potatoes, for sugar beet and other crops in France, oranges in Spain, rice in Japan and sugar in Java There is evidence that it could advantageously be used for cotton. The greatly increased output tends to force down its price and so to widen its range of effective use. Attempts are being made to extend its use on grass land by extensive manuring and close grazing, but the tests have not continued long enough to show whether the method is a financial success

Sulphate of ammonia differs in two important respects from nitrate of soda When applied to the soil it reacts with calcium carbonate, giving rise to calcium sulphate and ammonium carbonate The calcium sulphate washes out in the drainage-water, but the ammonia does not, but becomes absorbed by some of the reactive constituents contained in the soil The ammonia becomes nitrified by bacterial action, and presumably is changed to calcium nitrate through interaction with more calcium carbonate. The calcium nitrate, however, is not wholly retained by the plant; the calcium is left in the soil and reconverted into carbonate

There still remains a loss of 100 lb. of calcium carbonate for each 132 lb. of ammonium sulphate applied, and on soils deficient in lime this becomes serious for two reasons: the lime is greatly needed for other purposes, and in its absence ammonium sulphate leaves an acid residue in the soil, the ammonium portion being more completely taken by plants than the rest Now most agricultural plants will not tolerate this acidity, and in extreme cases completely refuse to grow This remarkable action was first observed in 1890 by Dr Wheeler at the Rhode Island experiment station, where it has been more fully studied than anywhere else A few years later it was seen at the Woburn experimental farm and described by Dr. Voelcker.

Dressings of lime must therefore be given periodically to avoid this trouble

The absorption of ammonia by the soil is an advantage in regions of torrential rainfall. Where nitrate of soda might be completely washed away sulphate of ammonia remains safely in the soil

Urea.—This substance is now prepared synthetically and it promises to be a highly important fertilizer. It contains 47% of nitrogen, and is thus more than 2¼ times as concentrated as

sulphate of ammonia and 3 times as concentrated as nitrate of soda, a great advantage for transport and cartage. In the soil it is rapidly converted into ammonium carbonate which is then oxidized to nitrate It does not appear to give its best results when used as a top dressing, and is better put into the soil at the same time as the seed, and speedily covered up It seems to be safe for all crops, and does not make the soil acid, nor does it cause poaching of heavy soils; indeed, it appears to be remarkably free from the indirect action on soil other fertilizers show

Calcium Cyanamide ($CaCN_2$).—This is prepared by heating a mixture of calcium oxide and carbon to a high temperature in an electric furnace. the resulting calcium carbide is then heated in a stream of nitrogen Great quantities are made in Sweden, Switzerland and Italy where cheap water power is available; there are also factories in Japan and elsewhere. Recently there have been important changes in the method of manufacture, and the modern product contains 19% of nitrogen and 60% of total lime, of which 22% is free and 38% is in combination as cyanamide Practically all the nitrogen is in the cyanamide form

In the soil it changes to urea, by a reaction not yet understood but apparently not brought about by micro-organisms the urea then decomposes as described above In some conditions, *e g*, in presence of an alkali, cyanamide polymerizes, two molecules joining together to form one of the dicyanodiamide, a substance which in any large quantity is poisonous to plants and also to the nitrifying bacteria, and in any case has nothing like the fertilizing value of cyanamide. The older samples were dusty and unpleasant to handle, but this difficulty is now overcome

Cyanamide has a retarding effect on germination of rapidly germinating seeds if it is applied along with them but not if it is applied to the land a few days beforehand. this is, therefore, always recommended. It has the advantages of cheapness, of supplying calcium, and apparently, though this is not yet fully demonstrated, of producing grain in cereals without lengthening the straw so much as sulphate of ammonia would do. Its effects are being studied at Rothamsted and elsewhere

(2) PHOSPHATIC FERTILIZERS

Four substances are in common use as phosphate fertilizers, namely, superphosphate, called acid phosphate in the United States, basic slag, mineral phosphate, and bones

Acid or Superphosphate is historically, perhaps, the most interesting, as being the first artificial fertilizer to be made the process, which was patented by J B Lawes on May 23rd, 1842, consists simply in treating ground rock phosphate with sulphuric acid so as to convert the tricalcic phosphate, $Ca_3(PO_4)_2$, into the more soluble compound to which the formula $Ca(H_2PO_4)_2$ is usually assigned. in addition calcium sulphate is formed The following is the usual expression of the reaction; it is not, however, strictly correct

$$Ca_3(PO_4)_2 + 2H_2SO_4 = 2CaSO_4 + Ca(H_2PO_4)_2$$

The mixture of calcium sulphate, monocalcic phosphate and some free phosphoric acid constitutes the superphosphate No separation is attempted, and the calcium sulphate or gypsum is left in. it not only does no harm but has itself some fertilizing value and indeed was much used in the past: it also serves to get the superphosphate into a dry condition because it absorbs water very completely The process has attained a considerable degree of perfection, and allows of the production of a high-grade product, finely powdered and dry, free from many of the defects of the older samples

British and continental makers largely use as raw material the North African mineral phosphates, but much of it comes also from the United States In 1926 the imports of rock phosphate into Great Britain and the Free State of Ireland were·—

Florida	19,292 tons
Morocco	40,688 ,,
Algeria	82,267 ,,
Tunisia	175,238 ,,
Egypt	1,500 ,,
Belgium } France }	1,875 ,,
	320,860 tons

On an average 10 tons of rock phosphate give rise to about 18 tons of superphosphate instead of the theoretical 17.

It has been found convenient to standardize the various grades of superphosphate and sell them on a definite basis. The amount of soluble phosphate is determined by analysis as P_2O_5, and the figure is then calculated as tricalcic phosphate. Thus the ordinary grade contains about 12% P_2O_5 soluble in water; this figure is then multiplied by 2·18 to convert it into tricalcic phosphate, $Ca_3(PO_4)_2$ Both figures are conventional in that superphosphate consists neither of P_2O_5 nor of $Ca_3(PO_4)_2$, but either figure does very well to express the amount of phosphate soluble in water.

The following grades are now in common use·—

"30% soluble"	containing 13 6% P_2O_5	(England and Wales)
"35% ,,	,, 16 0% ,,	(Scotland)
"38% ,,	,, 17 4% ,,	

The 30% super is made from Tunisian phosphates (58/63%, Gafsa or Dyr), the 35% from Algerian (Constantine 65/68%) or Florida Pebble phosphate (70%), and the 38% from Morocco phosphate (75%)

In Britain superphosphate is mainly used for swedes and potatoes, but some is used also for cereals. Its first effect is to hasten the rate of growth of the seedling It causes swedes and turnips more rapidly to pass through the first leaf stage and acquire their true leaves, and cereals more rapidly to begin tillering The root system also develops well Later on the swelling of the root of the swede and turnip and the heading out and ripening of cereals are both hastened by superphosphate The earlier heading out of cereals has certain incidental advantages, the head of the barley receiving superphosphate emerges from its ensheathing leaves a few days in advance of those insufficiently supplied, and therefore has a better chance of escaping the attack of the larvae of the goutflies (*Chlorops taeniopus*, Meig) which, hatching from their eggs on the topmost leaf, crawl downwards, seeking the head for food Addition of phosphate leads to no increase in the proportion of grain borne by the plant

These effects are not observed in every season, nor are they always seen when farmyard manure has been applied Fortunately for farmers, however, the years when superphosphate acts well are those when crops are low and when, therefore, the additional yield is worth more than is easily expressed in money terms For if the farmer has insufficient food for his livestock in a bad year he must sell out at any price he can get, while if his food supply be adequate he can hold or sell whichever he pleases. As a bad root year is also commonly a bad grass year, he cannot usually meet the difficulty by changing from roots to hay This valuable effect of superphosphate in bad seasons accounts for its popularity among farmers; it can be regarded as an insurance against loss of crop at a time when loss would be peculiarly galling

Actual phosphate starvation occurs on some soils and its symptoms are very marked. Swedes and turnips are among the first crops to suffer: they may fail entirely unless farmyard manure is given it was because of the importance of these crops in British agriculture that the introduction of superphosphate produced so great a revolution in British agriculture 80 years ago Cereals and grass may grow where swedes fail, but not well Phosphate starvation occurs on certain soils in many countries. in Britain, on some of the boulder clays Cereals suffering from phosphate starvation have a stunted root system, especially in their early days, and even more stunted leaf and stem; total number of tillers and the number of tillers bearing seed both fall off Similar stunting of the root and leaf is seen in phosphate-starved fruit trees

Phosphate starvation markedly affects the composition of crops, lowering their nutritive value to animals and their special quality values to men. Over large areas of the world there are soils very deficient in phosphate. Such soils in parts of South Africa carry a natural herbage which causes deficiency diseases in cattle; the affected animals devour bones with great eagerness, even putrefying bones when the deficiency is pronounced, so that they become liable to a particular ptomaine poisoning The obvious remedy is to feed the cattle with bone meal. Similar diseases occur in Australia, where also the arable lands show

astonishing benefits from small dressings of phosphate. Great areas of land in the Middle West of the United States show marked response to phosphates. In the Rommey Marsh, the best fatting pastures are richer in phosphate than the poorer ones; this is generally true of England and France. G. Paturel has shown that the best wines contain most P_2O_5 (about 0 3 grm. per litre), the second and lower qualities containing successively less Further, when the vintages for different years were arranged in order of their P_2O_5 content, a list was obtained almost identical with the order assigned by the wine merchants W A. Davis has emphasized the importance of phosphate supply for the indigo crop

Excess of phosphate over the amount required to increase plant growth is liable to cause injury, instances have been recorded of barley in Suffolk and potatoes in Lincolnshire, while W. F Gericke in California has shown that the greatest growth is attained by supplying phosphate in the early life of the plant and withholding it later

Certain soil conditions seem particularly to call for phosphatic manure Heavy soils usually respond well in all parts of Britain as do the loams of the eastern counties and many of the Boulder clays The most striking increases in Britain, however, are obtained on the fen soils of East Anglia On the other hand sandy soils often show no response, and chalk soils may show but little

In conclusion, superphosphate is used for —

Crops fodder crops generally,—especially swedes and turnips in Britain, and cereals in certain districts
Soils heavy soils, many Boulder clays, fen soils
Seasons hot and dry, cold and wet

Phosphate of Ammonia ("Ammophos").—The enormous developments of technical chemistry dating from the World War have led to the production of ammonium phosphate by a new and remarkable synthetic process Gaseous nitrogen and hydrogen are combined by a catalyst forming ammonia, and mineral phosphate is heated with coke in an electric furnace to produce the element phosphorus. This is then burnt to form phosphoric oxide, which is combined with ammonia to form ammonium phosphate The product is a soluble highly effective fertilizer, concentrated and therefore easy to transport It undoubtedly has a great future and may indeed go far to displace superphosphate. It supplies only nitrogen and phosphorus to the plant, and therefore is not strictly comparable with superphosphate which supplies calcium and sulphur in addition How far these are important in ordinary farm practice is not known, as in most of the experiments hitherto made they have been supplied without regard to their possible action

Basic Slag.—This is a by-product in the manufacture of steel from pig iron, and is formed during that part of the process when the molten pig iron is heated in presence of air and lime, so that the various impurities are oxidized and the phosphorus converted into calcium phosphate.

Two processes are in use for effecting this oxidation The older one, adopted in 1879, is the Bessemer process; the molten pig iron is run into a pear-shaped vessel known as the converter, and air is blown through it The necessary high temperature is obtained mainly by the combustion of the phosphorus, silicon, etc. in the pig iron, hence the need for sufficient of these substances. ores containing phosphorus are therefore used and the Bessemer slag contains some 18% phosphoric oxide, equivalent to 40% tricalcic phosphate. In recent years another process, the Open Hearth Process, has almost entirely displaced the Bessemer process in Great Britain but not in Belgium, the heat for the molten pig iron being supplied by a flame of producer-gas so that phosphorus in the pig iron is unnecessary· none is therefore added and the slags contain usually only 7 to 14% phosphoric acid (P_2O_5) equivalent to 15·4 to 31% tricalcic phosphate.

Further, the open hearth slags are not usually as readily soluble in citric acid as those yielded by the Bessemer process This happens particularly when the pig iron contains much sulphur An excess of lime is required to remove the sulphur, and as this makes the slag infusible, fluorspar or calcium chloride is added to increase the fusibility. This treatment converts the phosphate in the slag into a chlor- or fluorapatite insoluble in citric acid, hence the slags finally produced are more or less insoluble according to the amount of lime and flux added

There are therefore three classes of basic slag available, namely, (1) Bessemer slag, containing phosphorus equivalent to 35-40% or more of tricalcic phosphate, and largely soluble in 2% citric acid Usually 80% of the total phosphate is guaranteed to be soluble[1] (2) Basic open hearth slag containing less phosphorus, equivalent to 18[2] to 30% tricalcic phosphate largely soluble (70% of the total phosphorus) in 2% citric acid, the first pourings being richer than the last (3) Basic open hearth slag made by the use of lime and fluorspar, containing as much phosphate as the poorer members of the preceding class but only slightly soluble (40% or less, usually only 20% in 2% citric acid)

When basic slag was first obtained in the Bessemer converters in 1879 its fertilizing properties were not recognized, till John Wrightson in 1884 and 1885 made his field experiments at Ferryhill and at Downton, and Paul Wagner in 1885 began his systematic pot experiments at Darmstadt Hereafter it gradually came into use and within four or five years could profitably be adulterated with mineral phosphates, to detect which Wagner devised the well-known citric acid test that, with certain modifications, has remained in force ever since Another important character of basic slag is the fineness to which it is ground General experience shows that 80% of the slag should pass through a sieve having 100 meshes to the linear inch, the official specification of the Institute of Mining and Metallurgy is that this should have an aperture of side 0 127 mm

The Bessemer slag achieved a high reputation for its marked effectiveness on poor pasture land, the experiments of W Somerville and D A. Gilchrist at Cockle Park, Northumberland, and elsewhere, furnishing some striking, almost dramatic, examples. The open hearth slags of high solubility are equally effective It has sometimes been urged that all grass land needs only treatment with slag to transform it into something vastly more productive, but further experience has shown that the improvement is strictly limited to certain types of soil conditions improvement has resulted because wild white clover has developed in the herbage, there is no improvement, however, where the proportion of clover is already high, or where for any reason the clover cannot grow well in spite of the presence of slag In the Rothamsted experiments improvement could not be obtained if the grass land was already so good that one acre yielded 200 lb live weight increase in sheep during the grazing season In the Cockle Park experiments the increase had been only 20 to 40 lb per acre, and here, therefore, improvement was possible after slag treatment the live weight increase was 80 to 100 lb per acre.

Basic slag is not confined in use to grass land it has given good results also on arable land It is not entirely like superphosphate in its action On heavy clays, on downland pasture and in wet situations, slag is generally better than superphosphate For roots, potatoes, hops and other short season crops superphosphate is usually better than slag In J Hendrick's swede expetiments at Aberdeen there was little to choose between them, though for equal amounts of phosphate applied superphosphate gave on the whole slightly larger increase in crop, but where "finger and toe" was prevalent it required the addition of lime. In the Irish experiments equal weights of basic slag and superphosphate gave approximately equal results

The phosphorus is present in the slag as a silico-phosphate. R. Bainbridge adduces evidence that the chief constituent is silico-carnotite, $Ca_3(PO_4)_2,(CaO)_2,SiO_2$, which is completely soluble in 2% citric acid But when fluorspar has been used in the manufacture a fluorapatite, $3Ca_3(PO_4)_2,CaF_2$, is formed, which is soluble only to the extent of 5% in 2% citric acid It is shown at

[1]There is a confusing difference in meaning of the phrase "30% (or other amount) soluble" as applied to basic slag and to superphosphate respectively. For basic slag it means that 30% of the total phosphate present is soluble in 2% citric acid, while for superphosphate it means that the amount of soluble phosphate would, if expressed as tricalcic phosphate, be 30% of the weight of the superphosphate

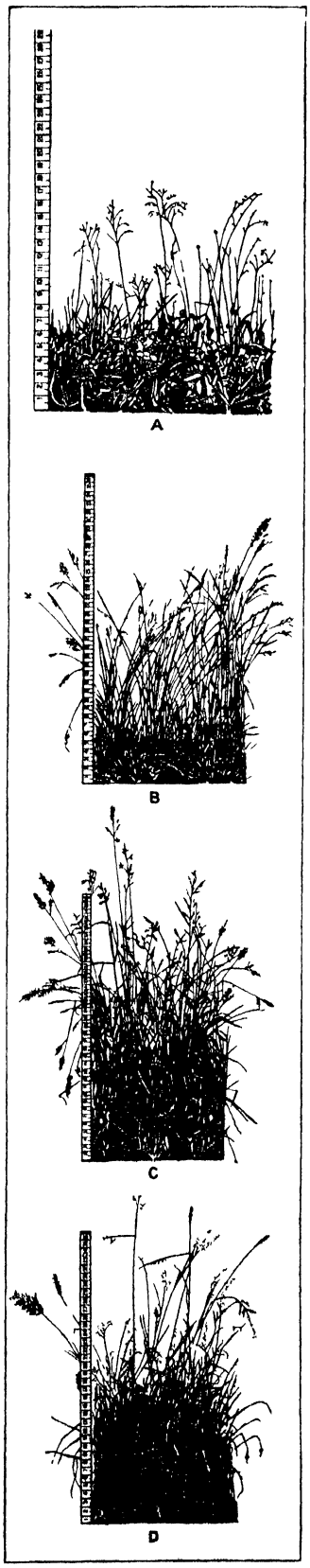
[2]The lower grades of slag containing less phosphorus than corresponds with 15% tricalcic phosphate, are too poor to bear transport for agricultural purposes.

Rothamsted that fluorapatite has but little fertilizer value, and for a series of slags their effectiveness decreased as more and more of the phosphate was in the fluorapatite form These experiments justify the use of 2% citric acid as a discriminating reagent in testing slags, though the action between the phosphate in the slag and the solvent is complicated by the presence of other soluble substances extracted from the slag In consequence the indications are not quite sharp, and solubility results do not altogether agree with the results of field tests

In the Rothamsted experiments made in several parts of Britain, slag of which the phosphate is of high solubility (60% or more) in 2% citric acid proved superior to those of low solubility (38% or less); slags of over 70% solubility varied among themselves in effectiveness but the variations showed no relationship with solubility, slags of less than 70% solubility also varied among themselves in effectiveness but the variations are usually related to and expressible by the solubility Medium and low soluble slags appeared to be more efficient in the western counties of England than in the eastern, a difference which may be associated with the higher rainfall or the longer growing seasons

Of the other constituents of basic slag the *calcium* is valuable, as also is its *oxide* but this occurs only in small amounts The *manganese* is considered valuable in France but not in Britain; it appeared, however, to act beneficially on an acid millstone grit soil in Cheshire Some of the constituents may be actually harmful to vegetation: a slag studied at Rothamsted lost in effectiveness when it was more finely ground than usual, apparently because the harmful constituents came more into prominence

In general the slags of low solubility differ from those of high solubility more than the figures indicate, showing that the difference does not consist simply in the amount of soluble phosphate present The low soluble slags behave in the field differently in kind and not simply in degree from those of high solubility and cannot be raised to their level of performance simply by increasing the dressing These slags of low solubility still present difficult problems to the agriculturist.



FROM HALL, "ROTHAMSTED EXPERIMENT," BY COURTESY OF JOHN MURRAY

FIG 1.—DIAGRAM SHOWING THE EFFECT OF FERTILIZERS ON GRASS (A) GROWN WITHOUT MANURE (B) AMMONIUM SALTS ALONE (C) FULL MINERALS AND SULPHATE OF AMMONIA (D) FULL MINERALS AND NITRATE OF SODA

Rock Phosphate.—In agricultural conditions where low costs of working are absolutely essential and high yields per acre are not so necessary, ground (but otherwise untreated) mineral or rock phosphate has often given sufficiently good results On some of the acid soils of the United States, especially in the Middle West, notable results have been achieved by a combination of rock phosphate and clover: Cyril Hopkins in Illinois, and A R Whitson in Wisconsin have provided numerous demonstrations In the north of England, north African phosphates ground so that 80% shall pass a sieve showing 120 meshes to the inch, and therefore finer than basic slag, have proved useful on arable land in increasing the development of clover in the seeds ley Elsewhere acid moorland soils have responded to these phosphates In all comparative experiments basic slag has given better yields, but considerations of transport may make the rock phosphate cheaper

The following table gives the percentage of phosphate in some of the commoner minerals, in comparison with that in superphosphate and basic slag

	Mineral phosphate			
	North African	United States	Super phosphate	Basic slag
P_2O_5	26 6–28 9* 29 8–31 2† 34 4**	25–28†† 32–2§	13 6 17 4	8–18
Equivalent to phosphate	58–63* 65–68† 75**	55 61†† 70§	30–38	18–40

* Tunisia (Gafsa, Dyr) † Algeria (Constantine) ** Morocco †† S Carolina § Florida Pebble

The chief use of rock phosphate is, however, for conversion into superphosphate and for this purpose it is highly desirable that the mineral should be as free as possible from iron and alumina This consideration rules out many phosphatic deposits, which otherwise might have great value

Bones.—Bones have long been applied as manure in isolated parts of the country, but they were not commonly used until the beginning of the 19th century Such remarkable results were then obtained in certain districts, *e.g.*, in Cheshire, that the demand became very great, and the rather large accumulations of the past in various parts of the world had to be drawn upon to satisfy it The demand still continues, the butchers' shops, meat markets and marine store dealers of the great cities are ransacked to keep up the supply In modern practice the bones are sent to the works, put on to a perforated band and sorted, clean shank bones are picked out for cutlery, hard bones for glue-making and the remainder for crushed bone the separate batches are steamed at low pressure (15–20 lb) to remove fat, nowadays a valuable commercial product In some works the bones are degreased with benzene, and this process is more efficient than steam, so that the residual bonemeal is richer in nitrogen and in phosphate

The bones intended for "bone meal" are then crushed and sorted into half-inch bones, quarter-inch bones and bone meal. The bones intended for glue, and the ends of the cutlery bones, are crushed and again steamed, but this time at a higher pressure (50 lb), when most of the nitrogenous constituents are extracted as gelatine or glue The residue can now be got into a very fine state of division and is sold as "steamed bone flour" Dissolved or "vitriolized bones" are made by treating bones with sufficient sulphuric acid to dissolve about half of the phosphate The different products vary in composition, but typical analyses are:

	Nitrogen	Equivalent to ammonia	P_2O_5	Equivalent to tricalcic phosphate
Raw English bones	5	6	22	48
Bone meal	3·5–4 5	4·2–5·4	20·25	43–55
Steamed bone flour	1–2	1–2 5	25·32	55–69
Dissolved bones	2–3	2·3–3·8	15–16	33–35

The bone manures can be used in any conditions in which superphosphate is effective: in general they are not as good but they are safer in the hands of the inexpert and therefore are probably better for use in gardens

(3) POTASSIUM SALTS

The need for potassium salts in plant nutrition was recognized long ago by agricultural chemists As early as 1840 Liebig had insisted on the fertilizing value of "salts of the alkalis," without, however, specifying precisely which was the most important Lawes and Gilbert from the outset included these salts in their fertilizer trials and by 1852 had laid out field plots for comparing potassium, sodium and magnesium sulphates. these experiments soon showed that potassium salts had most value Farmers did not, however, begin to use them as fertilizers for many years; the need on the farm was met by farmyard manure and by wood ashes, on light soils by salt, and on farms near the seashore by seaweed It was about 1860 that the great deposits of potassium salts in the neighbourhood of Stassfurt in Saxony were first worked to supply agriculturists with definite potassic fertilizers, but little use was made of them in Britain till after 1890. The industry has developed and is now under the charge of the German Potash Syndicate

Four potassium salts are available on the market: potassium sulphate, potassium chloride; a mixture of potassium and sodium, and, if from Stassfurt, magnesium chlorides known as kainit; and a mixture of the chlorides and sulphates of potassium, sodium and magnesium known as potash manure salts Prior to sale all these are graded and standardized to contain definite amounts of potassium The sulphate and muriate are sold on a basis of potassium equivalent to 48 5% K_2O, muriate (*i.e.*, impure chloride), also on a basis of 45% K_2O, kainit 12 5% Potash manure salts are of several grades, from 20 to 30% The world consumption was in 1926 equivalent to 1 4 million tons K_2O annually, of which Great Britain took 3% (40,000 tons K_2O)

Up till the time of the World War the Stassfurt mines supplied all the potassium salts used in the world, but during the war other sources were exploited in the various countries, notably flue dusts and other industrial wastes and residues in Great Britain and certain natural deposits in the Western United States Most of these proved unsuitable for peace conditions and have not survived Two only remain of importance: the Alsace potash mines, which differ from those of Stassfurt in that the salts are free from sulphates and from magnesium, consisting of potassium and sodium chlorides only, and the Searle's Lake and other deposits in California, which can now supply a potassic fertilizer free from boron, which caused difficulty when this particular source was first exploited Attempts are also being made to exploit the potassium salts in the Dead Sea, but so far this is done only on an experimental scale

The four potassic fertilizers above mentioned all have certain properties in common due to potassium, their differences arise from the salts and radicals associated with them Four distinct effects are produced on the growing plant by potassium salts:— (i) on the general health and vigour of the plant; (ii) on the efficiency of the leaves for synthesising and translocating carbohydrates; (iii) on certain processes occurring in leguminous plants; and (iv) on the formation of grain

The effect on the growth and vigour of the plant makes potassic fertilizers of considerable value in adverse weather conditions, especially in sunless seasons If but little potash is supplied the potato crop becomes very dependent on the amount of sunshine during its growing period: at Rothamsted the lowest yield in the five years 1922–26 was 2·47 tons per acre in 1922, when there was also the lowest number (519) of hours of sunshine during the four months July to October inclusive, and the highest yield was 9·72 tons in 1923, when the hours of sunshine were also highest, numbering 708 But where potassic fertilizers were given, the loss of crop following the lack of sunshine was much less. the potash in some way making up for deficient sunshine and enabling the plant to produce a good crop in spite of the disadvantage of a bad season.

Another result of the increased vigour conferred by potassic fertilizers is that they increase the resistance of plants to fungus disease At Rothamsted the wheat receiving much nitrogen but no potassium is, in certain years, very liable to rust, while the adjoining plot receiving the same amount of nitrogen and equally exposed to infection, but receiving potassic fertilizers, is much freer from rust. The mangolds receiving much nitrogen but no potassium are badly attacked by *Uromyces betae,* while those receiving potassium largely escape. The permanent grass receiving nitrogen but no potassium is much more liable to attacks of *Epichloe* than the neighbouring plot receiving potassium The results suggest—and this is emphasized by the experiments of W F. Bewley on the bacterial stripe disease at Cheshunt—that the important factor is the ratio of nitrogen to potassium· if this is too high the plant tends to become susceptible to fungus attack It does not necessarily follow that potassium salts alter the physiological susceptibilities of the plant to the disease; their effect may be indirect, conditioned by the change in habit of growth or rate of maturation they bring about; more work is needed, however, to clear up this subject (*See* E C Stakman and O S Aamodt, *Journal Agricultural Research,* 1924, 27, 341–380, for a recent discussion of this aspect of the problem as applied to stem rust of wheat in the United States) Flax growers in the north of Ireland have found that potassic fertilizers decrease the liability of the plant to the attacks of the wilt organism In T Wallace's sand cultures of fruit trees (Long Ashton), omission of potassium caused a characteristic leaf scorch and premature defoliation· the shoot growth of apples was much restricted W W Garner (Washington, D C) found that potassium deficiency caused a "chlorosis" of tobacco leaf characterized by leaf spotting and distinct from that following magnesium deficiency, while H S Reed and A R C Haas (California) observed a bronzed appearance on the leaves of young orange trees suffering from potassium starvation

The effect of potassic fertilizers in increasing the efficiency of the leaf as an agent for assimilating carbon dioxide and synthesising and translocating carbohydrates gives these fertilizers special importance for crops like potatoes, mangolds and sugar beet which depend for their value largely on the amount of carbohydrate per acre they can produce On the mangold plots at Rothamsted a ton of leaf on plants receiving potassic fertilizers produces a much greater weight of root and of sugar than an equal weight of leaf receiving no potassium, especially when sufficient nitrogen is given to ensure adequate leaf area In like manner the weight of potatoes and starch per acre are both increased by additions of potassic fertilizers Potassic fertilizers are of great importance to sugar beet indeed the possession of the world's supply of these fertilizers was an important factor in the development of the sugar beet industry in Germany

Associated with these marked differences in crop there are great differences in the colours of the leaves especially towards the end of the season The leaves of mangolds well supplied with potash are healthy green in colour, well spread out and gradually die and become yellow from the bottom row upwards as the season advances Without potash, however, the mangold leaves are of an unhealthy dark green colour, crinkled and, instead of spreading out, they tend to bunch together, they do not ripen normally but tend to die late· the stems are often orange colour The facts are clear, but the physiological explanation has not yet been given The harmful effect of potash starvation on carbohydrate production does not seem to be the result of a pathological condition of the chloroplastids H S Reed found that they remained normal for two months, and even increased in numbers in potash-starved algae.

For some reason not fully understood, the turnip crop, although a great producer of sugar, responds less to potassic fertilizers than do mangolds or potatoes In general, cereals also respond but little. deficiency of potash is shown first by falling off in yield, and a slight rise in the percentage of nitrogen in the grain; later, however, when it becomes severe there is a shrinkage in size of the grain. These effects are most pronounced on light sandy, chalky and peaty soils: on these the need for potash seems

to be considerable.

A further effect of potassic fertilizers is to bring about a longer continuance of the growing period, and a longer functioning of the leaves, on some of the light soils fruit trees receiving potassic fertilizers retain their leaves in a green healthy state for some time after other trees have shed them. This extension of the vegetative processes seems to explain the retardation in maturation seen on lighter soils. An example of this is furnished by the North Carolina experiments on cotton, where phosphates markedly hasten maturation and potash equally delayed it Cotton does not ripen all at once, but requires several pickings. The percentage of the cotton open at the first picking was nearly twice as great under phosphatic manuring as under potassic manuring.

The effects of potassic manures on leguminous crops are difficult to explain but very important in practice. All leguminous crops need potash, and especially clover where, as often in Britain, it is grown not by itself but in association with grasses Lawes and Gilbert showed many years ago that in a mixed grass field, clovers have less capacity than the grasses for absorbing potassium from the soil, and in absence of potassic fertilizers they suffer from the competition; the potassium starved grass plots at Rothamsted contain notably less clover than those fully manured, the actual depression fluctuating according to the season

In conclusion, potassic fertilizers are of special importance for:

Crops, sugar beet, potatoes, mangolds, leguminous crops, especially clover, and therefore meadow hay
Soils, chalk, sands, peats
Seasons, cold, sunless, dry.
Other conditions, to promote resistance to fungous diseases and to extend the period of vegetative growth

Other Elements Associated with Potassium.—The potassic fertilizer being always a salt or mixture of salts the farmer is adding other substances besides potassium to the soil whenever he uses this fertilizer *Potassium sulphate* supplies sulphur, an essential element of plant food which is always advantageous so far as is known, and particularly in semi-arid regions. This salt is the most certain in its effect The chlorine supplied by *Muriate of potash* is not usually sufficient in amount to exert any particular effect, and in consequence this fertilizer is usually in humid conditions as effective as the sulphate, and being cheaper, it is more used by farmers But where larger dressings are given, as when kainit is used, the chlorine may be harmful especially to potatoes, which are very sensitive Mangolds and meadow hay are more tolerant, and to these crops kainit can be given

Magnesium, present in German kainit and potash manure salts, but not in those from Alsace, is of advantage in some conditions not well known, so that its effects cannot be predicted It has, however, proved beneficial on potatoes and sugar beet, and Garner has shown that tobacco plants suffering from shortage of magnesium become liable to a peculiar chlorosis known as "sand-drown."

(4) ORGANIC MANURES

The older kinds of manure, which are still the most important on the farm, are of animal and vegetable origin and contain much combustible organic matter they are therefore called "organic" to distinguish them from the inorganic salts or "artificial fertilizers"

Far the most important is *farmyard manure.* This consists of the solid and liquid excretions from the animals, together with the litter The solid excretions, or faeces, contain the undigested and indigestible parts of the food, which is made up of about half of the bulky food supplied to the animal (hay, straw, etc) and a small part of the concentrated food (corn, cake, etc). This material has resisted the attack of the digestive fluids in the animal and it also proves somewhat resistant to the decomposition agents in the soil The liquid excretion, or urine, contains most of the nitrogen and potassium of the digested portion of the food which, after entering the circulation and being used by the animal, is excreted in a soluble form very useful for plant growth The richest manure is therefore that which contains the most and richest urine, given by animals fed on much easily digestible food rich in protein, such as feeding cakes, meals, etc But the richness of the urine also depends on the animal. Fatting animals keep back very little of their nitrogen—only about 5%—and pass most of it out in the urine Growing animals and milch cows keep back considerably more, so that the urine is correspondingly poorer; consequently fatting animals make better manure than young stock or dairy cows The litter plays a very important part: it absorbs the urine, and on decomposition it adds valuable fertilizing material to the manure Straw, peat, moss and bracken are all used; of these straw is much the commonest and contains fair amounts of nitrogen and potassium, has considerable power of absorbing urine, and encourages a biological fixation of ammonia

The composition of farmyard manure is in principle readily ascertained Knowing the weight and composition of the food and litter, and deducting the food constituents retained by the animal, it is easy to calculate the amount of fertilizing materials in any particular lot of farmyard manure Experiments by J. A Voelcker, T B Wood and E. J. Russell show that the calculation does not come out right, the quantity of nitrogen found in the manure being usually about 15% less than was anticipated The loss does not take place in the animal: physiological experiments have shown that the whole of the nitrogen of the food is excreted in the urine and faeces the loss goes on through volatilization and the action of micro-organisms while the manure is in the stall and before it is removed After making the allowance the total quantity of fertilizing material in the heap can be accounted for. The amount per ton, however, depends on the amount of water present and this varies with the different animals; sheep and horses giving more concentrated urine and faeces than cattle and pigs.

In practice, however, farmyard manure is rarely used immediately it is made it has generally to be kept as a matter of

Average Composition of Potash Salts

Grades	Sulphate of Potash (K_2SO_4)	Chloride of Potash (KCl)	Sulphate of Magnesia ($MgSO_4$)	Chloride of Magnesia ($MgCl_2$)	Sodium Chloride (NaCl)	Sulphate of Lime (Gypsum) ($CaSO_4$)	Corresponding amount of Pure Potash (K_2O)	Total Chlorine (Cl)
Kainit 14%		23 7		0 1	62 3	2 5	14 9	49 1
Kainit 20%		33 2		0 1	53 8	2 1	20 9	48 5
Potash Manure Salt 20% (also sold as Kainit 20%)		33 3	12 0	4 2	40·2	2 1	20 9	40·3
Potash Manure Salt 30%	..	48 6	10 2	4 2	26 2	2·2	30·7	42·1
Sulphate of Potash—Magnesia 26%	50 4	.	28 0		3 5	3 4	27·2	2 1
Muriate of Potash—Purity 80–85%	.	83 5	0·4	0·3	14 5		52 6	48·5
Muriate of Potash—Purity 90–95%	..	91·7	0·2	0 2	7 1	.	57 8	48 1
Sulphate of Potash—Purity 90%	90 6	1 6	2 7	1 0	1 2	0 4	49 9	2·2
Sulphate of Potash—Purity . 96%	97 2	0·3	0 7	0·4	0·2	0·3	52·7	0·6

convenience and it then undergoes two types of changes, mechanical or physiological losses through leaching and volatilization, and chemical changes resulting from the activities of the hosts of micro-organisms, including bacteria and fungi, that flourish in it The decomposition brought about by these organisms is in large part an oxidation and it liberates much heat Relatively dry manure, *e.g.* horse dung, rises considerably in temperature; wetter manure, like cow dung, does not because of the great amount of heat needed to warm up all the water present and because much water means little air This production of heat involves the combustion of material in the heap so that there is a corresponding loss of dry matter The loss of nitrogen may be considerable At the high temperature—sometimes as high as 70° C—many of the micro-organisms cannot function and may be killed H Rege has shown, however, that some of the fungi present remain active at 50° C and upwards (*Annals Applied Biology*, 1927, vol xiv, 1–44).

The changes fall into two groups The cellulose is decomposed by some of the organisms, notably certain fungi, and forms humus, a black sticky substance of great value in soil fertility because of its useful effects on the physical properties. tilth, and the power of holding moisture. To effect this decomposition of cellulose the organisms require a supply of easily available nitrogen, *i.e.*, ammonia and amides, and therefore the process goes best when the animals have received cake and meal and the urine is all saved in the heap The nitrogen taken by the organisms is converted into their cell substances, this causes a loss of soluble but a gain of insoluble nitrogen

The nitrogen compounds of the manure undergo opposite kinds of changes (1) If much nitrogen is present ammonia is formed, some of which is lost by volatilization and some is assimilated by the micro-organisms as stated above. (2) If but little nitrogen is present the preceding changes are reduced to a minimum and there is a tendency for nitrogen to be assimilated from the air by certain bacteria (3) Complex insoluble nitrogen compounds in the manure tend to break down to ammonia (4) Ammonia tends to be assimilated by the organisms decomposing the cellulose, and converted by them into complex insoluble compounds

In consequence of these various changes farmyard manure, whatever its original content of nitrogen compounds, tends to become more uniform in composition on storage

These changes take place whether the manure is stored in heaps or is ploughed into the soil They are greatest in heaps to which air is admitted. they are least when air is excluded The losses vary in the same way They are least when air is excluded and the heap sheltered from the rain, in a compact heap stored under cover, or, what comes to the same thing, in manure made and kept under the animal They become greatest, amounting to 40% or more, when the manure is made in open yards and then loosely packed into heaps and exposed to rain in the open Some amount of change is unavoidable, and the rise of temperature has the great and increasing value that it kills weed seeds always present in the manure But it is desirable to minimize the losses and in order to do this the following general rules should be observed.

Manure Made from Fatting Beasts.—If this is made in covered yards it should be left under the beasts until it is wanted Defective roofing and spouting should be made good so far as possible to avoid washing by rain. If made in open yards the manure as soon as convenient should be hauled out and lightly clamped

The clamp should be so placed that it is not unduly exposed to rain; shelter should if possible be provided in the form of a layer of earth, thatched hurdles, corrugated iron sheets, etc. If any black liquid is running away it is a sign that shelter is insufficient and that wastage is going on. It is not sufficient to collect the liquid, though this should be done, steps should be taken to provide more shelter also The clamp should not be disturbed until it is wanted.

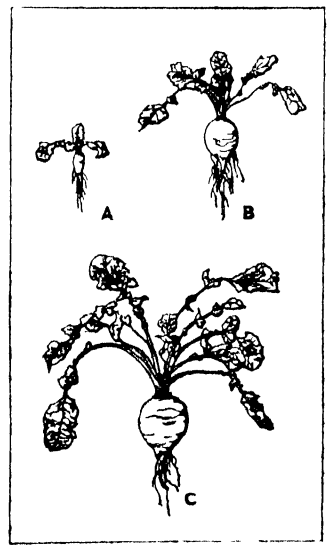
Manure Made from Dairy Cattle.—This has usually to be thrown out daily. It should be well protected from rain. The worst plan is that seen in some of the northern dales of England, where the manure is thrown out of a hole in the wall and left exposed to weather, with the result that streams of black liquid flow away A much better plan is to cart the manure to a dungstead as is done in other parts of the country.

Liquid Manure.—Special care should be taken of the liquid manure draining from the cowsheds This should be run into a tank and applied when convenient to the land. It may go on to grass land at almost any time, and to arable land after the autumn and before the middle or end of May. It is specially rich in nitrogen and potassium.

Time of Applying Farmyard Manure to the Land.—On heavy soils it is best to plough in the manure in autumn, winter or early spring in the "long" or fresh condition The undecomposed straw helps to keep the soil open, it facilitates drainage and the action of winter frost Losses of nitrogen compounds are reduced to a minimum: any decomposition of cellulose or other non-nitrogenous compounds is an advantage since it leads to assimulation of soluble nitrogen compounds which would otherwise be lost during the winter

On light soils the "long" manure should not as a rule be ploughed in later than winter or it may bring about too much evaporation of water the manure should be left to decompose in the heap before it is applied to the land In districts of high rainfall this objection disappears, and spring applications of manure (provided it has been well stored) gives better results than winter applications

Value of Cake Feeding.—From the foregoing it is clear that the feeding of cake to the animals enhances the value of the manure by enriching it in soluble and therefore available nitrogen compounds and by facilitating the conversion of the straw into highly valuable humus "Cake-fed dung," to use the farmers' expression, is therefore of great value and is much prized on the farm Unfortunately under present conditions its cost of production is so great that it can hardly if ever be profitable Many experiments have shown that its advantage over ordinary dung persists only for two years, and the difference in cost is rarely recovered in this period



FROM RUSSELL, "SOILS AND MANURES" (UNIVERSITY PRESS, CAMBRIDGE)

FIG 2.—EFFECT OF PHOSPHATES AND NITROGENOUS FERTILIZERS ON SWEDES IN PRESENCE OF POTASSIC FERTILIZERS

(A) No manure. (B) Superphosphate and potassio fertilizer. (C) Sulphate of ammonia, superphosphate and potassio fertilizer

Unexhausted Values.—Since the effects of farmyard manure are not exhausted in one year, but persist over several, the custom has grown up in Britain, and is now enforced by law, of giving compensation to farmers quitting their holdings for manure they have applied to the land The first tables for the guidance of valuers were drawn up by Lawes and Gilbert in 1870, they have been periodically revised and were reissued in 1914 by J. A Voelcker and A D Hall, who recommend that compensation should be payable in respect of half the nitrogen and three-quarters of potash and phosphoric acid contained in the food, it being supposed that the remainder is lost (*Journal Royal Agricultural Society*, 1914, lxxiv, 104)

Farmyard Compared with Artificial Manures.—When artificial fertilizers were first introduced, chemists felt much justifiable pride in their discovery. In Lawes's and Gilbert's first experiments the complete artificial manures had actually given larger yields of wheat and barley than had farmyard manure and although Lawes and Gilbert themselves did not urge that artificials were better than farmyard manure, some of their successors did so The great French agricultural chemist, Georges Ville, went

so far as to assert that farmyard manure was unnecessary and could in practice be economically replaced by artificial manures

Practical men in Great Britain never accepted this view but maintained that farmyard manure was more effective than artificial fertilizers and came in for some abuse for their supposed prejudice against new ideas and scientific discoveries As time went on, however, it appeared that the superiority of artificial to farmyard manure was not permanent For the first few years the artificials considerably enhanced the fertility of the soil, but after a time their effect began to fall off Farmyard manure, on the other hand, shows no such falling off and is more effective in permanently maintaining fertility Crops receiving it are less liable to suffer from seasonal factors than those receiving artificials only, so that the fluctuations in yield from season to season are less marked on the farmyard manured plot Again some crops seem to respond markedly to farmyard manure Clover, one of the most important crops in Great Britain, is an example it responds better to farmyard manure than to any combination of artificials yet tested, giving not only a better yield of clover hay but also enriching the ground and so improving the succeeding crop Gooseberries were shown by Spencer Pickering at the Woburn fruit farm to respond better to farmyard manure than to artificials and a similar result is shown by citric fruits at Riverside, California These and other experiments prove that farmyard manure has important effects on plant growth which are not produced by artificial manures

The effects are something more than nutrition with nitrogen, potassium and phosphate at Askov in South Jutland a comparison between farmyard manure and artificial fertilizers containing the same amount of plant nutrients has shown that the nutrients in the farmyard manure have only about half the value of those in the artificial fertilizers The composition of farmyard manure is as under —

	Ammoniacal nitrogen	Total nitrogen	Dry matter	Ash	P_2O_5	K_2O
Bullocks (cake fed)	0 181	0 773	27 40	5 72	0 389	0 601
Bullocks (no cake)	0 040	0 540	27 20	9 47	0 235	0 670
Dairy cows	0 091	0 427	19 44	4 17	0 193	0 436
Horses	0 084	0 536	26 87	4 98	0 231	0 535

Sewage Sludge.—Unfortunately no practicable means of realizing the value of sewage has yet been devised Broad irrigation and sewage farming answer under certain conditions, but not as general methods of treatment The only material generally available is the sludge which is prepared by some precipitating or settling process, and it contains therefore only the insoluble compounds and not the soluble and valuable nitrates, ammonia, etc It is usual to add a certain proportion of lime and then to force the mass into presses, when it forms a cake containing roughly 50% of water, 15 to 25% of organic matter and 25 to 35% of mineral matter much of which is lime, and about 1% each of nitrogen and of P_2O_5 This is not usually of much fertilizing value At some places other wastes and residues are added to enrich the sludge and in some northern towns a process is at work to extract the fat, grease, etc , which in modern times have become too precious to lose even in sewage. the resulting products contain respectively 2 and 3½% of nitrogen and are of distinct fertilizer value. The best of these materials is the so-called activated sludge prepared by blowing air through the sewage, this has a very different character from the older types and contains as much as 5% or more of nitrogen and over 4% of P_2O_5, it is a promising fertilizer

Other Organic Manures.—Broadly speaking any animal or vegetable material can be used as manure, and if it can be made to contain more than 5% of nitrogen it may become an article of commerce· poorer materials rarely pay for transport. The guanos are the droppings of sea birds, feathers, etc., gathered from small islands off Peru, South Africa, and elsewhere. Fish and meat guanos are prepared from fish and meat unsalable as human or animal food, the fat having been wholly or partly removed Various seed meals (rape, etc.) are residues left after extraction of oil and for some reason unsuited for animal food Shoddy is a waste material from the Yorkshire mills which tear up old cloth and woollen rags to make them into new cloth All these have fertilizer value though they are more appropriate for special purposes than for ordinary farming Their composition varies, but the following are typical figures —

Material	Nitrogen	P_2O_5	Equivalent to tricalcic phosphate	K_2O
Peruvian guano, high grade	10 14	9–11	20 24	2–4
Peruvian guano, ordinary	5 – 8	14 –18	30–40	2 4
Peruvian guano, phosphatic	2 5– 3 5	18 –32	40–70	2–6
Fish guano	8 –10	4 5– 9	10–20	1
Meat guano, high grade	8 – 9	4 0– 7	10–15	
Meat guano, phosphatic (bone added)	5 – 6	11 5–16	25–35	
Oil cakes about	5	2	4	1
Shoddy	5 –12			

(5) LIME, LIMESTONE AND CHALK

These substances act in two ways they supply calcium as a base, and they improve the physical condition of the soil The need for calcium arises from the circumstance that fertile soils are rich in exchangeable calcium (*see* SOIL), if this becomes displaced by hydrogen, a common occurrence in natural and farm conditions, a sour or acid soil is found unfavourable to vegetation These sour soils are widely distributed in nature and they are dealt with either by using them only for crops tolerant of acidity, or by treatment with lime or limestone to supply the necessary calcium

Lime and limestone are very effective on heavy arable soils, and they are often needed on lighter arable soils also the need is indicated by partial failure of clover and by the prevalence of "finger and toe" (*Plasmodiophora*) on the swede turnip or other crop of the *Brassica* family They are less certain in effect on grass land especially where basic slag is used instances of successful use of lime are found in the north of England

There being no necessity for purity, farmers often use impure lime or limestone so long as it is sufficiently cheap It should, however, always be bought on analysis samples of lime may contain 80–95% calcium oxide, limestone may be of 95% purity

Waste lime from various factories is sometimes available The differences in action between lime and limestone are essentially minor and the choice between them is determined mainly by considerations of cost and transport Both should be somewhat finely ground before being applied, and if possible both should be applied in winter or early spring Lime is fatal to certain animal pests, slugs and others, and should be used if they are of importance, The rate of application should be adjusted to the need which can be approximately estimated by modern analytical methods.

(E J R)

BIBLIOGRAPHY —Selected bibliographies to the vast periodical scientific literature of the subject will be found in S H Collins, *Plant Products and Chemical Fertilizers* (2nd ed., 1926) and Sir E. J. Russell, *Soil Conditions and Plant Growth* (5th ed , 1927) Reports of the Rothamsted and Woburn experimental stations may be read in Sir A D Hall, *The Book of the Rothamsted Experiments* (2nd ed , 1919) and the *Journal of the Royal Agricultural Society*, respectively Among general works or special monographs the following may be consulted. H Ingle, *A Manual of Agricultural Chemistry* (4th ed 1920); G. S. Robertson, *Basic Slags and Rock Phosphates* (1922); Sir E. J Russell, *Manuring for Higher Crop Production* (2nd ed , 1917); *A Student's Book on Soils and Manures* (2nd ed , 1919); *Farm Soil and its Improvement* (1923); and T B Wood, *The Chemistry of Crop Production* (2nd ed , 1924)

United States.—In the United States, practice in the production and application of fertilizers differs somewhat from that of Great Britain and the Continent. Mixed or "complete" fer-

tilizer is usually used. This contains, as a rule, all three of the essential fertilizer elements—nitrogen, phosphorus and potassium —in some definite ratio All the fertilizer materials may be applied simultaneously in this way with a resulting saving of time and labour.

In making mixed fertilizers in America most of the materials which are described in the article above are utilized Usually, superphosphate (acid phosphate) is manufactured at the factory and the other raw materials assembled These are mixed with the superphosphate In the United States superphosphate (acid phosphate) is graded according to the amount of available phosphoric acid (P_2O_5) it contains, which includes not only P_2O_5 soluble in water but also that which is soluble, under certain very definite conditions, in a neutral solution of ammonium citrate of 1 09 specific gravity. Ordinarily, from 75 to 85% of the available phosphoric acid is water soluble The grades produced range from 16 to 20% available phosphoric acid There is, also, a growing use for so-called double or treble superphosphate, which contains from 40 to 50% available phosphoric acid This is prepared by acidulating phosphate rock with liquid phosphoric acid instead of with sulphuric acid

The various ingredients of a mixed fertilizer must be chemically compatible, otherwise both the chemical and physical condition of the finished product would be seriously impaired If improper mixtures are made, loss of nitrogen and reversion of available phosphoric acid to an insoluble form may occur and the product may become hard and lumpy instead of remaining fine and granular The physical condition of the mixture is of much importance as it affects the ease and uniformity of distribution on the farm Often mixtures are allowed to stand in storage for some weeks before bagging and shipping to permit the completion of chemical reactions among ingredients The "cured" fertilizer is then milled to break up lumps before being bagged and shipped Nitrogenous organic materials such as slaughter-house tankage, dried blood, cotton-seed meal, etc , have a decidedly beneficial effect on physical condition These materials, however, are comparatively expensive as nitrogen carriers, and, in general, only the off-grade products, unfit for use in animal feeding-stuffs, find their way into fertilizers Tankage from garbage, sewage and industrial wastes are also used The present day trend, however, is distinctly away from extensive use of organic materials in mixed fertilizers

The greatest quantity of fertilizer is used in the south-eastern States under cotton Tobacco, too, is treated heavily, and potatoes in certain sections, as in Maine, require liberal amounts In some sections of the east and south, it is used extensively with truck and cereal crops, but in the great cereal raising States of the middle west very little fertilizer is, as yet, consumed In the fruit-growing districts of California and Florida fertilizer is required In 1928 between 7 and 8 million tons of fertilizer were used annually in the United States Owing to diverse requirements of widely separated localities a system has developed in the United States whereby comparatively small fertilizer works are situated in consuming districts catering to the special needs of each neighbourhood Some of these works manufacture their own sulphuric acid, superphosphate (acid phosphate) and mixed fertilizers, others buy acid and make superphosphate (acid phosphate) and mixed fertilizers; while still others are merely mixing units, buying all the fertilizer ingredients Formulae used for mixed fertilizers vary widely, depending on kind of crops, types of soil and local prejudices, so that many brands are on the market Until recently the more popular formulae were of comparatively low analysis such as: 1 65% nitrogen (N_2), equivalent to 2% ammonia (NH_3), 10% phosphoric acid (P_2O_5), 2% potash (K_2O) and 2·48% N_2 (3% NH_3), 9% P_2O_5, 3% K_2O The present trend, however, is toward higher grade goods, such as. 4·12% N_2 (5% NH_3), 15% P_2O_5, 5% K_2O and 3·3% N_2 (4% NH_3), 16% P_2O_5, 4% K_2O Experiments are being made throughout the world on the direct application to the soil of concentrated materials such as urea, ammonium phosphate and mixtures containing between 50 and 70% of nitrogen, phosphoric acid and potash It is possible that in the future such mixtures will replace to a great extent the "complete" fertilizer combinations in use to-day.

The *Journal* of the Association of Official Agricultural Chemists contains many important contributions to the literature of fertilizer chemistry The division of fertilizer chemistry of the American Chemical Society also contributes to the literature of the subject in the journals of that society (H H Me)

FESCENNIA, an ancient city of Etruria, probably immediately north of the modern Corchiano, 6 m N W of Civita Castellana (*see* Falerii) At Corchiano itself, however, Etruscan walls may be traced, and the site is strong—a triangle between two deep ravines, with the third (west) side cut off by a ditch

FESCENNINE VERSES, *Fescennini versus, carmina Fescennina,* a native Italian form of poetry At vintage (Virgil, *Georg* , ii 385) and harvest (Horace, *Epp* , ii 1, 139), probably at other rustic festivals also (*cf* Tibullus, ii 1, 51) masked dancers sang jocular dialogues in verse Similar songs were in use at weddings (Festus, p 76 Lindsay, Symmachus, *Orat* iv 13) According to Horace, they became so abusive that a law was passed to check them; apparently the provision of the Twelve Tables (viii , 1 Bruns) which forbade a *malum carmen* (evil song, *i e* , charm intended to hurt) was stretched to include libellous verses. We also know (*see* the literary imitations, Catullus lxi , 126 ff , Claudian xi –xiv) that they were very free, to our notions obscene, in language Further, Festus (*loc cit*) says that they averted the evil eye and that therefore some connected the name with *fascinum* This derivation, philologically most unlikely, is supported by one or two moderns, who suppose *fascinum* to have the sense of "phallus," not "evil eye " The true derivation is in all probability from Fescennia, but we may very reasonably suppose that in their origin they had a magico-religious intent, abuse, buffoonery, and obscenity being well-known fertility or luck charms That they developed into the dramatic *satura* and thus gave birth to the beginnings of a native drama is implied in Livy, vii , 2, 7, but has been seriously doubted in modern times, *cf* Latin Literature

See Schanz-Hosius, *Gesch der rom Literatur* (bibl)

FESCH, JOSEPH (1763–1839), cardinal, was born at Ajaccio, Corsica, on Jan 3, 1763 He was connected with the Bonaparte family by his father's second marriage with Laetitia Bonaparte's widowed mother. At the outbreak of the French Revolution, he was archdeacon of Ajaccio, he protested against the application to Corsica of the act known as the "civil constitution of the clergy" (July 1790) On the suppression of religious orders and corporations, he had to retire into private life

He was drawn by the Bonaparte family into espousing the French cause against Paoli and the Anglophiles, and accompanied Laetitia and her son to Toulon, in the early part of the autumn of 1793 His fortunes rose rapidly when Napoleon became First Consul (Nov 1799) He resumed his clerical vocation, and took an active part in the complex negotiations which led to the signing of the Concordat with the Holy See on July 15, 1801 He was then made archbishop of Lyons (1802), and cardinal (1803)

In 1804 he succeeded Cacault as French ambassador at Rome He was assisted by Châteaubriand, but soon sharply differed with him on many questions His tact in overcoming the reluctance of the pope to be present at the coronation of Napoleon in Notre Dame, Paris (it was only eight months after the execution of the duc d'Enghien) was rewarded with further honours Finally, in 1806 Karl von Dalberg, then prince bishop of Regensburg, chose him as coadjutor and designated him as his successor Before the succession fell vacant, however, Regensburg had been incorporated in Bavaria.

By this time Napoleon was in sharp collision with the pope on various matters both political and religious Fesch, who was still ambassador in Rome, went as far as possible in counselling the submission of the spiritual to the civil power For a time he was not on speaking terms with the pope; but Napoleon was dissatisfied, and recalled him

Affairs came to a crisis when Napoleon decreed (May 17, 1809) the annexation of the papal states to the French empire In that year Napoleon conferred on Fesch the archbishopric of Paris, but he refused the honour. In 1811 Fesch presided over a Gallican

church council convened by the emperor, but failed to satisfy Napoleon, and was dismissed to his diocese Next year Napoleon intercepted a letter from Fesch to Pius VII, who was then detained at Fontainebleau, and there was a serious breach The tension between Fesch and the emperor was less in 1812–13 During the Hundred Days Fesch resumed his archiepiscopal duties at Lyons and became a member of the senate. On the second abdication Fesch retired to Rome He left many works of art to the city of Lyons He died at Rome on May 13, 1839

See Ricard, *Le Cardinal Fesch* (1893); H. Welschinger, *Le Pape et l'empereur* (1905); F Masson, *Napoléon et sa famille* (4 vols, 1897–1900), this correspondence with Napoleon was edited by Ducasse (1855).

FESCUE, the name given to the numerous and widely distributed perennial grasses of the botanical genus *Festuca,* found chiefly in temperate and cold regions, among which are several pasture and fodder grasses of agricultural importance The most important of these is the tall or meadow fescue (*F elatior*) common throughout Europe and in parts of Asia and widely cultivated and naturalized in the United States and Canada It grows to a height of from 2 ft to 5 ft, and is regarded as one of the most valuable grasses both for fodder and for permanent pasture The red fescue (*F rubra*), found throughout cool north temperate regions, is sometimes grown in meadows The sheep's fescue (*F ovina*), native to the Himalayas and certain mountainous districts of Europe and North America, and widely naturalized in north temperate regions, is sometimes used in dry pastures and a form called the blue fescue (var *glauca*), with silvery-glaucous leaves, is grown for ornament

The closely allied genus *Bromus,* which includes the brome grasses, is abundantly represented in north temperate regions, and various species are grown for forage and for ornamental purposes Among those important agriculturally are the erect brome (*B erectus*), useful as a forage grass on dry, chalky soil, and the awnless or Hungarian brome (*B inermis*), grown for pastures and meadows (*See* GRASSES)

FESSA, a town and district of Persia in the province of Fars The town is situated in a fertile plain in 29° N and 90 m from Shiraz The district comprises forty villages and extends about 40 m north-south from Runiz to Nasirabad and 16 m. east-west from Vasilabad to Deh Dasteh (Dastajah); it produces much grain, fruit and tobacco

FESSE, one of the ordinaries in heraldry consisting of a horizontal band across the centre of the shield *See* HERALDRY.

FESSENDEN, WILLIAM PITT (1806–1869), American statesman and financier, was born in Boscawen, N H, on Oct 16, 1806 After graduating at Bowdoin college in 1823, he studied law, and in 1827 was admitted to the bar, eventually settling in Portland, Me, where for two years he was associated in practice with his father, Samuel Fessenden (1784–1869), a prominent lawyer and anti-slavery leader. In 1832 and in 1840 Fessenden was a representative in the Maine legislature, and in 1841–43 a Whig member of the national House of Representatives. When his term in this capacity was over, he devoted himself with great success to the law He became well known, also, as an eloquent advocate of slavery restriction In 1854 he was chosen by the combined votes of Whigs and Anti-Slavery Democrats to the United States Senate, where he delivered a speech in opposition to the Kansas-Nebraska bill which made him a force in the congressional anti-slavery contest He was re-elected to the Senate as a member of the Republican party. As chairman of the Senate committee on finance, his services were second in value only to those of President Lincoln and Secretary Salmon P. Chase in efforts to provide funds for the defence of the Union; in 1864 Fessenden succeeded Chase as secretary of the Treasury. The finances of the country in the early summer of 1864 were in a critical condition, a few days before leaving office Chase had been compelled to withdraw from the market $32,000,000 of 6% bonds, on account of the lack of acceptable bids; gold had reached 285, while the value of the paper dollar had sunk as low as 34 cents. It was Fessenden's policy to avoid a further increase of the circulating medium, and in spite of powerful pressure the paper currency was not increased during his tenure of office. As the sales of bonds and treasury notes were not sufficient for the needs of the Treasury, interest-bearing certificates of indebtedness were issued to cover the deficits. When these began to depreciate Fessenden engaged the services of the Philadelphia banker Jay Cooke (*q v*) and secured the consent of Congress to raise the balance of the $400,000,000 loan authorized in 1864 by the sale of the so-called "seven-thirty" Treasury notes (*i.e*, notes bearing interest at 7 3% payable in currency in three years or convertible at the option of the holder into 6% 5–20 year gold bonds). Through Cooke's activities the sales were enormous, the notes, issued in denominations as low as $50, appealed to the patriotic impulses of the people who could not subscribe for bonds of a higher denomination In the spring of 1865 Congress authorized an additional loan of $600,000,000 to be raised in the same manner, and for the first time in four years the Treasury was able to meet all its obligations After thus securing ample funds for the enormous expenditures of the war, Fessenden resigned the Treasury portfolio in March 1865, and again took his seat in the Senate, serving till his death He was not, however, entirely in accord with the more radical members of his own party, and this difference was exemplified in his opposition to the impeachment of President Johnson and subsequently in his voting for Johnson's acquittal He died at Portland, Me, on Sept 6, 1869

See Francis Fessenden, *Life and Public Services of William Pitt Fessenden* (Boston, 1907)

FESSLER, IGNAZ AURELIUS (1756–1839), Hungarian scholar, was born on May 18, 1756, at Zurány, Hungary He became a capuchin, and made many enemies by exposing the abuses of the monasteries to the emperor, Joseph II, who ordered a searching examination in consequence He held a chair at Lemberg university for a short time, but had to leave Hungary after the publication of his tragedy *Sidney* (1788), attacking the English Roman Catholics He was converted to Lutheranism, and wandered from place to place In 1796 he was in Berlin and was commissioned, with Fichte, to reform the statutes of the freemasons' lodge there In 1809 Alexander I offered him a chair at St Petersburg (now Leningrad), of which he was soon deprived on account of his heterodox opinions In Nov 1820 he was appointed consistorial president of the evangelical communities at Saratov, and subsequently became superintendent of the Lutheran communities in St Petersburg Fessler died at St Petersburg on Dec 15, 1839

Among his numerous works are *Die Geschichten der Ungarn und ihrer Landsassen* (10 vols., Leipzig, 1815–25), *Mathias Corvinus* (2 vols, Breslau, 1793–94), *Die drei grossen Könige der Ungarn aus dem Arpadischen Stamme* (Breslau, 1808), and the autobiographical *Ruckblicke auf seine siebzigjahrige Pilgerschaft* (Breslau, 1824; 2nd ed, Leipzig, 1851) *See* J Koszó, *A. I. Fessler* (1923).

FESTA, CONSTANZO (*c* 1495–1545), Italian singer and musical composer, became a member of the Pontifical choir in Rome in 1517, and soon afterwards *maestro* at the Vatican His motets and madrigals (the first book of which appeared in 1537) excited Dr. Burney's warm praise in his *History of Music;* and, among other church music, his *Te Deum* (published in 1596) is still sung at important services in Rome His madrigal, called in English "Down in a flow'ry vale," is well known

FESTINIOG or **FFESTINIOG,** a town of Merionethshire, North Wales, beautifully situated at the head of the Festiniog valley, 600 ft. above sea level Pop of urban district (1921) 8 128 There are important slate quarries in the neighbourhood, especially at Blaenau Festiniog, the junction of the L M S and G.W R with a narrow-gauge line between Portmadoc and Duffws. This light railway runs at a considerable elevation (some 700 ft.), commanding a view across the valley and Tan y Bwlch lake. The Cynfael falls are famous. Near are *Beddau gwyr Ardudwy* (the graves of the men of Ardudwy), memorials of early warfare. The slate industry was very depressed in 1928.

FESTIVALS, MUSICAL. In various forms musical festivals have been held for some centuries. No doubt the earliest examples owed their origin mainly to the difficulties of travel, which led the musicians in a wide area to concentrate their activities periodically at some convenient centre. Inevitably, too, such

music-makings were connected with the Church, to which most musicians and performing bodies were attached.

Both custom and title seem to have originated in England, where the earliest gathering of the kind appears to have been the *Festival of the Sons of the Clergy*. Founded in 1655, with the object of assisting necessitous clergy and their dependents, this gathering has been held annually in St. Paul's Cathedral, as one of the most important church-music events in London The *Three Choirs Festival* dates from 1724—perhaps a little earlier That year, at all events, saw it first coming into prominence, with a performance at Gloucester of a cathedral service on an imposing scale with orchestral accompaniment It owed its inception largely to the Rev Thomas Bisse, Chancellor of Hereford and brother of the bishop of that diocese The proceeds were given to a fund for the widows and orphans of the poorer clergy of the Hereford, Gloucester, and Worcester dioceses The meetings were held in turn at each of the three cathedral towns, the cathedral organist at the chosen place conducting with his two colleagues assisting as pianist and organist. This practice was almost invariable, and is still maintained in a modified form, the conducting now being shared by visiting musicians of distinction The festivals were discontinued during the World War, but resumed in 1920 with marked success Other famous English festivals are the *Birmingham* (1768, discontinued since 1914), *Norwich* (1824 in its present Triennial form, but held at irregular intervals since 1770), *Leeds* (1858, but not regularly established until about 20 years later), the *Handel Commemoration* (1784 in Westminster Abbey and The Pantheon, subsequently at the Abbey alone, until 1791), and the *Handel Festival* (1857, and triennially from 1862, at the Crystal Palace, with a break during the War period)

In Germany an early event of the kind was the series of elaborate performances known as "Abendmusiken," which were started at the Marienkirche of Lubeck by Buxtehude in 1673 These consisted of choral and orchestral works, interspersed with organ solos They were held on the five Sundays in Advent, in connection with the evening services, and soon became famous, visitors being attracted from remote parts (Bach, when a young organist at Arnstadt, spent one of his holidays in walking to Lübeck—about 230 English miles—in order to attend) The "Abendmusiken" continued without break until well into the 19th century Present-day German and Austrian Festivals include the *Lower-Rhine* (founded about 1824, held alternately at Cologne, Düsseldorf, and Aix-la-Chapelle, its origin was a Thuringian Festival held at Erfurt in 1811), the *Middle-Rhine* (Coblenz, Mayence, etc), the *Tonkunstler-Societät* of Vienna (1772), and *Salzburg* (1917); but summer festivals, devoted mainly to Mozart's operas, had been held there for some years previously, the 1922 festival led to the founding of the International Society for Contemporary Music (*q v*), which has now (1928) about 20 branches in various countries In addition, many festivals have long been held in commemoration of individual composers—*e.g*, Bach at Eisenach and Leipzig; Beethoven at Bonn, Wagner at Bayreuth

In America the earliest festivals were at Boston (1857) and Worcester (1858). In 1873 Theodore Thomas started the Cincinnati Festival (biennial). The Ann Arbor Festival (University of Michigan) has been held since 1893. Specially notable is the Bethlehem Bach Festival, held at Bethlehem, Pa., founded by Frederick Wolle in 1900, and conducted by him (The sequence was broken in 1905–11) From about 1900 dates the Norfolk, Conn , Festival; in 1910 that of Peterboro, N. H., came into being, and annually in early summer the North Shore Festival is held at Evanston, Ill. In 1917, Mrs Coolidge began her munificent work on behalf of contemporary chamber music by founding the Berkshire Festival at Pittsfield, Mass , where the programmes are confined to chamber music, many important new works having been commissioned, or awarded prizes. The National Federation of Musical Clubs holds a biennial meeting and festival, and does much to promote smaller enterprises throughout the country.

Competition Festivals.—Of recent origin, but already one of the most important musical developments in the United Kingdom, is the Competition Festival movement. Originally it was confined to brass band contests. An account of one of these contests, held in Yorkshire, appeared in *Household Words* during Dickens's editorship. The extension of the movement to other branches of executive music, especially choral, occurred in 1882, the *Stratford* (*Essex*) *Festival* was started by J S Curwen The *Kendal Festival*, which owed its inception to Mary Wakefield, followed in 1885. The movement spread rapidly, and in 1927 about 200 organizations of the kind were affiliated to the British Federation of Musical Competition Festivals, which has its headquarters in London. The bulk of these meetings is held in England Scotland has, however, a good number of flourishing festivals, and Ireland is becoming increasingly active in this respect The movement has spread to remote parts of the British empire, 14 overseas festivals being attached to the Federation Of these the largest are in Canada, and the remainder in Australia, New Zealand, South Africa and India In addition there are held in Great Britain a considerable number of unaffiliated competitions; and Wales has numerous old established Eisteddofod (*q.v.*) wherein music plays a prominent part.

The scope of the Competition Festival has lately been extended very considerably, and most of the larger type include, not only sections for practically every branch of musical performance, but also classes in folk-dancing, elocution, composition (musical and literary), and dramatic art An idea of the social and musical importance of the festivals may be gathered from a few statistics in connection with some of the larger meetings held in 1926, the figures being taken from the Federation Year Book for 1927: Bedfordshire, entries, 2,063, number of competitors, 10,486; Glasgow, 1,735—14,532, Blackpool, 1,650—8,000, Birmingham, 1,238—11,500 These festivals occupy from 7 to 14 days That of Glasgow, for example, lasts a fortnight, with three sessions daily, classes sometimes being held simultaneously in three halls

The importance of the small local festivals, however, must not be overlooked Often their educational value is even greater than that of mammoth gatherings at which the proceedings are sometimes too congested to permit of this side being fully developed The small rural festival usually affords ample opportunity for detailed adjudications, lectures and demonstrations, besides developing musical activities in places which would otherwise be more or less barren

The movement has recently undergone some modifications, chiefly for good Thus, money prizes and costly trophies are less in evidence, their places being taken by certificates With this change of motive (from the tangible reward to the pleasure of making music for its own sake) has come an increasing tendency to focus the activity of a festival on to an important work for chorus and orchestra A frequent plan is to choose a choral work, the whole of which is studied by entrants for some months At the festival various numbers are used separately as test pieces in various classes (solo and choral), and the climax of the festival is reached with a performance of the complete work by all the competitors under the conductorship of one of the adjudicators. It is difficult to overestimate the value of this development, which gives some hundreds of musicians in a district a practical and intimate knowledge of masterpieces that otherwise they might never even hear

It will be gathered that much depends on the standing and equipment of those who undertake the important work of judging Happily the roll contains the names of a large proportion of the most prominent musicians in the country. It is no uncommon thing to find at a large festival as many as a dozen singers, instrumentalists, conductors and teachers, of more than national reputation, engaged in this important work

Thus well established, both in regard to organization and musicianship, the Competition Festival has rapidly become one of the most potent factors in the social and artistic life of the country. (*See* also CHORAL SINGING.) (H. G)

FESTOON, an ornament developed from the representation of a garland of leaves, fruit or flowers, cloth or ribbon, supported at two or more points and hanging in curves between. The festoon appears occasionally in late Greek work, particularly as a decoration for Hellenistic altars, but it was the Romans who gave it definite form. Roman festoons are usually made of fruit, grain,

leaves and flowers, treated with extreme naturalism, although in wall paintings and stucco decoration simpler and more conventional types are found The festoon was a favourite motive of the early Italian Renaissance. In Baroque work through Europe many fantastic treatments of the cloth festoon exist



FESTOON (ITALIAN RENAISSANCE)

FESTUS (? RUFUS or RUFIUS), one of the Roman writers of *breviaria* (epitomes of Roman history) The fact that he refers to the defeat of the Goths at Noviodunum (A D 369) by Valens, but is unaware of the constitution of Valentia as a province (which took place in the same year) fixes the date of composition Mommsen identifies the author with Rufius Festus, proconsul of Achaea (366), and both with Rufius Festus Avienus (*q v*), the translator of Aratus But the absence of the name Rufius in the best mss is against this Others take him to be Festus of Tridentum, *magister memoriae* (secretary) to Valens who, as proconsul of Asia, punished with merciless severity those implicated in the conspiracy of Theodorus The work itself (*Breviarium rerum gestarum populi Romani*) is divided into two parts—one geographical, the other historical The chief authorities used are Livy, Eutropius and Florus It is extremely meagre, but the last part, which is based on the writer's personal recollections, is of some value for the history of the fourth century

Editions by W Forster (1873) and C Wagener (1886), *see* also R Jacobi, *De Festi breviarii fontibus* (1874), and H Peter, *Die geschichtliche Litt uber die romische Kaiserzeit* II p. 133 (1897), where the epitomes of Festus, Aurelius Victor and Eutropius are compared

FESTUS, SEXTUS POMPEIUS, Roman grammarian, probably flourished in the 2nd century A D. He made an epitome of the valuable work *De verborum significatu* (of which only fragments remain), by M Verrius Flaccus, a freedman and grammarian who flourished in the reign of Augustus Festus gives the etymology and meaning of every word; and throws light on the antiquities of Rome He made a few alterations, and inserted some critical remarks of his own Latin words which had long become obsolete were relegated to a separate work (*Priscorum verborum cum exemplis*), now lost. Festus's epitome exists in only one ms, the Codex Festi Farnesianus at Naples, which contains the second half of the work (M-V) only, and that not in a perfect condition It has been published in facsimile by Thewrewk de Ponor (1890) At the close of the 8th century Paulus Diaconus abridged the abridgment From his work and the solitary copy of the original attempts have been made to reconstruct the treatise of Festus.

Of the early editions the best are those of J. Scaliger (1565) and Fulvius Ursinus (1581), in modern times, those of C. O Muller (1839, reprinted 1880) and de Ponor (1889), new edition by W M Lindsay (Leipzig, 1913) *See* J E. Sandys, *History of Classical Scholarship*, vol I (1906); L Havet, "Notes Critiques sur le Texte de F," (in *Bib de l'École des Hautes Études*, 1914, W. M Lindsay, *Ancient Lore in Mediaeval Glossaries* (1921) for Festus as a source of the Abolita Glossary.

FET or **FOETH, AFANASI AFANASIEVICH** (1820–1892), who assumed by decree in 1876 the name of Shenshin, Russian poet, was born at Novoselki, Orel, on Dec. 5, 1820, the illegitimate son of a landowner named Shenshin He was still a student at Moscow university when, in 1842, he published some admirable lyrics in the *Moskvityanin* In 1850 a volume of his *Poems* appeared, followed by another in 1856 He then served for some years in the army, retiring with the grade of captain in 1856 In 1860 he settled on an estate at Stepanovka, where he was often visited by Turgeniev and Tolstoi Fet's sincere and passionate lyric poetry strongly influenced later Russian poets, but during his lifetime he was decried because of his reactionary political views, and somewhat unattractive personality He published very little after 1863, but he continued to write nature poetry and love lyrics which were published in a collected edition (4 vols 1894). Fet also made some fine translations from Horace, Catullus and Tibullus, of Goethe's *Faust* and *Hermann und Dorothea.* He died in Moscow on Dec. 3, 1892

See a paper on Fet in Oliver Elton's *Sheaf of Papers* (1922) which includes some translations.

FÊTE NATIONALE, an annual national holiday in France held on July 14 in commemoration of the fall of the Bastille. A second *fête nationale* is held on Sept. 22, commemorating the establishment of republican government

FÉTIS, FRANÇOIS JOSEPH (1784–1871), Belgian composer and writer on music, was born in Mons on March 25, 1784, and died in Brussels on March 26, 1871. He was trained as a musician by his father, who followed the same calling His talent for composition manifested itself at the age of seven, and at nine years old he was an organist at Sainte-Waudru. In 1800 he went to Paris and completed his studies at the conservatoire under Boieldieu, Rey and Pradher In 1806 he undertook the revision of the Roman liturgical chants in the hope of discovering and establishing their original form In this year he married the granddaughter of the Chevalier de Kéralio, and also began his *Biographie universelle des musiciens,* the most important of his works, which did not appear until 1834. In 1821 he was appointed professor of counterpoint and fugue at the Paris conservatoire In 1827 he founded the *Revue musicale,* the first serious paper in France devoted exclusively to musical matters In 1833, at the request of Leopold I, he became director of the conservatoire of Brussels and the king's *maître de chapelle* Fétis was a prolific composer, but his real service to music lies not in his compositions but in his historical and theoretical work The *Biographie universelle* is not without errors, but many of these were corrected in the 2nd ed (Paris 1860-65), and the work is still one of great value It was completed by Pougin (2 vols 1878–80) His other works included *Histoire générale de la musique* (5 vols 1869–76), in which he comes down to the 15th century, *La Musique mise à la portée de tout le monde* (Paris, 1830), *Traité de l'accompagnement de la partition* (1829), *Traité complet de la théorie et de la pratique de l'harmonie* (1844); and the important, indeed classical, *Traité du contrepoint et de la fugue* (1824)

See L Alvin, *Notice sur J J Fétis* (1874)

FETISHISM, an ill-defined term, used in many different senses. (*a*) the worship of inanimate objects, often regarded as peculiarly African, (*b*) negro religion in general, (*c*) the worship of inanimate objects conceived as the residence of spirits not inseparably bound up with, nor originally connected with such objects; (*d*) the doctrine of spirits embodied in, or attached to, or conveying influence through, certain material objects (Tylor); (*e*) the use of charms, which are not worshipped, but derive their magical power from a god or spirit, (*f*) the use as charms of objects regarded as magically potent in themselves; (*g*) as synonymous with the religions of primitive peoples, including under it not only the worship of inanimate objects, such as the sun, moon or stars, but even such phases of primitive philosophy as totemism. Comte applied the term to denominate the view of nature more commonly termed animism

Derivation.—The word fetish (or fetich) was first used in connection with Africa by the Portuguese discoverers of the last half of the 15th century; relics of saints, rosaries and images were then abundant all over Europe and were regarded as possessing magical virtue, they were termed by the Portuguese *Feiticos* (*i e*, charms) Early voyagers to West Africa applied this term to the wooden figures, stones, etc, regarded as the temporary residence of gods or spirits, and to charms There is no reason to suppose that the word *feitico* was applied either to an animal or to the local spirit of a river, hill or forest *Feitico* is sometimes interpreted to mean artificial, made by man, but the original sense is more probably "magically active or artful" The word was probably brought into general use by C. de Brosses, author of *Du culte des dieux fétiches* (1760), but it is frequently used by W. Bosman in his *Description of Guinea* (1705), in the sense of "the false god, Bossum" or "Bohsum," properly a tutelary deity of an individual

Definition.—The term fetish is commonly understood to mean the worship of or respect for material, inanimate objects, conceived as magically active from a virtue inherent in them temporarily or permanently, which does not arise from the fact that a god or spirit is believed to reside in them or communicate virtue to

them After a certain grade of culture has been attained the belief in luck appears; the fetish is essentially a mascot or object carried for luck

Ordinary Usage.—In the sense in which Dr. Tylor uses the term the fetish is (1) a "god-house" or (2) a charm derived from a tutelary deity or spirit, and magically active in virtue of its association with such deity or spirit In the first of these senses the word is applied to objects ranging from the unworked stone to the pot or the wooden figure, and is thus hardly distinguishable from idolatry (*a*) The *bohsum* or tutelary deity of a particular section of the community is derived from the local gods through the priests by the performance of a certain series of rites. A *bohsum* may also be procured through a dream, but in this case, too, it is necessary to apply to the priest to decide whether the dream was veridical (*b*) The *suman* is "an object which is the potential dwelling-place of a spirit or spirits of an inferior status, generally belonging to the vegetable kingdom. this object is closely associated with the control of the powers of evil or black magic, for personal ends, but not necessarily to assist the owner to work evil, since it is used as much for defensive as for offensive purposes"

On the Guinea coast the spirit in the object is usually, if not invariably, non-human Farther south on the Congo the "fetish" is inhabited by human souls also The priest goes into the forest and cuts an image, when a party enters a wood for this purpose they may not mention the name of any living being unless they wish him to die and his soul to enter the fetish The right person having been selected, his name is mentioned, and he is believed to die within ten days, his soul passing into the *nkissi* Nails are driven into these figures in order to procure the vengeance of the indwelling spirit on some enemy

African religion is not fetishism it rests on animism and the belief in higher gods, not necessarily accompanied with worship or propitiation, which there is no reason to suppose has been derived in every case, even in any case, from Christian or Mohammedan missionaries

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FETTERCAIRN, burgh of barony and parish, Kincardineshire, Scotland, 4½ m NW. of Laurencekirk Pop of parish (1921) 1,325 The market cross originally belonged to the extinct town of Kincardine There is a large distillery near the town Balbegno Castle, dating from 1509, contains a lofty hall of fine proportions Ruins are seen of the royal castle of Kincardine, where, according to tradition, Kenneth III was assassinated in 1005, although he is more generally said to have been slain in battle at Monzievaird, near Crieff in Perthshire

FETTERS AND HANDCUFFS, instruments for securing the feet and hands of prisoners under arrest, or as a means of punishment. The old names were manacles, shackbolts or shackles, gyves and swivels. Until within recent times handcuffs were of two kinds, the figure-8 ones which confined the hands close together either in front or behind the prisoner, or the rings from the wrists were connected by a short chain much on the model of the handcuffs in use by the police forces of to-day. For the removal of gangs of convicts an arrangement of handcuffs connected by a light chain is used, the chain running through a ring on each fetter and made fast at both ends by what are known as *end-locks.* Several recently invented appliances are used as handcuffs, *e.g.,* snaps, nippers, twisters. They differ from handcuffs in being intended for one wrist only, the other portion being held by the captor. In the snap the smaller circlet is snapped to on the prisoner's wrist. The nippers can be instantly fastened on the wrist. The twister, not now used in England as being liable to injure prisoners seriously, is a chain attached to two handles; the chain is put round the wrist and the two handles twisted till the chain is tight enough

Leg-irons are anklets of steel connected by light chains long enough to permit of the wearer walking with short steps An obsolete form was an anklet and chain to the end of which was attached a heavy weight, usually a round shot The Spanish used to secure prisoners in bilboes, shackles round the ankles secured by a long bar of iron This form of leg-iron was adopted in England, and was much employed in the services during the 17th and 18th centuries An ancient example is preserved in the Tower of London

FEU, in Scotland, the common mode of land tenure The word is the Scots variant of "fee" (*q v*) The feudal system still dominates Scots conveyancing, but its forms are now extensively modified by the Titles to Land (Consolidation) (Scotland) Act 1868, the Conveyancing (Scotland) Act 1874, the Conveyancing (Scotland) Act 1924, and some other statutes It now contains three variants of holding Burgage holding is the system by which land in royal burghs is held Blench holding is by a nominal payment, as of a penny Scots to be rendered upon demand only In feu holding proper there is a substantial annual payment in money in return for the enjoyment of the land The Crown is the first overlord or superior, and land is held of it by Crown vassals, but they in their turn may "feu" their land, as it is called, to others who become *their* vassals, whilst they themselves become mediate overlords or superiors This process of sub-infeudation may be repeated to an indefinite extent, except in cases where sub-infeudation has been conventionally prohibited prior to 1874 If the vassal does not pay the annual feu-duty for two years, the superior, among other remedies, may obtain by legal process a decree of irritancy, whereupon *tinsel* or forfeiture of the feu follows Casualties, which are a feature of land held in feu, are additional payments to the superior, contingent on the happening of certain events By the Feudal Casualties (Scotland) Act 1914 all such casualties as may not have been redeemed or commuted by Jan 1, 1930, shall be extinguished and discharged

See Erskine's *Principles;* Bell's *Principles;* Rankine, *Law of Landownership in Scotland*

FEUCHÈRES, SOPHIE, BARONNE DE (1795–1840), Anglo-French adventuress, was born at St Helens, Isle of Wight, in 1795, the daughter of a drunken fisherman named Dawes She grew up in the workhouse, went up to London as a servant, and became the mistress of the duc de Bourbon, afterwards prince de Condé, who gave her a good education in modern and ancient languages He arranged her marriage to Adrien Victor de Feuchères, and the baroness, pretty and clever, became a person of consequence at the court of Louis XVIII De Feuchères discovered the relations between his wife and Condé, whom he had been assured was her father, obtained a legal separation in 1827, and the king forbade her appearance at court Thanks to her influence, however, Condé was induced in 1829 to sign a will bequeathing more than sixty-six million francs to the duc d'Aumale, fourth son of Louis Philippe Again she was in high favour Charles X received her at court, Talleyrand visited her, her niece married a marquis and her nephew was made a baron Condé, wearied by his mistress's importunities, and but half pleased by the advances made him by the government of July, had made up his mind to leave France secretly However, he was found hanging dead from his window (Aug. 27, 1830) The baroness returned to London, where she died in Dec. 1840.

FEUCHTERSLEBEN, ERNST, FREIHERR VON (1806–1849), Austrian physician, poet and philosopher, was born in Vienna on April 29, 1806, of an old Saxon noble family He was educated at the University of Vienna, and in 1844 was appointed dean of the faculty of medicine In 1848, while refusing the presidency of the ministry of education, he accepted the appointment of under secretary of state in that department He died in Vienna on Sept 3, 1849 He was not only a clever physician, but a poet of fine aesthetical taste and a philosopher. Among his medical works may be mentioned: *Über das Hippokratische erste Buch von der Diät* (Vienna, 1835), *Ärzte und Publicum* (Vienna, 1848) and *Lehrbuch der ärztlichen Seelenkunde* (1845). His poetical works include *Gedichte* (Stutt, 1836), among which is the

well-known beautiful hymn, which Mendelssohn set to music, "Es ist bestimmt in Gottes Rat." As a philosopher he is best known by his *zur Diatetik der Seele* [Dietetics of the Soul] (Vienna, 1838) Noteworthy also is his *Beitrage zur Litteratur-'Kunst und Lebenstheorie* (Vienna, 1837–41), and an anthology, *Geist der deutschen Klassiker* (Vienna, 1851).

His collected works (with the exception of the purely medical ones) were published in 7 vols. by Fr Hebbel (1851–53). *See* M. Necker, "Ernst von Feuchtersleben, der Freund Grillparzers," in the *Jahrbuch der Grillparzer Gesellschaft,* vol iii (1893)

FEUCHTWANGER, LION (1884–), German writer, was born in Munich on July 7, 1884, of a Jewish family, his father being a manufacturer He studied philosophy in Berlin and Munich but early devoted himself to literature His first works were dramatic pieces, original or translations; *Die Perser* (Aeschylus) (1915), *Vasantasena* (1915), *Friede* (Aristophanes) (1916), *Kriegsgefangenen* (1916); *Thomas Wendt* (dramatic novel, 1919), *Der hollandische Kaufmann* (1921) He broke new ground in 1923 with a remarkable historical novel of Margarete Maultasch, duchess of Tirol (*Die hassliche Herzogin*, English trans *The Ugly Duchess* 1927) in which the life of 14th century Tirol was reproduced with great dramatic force and erudite accuracy *Jud Suss* (1925, English trans *Jew Suss* 1927) a novel of 18th century Germany was more remarkable still The background was extraordinarily rich, the central figure drawn with great power, the story most moving Feuchtwanger's later works include *Angelsachsische Trilogie* (1927); *Eduard II.* drama (1925), *Wetcheeks amerikanisches Liederbuch* (1927), poems

FEUD, animosity, hatred, especially a permanent condition of hostilities between persons, and hence applied to a state of private warfare between tribes, clans or families, a "vendetta" For the etymology of "feud" (*feudum*) *see* FEE, and for its history *see* FEUDALISM

FEUDALISM (from Late Lat. *feodum* or *feudum*, a fee or fief, *see* FEE) In every case of institutional growth in history two things are to be distinguished from the beginning for an understanding of the process and its results One of these is the change of conditions in the political or social environment which made growth necessary The other is the already existing institutions which began to be transformed to meet the new needs. In studying the origin and growth of political feudalism, the distinction is easy to make. The prevailing need of the later Roman and early mediaeval society was protection—protection against the sudden attacks of invaders or revolted peasants, against the unwarranted demands of government officers, or even against the legal but too heavy exactions of the government The protection which the government normally furnished, the weak freeman and the small landowner could no longer obtain He must seek protection wherever he could get it, and pay the price demanded for it These are the great social facts—the failure of government to perform one of its most primary duties, the necessity of finding some substitute in private life—extending through the whole formative period of feudalism

Roman Origins.—The institutions which the need of protection seized upon had both long existed in the private, not public, relations of the Romans One of them related to the person, the other related to land There are thus distinguished at the beginning those two great sides of feudalism which remained to the end more or less distinct. The personal institution needs little description It was the Roman patron and client relationship which had remained in the days of the empire, in later times less important perhaps legally than socially. This institution, the *patrocinium,* was firmly enough entrenched to survive the German conquest, and to be continued by the conquerors. In its new use, alike in the later Roman and the early German state, the landless freeman who could not support himself offered his services, those proper to a freeman, to some powerful man in return for shelter and support. This transaction, called commendation, gave rise in the German state to a written contract which related the facts and provided a penalty for its violation It created a relationship of protection and support on one side, and of free service on the other.

The other institution, relating to land, was that known to the Roman law as the *precarium,* because of the prayer of the suppliant by which the relationship was begun. The *precarium* was a form of renting land not intended primarily for income, but for use when the lease was made from friendship, for example, or as a reward, or to secure a debt. Legally its characteristic feature was that the lessee had no right of any kind against the grantor. The owner could terminate the relation at any time, for any reason, or for none at all, and the heirs of neither party were bound by it [1] The legal character of this transaction is summed up in a well-known passage in the *Digest* (xliii. 26. 12) which may be paraphrased as follows —The *precarium* tenant may employ the interdict against a third party, because he cannot use the ordinary civil action, his holding being not a matter of business but rather of favour and kindness.

As used for protection in later Roman days the *precarium* gave rise to what was called the commendation of lands, *patrocinium fundorum.* The poor landowner surrendered to his powerful neighbour the ownership of his lands, which he then received back as a *precarium*—gaining protection during his lifetime at the cost of his children, who were left without legal claim and compelled to make the best terms they could [2] Applied to this use the *precarium* found extensive employment in the last age of the empire The government looked on the practice with disfavour, because it transferred large areas from the easy access of the state to an ownership beyond its reach The laws repeatedly forbade it under increasing penalties, but it could not be stopped

Frankish Development.—These practices the Frankish conquerors of Gaul found in full possession of society, and they seem to have made them their own without material change The *patrocinium* they could understand by the existence of a somewhat similar institution among themselves, the *comitatus,* described by Tacitus The *comitatus* made contributions of its own to future feudalism, to some extent to its institutional side, largely to the ideas and spirit which ruled in it Probably the ceremony which grew into feudal homage, and the oath of fealty, certainly the honourable position of the vassal and his pride in the relationship, the strong tie which bound lord and man, and the idea that faith and service were due on both sides in equal measure, may be traced to German sources But we must not forget that the origin of the vassal relationship, as an institution, is to be found on Roman soil.

To the *precarium* German institutions offered no close parallel The advantages which it afforded were obvious, and this side of feudalism developed as rapidly after the conquest as the personal The new German noble was as eager to extend his lands and to increase the numbers of his dependants as the Romans had been. The new German government furnished no better protection from local violence, nor was it able any more effectively to check the practices which were creating feudalism. *Precarium* and *patrocinium* easily passed from the Roman empire to the Frankish kingdom, and became firmly rooted in the new society Up to this point we have seen only the small landowner and the landless man entering into these relations. Feudalism could not be established, however, until the great of the land had begun to enter the clientage of others and to hold lands by the *precarium* tenure. The first step was quickly taken. The same class continued to furnish the king's men, and to form his household and body-guard whether the relation was that of the *patrocinium* or the *comitatus,* and to be made noble by entering into it. It was later that they became clients of one another, and in part at least as a result of their adoption of the *precarium* tenure In this latter step the influence of the Church rather than of the king seems to have been effective. The large estates which pious intentions had bestowed on the Church it was not allowed to alienate. It could most easily make them useful by employing the *precarium* tenure. On the other side, the great men were ready without persuasion to annex portions of these estates for their own on the easy terms of this tenure, not always indeed observed by the holder, or able to be enforced by the Church. The employment of the

[1] *Digest,* xlfii. 26. 14, and *cf.* 17.
[2] Salvian, *De gub. Dei,* v. 8, ed. Halm, p. 62.

precarium by the Church seems to have been one of the surest means by which this form of landholding was carried over from the Romans to the Frankish period and developed into new forms. It came to be made by degrees the subject of written contract, by which the rights of the holder were more definitely defined and protected than had been the case in Roman law The length of time for which the holding should last came to be specified, at first for a term of years and then for life, and some payment to the grantor was provided for, not pretending to represent the economic value of the land, but only to serve as a mark of his continued ownership

The Carolingian Age.—These changes characterize the Merovingian age, which had practically ended, however, before these two institutions showed any tendency to join Nor had the king up to that time exerted any apparent influence on the processes that were going forward It was the advent of the Carolingian princes that carried these institutions a stage further forward Making their way up from a position among the nobility to be the rulers of the land, and finally to supplant the kings, the Carolingians had especial need of resources from which to purchase and reward faithful support The fundamental principle of the Frankish military system, that the man served at his own expense, was still unchanged It had indeed begun to break down under the strain of frequent and distant campaigns, but it was long before it was changed as the recognized rule of mediaeval service If now, in addition to his own expenses, the soldier must provide a horse and its keeping, the system was likely to break down To solve this problem the early Carolingian princes, especially Charles Martel, grasped at the land of the Church The means devised to permit its use were found in the *precarium* tenure Keeping alive, as it did, the fact of the grantor's ownership, it did not in form deprive the Church of the land Recognizing that ownership by a small payment not corresponding to the value of the land, it left the larger part of the income to meet the need which had arisen At the same time undoubtedly the new holder of the land, if not already the vassal of the prince, was obliged to assume an obligation of service with a mounted force when called upon This expedient gave rise to the numerous *precariae verbo regis*, of the Church records, and to the condemnation of Charles Martel in the visions of the clergy to worse difficulties in the future life than he had overcome in this The most important consequences of the expedient, however, was the bringing together of the two sides of feudalism, vassalage and benefice, as they were now commonly called It emphasized military service as an essential obligation of the vassal; and it spread the vassal relation between individual proprietors and the sovereign

During the reign of Charlemagne and the later Carolingian age continued necessities, military and civil, forced the kings to recognize these new institutions more fully, even when standing between the government and the subject, intercepting the public duties of the latter The incipient feudal baron had not been slow to take advantage of the break-down of the old German military system The poor Frank could escape the ruinous demands of military service only by submitting himself and his lands to the count, who did not hesitate on his side to force such submission. Charlemagne legislated against this tendency, trying to make it easier for the poor freeman to fulfil his military duties directly to the state, and to forbid the misuse of power by the rich Finally the king was compelled to recognize existing facts, to lay upon the lord the duty of producing his men in the field and to allow him to appear as their commander This completed the transformation of the army into a vassal army; it completed the recognition of feudalism by the state, as a legitimate relation between different ranks of the people; and it recognized the transformation in a great number of cases of a public duty into a private obligation

In the meantime another institution had grown up in this Franco-Roman society, which probably began and certainly assisted in another transformation of the same kind. This is the immunity. Suggested probably by Roman practices, it received a great extension in the Merovingian period, at first and especially in the interest of the Church, but soon of lay land-holders By the grant of an immunity to a proprietor the royal officers, the count and his representatives, were forbidden to enter his lands to exercise any public function there The duties which the count should perform passed to the proprietor, who now represented the government for all his tenants free and unfree Apparently no modification of the royal rights was intended by this arrangement, but the beginning of a great change had really been made The king might still receive the same revenues and the same services from the district held by the lord as formerly, but for their payment a private person in his capacity as overlord was now responsible In the course of a long period characterized by a weak central government, it was not difficult to enlarge the rights which the lord thus obtained, to exclude even the king's personal authority from the immunity, and to translate the duties and payments which the tenant had once owed to the state into obligations which he owed to his lord, even finally into incidents of his tenure The most important public function whose transformation into a private possession was assisted by the growth of the immunity was the judicial The lord's court gradually took the place of the public court in civil, and even by degrees in criminal cases The plaintiff, even if he were under another lord, was obliged to sue in the court of the defendant's lord, and the portion of the fine for a breach of the peace which should have gone to the state went in the end to the lord

The transfer of the judicial process, and of the financial and administrative sides of the government as well, into private possession, was not, however, accomplished entirely by the road of the immunity As government weakened after the strong days of Charlemagne, and disorder, invasion, and the difficulty of intercommunication tended to throw the locality more and more upon its own resources, the officer who had once been the means of centralization, the count, was able to exercise the powers which had been committed to him as an agent of the king, as if they were his own private possession Nor was the king's aid lacking to this method of dividing up the royal authority, any more than to the immunity, for it became a frequent practice to make the administrative office into a fief, and to grant it to be held in that form of property by the count In this way the feudal county, or duchy, formed itself, corresponding in most cases only roughly to the old administrative divisions of the state

DIFFERENT STAGES OF GROWTH

In its earliest stage of growth the feudal system was that of the private possession only For protection the great landowner forced his smaller neighbours to become his dependants in return under a great variety of forms, but especially developing thereby the *precarium* land tenure and the *patrocinium* personal service, and organizing a private jurisdiction over his tenants, and a private army for defence Finally he secured from the king an immunity which excluded the royal officers from his lands and made him a quasi-representative of the state In the meantime his neighbour the count had been following a similar process. His right to exact military, financial and judicial duties for the state he had used to force men to become his dependants, and then he had stood between them and the state, freeing them from burdens which he threw with increased weight upon those who still stood outside his personal protection The kings first adopted for themselves some of the forms and practices which had thus grown up, and by degrees recognized them as legally proper for all classes It proved to be easier to hold the lord responsible for the public duties of all his dependants because he was the king's vassal and by attaching them as conditions to the benefices which he held, than to enforce them directly upon every subject. When this stage was reached the formative age of feudalism may be considered at an end When the government of the state had entered into feudalism, and the king was as much lord as king; when the vassal relationship was recognized as a proper and legal foundation of public duties; when the two separate sides of early feudalism were united as the almost universal rule, so that a man received a fief because he owed a vassal's duties, or looked at in the other and finally prevailing way, that he owed a vassal's

duties because he had received a fief; and finally, when the old idea of the temporary character of the *precarium* tenure was lost sight of, and the right of the vassal's heir to receive his father's holding was recognized as the general rule—then the feudal system may be called full grown We shall not be far wrong if we place the end of its formative age near the beginning of the 10th century

Results in England.—The growth which we have traced took place within the Frankish Empire In Anglo-Saxon England *precarium* and *patrocinium* were lacking Certain forms of personal commendation did develop, certain forms of dependent land tenure came into use, but these were not characteristic of the actual line of feudal descent Scholars are not yet agreed as to what would have been their result if their natural development had not been cut off by the violent introduction of Frankish feudalism with the Norman conquest, whether the historical feudal system, or a feudal system in the general sense To the writer it seems clear that the latter is the most that can be asserted They were forms which may rightly be called feudal, but only in the wider meaning in which we speak of the feudalism of Japan, or of Central Africa, not in the sense of 12th-century European feudalism, Saxon commendation may rightly be called vassalage, but only as looking back to the early Frankish use of the term for many varying forms of practice, not as looking forward to the later and more definite usage of completed feudalism, and such use of the terms feudal and vassalage is sure to be misleading There is no trace of the distinctive marks of Frankish feudalism in Saxon England, not where military service may be thought to rest upon the land, nor even in the rare cases where the tenant seems to some to be made responsible for it, for between these cases as they are described in the original accounts, legally interpreted, and the feudal conception of the vassal's military service, there is a great gulf

The Completed System.—The temptation to use the larger part of any space allotted to the history of feudalism for a discussion of origins does not arise alone from greater interest in that phase of the subject It is almost impossible even with the most discriminating care to give a brief account of completed feudalism and convey no wrong impression We use the term "feudal system" for convenience sake, but with a degree of impropriety if it conveys the meaning "systematic" Feudalism in its most flourishing age was anything but systematic Great diversity prevailed everywhere, and different facts or customs are found in every lordship But underlying all the apparent confusion of fact and practice were certain fundamental principles and relationships, which were alike everywhere The chief of these are the relation of vassal and lord, the principle that every holder of land is a tenant and not an owner, until the highest rank is reached, sometimes even the conception rules in that rank; that the tenure by which a thing of value is held is one of honourable service, not intended to be economic, but moral and political in character, the principle of mutual obligations of loyalty, protection and service binding together all the ranks of this society from the highest to the lowest, and the principle of contract between lord and tenant, as determining all rights, controlling their modification, and forming the foundation of all law

The foundation of the feudal relationship proper was the fief, which was usually land, but might be any desirable thing, as an office, a revenue in money or kind, the right to collect a toll, or operate a mill In return for the fief, the man became the vassal of his lord, he knelt before him, and, with his hands between his lord's hands, promised him fealty and service; he rose to his feet and took the oath of fealty which bound him to the obligations he had assumed in homage, he received from his lord ceremonial investiture with the fief The faithful performance of all the duties he had assumed in homage constituted the vassal's right and title to his fief So long as they were fulfilled, he, and his heir after him, held the fief as his property, practically and in relation to all under tenants as if he were the owner In the ceremony of homage and investiture, which is the creative contract of feudalism, the obligations assumed by the two parties were determined, as a rule, by local custom In detail the vassal's services differed widely, but they fall into two classes, general and specific The general included all that might come under the idea of loyalty, seeking the lord's interests, keeping his secrets, betraying the plans of his enemies, protecting his family, etc. The specific services covered military service, which included appearance in the field on summons with a certain force, often armed in a specified way, and remaining a specified time. It often covered also the duty of guarding the lord's castle, and of holding one's own castle subject to the plans of the lord for the defence of his fief Hardly less characteristic was court service, which included the duty of helping to form the court on summons, of taking one's own cases to that court instead of to some other, and of submitting to its judgments The duty of giving the lord advice was often fulfilled in sessions of the court, and in these feudal courts the obligations of lord and vassal were enforced, with an ultimate appeal to war. Under this head may be enumerated the financial duties of the vassal, which were either intended to mark the vassal's tenant relation, like the relief, or to be a part of his service, like the aid, that is, he was held to come to the aid of his lord in a case of financial as of military necessity The relief was a sum paid by the heir for the lord's recognition of his succession. The aids were paid on a few occasions, determined by custom, where the lord was put to unusual expense, as for his ransom when captured by the enemy, or for the knighting of his eldest son The most lucrative of the lord's rights were wardship and marriage

Ideally regarded, feudalism covered Europe with a network of these fiefs, rising gradually from the smallest, the knight's fee, at the bottom, to the king at the top, who was the supreme landowner, or who held the kingdom from God Actually not even in the most regular of feudal countries, like England or Germany, was there any fixed gradation A knight might hold directly of the king, a count of a viscount, a bishop of an abbot, or the king himself of one of his own vassals, or even of a vassal's vassal, and in return his vassal's vassal might hold another fief directly of him

The Government of Feudal Countries.—It is now possible perhaps to get some idea of the way in which the government of a feudal country was operated The early German governments whose chief functions, military, judicial, financial, legislative, were carried on by the freemen of the nation, and were performed as duties owed to the community for its defence and sustenance, had given way to new forms of organization in which these conceptions had not entirely disappeared, but in which the vast majority of cases a wholly different idea of the ground of service and obligation prevailed The members of the feudal court met, not to fulfil a duty owed to the community, but a private obligation which they had assumed in return for the fiefs The feudal state was one in which, as it has been said, private law had usurped the place of public law Public duty had become private obligation. To understand the feudal state it is essential to realize that all sorts of services, which men ordinarily owe to the public or to one another, were translated into a form of rent paid for the use of land, and defined and enforced by a private contract In every feudal country, however, something of the earlier conception survived A general military levy was occasionally made Something like taxation occasionally occurred, though the government was usually sustained by the scanty feudal payments, by the proceeds of justice and by the income of domain manors About the office of king more of this earlier conception gathered than elsewhere in the state, and gradually grew, aided not merely by traditional ideas, but by the active influence of the Bible, and soon of the Roman law The kingship formed the nucleus of new governments as the feudal system passed away.

Actual government in the feudal age was primitive and undifferentiated Its chief and almost only organ, for kingdom and barony alike, was the *curia*—a court formed of the vassals. This acted at once and without any consciousness of difference of function, as judiciary, as legislature, and as council, and it exercised final supervision and control over revenue and administration. Almost all the institutions of modern states go back to the *curia regis*, branching off from it as the growing complexity of business forced differentiation of function and personnel In action it was an assembly court, deciding all questions by discussion and the weight of opinion, though its decisions obtained their legal

validity by the formal pronunciation of the presiding member, *i e*, of the lord whose court it was. In a government of this kind the essential operative element was the baron. So long as the government remained dependent on the baron, it remained feudal in its character. Feudalism disappeared as the organization of society, when a professional class arose to form the judiciary, when the increased circulation of money made regular taxation possible and enabled the government to buy military and other services, and when better means of intercommunication and the growth of common ideas made a wide centralization possible and likely to be permanent In nearly all the states of Europe the end of the feudal age was reached about the close of the 13th century

Decline and Survivals.—As feudalism passed into decline, its customs tended to crystallize into fixed forms At the same time a class of men arose interested in these forms for their own sake, professional lawyers or judges, who wrote down for their own and others' use the feudal usages with which they were familiar. The great age of these codes was especially the second half of the 13th century The codes in their turn tended still further to harden these usages into fixed forms, and we may date from the end of the 13th century an age of feudal law regulating especially the holding and transfer of land, and much more uniform in character than the law of the feudal age proper This was particularly the case in parts of France and Germany where feudalism continued to regulate the property relations of lords and vassals longer than elsewhere, and where the underlying economic feudalism remained in large part unchanged

Feudalism formed the starting-point also of the later social nobilities of Europe They drew from it their titles and ranks and many of their regulative ideas, though these were formed into more definite and regular systems than ever existed in feudalism proper. It was often the policy of kings to increase the social privileges and legal exemptions of the nobility while taking away all political power, so that it is necessary in the history of institutions to distinguish sharply between these nobilities and the feudal baronage proper It is only in certain backward parts of Europe that the terms feudal and baronage in any technical sense can be used of the nobility of the 15th century.

(G B A; X)

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FEU DE JOIE. French, meaning literally a bonfire, or fire of joy. A discharge of musketry into the air, with blank ammunition, made in honour of some great occasion and usually forming part of a salute.

It is carried out by men firing in rapid succession along a line or lines of riflemen It has a great spectacular effect when carried out by large numbers of troops

FEUERBACH, ANSELM (1829–1880), German painter, born in Speyer on Sept 12, 1829, son of J A. Feuerbach, professor of philology and archaeology Equipped with a superior education and good family traditions, he went to Dusseldorf in 1845 to study art under W Schadow. In Munich, where he studied in 1848, he came under the influence of Karl Rahls. He then proceeded to Antwerp, and in 1851 to Paris, where he worked under Thomas Couture He was thus the first of a line of German painters, who, dissatisfied with the somewhat theoretic artistic traditions in their native country, sought inspiration in French art. Having obtained a prize to go to Italy in 1855, he copied, in Venice, the "Assumption" by Titian for the court at Carlsruhe He then went to Florence and to Rome, where he stayed till 1873 The impressions of Italy strengthened and perfected his classicist training He aimed henceforth at a revival of antique classical ideals, considering them as the absolute standard of beauty, and he became the greatest representative of classicism in Germany His first works of importance, painted while in Paris, the "Hafiz at the Well" (1852) and the "Death of Aretino" (1854) showed that he had assimilated the traditions of French classicism as taught by Ingres' pupil, Couture Venetian influences can be traced in the warm and glowing colour and in the treatment of "Dante Walking with the Noble Ladies of Ravenna" (1857) and of "Dante's Death" (1858) Then came his Roman period The "Pietà" (1863), the two pictures representing "Iphigenia" (1862 and 1871) and "Plato's Symposium" (1873) are cool and grey in tone, defined and plastic in form with a clear outline. They reveal the artist at the height of his classicist achievement The composition of the "Symposium" is like an antique relief Other notable works are the "Medea," the "Judgment of Paris," and the "Battle of the Amazons" (1869) He was now at the height of his reputation and counted Graf von Schack and the king of Bavaria among his patrons In 1873 he accepted an invitation to teach at the Vienna academy and to decorate a ceiling in that academy with a series of compositions representing the "Wars of the Titans" This work was never completed The artistic atmosphere of Vienna, where Makart with his luxurious colour dominated, was not congenial to Feuerbach's intellectual art His work met with little appreciation and his sensitive nature was wounded by unfavourable criticism His health gave way, and he resigned his post Hoping to regain his strength he went to Italy and died in a hotel at Venice on Jan 4, 1880. Posterity has made amends for the want of appreciation His works are now exhibited in the leading galleries of Germany, but though his ambition had been to be Germany's greatest monumental painter, his strongest appeal to modern art-lovers lies in his portraits, his landscapes and his single figures, for here his fine conception and depth of feeling is not effaced by vain strivings in imitation of classic masters. The dignified portrait of his stepmother and that of "Nanna Risi," his beautiful Roman model, who figured in many of his large compositions, are among his finest works, and so are his drawings The story of the artist's struggles is told in the *Vermächtnis* written during his illness in Vienna and published in 1882 It belongs to the finest things in German literature, and contributed much to a revival of his fame His letters to his stepmother, who was his greatest friend, were published in two volumes in 1911.

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FEUERBACH, LUDWIG ANDREAS (1804–1872), German philosopher, fourth son of the eminent jurist (*see* below), was born at Landshut, Bavaria, on July 28, 1804. After two years in Berlin, under Hegel. Feuerbach studied natural science at Erlangen in 1828. His first book, published anonymously, *Ge-*

immortality and advocates the Spinozistic immortality of reabsorption in nature. He then published *Geschichte der neueren Philosophie* (2 vols., 1833–37), *Abalard und Heloise* (1834), *Pierre Bayle* (1838) and *Philosophie und Christentum* (1839) in which he claimed "that Christianity has in fact long vanished not only from the reason but from the life of mankind, that it is nothing more than a fixed idea." This attack is followed up in his most important work, *Das Wesen des Christentums* (1841 Eng trs by George Eliot, 1853) which aims to humanize theology He lays it down that man is to himself his own object of thought Religion is consciousness of the infinite Religion therefore is "nothing else than the consciousness of the infinity of the consciousness, or, in the consciousness of the infinite, the conscious subject has for his object the infinity of his own nature" Thus God is, so to speak, the outward projection of man's inward nature In pt. i he develops the "true or anthropological essence of religion" Treating of God in his various aspects "as a being of the understanding," "as a moral being or law," "as love" and so on, Feuerbach shows that these aspects correspond to some need of human nature In pt. ii he discusses the "false or theological essence of religion," *i.e.* the view which regards God as having a separate existence leads to a belief in revelation and in sacraments, which are pieces of religious materialism Feuerbach denied that he was rightly called an atheist, but the denial is merely verbal Like Fichte, he strives in vain to reconcile the religious consciousness with subjectivism. During the troubles of 1848–49 Feuerbach's attack upon orthodoxy made him something of a hero with the revolutionary party His *Theogonie* (1857) was followed by *Gottheit, Freiheit und Unsterblichkeit* (1866) He died on Sept 13, 1872

Feuerbach's influence has been greatest upon the anti-Christian theologians such as D F Strauss, author of the *Leben Jesu*, and Bruno Bauer, who like Feuerbach had passed from Hegelianism to a form of naturalism Some of his ideas were taken up by those engaged in the struggle between church and state in Germany, and those who, like F Engels and Karl Marx, were leaders in the revolt of labour against capital His work was too deliberately unsystematic ever to make him a power in philosophy

His works appeared in 10 vols (Leipzig, 1846–66; at Stuttgart 1903–11), his correspondence has been edited by K Grun (1874). *See* A Lévy, *La Philosophie de Feuerbach* (1904), M Meyer, *L. Feuerbachs Moralphilosophie* (Berlin, 1899), E v. Hartmann, *Geschichte d Metaphysik* (Leipzig, 1899), F Engels, *L Feuerbach und d Ausgang d class. deutsch Philos* (2nd ed, 1895), A Kohut, *L. Feuerbach* (1909)

FEUERBACH, PAUL JOHANN ANSELM, RITTER VON (1775–1833), German jurist and writer on criminal law, was born at Hainichen near Jena on Nov 14, 1775, and brought up at Frankfort on Main At 16 he ran away from home to study at Jena In spite of poor health and desperate poverty, he made his way, and took his doctorate in philosophy in 1795 Marriage in 1796 forced him to turn from his favourite studies of philosophy and history to law, which offered better prospects. In 1796 he published *Kritik des naturlichen Rechts als Propädeutik zu einer Wissenschaft der naturlichen Rechte,* followed by *Anti-Hobbes, oder uber die Grenzen der burgerlichen Gewalt* (1798), a dissertation on the limits of the civil power Feuerbach, as the founder of a new theory of penal law, the so-called "psychological-coercive or intimidation theory," occupied a prominent place in the history of criminal science His views, as expounded in his *Revision der Grundsätze und Grundbegriffe des positiven peinlichen Rechts* (1799), were further elucidated and expounded in the *Bibliothek für die peinliche Rechtswissenschaft* (1800–01), in which he had the assistance of Karl Grolmann and Harscher von Almendingen, and in his famous *Lehrbuch des gemeinen in Deutschland geltenden peinlichen Rechts* (1801). These works were a powerful protest against vindictive punishment, and furthered the reformation of the German criminal law. The administration of justice was, before Feuerbach's time, distinguished by two characteristics: the superiority of the judge to all law, and the blending of the judicial and executive offices Feuerbach, using as his chief weapon the *Revision der Grundbegriffe,* achieved the recognition of the formula, *nullum crimen, nulla poena sine lege* (no wrong and no punishment without a remedy). He lectured at Jena, Kiel and Landshut between 1801 and 1805.

On being commanded by King Maximilian Joseph to draft a penal code for Bavaria (*Strafgesetzbuch für das Königreich Bayern*), he removed in 1805 to Munich, where he was given an appointment in the ministry of justice and was ennobled in 1808. Meanwhile the practical reform of penal legislation in Bavaria was begun under his influence in 1806 by the abolition of torture. In 1808 appeared the first volume of his *Merkwürdige Criminalfalle,* completed in 1811—a work of deep interest for its application of psychological considerations to cases of crime, and intended to illustrate the inevitable imperfection of human laws in their application to individuals In his *Betrachtungen uber das Geschworenengericht* (1811) Feuerbach declared against trial by jury, maintaining that the verdict of a jury was not adequate legal proof of a crime. Much controversy was aroused, and Feuerbach subsequently modified his view. The Bavarian penal code was promulgated in 1813 It was at once made the basis for new codes in Wurttemberg and Saxe-Weimar, it was adopted in its entirety in the grand-duchy of Oldenburg, and it was translated into Swedish by order of the king Several of the Swiss cantons reformed their codes in conformity with it

During the war of liberation (1813–14) Feuerbach published several political brochures which, from the writer's position, had almost the weight of State manifestoes One of these is entitled *Über deutsche Freiheit und Vertretung deutscher Volker durch Landstande* (1814). In 1814 Feuerbach was appointed second president of the court of appeal at Bamberg, and three years later he became first president of the court of appeals at Anspach In 1821 he was deputed by the Government to visit France, Belgium, and the Rhine provinces for the purpose of investigating their juridical institutions As the fruit of this visit, he published his treatises *Betrachtungen uber Öffentlichkeit und Mundigkeit der Gerechtigkeitspflege* (1821) and *Über die Gerichtsverfassung und das gerichtliche Verfahren Frankreichs* (1825) In these he pleaded unconditionally for publicity in all legal proceedings. Feuerbach died suddenly at Frankfort on May 29, 1833

See *Leben und Wirken Ans von Feuerbachs* (2 vols, 1853), consisting of a selection of his letters and journals, with occasional notes by his fourth son Ludwig, a distinguished philosopher *See* also E Holder, *Savigny und Feuerbach, die Koryphaen der deutschen Rechtswissenschaft* (1881)

FEUILLANTS, CLUB OF THE, a political association which played a prominent part during the French Revolution. It was founded on July 16, 1791, by several members of the Jacobin Club, who refused to sign a petition presented by this body, demanding the deposition of Louis XVI Among them were Barère and Sieyès The name of Feuillants was popularly given to this group because they met in the house in the rue Saint-Honoré which had been occupied by the religious order bearing this name The official name of the club was *Société des amis de la Constitution,* its object being to support the constitution of 1791 against the *émigrés* on the one hand and the Jacobins on the other With the rapid growth of extreme democratic ideas the Feuillants soon began to be looked upon as reactionaries, and to be classed with "aristocrats." A few days after the insurrection of August 10 their papers were seized, and 841 members were proclaimed as suspects This was the death-blow of the club; but the name of Feuillants, as a party designation, survived. It was applied to those who advocated a policy of "cowardly moderation," and *feuillantisme* was associated with *aristocratie* in the mouths of the sansculottes. (*See* FRANCE: *History*) *See* also A. Aulard, *Histoire politique de la Révolution française* (1903), 2nd. ed., p. 153.

FEUILLET, OCTAVE (1821–1890), French novelist and dramatist, was born at Saint-Lô, Manche, on Aug. 11, 1821. He was educated at the lycée Louis-le-Grand, Paris, and was intended for the diplomatic profession. He became a novelist much against the will of a nervous and irritable father, who cut off his allowance for some years He had already made himself a name when he obeyed an urgent summons from his father to return home. There he was virtually a prisoner, in constant attendance on the invalid, but there, nevertheless, his work gained in depth and power His exile was lightened by his marriage with his

cousin, Valerie Feuillet. At Saint-Lô he wrote *Bellah* (1852); *La Crise* (1852), a drama; *La Petite Comtesse* (1857); *Dalila* (1857), and his most popular work, *Le Roman d'un jeune homme pauvre* (1858). Both the two last-named were dramatized, and Feuillet broke away from Saint-Lô to Paris in each case to see the first performance During the second of these absences his father died. He was now free, and was much courted and fêted in Paris His plays were performed at Compiègne before they were given on the public stage, and Empress Eugenie herself played Madame de Pons in *Les Portraits de la Marquise.* After the publication of *Sibylle* (1862) he left Paris and established himself at "Les Paillers," a house near Saint-Lô His nerves had suffered during his long attendance on his father, and after a time he sold "Les Paillers," and lived a rather sad and wandering life. The best of his numerous novels, *Monsieur de Camors* (1867) and *Julia de Trécoeur* (1872), appeared during these years. He died in Paris on Dec 29, 1890.

See Sainte-Beuve, *Nouveaux Lundis,* vol v ; F Brunetière, *Nouveaux Essais sur la Littérature Contemporaine* (1895); Denes, *Octave Feuillet* (1902).

FEUILLETON, originally a kind of supplement attached to the political portion of French newspapers Its inventor was Bertin the elder, editor of the *Débats* It was usually separated from the political part of the newspaper by a line, and printed in smaller type In French newspapers it consists chiefly of non-political news and gossip, literature and art criticism, a chronicle of fashions, epigrams, charades, etc The term has come into English use to indicate the instalment of a serial story printed in one part of a newspaper

FEUQUIÈRES, ISAAC MANASSÈS DE PAS, Marquis de (1590–1640), French soldier and diplomatist, born at Saumur on June 1, 1590, served in the Valtelline (1626), at La Rochelle (1628–29), in Lorraine, and in Germany (1636–39) He was repeatedly employed by Richelieu on diplomatic missions He renewed at Heilbronn (April 19, 1633), the treaty of alliance with Sweden He was also employed in the tortuous negotiations at Frankfurt in 1634 Feuquières was killed at the siege of Thionville (Diedenhofen) His *Lettres inédites* appeared (ed. Gallois) in Paris in 1845

His nephew Antoine Manassès de Pas, Marquis de Feuquières (1648–1711), served in the French campaigns under Luxemburg and Catinat, and was given the rank of lieutenant-general as a result of his defence of Speierbach in 1692 He subsequently quarrelled with Marshal Villeroi, and failed to obtain the expected marshal's baton on the resumption of war in 1701 He spent the rest of his life compiling his memoirs, which were considered in the 18th century the standard work on the art of war, although they are embittered by his failure to obtain promotion, and coloured by his personal prejudices The *Mémoires de la guerre* (1701, 1711, 1725, 1735, etc, London 1736, Amsterdam subsequently) were translated into English (1737) and German (Leipzig, 1732) They deal in detail with every branch of the art of war and of military service

FÉVAL, PAUL HENRI CORENTIN (1817–1887), French novelist and dramatist, was born at Rennes in Brittany, and much of his best work deals with the history of his native province. He was educated for the bar, but after his first brief he went to Paris and began to write The *Mystères de Londres* (1844) was published under the pseudonym "Sir Francis Trolopp" Others of his novels are. *Le Fils du diable* (1846); *Les Compagnons du silence* (1857); *Le Bossu* (1858); *Le Poisson d'or* (1863), *Les Habits noirs* (1863); *Jean le diable* (1868), and *Les Compagnons du trésor* (1872). Some of his novels were dramatized. His chronicles of crime exercised an evil influence, eventually recognized by the author himself In his later years he became an ardent Catholic, and occupied himself in revising his earlier works from his new standpoint and in writing religious pamphlets. He died of paralysis in the monastery of the Brothers of Saint John in Paris on March 8, 1887 His *Oeuvres* (38 vols.) appeared in 1895.

His son, Paul Féval (1860–), became well known as a novelist and dramatist Among his works are *Nouvelles* (1890), *Maria Laura* (1891) and *Chantepie* (1896).

FEVER, a term generally used for conditions in which the normal temperature of the animal body is raised for any length of time. This normal varies in different animals, and in man is 98·4°. When the temperature reaches 106° in man the term hyperpyrexia (excessive fever) is applied. The patient's condition then is very serious and if it exceeds 107° or 108° death results except in some cases of sun- or heat-strokes Occasionally the temperature rises to 110°–112° immediately before death (For the treatment of fever in general *see* Therapeutics). (For the specific fevers *see* Small-pox, Scarlet Fever, Typhoid Fever, etc)

Pathology.—Every rise of temperature is due to a disturbance in the heat-regulating mechanism, the chief variable of which is the action of the skin in eliminating heat (*see* Animal Heat) This mechanism works satisfactorily but not instantaneously, and many physiological conditions cause a transient rise of temperature; *e g* severe muscular exercise, in which the cutaneous mechanism is unable at once to dispose of the increased amount of heat produced in the muscles Pathologically, it may be disturbed in three different ways. 1st, by mechanical interference with the nervous system, 2nd, by interference with heat loss; 3rd, by the action of various poisons

1 —In man, fever the result of *mechanical interference* with the nervous system rarely occurs, the nearest approach being haemorrhage into the basal ganglia or pons, but it can readily be produced in lower animals by stimulating certain parts of the great brain, *e g* the anterior portion of the corpus striatum This leads to a rise of temperature with increased heat production The high temperature seems to cause disintegration of cell protoplasm and increased excretion of nitrogen and of carbonic acid Possibly some of the cases of high temperature recorded after injuries to the nervous system are caused in this way; but some may also be due to stimulation of vaso-constrictor fibres to the cutaneous vessels diminishing heat loss

2 —Fever may readily be produced by *interference with heat loss* It occurs when animals are exposed to a temperature slightly below that of the rectum, and is seen in man in *sunstroke* The nervous symptoms of fever are produced, the rate of chemical change is accelerated, as is shown by the increased excretion of carbonic acid, the cells are injured and broken down as shown by degenerative changes and increased excretion of nitrogen.

3 —Many bacterial toxins and a few chemical substances cause a rise of temperature when injected in small doses and a fall when the dose is large In all instances they lead to destruction of protein Hence, the true measure of the intensity of a fever is not merely the temperature attained but the extent of disintegration of protoplasm This may be estimated by the amount of nitrogen excreted in the urine, by a rise in the excretion of sulphur and phosphorus and by the appearance in the urine of acetone, aceto-acetic and β-oxybutyric acids (*see* Nutrition). Further, a high temperature has of itself an injurious action on the protoplasm, and tends to increase disintegration just as when heat loss is experimentally retarded, though the increase is small compared to that produced by the destructive action of the microbial products. In the early stage of fever (rigors) the rise of temperature is primarily due to deficient heat loss, though increased production plays its part, and even in the later stages until defervescence occurs, heat loss is inadequate to get rid of the heat produced The mechanism of increased heat production in fever is uncertain In part, no doubt, it is due to increased muscular activity but in part it may be due to stimulation of the heat-producing centre by the products of tissue disintegration.

Probably as the result of toxic action fever is accompanied by disturbances in the functions of various organs. The activity of the *digestive glands* is diminished and appetite is lost. Food is not taken, the patient suffers from inanition, lives largely on his own fats and proteids, and rapidly emaciates. Glycogen is not stored in the *liver* cells, and bile is modified, the essential constituents disappearing almost entirely in some cases The production of urea is interfered with, and the proportion of non-urea

nitrogen in the urine increases This is in part due to the increased disintegration of proteids setting free sulphur and phosphorus, which, oxidized into sulphuric and phosphoric acids, combine with the ammonia which would otherwise have been changed to urea. Thus the proportion of ammonia in the urine is increased Concurrently with these alterations in the functions of the liver-cells, granular, and probably fatty degeneration, make their appearance That the functional activity of the *kidneys* is modified, is shown by the frequent occurrence of proteoses or of albumen and globulin in the urine Frequently the toxin causes a shedding of the renal epithelium The *muscles* are weakened, granular and fatty degeneration supervene, and the fibres waste The *nervous structures*, especially the nerve-cells, suffer functionally and structurally The *blood* shows a fall in alkalinity and variation in the number of leucocytes, chiefly, the polymorphonuclear variety. Thus in pneumonia, the normal number is often increased twofold and sometimes more than tenfold, while the numbers are often reduced in enteric fever

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FEYADILHA: *see* BARABRA

FEYDEAU, ERNEST-AIME (1821–1873), French author, was born in Paris He gained a great success with his novel *Fanny* (1858), followed in rapid succession by a series of similar stories Besides his novels Feydeau wrote several plays He died in Paris on Oct 27, 1873 His son GEORGES (1862–1921) was a well known writer of comedy and farce Examples are *La dame de chez Maxim* (1899) and *On purge Bébé* (1910)

See Sainte-Beuve, *Causeries du lundi*, vol xiv, and Barbey d'Aurevilly, *Les Oeuvres et les hommes au XIXe siècle*

FEZ (*Fās*), capital of northern Morocco Its historical importance as much as the numbers and the wealth of its population entitle Fez to be called the real centre—religious, political and economic—of the Shereefian empire. It lies in 34° 6′ 3″ N, 4° 38′ 15″ W, about 230 m N E of Marrākesh, 100 m E from the Atlantic and 85 m S of the Mediterranean on the great line of communication between the Atlantic coast and Algiers It is beautifully situated in a deep valley on the Wad Fās, an affluent of the Wad Sebu, which divides the town into two parts—the ancient town, Fās el Bali, on the right bank, and the new, Fās el Jadid, on the left

Like many other Oriental cities, Fez from a distance appears a very attractive place It stretches out between low hills, crowned by the ruins of ancient fortresses, and though there is nothing imposing, there is something particularly impressive in the sight of that white-roofed conglomeration of habitations, broken only by occasional mosque towers Except on the south side the city is surrounded by hills, interspersed with groves of orange, pomegranate and other fruit trees, and large olive gardens.

From its peculiar situation Fez has a drainage superior to that of most Moorish towns When the town becomes very dirty, the water is allowed to run down the streets by opening lids for the purpose in the conduits and closing the ordinary exits, so that it overflows and cleanses the pavements. The general dampness of the town renders it unhealthy, however, as the pallid faces of the inhabitants betoken, but this is considered a mark of distinction and is jealously guarded

Streets and Trade.—Most of the streets are exceedingly narrow, and as the houses are high, and built in many cases over the thoroughfares, these are often very dark and gloomy, though, since wooden beams, rough stones and mortar are used in building, there is less of that ruined, half-decayed appearance so common in other Moorish towns where mud concrete is the material employed

As a commercial town Fez is a great depot for the trade of Barbary. The manufactures still carried on are those of yellow slippers of the famous Morocco leather, fine white woollen and silk haiks, of which it is justly proud, women's embroidered sashes various coarse woollen cloths and blankets, cotton and silk handkerchiefs, silk cords and braids, swords and guns, saddlery, brass trays, Moorish musical instruments, rude painted pottery and coloured tiles As in other capitals each trade has a district or street devoted chiefly to its activities. Old Fez is the business portion of the town, new Fez being occupied principally by Government quarters and the Jews' mellah

Schools and Mosques.—In the early days of Mohammedan rule in Morocco, Fez was the seat of learning and the empire's pride. Its schools of religion, philosophy and astronomy enjoyed a great reputation in Africa and also in southern Europe, and were even attended by Christians On the expulsion of the Moors from Spain, refugees of all kinds flocked to Fez, and brought with them some knowledge of arts, sciences and manufactures, and thither flocked students to make use of its extensive libraries But its glories were brief, and though still "the university town" of Morocco, it retains but a shadow of its greatness There are about 1,500 students who read at the Karueein They pay no rents, but buy the keys of the rooms from the last occupants, selling them again on leaving

The Karueein is celebrated as the largest mosque in Africa On account of the vast area covered, the roof, supported by 366 pillars of stone, appears very low The side chapel for services for the dead contains 24 pillars All these columns support horse-shoe arches, on which the roof is built, long vistas of arches being seen from each of the 18 doors of the mosque The large lamp is stated to weigh 1,763 lb and to have 509 lights, but it is very seldom lit The total number of lights in the Karueein is given as 1,700 The mosque of Mulai Idris, built by the founder of Fez about the year 810, is considered so sacred that the streets which approach its entrance are forbidden to Jews, Christians or four-footed beasts The sanctity of the shrine in particular is esteemed very great

Since Morocco was placed under French protection in 1912 a new city has grown up 5 km to the west of the old town, leaving the picturesque charm of the latter unspoilt This new European town lies between the old one and the station of the railway which connects Fez with Rabat, Casablanca and Tangiers and continues as far as Taza, Oujda and Algiers Of its population of 81,172, 77,613 are natives (70,060 Mohammedan, 7,553 Jewish) and 3,559 are Europeans (3,053 French)

According to tradition Fez was founded in 808 by Idris II, son of Idris I. descended from Ali, the son-in-law of the Prophet The original town consisted of the quarter of the people of Quairan and the Andalusian quarter In the 13th century Fez, Jeded and many other beautiful *medersas* or colleges were built to house the foreign students, some are still standing, and are the purest examples of Spanish-Moorish art in Morocco Fez had then 125,000 inhabitants, but the city declined under the Saadi and Filali sharifs On May 21, 1911, the French entered Fez at the request of the sultan, Mulai Hafid It was at Fez that M. Regnault signed the treaty of March 30, 1912, establishing the French protectorate over Morocco A riot broke out, and Fez was besieged by the Berbers, but order was restored by General Lyautey

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FEZZAN (the ancient *Phazania*, or country of the Garamantes) (*see* GHADAMES), a region of the Sahara, forming nominally the southern part of the Italian colony of Tripolitania, though it is not yet effectively occupied The general form of the country is determined by the ranges of hills, including the Jebel-es-Suda (highest peak about 4,000 ft), the Haruj-el-Aswad and the Haruj-el-Abiad, which between 14° and 19° E and 27° and 29° N. form the northern edge of a broad desert plateau, and shut off the northern region draining to the Mediterranean from

the depressions in which lie the oases of Fezzan proper in the south. The central depression of Hofra ("ditch"), as it is called, lies in about 26° N. It does not form a continuous fertile tract, but consists of a monotonous sandy expanse somewhat more thickly studded with oases than the surrounding wastes. The Hofra at its lowest part is not more than 600 ft above the sea-level, and in this hollow is situated the capital Murzuk It has a general east to west direction North-west of the Hofra is a long narrow valley, the Wadi-el-Gharbi, which trends north-east and is the most fertile district of Fezzan It contains several perennial springs and lake-like basins. One of these basins, the saline Bahr-el-Dud ("Sea of Worms"), has an extent of 600 sq m , and is in places 26 ft. deep Southwards the Hofra rises to a height of 2,000 ft., and in this direction lies the oasis of Gatron, followed by Tejerri on the verge of the desert, which marks the southern limit of the date and the northern of the dum palm Beyond Tejerri the Saharan plateau rises continuously to the Tibesti highlands

Climate.—The average temperature of Murzuk was found by Rohlfs to be 70° F Frost is not uncommon in the winter months The climate is a very regular one, and is in general healthy, the dryness of the air in summer making the heat bearable An almost perpetual blue sky overhangs the desert, and the people of Fezzan are so unaccustomed to and so ill-prepared for wet weather that, as in Tuat and Tidikelt, they pray to be spared from rain Water is found almost everywhere at small depths

Flora and Fauna.—The date-palm is the characteristic tree of Fezzan, and constitutes the chief wealth of the land. In the oasis of Murzuk alone more than 30 varieties are counted, the most esteemed being named the Tillis, Tuati and Auregh. Besides the date there are numerous olive, fig and almond trees Various grains are cultivated Wheat and barley are sown in winter, and in spring, summer and autumn several kinds of durra, especially ksob and gafoli. Cotton flourishes, is perennial for six or seven years, and gives large pods of moderate length of staple.

In the uninhabited oases gazelles and antelopes are occasionally found The most important animal is the camel, of which there are two varieties, the Tebu or Sudan camel and the Arabian, differing very much in size, form and capabilities. Horses and cattle are not numerous Among birds are ostriches, falcons, vultures, swallows and ravens; in summer wild pigeons and ducks are numerous, but in winter they seek a warmer climate. There are no remarkable insects or snakes A species of *Artemia* or brine shrimp, about a quarter of an inch in length, of a colour resembling the bright hue of the gold fish, is fished for with cotton nets in the "Sea of Worms," and, mixed with dates and kneaded into a paste, which has the taste and smell of salt herring, is considered a luxury by the people of Fezzan

Inhabitants.—The total population is estimated at between 50,000 and 80,000 The inhabitants are a mixed people, derived from the surrounding Teda and Bornu on the south, Tuareg of the plateaus on the west, Berbers and Arabs from the north. The primitive inhabitants, called by their Arab conquerors Berāuna, are believed to have been of Negro origin. They no longer persist as a distinct people. In colour the present inhabitants vary from black to white, but the prevailing hue of skin is a Malay-like yellow, the features and woolly hair being Negro. The chief languages are the Kanuri or Bornu language and Arabic. Many understand Targish, the Teda and the Hausa tongues If among such a mixed people there can be said to be any national language, it is that of Bornu, which is most widely understood and spoken The people of Sokna, north of the Jebel-es-Suda, have a peculiar Berber dialect which Rohlfs found to be very closely allied to that of Ghadames. The men wear a haik or barakan like those of Tripoli, and a fez; short hose, and a large loose shirt called mansaria, with red or yellow slippers, complete their toilet. Yet one often sees the large blue or white *tobe* of Bornu, and the *litham* or shawl-muffler of the Tuareg, wound round the mouth to keep out the blown sand of the desert. The women, who so long as they are young have very plump forms, and who are generally small, are more simply dressed, as a rule, in the barakan, wound round their bodies; they seldom wear shoes, but generally have sandals made of palm leaf Like the Arab women they load arms and legs with heavy metal rings, which are of silver among the more wealthy The hair, thickly greased with butter, soon catching the dust which forms a crust over it, is done up in numberless little plaits round the head, in the same fashion as in Bornu and the Hausa countries. Children run about naked until they attain the age of puberty, which comes very early, for mothers of ten or twelve years of age are not uncommon The Fezzani are of a gay disposition, much given to music and dancing.

Towns and Trade.—Murzuk, the present capital, lies in the western corner of the Hofra depression, in 25° 55′ N and 14° 10′ E It was founded about 1310, about which time the *kasbah* or citadel was built The Turks repaired it, as well as the town-wall, which has, however, again fallen into a ruinous condition. Murzuk had in 1906 some 3,000 inhabitants The citadel and most of the houses are built of salt-saturated dried mud Sokna, about midway between Tripoli and Murzuk, situated on a great gravel plain north of the Suda range, has a population of about 2,500

Garama (Derma-el-Kedima north-east of Murzuk), the capital under the Garamantes and the Romans, was in the Wadi-el-Gharbi. It was a flourishing town at the time of the Arab conquest but is now deserted Among the ruins is a well-preserved stone monument marking the southern limit of the Roman dominions in this part of Africa. Zuila, the capital under the Arabs, lies in a depression called the Sherguia east of Murzuk on the most direct caravan route to Barca and Egypt Of Traghen, the capital under the Nesur dynasty, which was on the same caravan route and between Zuila and Murzuk, little besides the ruined kasbah remains

Placed roughly midway between the countries of the central Sudan and Tripoli, Fezzan serves as a depot for caravans crossing the Sahara. Its most important export is that of dates.

See C Zoli, *Nel Fezzan* (Milan, Alfieri and Lacroix, 1926). The scanty rock sculptures of Fezzan are described by Zoli in *Rivista delle colonie italiane* 1. (1927) 7–13 and indicate that the Garamantes (as ancient authors also tell us) possessed oxen.

History.—The country formed part of the territory of the Garamantes, described by Herodotus as a very powerful people. Attempts have been made to identify the Garamantes with the Berāuna of the Arabs of the 7th century, and to the period of the Garamantes Duveyrier assigns the remains of remarkable hydraulic works, and certain tombs and rock sculptures—indications, it is held, of a Negro civilization of ancient date which existed in the northern Sahara The Garamantes, whether of Libyan or Negro origin, had certainly a considerable degree of civilization when in the year 19 B C. they were conquered by the proconsul L Cornelius Balbus Minor and their country added to the Roman empire By the Romans it was called Phazania, whence the present name Fezzan After the Vandal invasion Phazania appears to have regained independence and to have been ruled by a Berāuna dynasty. At this time the people were Christians, but in 666 the Arabs conquered the country and all traces of Christianity seem speedily to have disappeared About the middle of the 16th century the people of Fezzan were rescued from slavery to the Arab tribe of Khorman by a sherif of Morocco, Montasir-b.-Mohammed, who founded the dynasty of Beni Mohammed This dynasty, which came into frequent conflict with the Turks in Tripoli, gradually extended its borders as far as Sokna in the north. It was the Beni Mohammed who chose Murzuk as their capital They became intermittently tributary to the pasha of Tripoli, but within Fezzan the power of the sultans was absolute The last of the Beni Mohammed sultans was killed in the vicinity of Traghen in 1811 by El-Mukkeni, one of the lieutenants of Yusef Pasha, the last sovereign but one of the independent Karamanli dynasty of Tripoli. El-Mukkeni now made himself sultan of Fezzan, and became notorious by his slaving expeditions into the central Sudan, in which he advanced as far as Bagirmi. In 1831, Abd-el-Jelil, a chief of the Walid-Sliman Arabs, usurped the sovereign authority After a troublous reign of ten years he was slain in battle by a Turkish force under Bakir Bey, and Fezzan was added to the Turkish empire With the rest of Tripolitania, it was seized by Italy in 1911 but not occupied till 1914.

FIACRE, SAINT (Celt *Fiachra*), an anchorite of the 7th century, of noble Irish descent His *Acta,* which have little historical value, relate that he went to France and with the permission of St Faro, the bishop of Meaux, built a monastery at Prodilus (Brodolium), the modern Breuil, in the province of Brie. Here he received St Chillen (? Killian), who was returning from a pilgrimage to Rome, and here he remained until his death In 1568, at the time of the religious troubles, his remains were transferred to their present shrine in the cathedral of Meaux St Fiacre is the patron of Brie, and gardeners invoke him as their protector, his feast is kept on Aug 30.

See O'Hanlon, *Lives of the Irish Saints,* VIII. 421–447 (Dublin, 1875–1904).

FIARS PRICES, in the law of Scotland, the average prices of each of the different sorts of grain grown in each county, as fixed annually by the sheriff, usually after the verdict of a jury, they serve as a rule for ascertaining the value of the grain due to feudal superiors, to the clergy, or to lay proprietors of *teinds,* to landlords as a part or the whole of their rents, and in all cases where the price of grain has not been fixed by the parties. It is not known when or how the practice of "striking the fiars," as it is called, originated. It probably was first used to determine the value of the grain rents and duties payable to the crown In confirmation of this view it seems that at first the duty of the sheriffs was merely to make a return to the court of exchequer of the prices of grain within their counties, the court itself striking the fiars, and from an old case it appears that the fiars were struck above the true prices, being regarded rather as punishments to force the king's tenants to pay their rents than as the proper equivalent of the grain they had to pay Co-existent, however, with these fiars, which were termed sheriffs' fiars, there was at an early period another class called commissaries' fiars, by which the values of *teinds* were regulated. They have been traced back to the Reformation and were under the management of the commissary or consistorial courts, which then took the place of the bishops and their officials They have been long out of use, but they were perhaps of greater antiquity than the sheriff's fiars and the model upon which these were instituted

In 1723 the court of session passed an Act of Sederunt for the purpose of regulating the procedure in fiars courts. Down to that date the practice of striking the fiars was by no means universal over Scotland, and even in those counties into which it had been introduced, there was, as the preamble of the act puts it, " a general complaint that the said fiars are struck and given out by the sheriffs without due care and inquiry into the current and just prices " The act in consequence provided that all sheriffs should summon annually, between Feb. 4 and 20, a competent number of persons, living in the shire, of experience in the prices of grain within its bounds, and that from these they could choose a jury of 15, of whom at least eight were to be heritors, that witnesses and other evidence as to the price of grain grown in the county, especially since Nov 1 preceding until the day of inquiry, were to be brought before the jury, who might also proceed on "their own proper knowledge"; that the verdict was to be returned and the sentence of the sheriff pronounced by March 1, and further, where custom or expediency recommended it, the sheriff was empowered to fix fiars of different values according to the different qualities of the grain It cannot be said that this act has remedied all the evils of which it complained. The propriety of some of its provisions has been questioned and the competency of the court to pass it has been doubted, even by the court itself. Its authority has been entirely disregarded in one county—Haddingtonshire—where the fiars are struck by the sheriff alone, without a jury; and when this practice was called in question the court declined to interfere, observing that the fiars were better struck in Haddingtonshire than anywhere else. The other sheriffs have in the main followed the act but with much variety of detail, and in many instances on principles the least calculated to reach the true average prices. Thus in some counties the averages are taken on the number of transactions, without regard to the quantities sold In one case, in 1838, the evidence was so carelessly collected that the second or inferior barley fiars were 2s 4d. higher than the first. Formerly the price was struck by the boll, commonly the Linlithgowshire boll; now the imperial quarter is always used.

FIASCO, originally a flask or bottle, and by derivation, probably in the sense of breaking, used figuratively of a breakdown or failure in a dramatic performance or other undertaking.

FIAT (FABBRICA ITALIANA AUTOMOBILI TORINO), Italian motor car company was founded in 1898. The original car was specially designed to cope with mountain conditions in Northern Italy, and gave great satisfaction in this connection for reliability and durability The *Fiat* cars subsequently won numerous successes in road and track events. The works at Turin soon became one of the largest in Europe, and rank among the finest and best equipped in the world. Their equipment may be gathered from the fact that the roof is a testing-track, 78 ft. wide, nearly three-quarters of a mile round, placed over 100 ft. above ground level During the World War the resources of the company were taxed to the utmost Employment was found for 30,000 workers; over 100 cars and lorries were produced daily; while in the output of aero engines the company ranked with the first in the world

In the sphere of aeroplane engineering the company is proud of the fact that *Fiat* engines made possible the phenomenal world air speed record (1928) of 319 m p h and the world's long distance flight record (1928) from Rome to Brazil, a distance of 4,850 miles The company produces, on a large scale, motor cars, commercial vehicles, agricultural tractors, marine engines, locomotives, railway trucks and carriages, aviation engines, etc

(M N)

FIAT MONEY, irredeemable money issued and made legal by Government order (fiat) but not secured by a gold or silver or other adequate reserve It is usually paper but may also consist of coins of baser metals whose metallic content is worth far less than their face value. The issue of fiat money tends to cause the withdrawal from circulation of sound money and a great inflation of prices in terms of the unsecured currency. Fiat money was issued freely in the United States during the Revolutionary War and the Civil War periods The "greenbacks" of the Civil War period were fiat money but under the Specie Resumption Act of 1875 were made redeemable and thus became real money.

FIBIGER, JOHANNES (1868–1928), Danish pathologist and professor at the University of Copenhagen, acquired universal fame by his researches into cancer in rats and cockroaches, which culminated in the first experimental production of that disease While examining tubercular rats, Fibiger found three with cancer of the stomach. These cancers contained a parasite (afterwards called *spiroptera neoplastica*), which he was able to trace to an uncommon type of cockroach that had come in sugar from the West Indies When the cockroaches were eaten by the rats infesting the particular sugar factory, the larvae coiled up in their muscles developed into the adult nematodes in the stomachs of the rats. By feeding rats in this way Fibiger was able to induce cancer in them, though not in other animals. He was awarded the Nobel Prize in 1927

FIBONACCI, LEONARDO: *see* LEONARDO OF PISA.

FIBRES, the general term for certain structural components of animal and vegetable tissue utilized in manufactures, and in respect of such uses, divided for the sake of classification into textile, paper-making, brush and miscellaneous fibres

Textile Fibres.—Textile fibres are mostly products of the organic world, elaborated in their elongated form to subserve protective functions in animal life (as wool and epidermal hairs, etc) or as structural components of vegetable tissues (flax, hemp and wood cells). It may be noted that the inorganic world provides an exception to this general statement in the fibrous mineral asbestos (*q v.*), which is spun or twisted into coarse textiles. Other silicates are also transformed by artificial processes into fibrous forms, such as "glass," which is fused and drawn or spun to a continuous fibre, and various "slags" which, in the fused state, are transformed into "slag wool." Lastly, we note that a number of metals are drawn down to the finest dimensions, in continuous lengths, and these are woven into cloth or gauze, such metallic cloths finding valuable applications in the arts. Certain

metals in the form of fine wire are woven into textile fabrics used as dress materials. Such exceptional applications are of insignificant importance, and will not be further considered in this article.

The common characteristics of the various forms of matter comprised in the widely diversified groups of textile fibres are those of the colloids. Colloidal matter is intrinsically devoid of structure, and in the mass may be regarded as homogeneous; whereas crystalline matter in its proximate forms assumes definite and specific shapes which express a complex of internal stresses The properties of matter which condition its adaptation to structural functions, first as a constituent of a living individual, and afterwards as a textile fibre, are homogeneous continuity of substance, with a high degree of interior cohesion, and associated with an irreducible minimum of elasticity or extensibility The colloids show an infinite diversity of variations in these essential properties. certain of them, and notably cellulose (*q v*), maintain these characteristics throughout a cycle of transformations such as permit of their being brought into a soluble plastic form, in which condition they may be drawn into filaments in continuous length The artificial silks or lustra-celluloses or rayons are produced in this way, and have already taken an established position as staple textiles For a more detailed account of these products *see* CELLULOSE and SILK, ARTIFICIAL

The animal fibres are composed of nitrogenous colloids of which the typical representatives are the albumens, fibrines and gelatines They are of highly complex constitution and their characteristics have only been generally investigated The vegetable fibre substances are celluloses and derivatives of celluloses, also typically colloidal bodies The broad distinction between the two groups is chiefly evident in their relationship to alkalis The former group are attacked, resolved and finally dissolved, under conditions of action by no means severe The celluloses, on the other hand, and therefore the vegetable fibres, are extraordinarily resistant to the action of alkalis

The animal fibres are relatively few in number but of great industrial importance They occur as detached units and are of varying dimensions, sheep's wool having lengths up to 36in., the fleeces being shorn for textile uses at lengths of 2 to 16in.; horse hair is used in lengths of 4 to 24in., whereas the silks may be considered as being produced in continuous length, "reeled silks" having lengths measured in hundreds of yards, but "spun silks" are composed of silk fibres purposely broken up into short lengths

The vegetable fibres are extremely numerous and of very diversified characteristics They are individualized units only in the case of seed hairs, of which cotton is by far the most important, with this exception they are elaborated as more or less complex aggregates The bast tissues of dicotyledonous annuals furnish such staple materials as flax, hemp, rhea or ramie and jute The bast occurs in a peripheral zone, external to the wood and beneath the cortex, and is mechanically separated from the stem, usually after steeping, followed by drying

The commercial forms of these fibres are elongated filaments composed of the elementary bast cells (ultimate fibres) aggregated into bundles. The number of these bundles, of any part of the filament may vary from 3 to 20 In the processes of refinement preparatory to the spinning (hackling, scutching) and in the spinning process itself, the fibre-bundles are more or less subdivided, and the divisibility of the bundles is an element in the textile value of the raw material But the value of the material is rather determined by the length of the ultimate fibres (for, although not the spinning unit, the tensile strength of the yarn is ultimately limited by the cohesion of these fibres), qualified by the important factor of uniformity.

Thus, the ultimate fibre of flax has a length of 25 to 35mm; jute, on the other hand, 2 to 3mm.; and this disparity is an essential condition of the difference of values of these fibres Rhea or ramie, to cite another typical instance, has an ultimate fibre of extraordinary length, but of equally conspicuous variability, viz., from 50 to 200mm The variability is a serious impediment in the preparation of the material for spinning and this defect, together with low drawing or spinning quality, limits the applications of this fibre to the lower counts or grades of yarn.

The monocotyledons yield still more complex fibre aggregates, which are the fibro-vascular bundles of leaves and stems. These complex structures as a class do not yield to the mechanical treatment by which the bast fibres are subdivided, nor is there any true spinning quality such as is conditioned by bringing the ultimate fibres into play under the drawing process, which immediately precedes the twisting into yarn. Such materials are therefore only used for the coarsest textiles, such as string or rope An exception to be noted in passing is to be found in the pine-apple (*Ananas Sativus*) the fibres of which are worked into yarns and cloth of the finest quality The more important fibres of this class are manila, sisal, phormium A heterogeneous mass of still more complex fibre aggregates, in many cases the entire stem (cereal straws, esparto), in addition to being used in plaited form, *e g*, in hats, chairs, mats, constitute the staple raw material for paper manufacturers, requiring a severe chemical treatment for the separation of the ultimate fibres.

In this class we must include the woods which furnish wood pulps of various classes and grades Chemical processes of two types (*a*) acid and (*b*) alkaline, are also employed in resolving the wood, and the resolution not only effects a complete isolation of the wood cells, but, by attacking the hydrolysable constituents of the wood substance (lignocellulose), the cells are obtained in the form of cellulose These cellulose pulps are known in commerce as "sulphite pulps" and "soda pulps" respectively In addition to these raw materials or "half stuffs" the paper-maker employs the rejecta of the vegetable and textile industries, scutching, spinning and cloth wastes of all kinds, which are treated by chemical (boiling) and mechanical means (beating) to separate the ultimate fibres and reduce them to the suitable dimensions (0·5–2·0mm.) These paper-making fibres have also to be reckoned with as textile raw materials, in view of a new and growing industry in "pulp yarns" (*Papierstoffgarn*), a coarse textile obtained by treating paper as delivered in narrow strips from the paper machine, the strips are reeled, dried to retain 30–40% moisture, and in this condition subjected to the twisting operation, which confers the cylindrical form and adds considerably to the strength of the fibrous strip The following are the essential characteristics of the economically important fibres

Animal Fibres.—A Silk (*a*) The true silks are produced by the *Bombyx mori*, the worm feeding on the leaves of the mulberry The fibre is extruded as a viscous liquid from the glands of the worm, and solidifies to a cylindrical thread The cohesion of these threads in pairs gives to raw silk the form of a dual cylinder If they are used for textile purposes the thread is reeled from the cocoon, and several units, five and upwards, are brought together and suitably twisted (*b*) The "Wild" silks are produced by a large variety of insects, of which the most important are the various species of Antherea, which yield the Tussore silks These silks differ in form and composition from the true silks While they consist of a "dual" thread, each unit of these is complex, being made up of a number of fibrillae This unit thread is quadrangular in section, and of larger diameter than the true silk, the mean breadth being 0·052mm., as compared with 0·018, the mean diameter of the true silks The variations in structure as well as in dimensions are, however, very considerable

B Epidermal hairs Of these (*a*) wool, the epidermal protective covering of sheep, is the most important The varying species of the animal produce wools of characteristic qualities, varying considerably in fineness, in length of staple, in composition and in spinning quality Hence the classing of the fleeces or raw wool followed by the elaborate processes of selection, *i e*, "sorting" and preparation, which precede the actual spinning or twisting of the yarn These consist in entirely freeing the fibres and sorting them mechanically (combing, etc.), thereafter forming them into continuous lengths of parallelized units. This is followed by the spinning process which consists in a simultaneous drawing and twisting, and a continuous production of the yarn with the structural characteristics of *worsted* yarns. The shorter staple—from 5 to 25% of average fleeces—is prepared by the "carding" process for the spinning operation, in which drawing and twisting

are simultaneous, the length spun being then wound up, and the process being consequently intermittent. This section of the industry is known as "woollen spinning" in contrast to the former or "worsted spinning." (*b*) An important group of raw material closely allied to the wools are the epidermal hairs of the Angora goat (mohair), the llama, alpaca Owing to their form and the nature of the substance of which they are composed, they possess more lustre than the wools They present structural differences from sheep wools which influence the processes by which they are prepared or spun, and the character of the yarns, but the differences are only of subordinate moment. (*c*) Various animal hairs, such as those of the cow, camel and rabbit, are also employed, the latter is largely worked into the class of fabrics known as felts. In these the hairs are compacted together by taking advantage of the peculiarity of structure which causes the imbrications of the surface. (*d*) Horse hair is employed in its natural form as an individual filament or monofil

Vegetable Fibres.—The subjoined scheme of classification sets out the morphological structural characteristics of the vegetable fibres —

Produced from

Dicotyledons	*Monocotyledons.*
A. Seed hairs	D Fibro-vascular bundles
B Bast fibres.	E Entire leaves and stems.
C. Bast aggregates	

In the list of the more important fibrous raw materials subjoined, the capital letter immediately following the name refers the individual to its position in this classification. In reference to the important question of chemical composition and the actual nature of the fibre substance, it may be premised that the vegetable fibres are composed of cellulose, an important representative of the group of carbohydrates, of which the cotton fibre substance is the chemical prototype, mixed and combined with various derivatives belonging to the subgroups (*a*) Carbohydrates. (*b*) Unsaturated compounds of benzenoid and furfuroid constitutions (*c*) "Fat and wax" derivatives, *i e*, groups belonging to the fatty series, and of higher molecular dimensions—of such compound celluloses the following are the prototypes —

(*a*) Cellulose combined and mixed with "pectic" bodies (*i e*, pecto-celluloses), flax, rhea
(*b*) Cellulose combined with unsaturated groups or ligno-celluloses, jute and the woods
(*c*) Cellulose combined and mixed with higher fatty acids, alcohols, ethers, cuto-celluloses, protective epidermal covering of leaves

The letters *a*, *b*, *c* in the table below and following the capitals, which have reference to the structural basis of classification, indicate the main characteristics of the fibre substances (*See* also CELLULOSE)

Miscellaneous Fibres.—Various species of the family Palmaceae yield fibrous products of value, of which mention must be

-	Botanical identity Genus and order	Country of origin	Dimensions of ultimate.	Textile uses
Cotton, A *a*	Gossypium Malvaceae	Subtropical and tropical countries	12-40mm 0 019–0 025 28mm Av	Universal Also as a raw material in chemical industries, notably explosives, celluloid
Flax, B *a*	I inum I inaceae	Temperate countries, chiefly European	6–60mm. 0 011–0 025 28mm. Av	General Special effects in lustre damasks In India and America plants grown for seed (linseed)
Hemp, B *a*	Cannabis Cannabineae	Temperate countries, chiefly Europe	5-55mm. 0·016–0·050. 22mm. Av 0 022 Av	Coarser textiles, sail-cloth, rope and twine.
Ramie, B *a*	Boehmeria Urticaceae	Warm temperate, China	60–200mm. 0 03–0 08 120mm Av 0 050 Av	Clothing in China: "grass cloth." gas mantels
Jute, B.*b*	Corchorus Tiliaceae	Tropical countries, chiefly India	1·5–5mm 0 020–0 025. 2 5mm. Av. 0 022 Av	Coarse textiles, chiefly "Hessians" and sacking "Line" spun yarns used in cretonne and furniture textiles.
Sunn-hemp, B *b*	Crotalaria Leguminosae	India	4·0–12 0 0·025–0 050 7·5. Av 0 022 Av	Twine and rope. Coarse textiles.
Ambari, B *b*	Hibiscus	Persia, Russia, India	2–6mm. 0 014–0 033. 4mm Av 0 021 Av	Coarse textiles. *H Elams* has been extensively used in making mats
Sida, B.*b*	Sida Malvaceae	Tropical and subtropical	1 5–4mm 0·013–0 02 2mm Av 0 015 Av	Coarse textiles Appears capable of substituting jute.
Chingma, B *b*	Abutilon Malvaceae	China Manchuria Japan		Coarse fabrics, twines.
Lime or Linden, C.*b*	Tilia Tiliaceae	European countries, chiefly Russia	1·5mm. 0·014–0 020. 2mm Av 0 016 Av.	Matting and binder twine.
Mulberry, C	Broussonetia Moraceae	Far East	5–31mm 0 02–0·04 15mm Av 0 03 Av	Paper and paper cloths.
Manila, D	Musa Musaceae	Tropical countries, chiefly Philippine Islands	3–12mm. 0 016–0 032 6mm Av 0 024 Av.	Twine and ropes Produces papers of special quality
Sisal, D	Agave Amaryllideae	Tropical countries	1·5–4mm 0 020–0·032. 2·5 Av. 0·024 Av	Twine and ropes.
Yucca . .	Yucca Liliaceae	do	0·5–6mm. 0 01–0 02	do.
Bow-string hemp	Sansevieria Liliaceae	East Indies, Ceylon, East Africa	1 5–6mm. 0·015–0 026. 3mm Av. 0 020 Av	do.
Phormium, D	Phormium tenax Liliaceae	New Zealand	5 0–15mm. 0·010–0 020 9mm. Av. 0·016 Av	Twine and ropes. Distinguished by high yield of fibre from green leaf
Pineapple, D	Ananas Bromeliaceae	Tropical East and West Indies	3·0–9·0mm 0 004–0·008. 5. Av 0·006 Av	Textiles of remarkable fineness Exceptional fineness of ultimate fibre
Henequén, D	Agave Amaryllidaceae	Yucatan, Cuba	1·5–4 mm 0·02–0·03	Binder twine, rope.
Cantala, D	Agave Amaryllidaceae	Java, Philippines		Twines and ropes.
Tula ixtle, D	Agave Amaryllidaceae	Mexico		Twines, "Tampico," brushes.
Jaumave ixtle, D.	Agave Amaryllidaceae	Mexico		Twines, "Tampico," brushes.
Palma, D.	Samuela Yucceae	Mexico		Twines.
Piteira, D.	Furcraea Amaryllidaceae	Brazil, Mauritius	1·3–3·7 mm. 0·015–0·24	Ropes, sacks

made of the following *Raffia,* epidermal strips of the leaves of *Raphia ruffia* (Madagascar), *R taedigera* (Japan), largely employed as binder twine in horticulture, replacing the "bast" (linden) formerly employed. *Coir,* the fibrous envelope of the fruit of the *Cocos nucifera,* extensively used for matting and other coarse textiles. *Carludovica palmata* (Central America) yields the raw material for Panama hats, the *Corypha australis* (Australia) yields a similar product. The leaves of the date palm, *Phoenix dactylifera,* are employed in making baskets and mats, and the fibro-vascular bundles are isolated for working up into coarse twine and rope, similarly, the leaves of the *Elaeis guineensis,* the fruit of which yields the "palm oil" of commerce, yield a fibre which finds employment locally for special purposes *Chamaerops humilis,* the dwarf palm, yields the well-known "Crin d'Afrique" Locally (Algiers) it is twisted into ropes, but its more general use, in Europe, is in upholstery as a stuffing material. The cereal straws are used in the form of plait in the making of hats and mats. Esparto grass is also used in the making of coarse mats

The processes by which the fibres are transformed into textile fabrics are in the main determined by their structural features The following are the distinctive types of treatment.

A The fibre is in virtually continuous lengths The textile yarn is produced by assembling together the unit threads, which are wound together and suitably twisted (silk, artificial silk).

B. The fibres in the form of units of variable short dimensions are treated by more or less elaborate processes of scutching, hackling, combing, with the aim of producing a mass of free parallelized units of uniform dimensions; these are then laid together and drawn into continuous bands of sliver and roving, which are finally drawn and twisted into yarns In this group are comprised the larger number of textile products, such as cotton, wool, flax and jute, and it also includes at the other extreme the production of coarse textiles, such as twine and rope

C The fibres of still shorter dimensions are treated in various ways for the production of a fabric in continuous length

The distinction of type of manufacturing processes in which the relatively short fibres are utilized, either as disintegrated units or comminuted long fibres, follows the lines of division into long and short fibres; the long fibres are worked into yarns by various processes, whereas the shorter fibres are agglomerated by both dry and wet processes to felted tissues or felts It is obvious, however, that these distinctions do not constitute rigid dividing lines Thus the principles involved in felting are also applied in the manipulation of long fibre fabrics For instance, woollen goods are closed or shrunk by milling, the web being subjected to a beating or hammering treatment in an apparatus known as "the stocks," or is continuously run through squeezing rollers, in weak alkaline liquids Flax goods are "closed" by the process of beetling, a long-continued process of hammering, under which the ultimate fibres are more or less subdivided, and at the same time welded or incorporated together. As already indicated, paper, which is a web composed of units of short dimensions produced by deposition from suspension in water and agglomerated by the interlacing of the component fibres in all planes within the mass, is a species of textile Further, whereas the silks are mostly worked up in the extreme lengths of the cocoon, there are various systems of spinning silk wastes of variable short lengths, which are similar to those required for spinning the fibres which occur naturally in the shorter lengths

The fibres thus enumerated as commercially and industrially important have established themselves as the result of a struggle for survival, and each embodies typical features of utility. There are innumerable vegetable fibres, many of which are utilized in the locality or region of their production, but are not available for the highly specialized applications of modern competitive industry to qualify for which a very complex range of requirements has to be met. These include primarily the factors of production and transport summed up in cost of production, together with the question of regularity of supply; structural characteristics, form and dimensions, including uniformity of ultimate unit and adaptability to standard methods of preparing and spinning, together with tenacity and elasticity, lustre Lastly, composition, which determines the degree of resistance to chemical disintegrating influences as well as subsidiary questions of colour and relationship to colouring matters The quest for new fibres, as well as modified methods of production of those already known, require critical investigation from the point of view of established practice. The present perspective outline of the group will be found to contain the elements of a grammar of the subject But those who wish to pursue the matter will require to amplify this outlined picture by a study of the special treatises which deal with general principles, as well as the separate articles on the various fibres

Analysis and Identification.—For the analysis of textile fabrics and the identification of component fibre, a special treatise must be consulted The following general facts are to be noted as of importance

All animal fibres are effectively dissolved by 10% solution of caustic potash or soda The fabric or material is boiled in this solution for ten minutes and exhaustively washed Any residue will be vegetable or cellulose fibre. It must not be forgotten that the chemical properties of the fibre substances are modified more or less by association in combination with colouring matters and mordants These may, in many cases, be removed by treatments which do not seriously modify the fibre substances.

Wool is distinguished from silk by its relative resistance to the action of sulphuric acid The cold concentrated acid rapidly dissolves silk as well as the vegetable fibres The attack on wool is slow, and the epidermal scales of wool make their appearance The true silks are distinguished from the wild silks by the action of concentrated hydrochloric acid in the cold, which reagent dissolves the former, but has only a slight effect on Tussore silk. After preliminary resolution by these group reagents, the fabric is subjected to microscopical analysis for the final identification of its component fibres (*see* H. Schlichter, *Journal Soc Chem. Ind*, 1890, p 241).

A scheme for the commercial analysis or assay of vegetable fibres, originally proposed by the author (Col Ind. Exhibition, 1886, *Miscellaneous Reports*) and now generally adopted, includes the following operations —

1 Determination of moisture
2 Determination of ash left after complete ignition
3 Hydrolysis·
  (*a*) loss of weight after boiling the raw fibre with a 1% caustic soda solution for five minutes;
  (*b*) loss after boiling for one hour
4 Determination of cellulose. the white residue after
  (*a*) boiling for five minutes with 1% caustic soda,
  (*b*) exposure to chlorine gas for one hour,
  (*c*) boiling with basic sodium sulphite solution

5 Mercerizing. the loss of weight after digestion with a 20% solution of sodium hydrate for one hour in the cold

6 Nitration. the weight of the product obtained after digestion with a mixture of equal volumes of sulphuric and nitric acids for one hour in the cold

7 Acid purification. treatment of the raw fibre with 20% acetic acid for one minute, the product being washed with water and alcohol, and then dried.

8. Determination of the total carbon by combustion.

Paper-making.—The paper-making industry (*see* PAPER) employs as raw materials a large proportion of the vegetable fibre products already enumerated, and, for the reasons incidentally mentioned, they may be, and are, employed in a large variety of forms; in fact any fibrous material containing over 30% "cellulose" and yielding ultimate fibres of a length exceeding 1mm. can be used in this industry. Most important staples are cotton and flax; these are known to the paper-maker as "rag" fibres, rags, *i.e.*, cuttings of textile fabrics, new and old, being their main source of supply. These are used for writing and drawing papers In the class of "printings" two of the most important staples are wood pulp, prepared by chemical treatment from both pine and foliage woods, and in England esparto cellulose, the cellulose obtained from esparto grass by alkali treatment; the cereal straws

are also used and are resolved into cellulose by alkaline boiling followed by bleaching In the class of "wrappings" and miscellaneous papers a large number of other materials find use, such as various residues of manufacturing and preparing processes, scutching wastes, ends of rovings and yarns, flax, hemp and manila rope waste, adansonia bast and jute wastes, raw (cuttings) and manufactured (bagging) Other materials have been experimentally tried, and would no doubt come into use on their paper-making merits, but as a matter of fact the actually suitable raw materials are comprised in the list above enumerated, and are limited in number, through the influence of a number of factors of value or utility

Brush Fibres, Etc.—In addition to the textile industries there are manufactures which utilize fibres of both animal and vegetable character The most important of these is brush-making The familiar brushes of everyday use are extremely diversified in form and texture The supplies of animal fibres are mainly drawn from the badger, hog, bear, sable, squirrel and horse These fibres and bristles cover a large range of effects Brushes required for cleansing purposes are composed of fibres of a more or less hard and resilient character, such as horse hairs, and other tail hairs and bristles For painting work brushes of soft quality are employed, graduating for fine work into the extreme softness of the "camel hair" pencil Of vegetable fibres the following are used in this industry The *Caryota urens* furnishes the Kittul fibre, obtained from the base of the leaf stalks Piassava is obtained from the *Attalea funifera,* also from the *Leopoldinia piassaba* (Brazil) Palmyra fibre is obtained from the *Borassus flabellifer* These are all members of the natural order of the Palmaceae Mexican fibre, or Istle, is obtained from the agave The fibre known as Whisk, largely used for dusting brushes, is obtained from various species of the Gramineae, the "Mexican Whisk" from *Epicampes macroura;* and "Italian Whisk" from *Andropogon* The *coir* fibre mentioned above in connection with coarse textiles is also extensively used in brush-making Aloe and agave fibres in their softer forms are also used for plasterers' brushes Many of the whitewashes and cleansing solutions used in house decoration are alkaline in character, and for such uses advantage is taken of the specially resistant character of the cellulose group of materials

Stuffing and Upholstery.—Another important use for fibrous materials is for filling or stuffing in connection with the seats and cushions in upholstery In the large range of effects required, a corresponding number and variety of products find employment One of the most important is the floss or seed-hair of the *Ceiba pentandia,* known as Kapok, the use of which in Europe was created by the Dutch merchants who drew their supplies from Java The fibre is soft, silky and resilient, and maintains its resiliency in use Many fibres when used in the mass show, on the other hand, a tendency to become matted and compressed in use, and to restore them to their original state the fibre requires to be removed and subjected to a teasing or carding process This defect limits the use of other "flosses" or seed hairs in competition with Kapok Horse hair is extensively used in this industry, as are also wool flocks and other short animal hairs and wastes

For hat and matting manufactures a large range of the fibrous products above described are employed, chiefly in their natural or raw state (*See* also ALPACA, COTTON; FELT; FLAX, HEMP, JUTE, MOHAIR; WOOL, CELLULOSE; SILK, ARTIFICIAL; SHODDY, SILK; RAMIE; KAPOK; FUR, etc.)

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FIBRIN: *see* BLOOD

FIBROUS PLASTER: *see* PLASTERWORK.

FICHTE, IMMANUEL HERMANN (originally HARTMANN) **VON** (1796–1879), German philosopher, son of J G. Fichte, was born at Jena on July 18, 1796 Having held educational posts at Saarbrucken and Düsseldorf, in 1836 he became professor of philosophy at Bonn and in 1842 at Tubingen He died at Stuttgart on Aug 8, 1879 His most important writings are. *System der Ethik* (1850–53), *Anthropologie* (1856), *Psychologie* (1864–73), *Die theistische Weltansicht* (1873) Fichte's general views on philosophy are marked by an eclecticism, a predominantly historical treatment of problems and a conciliatory tone He attempts to reconcile monism (Hegel) and individualism (Herbart) by means of theism (Leibnitz) He attacks Hegelianism for its pantheism, its lowering of human personality and imperfect recognition of the demands of the moral consciousness God, he says, is not an absolute but an Infinite Person, whose nature it is to realize Himself in finite persons; these persons are objects of God's love, and He arranges the world for their good Fichte, in short, advocates an ethical theism; in his conception of finite personality he recurs to something like the monadism of Leibnitz; and his insistence on moral experience is connected with his insistence on personality Fichte evaluates previous systems by the adequateness with which they interpret moral experience Thus he depreciates Hegel, praises Krause (panentheism) and Schleiermacher, and speaks respectfully of English philosophy In his *Der neuere Spiritualismus* (1878), he employs arguments of a somewhat occult or theosophical cast, not unlike those of F W H Myers He edited the works and correspondence of his father

See R Eucken, "Zur Erinnerung I H. F," in *Zeitschrift fur Philosophie,* cx (1897), C C Scherer, *Die Gotteslehre von I H F* (1902) Some of his works were translated by J D Morell under the title of *Contributions to Mental Philosophy* (1860).

FICHTE, JOHANN GOTTLIEB (1762–1814), German philosopher, was born at Rammenau in Upper Lusatia on May 19, 1762, the son of a ribbon-weaver After attending the celebrated school at Pforta, near Naumburg, he entered the university of Jena, but in 1781 went to Leipzig During 1784–87 he acted as tutor in various families of Saxony, going to Zurich in 1788.

In 1790, he settled at Leipzig, and though reduced to literary drudgery, produced his *Aphorismen uber Religion und Deismus* (unpublished, date 1790, *Werke,* i. 1–8), a species of Spinozistic determinism, regarded, however, as lying altogether outside the boundary of religion

Fichte's *Letters* of this period attest the influence exercised on him by the study of Kant The Kantian doctrine of the inherent moral worth of man harmonized with his own character, and his life became an effort to perfect a true philosophy, and to make its principles practical maxims An abridgement of the *Kritik der Urtheilskraft* in a popular, intelligible form was begun, but left unfinished A post as private tutor in Warsaw having proved unsuitable after a fortnight's trial, Fichte set out for Königsberg to see Kant His first interview was disappointing, and he resolved to bring himself to the notice of the aged philosopher by a work in which the principles of the Kantian philosophy should be applied. Such was the origin of *Versucheiner Kritik aller Offenbarung* (Essay towards a Critique of all Revelation). The problem which Fichte dealt with in this essay was one not yet handled by Kant himself, the relations of which to the critical philosophy furnished matter for surmise From the *Critique of Pure Reason* it was clear that for Kant speculative theology must be purely negative, while the *Critique of Practical Reason* as clearly indicated the view that

the moral law is the absolute content or substance of any religion. A *critical* investigation of the conditions under which religious belief was possible was still wanting Kant having approved the essay and exerted his influence to procure a publisher, it appeared (1792). By an oversight Fichte's name on the title-page and the preface in which he spoke of himself as a beginner in philosophy, were omitted. The work was universally ascribed to Kant who, while correcting the mistake, commended the work, and Fichte's reputation was secured at a stroke

The *Critique of Revelation* marks the culminating point of Fichte's Kantian period The exposition of the conditions under which revealed religion is possible turns upon the absolute requirements of the moral law in human nature Religion itself is the belief in this moral law as divine, and such belief is a practical postulate, necessary in order to add force to the law. The supernatural element in religion can only be the divine character of the moral law Now, the revelation of this divine character of morality is possible only to a being in whom the lower impulses have been, or are, successful in overcoming reverence for the law In such a case it is conceivable that a revelation might be given in order to add strength to the moral law Religion ultimately then rests upon the practical reason, and expresses some want of the pure ego In this conclusion we see the prominence assigned by Fichte to the practical element, and the tendency to make the requirements of the ego the ground for all judgment on reality. Having reached this point he had to press forward and leave the Kantian position.

Shortly after his marriage in 1793, Fichte published anonymously two remarkable political works, *Zuruckforderung der Denkfreiheit von den Fursten Europas* and *Beitrage zur Berichtigung der Urtheile des Publicums uber die franzosische Revolution* Of these the latter, which is much the more important, aimed to direct attention to the true nature of the French Revolution, to demonstrate how inextricably the right of liberty is interwoven with the very existence of man as an intelligent agent, to point out the inherent progressiveness of state arrangements, and the consequent necessity of reform or amendment As in the *Critique of Revelation* so here the rational nature of man and the conditions necessary for its realization become the standard for critical judgment

Towards the close of 1793 Fichte was called to succeed Reinhold at Jena as professor of philosophy His success was instantaneous, and he lectured not only to his own class, but on general moral subjects to all students of the university These general addresses, published as *Bestimmung des Gelehrten* (Vocation of the Scholar), were on a subject dear to Fichte's heart, the supreme importance of the highest intellectual culture and the duties incumbent on those who had received it. The completed Fichtean philosophy is contained in the writings of this period at Jena. A general introduction to the system is given in *Über den Begriff der Wissenschaftslehre* (On the Notion of the Theory of Science), 1794, and the theoretical portion is worked out in the *Grundlage der gesammten Wissenschaftslehre* (Foundation of the whole Theory of Science, 1794) and *Grundriss des Eigenthumlichen d. Wissenschaftslehre* (Outline of what is peculiar in the Theory of Science, 1794). To these were added in 1797 the masterly *First* and *Second Introduction to the Theory of Science,* and an *Essay towards a new Exposition of the Theory of Science* The practical philosophy was given in the *Grundlage des Naturrechts* (1796) and *System der Sittenlehre* (1798). The last is probably the most important of all Fichte's works; apart from it, his theoretical philosophy is unintelligible.

During this period Fichte's academic career had been troubled by various storms, the last so violent as to put a close to his professorate at Jena. In 1798 Fichte, who had edited the *Philosophical Journal* since 1795, received from his friend F. K Forberg (1770–1848) an essay on the "Development of the Idea of Religion." With much of the essay he entirely agreed, but thinking the exposition in many ways defective and calculated to create an erroneous impression, he prefaced it with a short paper *On the Grounds of our Belief in a Divine Government of the Universe,* in which God is defined as the moral order of the universe, the eternal law of right which is the foundation of all our being. The cry of atheism was raised, and the electoral government of Saxony, followed by all the German states except Prussia, suppressed the *Journal* and demanded Fichte's expulsion from Jena After his defences (*Appellation an das Publicum gegen die Anklage des Atheismus,* and *Gerichtliche Verantwortung der Herausgeber der phil Zeitschrift,* 1799) Fichte threatened to resign in case of reprimand and much to his discomfort, his threat was taken as a request to resign.

Except for the summer of 1805 at Erlangen where he lectured, Fichte resided from 1799 to 1805 in Berlin, surrounded by friends, including Schlegel and Schleiermacher, and perfecting the *Wissenschaftslehre* The chief works from this period are *Bestimmung des Menschen* (Vocation of Man, 1800), a book notable for beauty of style, richness of content, and elevation of thought; *Der geschlossene Handelsstaat,* 1800 (The Exclusive or Isolated Commercial State), a remarkable treatise, intensely socialist in tone, and inculcating organized protection; and *Sonnenklarer Bericht an das grossere Publicum uber die neueste Philosophie,* 1801. In 1801 was also written the *Darstellung der Wissenschaftslehre,* published after his death In 1804 were delivered the lectures entitled *Grundzuge des gegenwartigen Zeitalters* (Characteristics of the Present Age, 1804), containing a most admirable analysis of the *Aufklarung,* tracing the position of such a movement of thought in the natural evolution of the general human consciousness, pointing out its inherent defects, and indicating as the ultimate goal of progress the life of reason in its highest aspect as a belief in the divine order of the universe In 1805 and 1806 appeared the *Wesen des Gelehrten* (Nature of the Scholar) and the *Anweisung zum seligen Leben oder Religionslehre* (Way to a Blessed Life), the latter the most important work of this Berlin period In it the union between the finite self-consciousness and the infinite ego or God is handled in an almost mystical manner, and the knowledge and love of God declared to be the end of life. The infinite God is the all; the world of independent objects is the result of reflection or self-consciousness, by which the infinite unity is broken up God is thus over and above the distinction of subject and object, our knowledge is but a reflex or picture of the infinite essence Being is not thought.

The French victories over the Prussians in 1806 drove Fichte from Berlin to Konigsberg (where he lectured for a time), then to Copenhagen, whence he returned to the capital in Aug 1807. From this time his published writings are practical in character; not till after the appearance of the *Nachgelassene Werke* was the shape of his final speculations known We may here note the order of these posthumous writings as important for tracing the development of Fichte's thought. From 1806 we have the remarkable *Bericht uber die Wissenschaftslehre* (*Werke,* vol. viii.), with its sharp critique of Schelling and from 1810 the *Thatsachen des Bewusstseyns* (published 1817) of which another treatment is given in lectures of 1813 (*Nach. Werke,* vol i). Of the *Wissenschaftslehre* we have, in 1812–13, four separate treatments contained in the *Nach Werke.* Perhaps the most interesting are the lectures of 1812 on *Transcendental Logic* (*Nach. Werke,* i. 106–400).

From 1812 we have notes of two courses on practical philosophy, *Rechtslehre* (*Nach Werke,* vol ii) and *Sittenlehre* (*ib.* vol. iii) A finished work in the same department is the *Staatslehre* (published 1820). This gives the Fichtean utopia organized on principles of pure reason, in too many cases the proposals are identical with principles of pure despotism.

During these years, however, Fichte was mainly occupied with public affairs. In 1807 he drew up a plan for the proposed new university of Berlin, and in 1807–08 delivered at Berlin his noble addresses to the German people (*Reden an die deutsche Nation*), full of practical views on the only true foundation for national prosperity. From 1810 to 1812 he was rector of the new Berlin University

During the great effort of Germany for national independence in 1813, Fichte lectured on the idea of a true war (*Über den Begriff eines wahrhaften Kriegs,* forming part of the *Staatslehre*). At the beginning of 1814, he was attacked with a

virulent hospital fever and died on Jan. 27, 1814. The philosophy of Fichte falls chronologically into the periods of Jena and Berlin, although there is no fundamental difference of philosophic conception It is demonstrable by various passages in the works and letters that he never looked upon the early *Wissenschaftslehre* as containing his whole system; the modifications supposed to be due to other thinkers were from the first implicit in his theory. On only one point, the position assigned in the *Wissenschaftslehre* to the absolute ego, is there any obscurity, but the relative passages are far from decisive, and from the early work, *Neue Darstellung der Wissenschaftslehre,* unquestionably of the Jena period, one can see that from the outset the doctrine of the absolute ego was held in a form differing only in statement from the later theory

Fichte's system cannot be compressed with intelligibility We shall here note only three points. (*a*) the origin in Kant; (*b*) the fundamental principle and method of the *Wissenschaftslehre;* (*c*) the connection with the later writings The most important works for (*a*) are the "Review of Aenesidemus," and the *Second Introduction to the Wissenschaftslehre;* for (*b*) the great treatises of the Jena period, for (*c*) the *Thatsachen des Bewusstseyns* of 1810

(*a*) The Kantian system had opened up a truly fruitful line of philosophic speculation, the transcendental consideration of knowledge, or the analysis of the conditions under which cognition is possible To Kant the fundamental condition was given in the synthetical unity of consciousness The primitive fact under which might be gathered the special conditions of that synthesis which we call cognition was this unity But Kant made no attempt to show that the said special conditions were necessary from the very nature of consciousness Their necessity was discovered and proved in a manner which might be called empirical Moreover, while Kant in a similar manner pointed out that intuition had special conditions, space and time, he did not show any connection between these and the primitive conditions of pure cognition Closely connected with this remarkable Kantian defect was the doctrine that the matter of cognition is altogether *given,* and to be referred to the action upon us of a *Ding-an-sich,* absolutely beyond consciousness While these hints towards a completely intelligible account of cognition were given by Kant, they were not reduced to system, and from the way in which the elements of cognition were related, could not be so reduced Only in the sphere of practical reason, where the intelligible nature prescribed to itself its own laws, was there the possibility of systematic deduction from a single principle.

To the criticisms of Kant's theory of knowledge by Schultze (Aenesidemus) and Maimon, Fichte owed much, but his own activity went far beyond what they supplied To complete Kant's work, to demonstrate that all the necessary conditions of knowledge can be deduced from a single principle, and consequently to expound the complete system of reason, that is the business of the *Wissenschaftslehre.* By it the theoretical and practical reason shall be shown to coincide; for while the categories of cognition and the whole system of pure thought can be expounded from one principle, the ground of this principle is scientifically, or to cognition, inexplicable, and is made conceivable only in the practical philosophy. The ultimate basis for the activity of cognition is given by the will. Even in the practical sphere, however, Fichte found that the contradiction, insoluble to cognition, was not completely suppressed, and he was thus driven to the higher view explicitly stated in the later writings.

(*b*) What, then, is this single principle, and how does it work itself out into system? To answer this one must bear in mind what Fichte intended by designating all philosophy *Wissenschaftslehre,* or theory of science. Philosophy is to him the rethinking of actual cognition, the *theory* of knowledge, the complete, systematic exposition of the principles which lie at the basis of all reasoned cognition. It traces the necessary acts by which the cognitive consciousness comes to be what it is, both in form and in content. It is the complete statement of the pure principles of the understanding in their rational or necessary order. But if complete, this *Wissenschaftslehre* must be able to deduce the whole organism of cognition from certain primary axioms, themselves incapable of proof; only thus can we have a *system* of reason.

Of such primitive principles only three are thinkable—one perfectly unconditioned both in form and matter; a second, unconditioned in form but not in matter; a third, unconditioned in matter but not in form. Of these, the first to some extent conditions the other two, though these cannot be deduced from it or proved by it. The statement of these principles forms the introduction to *Wissenschaftslehre.*

The primitive condition of all intelligence is that the ego shall affirm or be aware of itself This is the first pure act by which consciousness can come to be what it is It is what Fichte called a Deed-act (*Thathandlung*); we cannot be aware of the process—the ego *is* not until it has affirmed itself—but we are aware of the result, and can see the necessity of the act by which it is brought about In consciousness there is equally given a primitive act of op-positing, or contra-positing, formally distinct from the act of position, but materially determined, in so far as what is op-posited must be the negative of that which was posited The non-ego—not, be it noticed, the word as we know it—is op-posed in consciousness to the ego. How this act of op-positing is possible and necessary only becomes clear in the practical philosophy, and even there the inherent difficulty leads to a higher view But third, we have now an absolute antithesis to our original thesis Only the ego is real, but the non-ego is posited in the ego The contradiction is solved in a higher synthesis, which takes up into itself the two opposites The ego and non-ego *limit* one another, or determine one another, and, as limitation is negation of part of a divisible quantum, in this third act, the divisible ego is op-posed to a divisible non-ego

From this point onwards the course proceeds by the method already made clear. We progress by making explicit the oppositions contained in the fundamental synthesis, by uniting these opposites, and analysing the new synthesis until we reach an ultimate pair Now, in the synthesis of the third act two principles may be distinguished —(1) the non-ego determines the ego; (2) the ego determines the non-ego As determined the ego is theoretical, as determining it is practical, ultimately the opposed principles must be united by showing how the ego is both determining and determined.

It is impossible to enter here on the steps by which the theoretical ego is shown to develop into the complete system of cognitive categories, or to trace the deduction of the processes (productive imagination, intuition, sensation, understanding, judgment, reason) by which the indefinite non-ego comes to assume the appearance of definite objects in the forms of time and space All this evolution is the consequence of the determination of the ego by the non-ego But it is clear that the non-ego cannot really determine the ego There is no reality beyond the ego itself The contradiction can only be suppressed if the ego opposes to itself the non-ego, places it as an *Anstoss* or plane on which its own activity breaks and from which it is reflected. Now, this op-positing of the *Anstoss* is the necessary condition of the practical ego, of the will. If the ego be a striving power, then of necessity a limit must be set by which its striving is manifest But how can the infinitely active ego posit a limit to its activity? Here we come to the *crux* of Fichte's system, which is only partly cleared up in the *Rechtslehre* and *Sittenlehre.* If the ego be pure activity, it can only become aware of itself by positing some limit. We cannot possibly have any cognition of how such an act is possible. But as it is a free act, the ego cannot be determined to it by anything beyond itself; it cannot be aware of its own freedom otherwise than as determined by other free egos. Thus in the *Rechtslehre* and *Sittenlehre,* the multiplicity of egos is deduced, and with this deduction the first form of the *Wissenschaftslehre* appeared to end.

(*c*) But in fact deeper questions remained. We have spoken of the ego as becoming aware of its own freedom, and have shown how the existence of other egos and of a world in which these egos may act are the conditions of consciousness of freedom. But all this is the work of the ego, and follows if the ego comes to consciousness. We have therefore to consider that the absolute ego, from which spring all the individual egos, is not subject to

these conditions, but freely determines itself to them. In 1800 Fichte in the *Bestimmung des Menschen* defined this absolute ego as the infinite moral will of the universe, God, in whom are all the individual egos, from whom they have sprung. More precise utterances are given in the *Thatsachen des Bewusstseyns* and in the later lectures. In them God is the absolute Life, the absolute One, who becomes conscious of himself by self-diremption into the individual egos The individual ego is only possible as opposed to a non-ego, to a world of the senses, thus God, the infinite will, manifests himself in the individual and the individual has over against him the non-ego or thing "The individuals do not make part of the being of the one life, but are a pure form of its absolute freedom" "The individual is not conscious of himself, but the Life is conscious of itself in individual form and as an individual." In order that the Life may act, though it is not necessary that it *should act,* individualization is necessary. "Knowledge is not mere knowledge of itself, but of being, and of the one being that truly is, viz. God . . . This one possible object of knowledge is never known in its purity, but ever broken into the various forms of knowledge which are and can be shown to be necessary The demonstration of the necessity of these forms is philosophy or *Wissenschaftslehre" (Thats des Bewuss. Werke,* ii 685).

It will escape no one (1) how the idea and method of the *Wissenschaftslehre* prepare the way for the later Hegelian dialectic, and (2) how completely the philosophy of Schopenhauer is contained in the later writings of Fichte. It is not to the credit of historians that Schopenhauer's debt should have been given so little notice

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On Fichte's social philosophy *see* F. Schmidt-Warneck, *Die Sociologie Fichtes* (Berlin, 1884), W. Windelband, *Fichtes Idee des deutschen Staates* (1890), M Weber, *Fichtes Sozialismus und sein Verhaltnis zur Marx'schen Doctrin* (1900); S H Gutman, *J G Fichtes Sozialpadogogik* (1907); H. Lindau, *Fichte und der neuere Socialismus* (1900), R Strecker, *Fichtes Staatsphilosophie* (1917), G. H. Turnbull, *The Educational Theory of Fichte* (Liverpool, 1926). A complete bibliography is given in Ueberweg, *Grund der Gesch der Phil.* (pt. 4, 1916).

FICHTELGEBIRGE, a mountain group of Bavaria, forming the centre from which various mountain ranges radiate—the Elstergebirge, linking it to the Erzgebirge, in a north-east, the Frankenwald in a north-west, and the Bohmer Wald in a south-east direction. The streams which rise here are the Eger and the Saale, both flowing into the Elbe; the Weisser Main into the Rhine, and the Naab into the Danube. The chief peaks of the group are the Schneeberg (3,448 ft.) and the Ochsenkopf (3,356 ft) The district is thickly wooded and is rich in mineral wealth, producing iron, vitriol, sulphur, copper, lead and many kinds of marble. A large population is supported by the iron mines, forges and blast furnaces, and by charcoal burning. Although surrounded by railways and crossed by the several lines, the Fichtelgebirge, owing to its raw climate and bleakness, is not much visited. The chief places of interest are Alexandersbad (a delightfully situated watering-place) and the granite labyrinth of Luisenburg

FICINO, MARSILIO (1433–1499), Italian philosopher and writer, and recognized as the earliest Platonist of the Renaissance, was born on Oct 19, 1433, at Figline, in the upper Arno valley. His father, a physician of some eminence, was attached to Cosimo de' Medici. Cosimo perceived the boy's ability in literature and the physical sciences, and took him into his household with the intention of using his gifts in the propagation of Platonism and in the replacement of Christianity by a semi-pagan theosophy deduced from the writings of the later Pythagoreans and Platonists. To resuscitate the once so famous Academy of Athens Cosimo assembled men of letters for the purpose of Platonic disputation at certain regular intervals, and appointed Marsilio as hierophant and official expositor of Platonic doctrine.

Before he had begun to learn Greek, Marsilio entered upon the task of studying Plato, and while yet a novice, he wrote voluminous treatises on the great philosopher, which he afterwards burnt In 1459 John Argyropoulos was lecturing on Greek language and literature at Florence, and Marsilio became his pupil. About 1482 he completed his translation of Plato, and published his *Theologia Platonica de immortalitate animae,* by which his rank as a philosopher must be estimated. This was followed by the translation of Plotinus into Latin (1486) and by a voluminous commentary (1491) Marsilio next devoted his energies to the translation of Dionysius the Areopagite, who had supreme attraction for the mystic and uncritical intellect of Ficino.

It is not easy to evaluate the services of Marsilio Ficino. As a philosopher, he was not original, his laborious treatise on Platonic theology being little better than a mass of ill-digested erudition. As an exponent of Plato he, like his contemporaries, suffered from the error of confounding Plato with the later Platonists. The whole of antiquity seemed precious in his eyes Ficino was, moreover, a firm believer in planetary influences, and could not separate his philosophical from his astrological studies His superstition led to his being accused of magic in 1489, but the good offices of Francesco Soderini, Ermolao Barbaro, and the archbishop Rinaldo Orsini saved him. The value of Ficino's translations, however, gave an impulse to Platonic studies in Italy, and through them to the formation of the new philosophy in Europe Ficino differed from the majority of his contemporaries in that while he felt the charm of antiquity he never lost his faith in Christianity, or contaminated his morals For him, as for Petrarch, St. Augustine was the model of a Christian student The cardinal point of his doctrine was the identity of religion and philosophy. Philosophy consists in the study of truth and wisdom, and God alone is truth and wisdom; therefore philosophy is but religion, and true religion is genuine philosophy Religion, indeed, is common to all men, but its pure form is that revealed through Christ. The Platonic doctrine was providentially made to harmonize with Christianity, in order that by it speculative intellects might be led to Christ

Of Ficino's personal life there is but little to be said. Cosimo de' Medici gave him a house near S Maria Nuova in Florence, and a little farm at Montevecchio, near his two friends, Pico at Querceto, and Poliziano at Fiesole From his letters of 1474–94, published both separately and in his collected works, it may be gathered that nearly every living scholar of note was included among his friends. In 1473, Ficino took orders and received a canonry of S. Lorenzo. In spite of his weak health, he was assiduous in the performance of his duties, and in literary pursuits he was indefatigably industrious. His tastes were of the simplest; and while scholars like Filelfo were intent on extracting money from their patrons by flattery and threats, he remained so poor that he owed the publication of all his works to private munificence. For his Medici patrons Ficino always felt the liveliest gratitude. With Lorenzo he lived on terms of familiar, affectionate, almost parental intimacy, though in later years he did not shrink from uttering a word of warning and advice, when he thought that the master of the Florentine republic was too much inclined to pleasure. Ficino died at Florence in 1499.

Besides the works already noticed, Ficino composed a treatise on the Christian religion (1476), a translation into Italian of

Dante's *De monarchia,* a life of Plato, and numerous essays on ethical and semi-philosophical subjects. Vigour of reasoning and originality were not his characteristics as a writer. Only in familiar letters, prolegomena, and prefaces do we find the man Ficino, and learn to know his thoughts and sentiments unclouded by a mist of citations; these minor compositions have therefore a value, inasmuch as they throw light upon the learned circle gathered round Lorenzo in the golden age of humanism

See *Marsilii Ficini opera* (Basileae, 1576); *Marsilii Ficini vita,* auctore Corsio (ed Bandini, Pisa, 1771); *Briefe des Mediceerkreises aus M Ficino's Epistolarium,* trans by Karl Markgraf v Montoriola (1925), W Roscoe, *Life of Lorenzo de' Medici* (1796, etc), Pasquale Villari, *La Storia di Girolamo Savonarola* (1859, Eng trans, 1889), Von Reumont, *Lorenzo de' Medici* (Leipzig, 1874), and G Saitta, *La Filosofia di M Ficino* (Messina, 1924)

FICKSBURG, a town in the Orange Free State, near the Caledon river and Basutoland border; altitude 5,347 ft; pop (1921), 2,027 whites, 1,295 natives It is situated on the main railway line from Natal to Bloemfontein The town does a large trade with Basutoland The surrounding District of Ficksburg is healthy, and produces considerable quantities of wheat, maize, and, in recent years, apples and plums

FICTION: *see* NOVEL, ROMANCE

FICTIONS, or legal fictions, in law, the term used for false averments, the truth of which is not permitted to be called in question English law as well as Roman law abounds in fictions Sometimes they are merely the condensed expression of a rule of law—*e g*, the fiction of English law that husband and wife were one person, and the fiction of Roman law that the wife was the daughter of the husband Sometimes they must be regarded as reasons invented in order to justify a rule of law according to an implied ethical standard Of this sort seems to be the fiction or presumption that everyone knows the law, which reconciles the rule that ignorance is no excuse for crime with the moral commonplace that it is unfair to punish a man for violating a law of whose existence he was unaware Again, some fictions are deliberate falsehoods, adopted as true for the purpose of establishing a remedy not otherwise attainable Of this sort are the numerous fictions of English law by which the different courts obtained jurisdiction in private business, removed inconvenient restrictions in the law relating to land, etc (*See* BARGAIN AND SALE)

What to the scientific jurist is a stumbling-block is to the older writers on English law a beautiful device for reconciling the strict letter of the law with common sense and justice Blackstone, in noticing the well-known fiction by which the court of king's bench established its jurisdiction in common pleas (viz that the defendant was in custody of the marshal of the court), says, "These fictions of law, though at first they may startle the student, he will find upon further consideration to be highly beneficial and useful; especially as this maxim is ever invariably observed, that no fiction shall extend to work an injury, its proper operation being to prevent a mischief or remedy an inconvenience that might result from the general rule of law So true it is that in *fictione juris semper subsistit aequitas*"

Fictions form one of the agencies by which, in progressive societies, positive law is brought into harmony with public opinion. The others are equity and statutes Fictions in this sense include, not merely the obvious falsities of the English and Roman systems, but any assumption which conceals a change of law by retaining the old formula after the change has been made It thus includes both the case law of the English and the *Responsa Prudentum* of the Romans "At a particular stage of social progress they are invaluable expedients for overcoming the rigidity of law; and, indeed, without one of them, the fiction of adoption, which permits the family tie to be artificially created, it is difficult to understand how society would ever have escaped from its swaddling clothes, and taken its first steps towards civilization" (Sir H. Maine, *Ancient Law*)

The bolder remedial fictions of English law have been to a large extent removed by legislation Thus in ejectment cases the mysterious sham litigants have disappeared. The bond of entail can be broken without having recourse to the collusive proceedings of fine and recovery. Many fictions must have begun their career as metaphors concealing principles. The conception that a man-of-war is a floating island, or that an ambassador's house is beyond the territorial limits of the country in which he resides, was originally a figure of speech designed to set a rule of law in a striking light. It is then gravely accepted as true in fact, and other rules of law are deduced from it On the other hand, obsolete principles may be classed as fictions when they are quoted as having a present existence Thus the legal attributes of the king, and even of the House of Lords, are fictions Again, many would hold that the assertion that any elective government really represents the people is hardly more than a fiction.

Bentham notices the comparative rarity of fictions in Scots law As to fiction in particular, compared with the work done by it in English law, the use made of it by the Scottish lawyers is next to nothing No need have they had of any such clumsy instrument. They have two others "of their own making, by which things of the same sort have been done with much less trouble *Nobile officium* gives them the creative power of legislation; this and the word desuetude together the annihilative" And he notices aptly enough that, while the English lawyers declared that James II had abdicated the throne (which everybody knew to be false), the Scottish lawyers boldly said he had forfeited it (*Historical Preface to the second edition of the Fragment on Government*)

FIDDLE, a popular term for the violin, derived from the names of certain of its ancestors The word has first been traced in 1205 in Layamon's *Brut* (7002), "of harpe, of salteriun, of fithele and of coriun" In Chaucer's time the fiddle was evidently a well-known instrument·

> For him was lever [*i e*, liefer] have at his beddes hed
> A twenty bokes, clothed in black or red,
> Of Aristotle and his Philosophie,
> Than robes riche or fidel or sautrie.
>
> (Prologue, v. 298)

The remote common ancestor of the fiddle is the *ketharah* of the Assyrians, the parent of the Greek cithara. The Romans are responsible for the word fiddle, having bestowed upon a kind of cithara—probably then in its first transition—the name of *fidiculae* (more rarely *fidicula*), a diminutive form of *fides*

For the descent of the guitar-fiddle, the first bowed ancestor of the violin, through many transitions from the cithara, *see* CITHARA, GUITAR, and GUITAR-FIDDLE.

FIDEICOMMISSION, the name given in Roman law to a provision made by a testator directing his heir or legatee to enter on the inheritance and subsequently denude wholly or partially in favour of a third party. It was introduced formally in the time of Augustus, previously having had no legal force. As cases arose of a legatee failing to comply with this request a court was instituted, the *praetor commissarius,* with special powers of adjudication *See* ROMAN LAW; SETTLEMENT, ACT OF.

FIDELITY GUARANTEE: *see* INSURANCE. *Miscellaneous.*

FIDENAE, an ancient town of Latium, situated about 6 m. north of Rome on the Via Salaria. It was for some while the frontier of the Roman territory and was often in the hands of Veii being of importance owing both to its command of the road, and to the existence here of a ferry over the Tiber, which lasted on into imperial times, serving to connect the property of Livia, on this bank with her villa near Saxa Rubra (*q v.*) It is spoken of by classical authors as a place almost deserted in their time, though it was a post station The site of the *arx* of the ancient town is to be sought on the hill on which Castel Giubileo stands, while the town lay on the opposite side of the highroad

See Panaitescu in *Ephemeris Dacico-Romana,* ii. (1924) 416.

FIDENTIA, formerly **BORGO SAN DONNINO,** a town and Episcopal see of Emilia, Italy, province of Parma, 14 m. N.W. by rail from that town. Pop. (1921) town, 6,561; commune, 15,500 It occupies the site of the ancient Fidentia, on the Via Aemilia and resumed its name very recently. Here M. Lucullus defeated the democrats under Carbo in 82 B.C. Independent under Vespasian, it became subject to Parma. Its mediaeval name came from the martyrdom of S. Domninus under Maximian in

A.D 304. The cathedral of S. Domninus is one of the finest Lombardo-Romanesque churches (11th–13th cent). Near the town is the small brick church of S. Antonio del Viennese (13th century) The Palazzo Comunale is in Gothic-Lombard style of the 14th century Fidentia is an agricultural centre.

FIDUCIARY, a term derived from Roman law and used in those foreign codes which have been chiefly influenced thereby. The idea, but hardly the law, corresponds with the English trustee. (*See* TRUST) Many relations give rise to fiduciary obligations, and are even treated as occasioning trust obligations, *e.g.*, parent and child, guardian and ward, principal and agent, etc. (*See* CHILDREN, PROTECTIVE LAWS; INFANT; PRINCIPAL AND AGENT) Such obligations exist, however, independently of the true notion of trusteeship and are to be found where this notion is but rudimentary They may rather be said, being in relation to property, to arise from quasi-contract, where not statutory

FIDUCIARY ACCOUNTING, that branch of accounting pertaining to the accounts of one who undertakes to act in a fiduciary capacity, and, in general, any trustee who manages the affairs of a beneficiary The fiduciary must account to a court of competent jurisdiction in the form and manner prescribed, if any In rendering his account he will charge himself with the value of the assets with which he is intrusted, with the increase thereof as well as the income collected, if any, he will credit himself with the values of which he has divested himself, and with the decrease in assets, if any, as well as any proper expenses incurred in the administration of his trust The balance will represent the assets in his possession at the date of the accounting (J. T MAD)

FIDUCIARY ISSUE. This term refers to that portion of a note issue, whether that of a Government or of a bank, which is not protected by a specific backing of metal or coin or assets capable of being converted into coin or bullion on demand. Thus, where no metallic reserve or other assets capable of automatic conversion into metal is kept, the whole issue is of a fiduciary character The term does not imply that there are no assets of any kind maintained against the note, but only that such assets as are kept are of a non-metallic character—commercial bills of exchange, Government securities or floating debt due by Government In the modern world where many central banks keep part of their "metallic reserves" not in their own vaults, but in the shape of deposits with other central banks or in the shape of short-dated bills payable in other gold-using countries, it is no longer possible to draw a sharp line of distinction between the fiduciary and the non-fiduciary portion of the total circulation, and what is regarded as "gold cover" has in such cases to be defined carefully by the legislation governing the issue Strictly, the fiduciary circulation consists of all that part of the total issue which is not directly covered by gold coin or bullion in vault or such metal "earmarked" (*i.e.*, held specifically segregated) on account of the issue in some other institution

It does not follow that the mere maintenance of a cash reserve adds to the safety of a note issue. To do so the whole of the note issue must be convertible; *i.e.*, the reserve against the notes must be used in case holders desire them to be redeemed Unless the note is effectively convertible, an increase in the total note issue accompanied by an increase in the total reserve will not necessarily prevent "over issue," *i.e.*, a total of notes so large that its value falls in terms of the standard of value. A fiduciary issue may retain its full value provided it is limited in quantity, even without any metallic reserve at all.

The fiduciary amount may be fixed absolutely in amount: *i.e.*, the issuer may be prohibited from issuing more than a certain volume of uncovered notes. This is the traditional British principle. Or the note issue may be based upon the principle of a fixed absolute amount, the proportion of covered to uncovered notes being left to the discretion of the issuing authority, which is the traditional French principle. Or the note issue may be based upon the idea of a proportionate reserve without any absolute limit to the total, a minimum proportion of cash indirectly fixing the amount of the fiduciary issue. The system of proportional reserves and of a fixed fiduciary amount may be partly combined by providing that if the total issue exceeds the sum of the fully covered notes and the fixed fiduciary amount (the so-called tax-free contingent) the excess shall be taxable. Lastly in the modern world the principle of the elastic reserve proportion is gaining ground rapidly: the reserve proportion is allowed to vary (thus varying the fiduciary portion), subject to provisions by which the tendency to over-issue is checked by a scale of taxation rising as the reserve proportion falls (T. E G.)

FIEF, a feudal estate in land, land held from a superior (*see* FEUDALISM) The word is the French form, which is represented in Mediaeval Latin as *feudum* or *feodum*, and in English as "fee" or "feu" (*see* FEE) The A Fr *feoffer*, to invest with a fief or fee has given the English law terms "feoffee" and "feoffment"

FIELD, CYRUS WEST (1819–1892), American capitalist, projector of the first Atlantic cable, was born at Stockbridge, Mass, on Nov 30, 1819 He was a brother of David Dudley Field In 1840 he went into the paper business for himself at Westfield, Mass, but almost immediately became a partner in E Root and Co, wholesale paper dealers in New York city. In 1841 he formed the firm of Cyrus W. Field and Co. In 1853 he travelled with Frederick E Church, the artist, through South America In 1854 he became interested in the project of Frederick Newton Gisborne (1824–92) for a telegraph across Newfoundland; and he was attracted by the idea of a trans-Atlantic telegraphic cable, as to which he consulted S F B Morse and Matthew F Maury, head of the National Observatory at Washington With Peter Cooper, Moses Taylor (1806–82), Marshall Owen Roberts (1814–80) and Chandler White, he formed the New York, Newfoundland and London Telegraph Company He and John W Brett, who was now his principal colleague, approached Sir Charles Bright (*q.v.*) in London, and in Dec. 1856, the Atlantic Telegraph Company was organized by them in Great Britain, a Government grant being secured of £14,000 annually for Government messages Similar grants were made by the United States Government Unsuccessful attempts to lay the cable were made in Aug 1857, and in June 1858; the complete cable was laid between July 7 and Aug 5, 1858; but in October the cable became useless, owing to the failure of its electrical insulation In July 1866, after a futile attempt in the previous year, a cable was laid and brought successfully into use. From the Congress of the United States he received a gold medal and a vote of thanks, and he received many other honours both at home and abroad In 1877 he bought a controlling interest in the New York Elevated Railroad Company, controlling the Third and Ninth avenue lines, of which he was president in 1877–80. He worked with Jay Gould for the completion of the Wabash railway, and bought *The New York Evening Express* and *The Mail* and combined them as *The Mail and Express* In 1879 Field suffered financially by Samuel J Tilden's heavy sales of "Elevated" stock, but lost much more in the great "Manhattan squeeze" of June 24, 1887, when Jay Gould and Russell Sage, who had been supposed to be his backers, forsook him. Field died in New York on July 12, 1892.

See the biography by his daughter, Isabella (Field) Judson, *Cyrus W Field, His Life and Work* (1896), H. M Field, *History of the Atlantic Telegraph* (1866), and Charles Bright, *The Story of the Atlantic Cable* (1903).

FIELD, DAVID DUDLEY (1805–1894), American lawyer and law reformer, was born in Haddam, Conn., on Feb. 13, 1805. He graduated at Williams college in 1825, and settled in New York city, where he was admitted to the bar in 1828 Interested in the reformation of the common law, he visited Europe in 1836 and thoroughly investigated the courts, procedure and codes of England, France and other countries Upon his return, he worked for 40 years to bring about a codification of the common law procedure in the United States. In 1846 he published a pamphlet, "The Reorganization of the Judiciary," which had its influence in persuading the New York State Constitutional Convention of that year to report in favour of a codification of the laws. Finally, in 1847, he was appointed head of a State commission to revise the practice and procedure. The code of civil procedure was reported and enacted in 1848, and by April 6, 1857, the code of civil and

criminal procedure was completed and enacted

Eventually, the civil code with some changes was adopted in 24 states, and the criminal code in 18; the civil code of procedure was adopted in England and Ireland in 1873, and later by several British colonies. In 1857 Field became chairman of a state commission for the reduction into a written and systematic code of the whole body of law of the state. Although this codification was adopted only in small part, it has served as a model after which most of the law codes of the United States have been constructed In 1866 he proposed to the British National Association for the Promotion of Social Science a revision and codification of the laws of all nations For an international commission of lawyers he prepared *Draft Outlines of an International Code* in 1872, which resulted in the foundation of the International Law Association at Brussels in 1873. During his life, Field gave considerable attention to politics, and from Jan to March 1877 served out in Congress the unexpired term of Smith Ely, elected mayor of New York city. His congressional career, though short, was crowded with activity He died in New York city April 13, 1894

Part of his numerous pamphlets and addresses were collected in his *Speeches, Arguments and Miscellaneous Papers* (1884–90) *See* also the *Life of David Dudley Field* (1898), by Rev Henry Martyn Field

FIELD, EUGENE (1850–1895), American poet, was born in St Louis (Mo), Sept 3, 1850 Because of an error, Field thought, until the last years of his life, as is shown by his autobiographical notes and by the date appended to his birthday poem "Thirty-Nine," that the day of his birth was Sept 2 As a young child, after his mother's death, he was taken by relatives to Amherst (Mass), where he passed his boyhood Though educated mainly in a private school, he attended in turn Williams and Knox colleges and the University of Missouri, remaining but a few months in each and taking no degree. His early inclination was toward the stage, but his facility as a satirical writer, which was manifest even in early youth, gave him ready employment in journalism, first on a St Louis newspaper and later in turn on newspapers in St. Joseph, Kansas City and Denver. For them he wrote brilliant paragraphs, fantastic sketches, and humorous verse In 1883 he joined the editorial staff of *The Chicago Daily News*

From that time until his death, Nov. 4, 1895, he contributed to *The Daily News* paragraphs on a great variety of subjects, humorous and satirical articles, serious poems and light verse At first his work was notable mainly for its caustic humour and audacity, his fancy leading him into grotesque inventions that ostensibly set forth absurd views or described preposterous actions of well-known persons A collection of these effusions was republished in a volume (*Culture's Garland,* Boston, 1887). The book was received with such favour that its author was encouraged to attempt serious work In 1888 his best known poem "Little Boy Blue" appeared. There followed many others, a considerable number of which were written for or about children, and these attained instant popularity In 1889 was privately printed a collection of his poems entitled *A Little Book of Western Verse* (Chicago), along with a volume of his prose stories, *A Little Book of Profitable Tales* (Chicago). A year later these books were published in New York, and had a large sale Other volumes of poems followed: *A Second Book of Verse* (1892); *With Trumpet and Drum* (1892); and *Love Songs of Childhood* (1894) In 1892 *Echoes from the Sabine Farm* was privately printed The rhymed translations from Horace composing its contents were partly by Field and partly by his brother Roswell (1851–1919) The year after Field's death, his collected works were published in ten volumes, and in 1901 two more volumes were added. His poems of childhood have maintained their hold on the popular heart. In general, his poems are marked by a fine metrical quality, but not by originality of thought or expression. His prose writings are of distinctly less merit, being somewhat laboured and mechanical. Chief of his prose writings in a lighter vein is *The Love Affairs of a Bibliomaniac.*

See *The Life of Eugene Field,* by Slasen Thompson (1927), *Eugene Field's Creative Years,* by Charles H. Dennis (1924), and the introductions to the several volumes of Field's collected works.

FIELD, FREDERICK (1801–1885), English divine and biblical scholar, was born in London and educated at Christ's hospital and Trinity College, Cambridge, where he obtained a fellowship in 1824 He published an emended and annotated text of Chrysostom's *Homiliae in Matthaeum* (Cambridge, 1839), and some years later contributed to Pusey's *Bibliotheca Patrum* (Oxford, 1838–70), a similarly treated text of Chrysostom's homilies on Paul's epistles. The scholarship displayed in both of these critical editions is of a very high order. In 1839 he had accepted the living of Great Saxham, in Suffolk, and in 1842 was presented by his college to the rectory of Reepham in Norfolk He resigned in 1863, and settled at Norwich, in order to devote his whole time to study. Twelve years later he completed the *Origenis Hexaplorum quae supersunt* (Oxford, 1867–75), now well known as *Field's Hexapla,* a text reconstructed from the extant fragments of Origen's work of that name, together with materials drawn from the *Syro-hexaplar* version and the *Septuagint* of Holmes and Parsons (Oxford, 1798–1827). Field was appointed a member of the Old Testament revision company in 1870

FIELD, JOHN (1782–1837), English musical composer and pianist, was born at Dublin on July 26, 1782 He came of a musical family, his father being a violinist, and his grandfather the organist in one of the churches of Dublin From the latter the boy received his first musical education When a few years later the family settled in London, Field became the favourite pupil of Clementi, whom he accompanied to Paris for the purpose of showing off the Clementi pianos, and later, in 1802, on his great concert tour through France, Germany and Russia Field appeared in public in most of the great European capitals, and remained in St Petersburg as a teacher of music when Clementi returned to England His marriage with a French lady of the name of Charpentier was anything but happy, and had soon to be dissolved Field made frequent concert tours to the chief cities of Russia, and in 1820 settled permanently in Moscow In 1831 he came to England for a short time, and for the next four years led a wandering life in France, Germany and Italy In Naples he fell seriously ill, and lay several months in the hospital, till a Russian family discovered him and brought him back to Moscow There he died on Jan. 11, 1837. Field's seven concertos for the pianoforte are now forgotten; so are his quartets for strings and pianoforte But some of his "nocturnes" for the pianoforte, a form of music highly developed, if not actually created by him, still live because of their continuous flow of beautiful melody. They were indeed Chopin's models Field's execution on the pianoforte was nearly allied to the nature of his compositions, Moscheles, who heard Field in 1831, speaks of his "enchanting legato, his tenderness and elegance and his beautiful touch " An admirable essay by Liszt on Field is prefixed to a volume of the latter's nocturnes published by Schuberth & Co in 1837.

FIELD, MARSHALL (1835–1906), American merchant, was born at Conway (Mass), on Aug 18, 1835. At the age of 17 he became a clerk in a dry goods store at Pittsfield (Mass) In 1856 he removed to Chicago, where he became a clerk in the large mercantile establishment of Cooley, Wadsworth and Company. In 1860 he was admitted to a junior partnership. In 1865, with Potter Palmer (1826–1902) and Levi Z. Leiter (1834–1904), he organized the firm of Field, Palmer and Leiter, which subsequently became Marshall Field and Company Under Field's management the annual business of the firm increased to more than $40,000,000 in 1895 He died in New York city on Jan. 16, 1906 Field's public benefactions were numerous; notable among them being his gifts to the University of Chicago and to the Field Columbian Museum of Natural History

FIELD, NATHAN (1587–1633), son of the Puritan rector of Cripplegate, London, was baptized on Oct 17, 1587. He was a schoolboy at St. Paul's grammar school when he became (1600) one of the "children" of the Chapel Royal, and he remained connected with that company or the Queen's Revels until 1613, when the company was absorbed in the Lady Elizabeth's players. He played in Ben Jonson's pieces, and took the title rôle in Chapman's *Bussy d'Ambois* (1606). He left the company in 1615, and joined the King's Men. He seems to have left this company in

1619, and about this time married. A Nathaniel Field died on Feb. 20, 1633, in the parish of Blackfriars, but he had a brother named Nathaniel, to whom the entry probably refers. His name comes 17th on the list of 26 players, "the principal actors in all these Playes," in the 1623 Shakespeare folio

The two plays printed under Nat. Field's name are: *A Woman is a Weathercock* (acted 1609?, pr. 1611) and *Amends for Ladies* (acted 1611, pr. 1618). To Field is assigned a share in Massinger's *Fatal Dowry* (pr. 1632), and he is credited by some critics with a share in some of the Beaumont and Fletcher plays

His two plays were reprinted in J P. Collier's *Five Old Plays* (1833), in Hazlitt's edition of *Dodsley's Old Plays,* and in *Nero and other Plays* (Mermaid series, 1888), with an introduction by A. W. Verity.

FIELD, STEPHEN JOHNSON (1816–1899), American jurist, was born at Haddam (Conn), on Nov 4, 1816 In 1837 he graduated from Williams college. He then studied law, and in 1841 was admitted to the New York bar. He practised in New York until 1849, when he removed to California. In 1850 he was chosen a member of the first State legislature of California, in which he drew up and secured the enactment of two bodies of law known as the Civil and Criminal Practices Acts In the former Act he embodied a provision regulating and giving authority to the peculiar customs, usages, and regulations voluntarily adopted by the miners in various districts of the State for the adjudication of disputed mining claims. This Act was the foundation of the jurisprudence respecting mines in the country In 1857 Field was elected justice of the California supreme court, of which he became chief justice in 1859 In 1863 he was appointed by President Lincoln a justice of the U.S. supreme court In this capacity he was conspicuous for fearless independence of thought and action in his opinion in the test oath case, and in his dissenting opinions in the legal tender, conscription, and "slaughter house" cases. His anti-slavery sympathies forced him to accept Lincoln's doctrine of coercion, and led him to act with the Republican party. In 1873 he was a member of the commission which revised the California code, and of the electoral commission in 1877 (*q v.*), voting in favour of Tilden In Aug 1889, as a result of a ruling in the course of the Sharon-Hill litigation, a notorious conspiracy case, he was assaulted in a California railway station by Judge David S Terry, who in turn was shot and killed by a United States deputy marshal appointed to defend Justice Field Field retired from the supreme court on Dec 1, 1897 after a service of 34 years and six months, and died in Washington on April 9, 1899.

His *Personal Reminiscences of Early Days in California,* originally privately printed in 1878, was republished in 1893 with George C. Gorham's *Story of the Attempted Assassination of Justice Field.*

FIELD, WILLIAM VENTRIS FIELD, BARON (1813–1907), English judge, was born at Fielden, Bedfordshire, on Aug 21, 1813 He was called to the bar at the Inner Temple in 1850, after having practised for some time as a special pleader. He had for some time been the leader of the Midland circuit, when in Feb. 1875, on the retirement of Mr. Justice Keating, he was raised to the bench as a justice of the queen's bench When the rules of the Supreme Court 1883 came into force in the autumn of that year, the lord chancellor selected him to sit continuously at Judges' Chambers, in order that a consistent practice under the new rules might as far as possible be established. This he did for nearly a year, and his name will always be associated with the settling of the details of the new procedure, which finally did away with the former elaborate system of "special pleading" In 1890 he retired from the bench, and was raised to the peerage as Baron Field of Bakeham, becoming at the same time a member of the privy council. He died at Bognor on Jan. 23, 1907.

FIELD, open country as opposed to woodland, and particularly land for cultivation divided up into separate portions by hedges, banks, stone walls, etc. (Ger. *Feld,* Dutch *veld,* from the Gr. root *πλατύς,* broad). The word is applied to a region with particular reference to its products, as oil-field, gold-field, etc. There are many applications of the word; thus from the use of the term for the place where a battle is fought, or for the whole theatre of war, come such phrases as to "take the field" for the opening of a campaign, "in the field" of troops engaged in the operations of a campaign (also "field-fortifications" and "field-day"). A "field-officer" ranks above a captain and below a general (*see* OFFICERS), a field marshal is the highest general officer in the British and many European armies (*see* MARSHAL) "To field" in certain games is to stop or catch the ball played by the "in" side "The field" is used in hunting, for those taking part in the sport, and in racing for all the horses entered for a race, and, in such expressions as "to back the field," is confined to all the horses with the exception of the "favourite" A common application of the word is to a wide surface as of the sky or sea, or of such physical phenomena as ice or snow, or to the ground on which armorial bearings are displayed (*see* HERALDRY), or the "ground" of a flag; thus the white ensign of the British navy has a red St George's cross on a white "field" The word is used in science of the sphere of observation or of operations, and has come to be almost equivalent to a department of knowledge. In physics it is particularly applied to the area influenced by some agent, *e.g.*, the magnetic or electric field A "field-glass" is the name given to a binocular glass used in the field (*see* BINOCULAR INSTRUMENT). *See* also COMMONS; FIELD SYSTEM.

FIELD ARTILLERY, light guns suitable for active operations in the field (O.Fr. *artiller,* to arm) Field artillery forms the bulk of the artillery with an army; its main tasks are to assist the other arms, such as infantry and tanks, to close with the enemy, to give covering fire, to assist in repelling counter-attacks, and to carry out anti-tank defence. The British field artillery is organized into brigades of four batteries, of which three are armed with a gun of 3·3in calibre, firing a shell weighing 18lb., and one with a howitzer of 4·5in. calibre, firing a shell weighing 35lb. The field artillery of other armies corresponds fairly closely to this pattern, though the howitzer does not in all cases form part of their armament (*See* further ARTILLERY)

United States.—In the U S army the field artillery consists of light, horse, siege and mountain artillery. Its purpose is to assist the other branches, especially the infantry, on the field of battle It is organized into brigades of two or more regiments, composed of two to three battalions containing two to three batteries. For purposes of tactical employment it is divided into division artillery (light), corps artillery (medium), army artillery and GHQ reserve artillery (all types) The primary mission of division artillery is the close and immediate support of the infantry of its division The most important function of corps artillery is counterbattery. The function of army artillery is reinforcement of divisional and corps artillery within their respective zones, and long range fire deep into the enemy's territory Army artillery organically contains only a headquarters, an ammunition train and one anti-aircraft artillery brigade; but to meet its varied needs, artillery of all types is temporarily allotted from GHQ reserve.

FIELD DAY, a name given in the United States to a group picnic organized by large institutions City schools, trade organizations, corporations employing a large number of workers and city departments such as the police, make a practice of devoting a part or the whole of a day in spring to the field day It is usually held in an outlying city park, or, in some cases, in State or private amusement centres lying at some distance from the city. The main attraction on field day is a series of athletic contests, such as races, jumping contests and baseball games between individual groups within the organization. Medals, trophies and banners are given to the winners. In the case of corporations, the officers give awards to the winning employees Police field days have some of the characteristics of military manoeuvres and sham battles, and serve to demonstrate to the public the high degree of training and discipline to which the police of large cities are subject.

FIELDFARE, *Turdus pilaris,* one of the thrushes and a common winter visitor to the British Isles. In spring it nests in Scandinavian and Russian birch-forests, migrating to southern Europe, western Asia and northern Africa in winter It is gre-



BY GRACIOUS PERMISSION OF HIS MAJESTY KING GEORGE V

A CONTEMPORARY PAINTING OF THE FIELD OF THE CLOTH OF GOLD

The famous camp between Guines and Ardres, where Henry VIII of England and Francis I of France met on June 7 1520 After nearly three weeks of tournaments, pageants, masques and banquets, they parted having achieved no political results of importance. The illustration shows part of a painting attributed to Vincenzo Volpe now in Hampton Court Palace

Meanwhile he had intermittently occupied himself in composing is second great novel, *Tom Jones; or, the History of a Found-ing*, published in June 1748, with a dedication to Lyttelton. In *om Jones* Fielding systematically developed the "new Province f Writing," in which he had made a beginning in *Joseph An-rews*. He paid closer attention to the construction and evolution f the plot; he elaborated the initial essays to each book, which rovide part of its unending interest, and he compressed into his ork the flower and fruit of his forty years' experience of life. Ie has, indeed, no character quite up to the level of Parson dams, but his Westerns and Partridges, his Allworthys and lifils, his parson Thwackum and his philosopher Square, have he inestimable gift of life. He drew pictures of ordinary human-y with absolute truthfulness, neither extenuating nor disguising efects and shortcomings. The bill of fare he provided for his eaders he himself describes in the introduction of Book I. as human nature" pure and simple. As for his purpose and method e says in the Dedication: "I have employed all the wit and hu-iour of which I am master, in the following history; wherein I ave endeavoured to laugh mankind out of their favourite follies nd vices." Incidentally he produced a "document" of unrivalled xcellence on the social life of the England of his time. *Tom ones* follows the picaresque method of *Joseph Andrews*, but its lot, in spite of great diversity of its characters, the amazing vari-ty of its incidents, and its vast canvas, has a unity and coherence hich is new

Much of *Tom Jones* has become classic Take the dispute be-ween Thwackum and Square on the definition of honour. "Hon-ur," says Thwackum, "is not therefore manifold, because there re many absurd opinions about it; nor is religion manifold, be-ause there are various sects and heresies in the world. When I ention religion, I mean the Christian religion; and not only e Christian religion, but the Protestant religion; and not only e Protestant religion, but the Church of England. And when I ention honour, I mean that mode of Divine grace which is not nly consistent with, but dependent upon, this religion; and is onsistent with and dependent upon no other. . . " Square in his eply says "I have asserted that true honour and true virtue re almost synonymous terms, and they are both founded on the nalterable rule of right, and the eternal fitness of things; to which n untruth being absolutely repugnant and contrary, it is certain at true honour cannot support an untruth"

Meanwhile Fielding was taking his duties as a magistrate seri-usly His novels provide abundant evidence of his view of the nsatisfactory state of penal law and administration In May 749 he became chairman of quarter sessions at Westminster, nd in 1751 he wrote an *Enquiry into the Causes of the late ncrease of Robbers, etc.* These preoccupations left their mark on is next novel, *Amelia* (1752), which is more concerned with ocial problems and popular grievances than its forerunners. melia herself, in whom, as in the Sophia Western of *Tom Jones*, e reproduced the traits of his first wife, is certainly, as Johnson dmitted, "the most pleasing heroine of all the romances," and ie drawing of Dr. Harrison and Col. Bath is admirable. But in 749 he had been dangerously ill, and his health was visibly reaking. The £1,000 which Millar is said to have given for *melia* must have been painfully earned. Pamphlets, and an nsuccessful newspaper adventure, the *Covent Garden Journal* 1752) followed. He resigned his post as magistrate, and tried arious specifics to restore his health. Finally he tried change to warmer climate. On June 26, 1754, he accordingly left for Lis-on, in the "Queen of Portugal." The protracted discomforts of ie sick man and his family on this voyage are narrated at ngth in the posthumous tract entitled the *Journal of a Voyage Lisbon*, which, with a fragment of a comment on Bolingbroke's ien recently issued essays, was published in Feb. 1755 "for the enefit of his (Fielding's) Wife and Children." Reaching Lisbon t last in Aug. 1754, he died there two months later (Oct. 8) id was buried in the English cemetery, where a monument was ected to him in 1830. *Luget Britannia gremio non dari fovere atum* is inscribed upon it

There is but one absolutely authentic portrait of Fielding, a familiar outline by Hogarth, executed from memory for Andrew Millar's edition of his works in 1762. It is the likeness of a man broken by ill-health and affords but faint indication of the hand-some Harry Fielding, who in his salad days "warmed both hands before the fire of life."

Fielding has a great place in the history of the English novel In the *Spectator* is to be credited with foreshadowing the char-acters of the novel, Defoe with its earliest form, and Richardson with its experiments in sentimental analysis, it is to Henry Field-ing that we owe its first accurate delineation of contemporary manners. He owed much to *Don Quixote*, something to the best of the French picaresque novels, but his own creation was different from that of any of his predecessors Fielding drew a large and varied picture of life, of people neither good nor bad, but human, with a tolerance and a humour and penetrating in-sight which are rare enough. Fielding is the master from whom Dickens and Thackeray and the great school of the English Victorian novelists descend

Among the many editions of Fielding's works may be mentioned those edited by A Murphy (1762), G. Saintsbury (1893), E. Gosse (1899), the Harvard University edition (1903), etc For Fielding's life-work *see* A Dobson, *Fielding* (1907); G. M. Godden, *Henry Fielding* (1910), W L Cross, *The History of Henry Fielding* (Yale, 1918), F. T. Blanchard, *The Novels of Fielding* (Yale, 1926).

FIELDING, WILLIAM STEVENS (1848–), Canadian journalist and statesman, was born in Halifax, Nova Scotia, on Nov. 24, 1848. From 1864 to 1884 he was one of the staff of the *Morning Chronicle*, the chief Liberal paper of the province, and worked at all departments of newspaper life In 1882 he en-tered the local legislature as Liberal member for Halifax, and from 1884 to 1896 was premier and provincial secretary of the province, but in the latter year became finance minister in the Dominion administration of Sir Wilfrid Laurier and was elected to the House of Commons for Shelburne and Queen's county. He opposed Confederation in 1864–67, and as late as 1886 won a provincial election on the promise to advocate the repeal of the British North America Act His administration as finance minister of Canada was important, since in 1897 he introduced a new tariff, granting to the manufactures of Great Britain a preference, sub-sequently increased; and later he imposed a special surtax on German imports owing to unfriendly tariff legislation by that country. In 1902 he represented Canada at the Colonial Confer-ence in London He was a plenipotentiary for the negotiations of the Franco-Canada Commercial treaties in Paris (1907, 1909 and 1922); served on several Royal commissions, and negotiated various other commercial agreements He was one of the Cana-dian delegates to the Assembly of the League of Nations in 1922 From 1917–25 he was M P. for Shelburne and Queen's county, and from 1921–25 held office as minister of finance. In 1923 he was made privy councillor

FIELD-MOUSE (*apodemus*), the designation of such mouse-like British rodents as are not true or "house" mice. (*See* MOUSE and VOLE)

FIELD OF THE CLOTH OF GOLD, the name given to the place between Guînes and Ardres where Henry VIII of Eng-land met Francis I. of France in June 1520 Before the castle of Guînes a temporary palace, covering an area of nearly 12,000 sq yd, had been erected for Henry It was decorated sumptu-ously, and like the chapel, furnished with a profusion of golden ornaments. The size of Henry's following may be gathered from the fact that in one month 2,200 sheep and other viands in a similar proportion were consumed. In the fields beyond the castle, 2,800 tents were erected for less distinguished visitors. After Cardinal Wolsey had visited the French king at Ardres, the two monarchs met at the Val Doré, a spot midway between the two camps, on June 7. The subsequent tournaments, banquets and entertainments lasted until the 24th. The meeting made a great impression on contemporaries, but its political results were very small. Henry shortly after enjoyed an equally friendly meet-ing with Francis' rival, the Emperor Charles V

The *Ordonnance* for the *Field* is printed by J. S. Brewer in the *Calendar of State Papers, Henry VIII.* Vol. iii. (1867). *See* also J. S. Brewer *Reign of Henry VIII.* (1884).

FIELDS, JAMES THOMAS (1817–1881) American publisher and author, was born in Portsmouth (N H), Dec 31, 1817 At the age of 17 he went to Boston as clerk in a bookseller's shop, where he began to write for the newspapers In 1839 he became junior partner in the publishing and bookselling firm known after 1846 as Ticknor & Fields, and after 1868 as Fields, Osgood & Company He was the publisher of the foremost contemporary American writers, with whom he was on terms of close personal friendship, Whittier, for instance, depicting him in *The Tent on the Beach*, and he was the American publisher of some of the best-known British writers of his time, some of whom, also, he knew intimately The first collected edition of De Quincey's works (20 vol, 1850–55) was published by his firm As a publisher he was characterized by a somewhat rare combination of business acumen and discriminating literary taste, and as a man he was known for his geniality and charm of manner In 1862–70, as the successor of James Russell Lowell, he edited the *Atlantic Monthly* After his retirement Fields devoted himself to lecturing and to writing Apart from his poems, his chief books were the collection of sketches and essays entitled *Underbrush* (1877, enlarged ed 1881) and the chapters of reminiscence composing *Yesterdays with Authors* (1872). He died in Boston April 24, 1881

His second wife, ANNIE ADAMS FIELDS, whom he married in 1854, was a prominent literary figure She was the author, among other works, of *Under the Olive* (1880), a book of verses; *James T Fields Biographical Notes and Personal Sketches* (1881), *Authors and Friends* (1896), and *Orpheus, a Masque* (1900). *See* "Mr and Mrs James T Fields" by Henry James in the *Atlantic Monthly* (July, 1915), and *Memories of a Hostess*, drawn chiefly from the diaries of Mrs James T Fields by M A De Wolfe Howe (1922)

FIELDS, LEWIS: *see* WEBER AND FIELDS

FIELD SYSTEM: *see* OPEN FIELD SYSTEM

FIENNES, NATHANIEL (*c* 1608–1669), English politician, second son of William, first Viscount Saye and Sele, was educated at Winchester and at New College, Oxford, where as founder's kin he was admitted a perpetual fellow in 1624 After some time spent on the continent, where he came into touch with Calvinist leaders he returned to Scotland in 1639, and established communications with the Covenanters and the Opposition in England, and as member for Banbury in both the Short and Long Parliaments he took a leading part in the attacks upon the Church of England He was one of the commissioners appointed to attend the king to Scotland in Aug 1641; and was nominated one of the committee of safety in July 1642 In the Civil War he commanded a troop of horse in Essex's army, was present at the relief of Coventry in August, at Worcester and at Edgehill In Feb 1643 Fiennes was sent down to Bristol, arrested Colonel Essex the governor, executed the two leaders of a plot to deliver up the city, and received a commission himself as governor on May 1, 1643 On the arrival of Prince Rupert (July 22) Fiennes capitulated He was tried at St Albans by the council of war in December, was pronounced guilty of having surrendered the place improperly, and sentenced to death He was, however, pardoned, and subsequently exonerated He held various appointments under the Commonwealth He took no part in the Restoration, and died at Newton Tony in Wiltshire on Dec 16, 1669 Fiennes married (1), Elizabeth, daughter of Sir John Eliot, by whom he had one son, afterwards 3rd Viscount Saye and Sele, and (2), Frances, daughter of Richard Whitehead of Tuderley, Hants, by whom he had three daughters Fiennes was the author of a large number of pamphlets, some of which have been reprinted in the series of Thomason and Somers tracts

FIERI FACIAS: *see* EXECUTION.

FIESCHI, GIUSEPPE MARCO (1790–1836), Corsican adventurer, was born at Murato, Corsica on Dec 13, 1790. He served under Murat, then returned to Corsica, where he was condemned to ten years' imprisonment and perpetual surveillance by the police for theft and forgery He eluded the police, obtained a small post in Paris, and took lodgings on the boulevard du Temple There, with two members of the Société des Droits de l'Homme, Morey and Pépin by name, contrived an "infernal machine." On July 28, 1835, as Louis Philippe was passing along the boulevard to the Bastille, accompanied by his three sons and a numerous staff, the machine was exploded Marshal Mortier was killed, with 17 other persons, and many were wounded; but the king and the princes escaped Fieschi himself was severely wounded He was condemned to death, and was guillotined on Feb 19, 1836 Morey and Pépin were also executed, another accomplice was sentenced to 20 years' imprisonment and one was acquitted

See *Procès de Fieschi* (2 vols, 1836), also P Thureau-Dangin, *Hist. de la monarchie de Juillet* (vol. IV. ch. XII, 1884)

FIESCO (DE' FIESCHI), **GIOVANNI LUIGI** (*c* 1523–1547), count of Lavagna, was descended from one of the greatest families of Liguria, first mentioned in the 10th century He married Eleonora Cibò, marchioness of Massa, in 1540, a woman of great beauty and family influence The Fiesco belonged to the French or popular party, while the Doria were aristocrats and Imperialists When Fiesco determined to conspire against Doria he found friends in many quarters Pope Paul III was the first to encourage him, while both Pierluigi Farnese, duke of Parma, and Francis I of France encouraged him Among his associates in Genoa were his brothers Girolamo and Ottobuono, Verrina and R Sacco. A number of armed men from the Fiesco fiefs were secretly brought to Genoa, and it was agreed that on Jan 2, 1547, during the interregnum before the election of the new doge, the galleys in the port should be seized and the city gates held The first part of the programme was easily carried out, and Giannettino Doria, aroused by the tumult, rushed down to the port and was killed, but Andrea escaped from the city in time Giovanni Luigi, while crossing a plank from the quay to one of the galleys, fell into the water and was drowned The news spread consternation among the Fiesco faction, and Girolamo Fiesco found few adherents They came to terms with the senate and were granted a general amnesty Doria returned to Genoa on the 4th thirsting for revenge, and in spite of the amnesty he confiscated the Fiesco estates. Girolamo Fiesco and Verrina were captured, tried, tortured and executed Ottobuono Fiesco, who had escaped, was captured eight years afterwards and put to death by Doria's orders

There are many accounts of the conspiracy, of which perhaps the best is contained in E Petit's *André Doria* (1887), chs XI and XII, where all the chief authorities are quoted, *see* also E Callegari, *La Congiura del Fiesco* (Venice, 1892) and A Gavazzo, *Nuovi documenti sulla congiura del conte Fiesco* (Genoa, 1886), E Bernabò-Brea, in his *Sulla congiura di Giovanni Luigi Fieschi* (1865) publishes many important documents, while L Capelloni's *Congiura del Fiesco*, edited by A Olivieri (1858) and A Mascardi's *Congiura del conte Giovanni Luigi 'de' Fieschi* (Antwerp, 1629) may be commended among the earlier works The Fiesco conspiracy has been the subject of many poems and dramas, of which the most famous is that by Schiller *See* also under DORIA, ANDREA, FARNESE

FIESOLE (anc *Faesulae, q v*), a town and Episcopal see of Tuscany, Italy, province of Florence, it is 3 m N.E of the town of that name by electric tramway. Pop (1921) town, 2,786, commune 10,059. It is on a hill with two summits 970 ft above sea-level, and commands a fine view The cathedral of S Romolo is an early and simple Tuscan Romanesque basilica, begun 1028 and restored 1256 The picturesque battlemented campanile belongs to 1213. The 13th-century Palazzo Pretorio contains a small museum of antiquities The inhabitants of Fiesole are largely engaged in straw-plaiting

Below Fiesole, between it and Florence, lies San Domenico di Fiesole (485 ft). In the Dominican monastery the painter, Fra Giovanni Angelico da Fiesole (1387–1455), lived until he went to S. Marco at Florence Here, too, is the Badia di Fiesole, re-erected about 1456–1466 by a follower of Brunelleschi. It is an irregular pile of buildings, in fine and simple early Renaissance style; a small part of the original façade of 1028 in black and white marble is preserved The slopes of Fiesole are covered with beautiful villas, the Villa Medici and the Villa Palmieri are among the finest To the south-east lies Monte Ceceri (1,453 ft.), with quarries of grey *pietra serena*, largely used in Florence for building To the east of this lies the 14th-century castle of Vin-

cigliata restored and fitted up in the mediaeval style.

FIFE, eastern county, Scotland, bounded north by the Firth of Tay, east by the North sea, south by the Firth of Forth, and west by the shires of Perth, Kinross and Clackmannan. The Isle of May, Inchkeith, Inchcolm, Inchgarvie and the islet of Oxcar belong to the shire. It has an area (excluding water) of 323,012 acres. Its coast-line measures 108 miles The Lomond hills to the south and south-west of Falkland reach, in West Lomond, a height of 1,713 ft ; their summits show intrusive sheets of dolerite and basalt penetrating the lower Carboniferous rocks, as does that of Benarty, on the confines of Kinross Volcanic structures of various ages occur widely. in the north they are of Old Red Sandstone age and form the higher ground bordering the Firth of Tay, The Howe (or Hollow) of Fife; south of this tract, and watered in part by the river Eden, is a lowland underlain by soft Upper Old Red Sandstones· the quarries in these rocks in Dura Den are famous for their fossil fishes The Carboniferous formations occupy the rest of the county southward Many necks of volcanoes of the Permian period are traced in east Fife, as at Largo Law and in the example of columnar basalt at Kincraig Point on the coast Of the rivers the Eden is the longest, formed on the borders of Kinross-shire by the confluence of Beattie burn and Carmore burn, it pursues a wandering course for 25 m NE, partly through the Howe of Fife, to the North sea. There is good trout fishing in its upper waters, but weirs prevent salmon from ascending it The Leven and its tributary, the Ore, with the old and reclaimed loch Ore, and Motray water, are the other streams. The only large valley is the fertile Stratheden

History.—The term Fife was once applied to the peninsula lying between the estuaries of the Tay and Forth and separated from the rest of the mainland by the Ochil hills Its inhabitants were Picts of the northern branch, and their country was long known as Pictavia Doubtless it was owing to the long continuance of an independent king that Fife itself came to be called distinctively The Kingdom The Romans, probably only temporarily, occupied a few points, and left no impression on the civilization of the natives Christian missionaries—especially St Serf, St Kenneth, St Rule, St Adrian, St Moran and St Fillan—have left memorials in the numerous coast caves between Dysart and St Andrews, and in crosses and sculptured stones, some doubtless of pre-Christian origin, at various places The word Fife, according to Skene, seems to be identical with the Jutland *Fibh* (pronounced *Fife*) meaning "forest," and was probably first used by the Frisians to describe the country behind the coasts of the Forth and Tay, where Frisian tribes are supposed to have settled at the close of the 4th century The next immigration was Danish, which left lasting traces in many place-names (such as the frequent use of *law* for hill) In 1426 the first shire of Kinross was formed, consisting of Kinross and Orwell, and was enlarged to its present dimensions by the transference from Fife of the parishes of Portmoak, Cleish and Tulliebole Although the county has lain outside of the main stream of Scottish history, Dunfermline, Falkland and St Andrews were often the scene of pageantry and romantic episodes during the reigns of the earlier Stuarts Seventeen out of the 70 royal burghs in Scotland are in the shire. Notwithstanding the marked preference of the Stuarts, the Kingdom played the leading part in the dramas of the Reformation and the Covenant, and by the 18th century the people had ceased to regard the old royal line with any but sentimental interest, and the Jacobite risings of 1715 and 1745 evoked only lukewarm support.

Agriculture and Industries.—Only about $\frac{1}{17}$ of the total area is mountain and heath land, and the yield of wheat and barley is high Of the green crops most attention is given to turnips Potatoes also do well Cattle are mainly kept for feeding purposes, and dairy farming supplies only local markets. Sheep-farming, however, and the raising of horses, especially farm horses, are important. The horses are strong, active and hardy, with a large admixture, or purely, of Clydesdale blood. North of the Eden the soil, though generally thin, is fertile, and the sandy coastal waste of Tents moor is now planted with trees. From St. Andrews southwards all the coast land is very productive. That adjacent to the East Neuk is chiefly clay and rich loam. From Leven to Inverkeithing it varies from light sand to rich clayey loam Excepting Stratheden and Strathleven, which are mostly rich, fertile loam, the interior is principally cold and stiff clay or thin loam with strong clayey subsoil. Part of the Howe of Fife is light and shingly and covered with heather. Some small peat mosses still exist, and near Lochgelly there is a tract of waste, partly moss and partly heath

Fife is a great coal-producing county. The coal-field may roughly be divided into the Dunfermline basin (including Beath, Halbeath, Lochgelly and Kelty), where the principal house coals are found, and the Wemyss or Dysart basin (including Buckhaven and the hinderland), where gas-coal of the best quality is obtained Beds of ironstone, limestone, sandstone and shale lie in many places contiguous to the coal Iron is smelted at Kirkcaldy Limestone, sandstone and freestone are extensively quarried in the south, and whinstone of unusual hardness and durability is obtained in several places Pyropes, a variety of dark red garnet, sold under the name of Elie rubies, are found in the trap ufa at Elie

The staple manufacture is linen, ranging from damasks to ducks and sackings Its chief seats are at Kirkcaldy and Dunfermline, but it is carried on at many towns and villages, especially those situated near the Eden and Leven, on the banks of which rivers, as well as at Kirkcaldy and Dunfermline, are found the bleaching greens Flax is spun at Dysart, and Newburgh and Kirkcaldy are famous for oil-cloth and linoleum Most of the leading towns possess breweries and tanneries, and there are distilleries at Cameron Bridge, Kirkcaldy and Auchtermuchty Woollen cloth is made to a small extent in several towns, and fishing-net at Kirkcaldy and Buckhaven Paper is manufactured at Guardbridge, Markinch and Leslie, and earthenware at Kirkcaldy, there are engineering works and iron foundries at Kirkcaldy, Dunfermline and Tayport; and shipbuilding is carried on at Anstruther and Burntisland From Inverkeithing all the way round the coast to Newburgh there are harbours, mostly of moderate dimensions, the principal port being Kirkcaldy Salmon fishing is carried on at Newburgh and the chief seat of the herring fishery is Anstruther, but most of the coast towns take some part in the fishing

Communications, Population and Government.—The LNER has a monopoly in the shire. From the Forth bridge the main line follows the coast as far as Dysart, and then turns northwards to Ladybank, where it diverges to the north-east for Cupar and the Tay bridge From Thornton Junction a branch runs to Dunfermline and another to Methil, and here begins also the coast line for Leven, Crail and St Andrews which touches the main line again at Leuchars Junction; at Markinch a branch runs to Leslie, at Ladybank there are branches to Mawcarse Junction, and to Newburgh and Perth, and at Leuchars Junction a loop line runs to Tayport and Newport, joining the main at Wormit. From the Forth bridge the system also connects, via Dunfermline, with Alloa and Stirling in the west and with Kinross and Perth in the north. From Dunfermline there is a branch to Charlestown, which on that account is sometimes called the port of Dunfermline

The population was 292,925 in 1921, when 972 persons spoke Gaelic and English The chief towns are the Anstruthers (pop in 1921, 1,588), Buckhaven (16,332, with Methil and Innerleven), Burntisland (5,707), Cowdenbeath (14,215), Cupar (4,145), Dunfermline (39,886), Dysart (4,598), Kirkcaldy (39,591), Leven (7,180), Lochgelly (10,666), Newport (3,320), St. Andrews (9,336), Tayport (3,296) and Inverkeithing (3,350). For parliamentary purposes Fife is divided into an eastern and a western division each returning one member It also includes the Kirkcaldy district of parliamentary burghs (comprising Buckhaven, Methil and Innerleven, Burntisland, Dysart, Kinghorn and Kirkcaldy), and the Dunfermline district (Dunfermline, Cowdenbeath, Inverkeithing and Lochgelly)

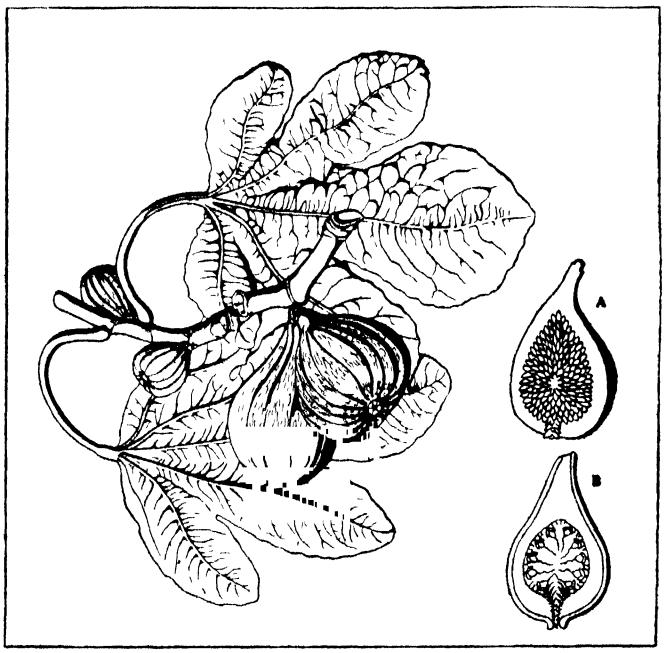
FIFE, originally the small primitive cylindrical transverse flute, now the small B♭ military flute, usually conoidal in bore, used in a drum and fife band The pitch of the fife lies between that of the concert flute and piccolo The words *fife* and the Fr *fifre*

were undoubtedly derived from the Ger. *Pfeiff*. The O E spelling was *phife, phiphe,* or *ffyffe*. The fife was in use in England in the middle of the 16th century. At the battle of St. Quentin (1557) the list of the English army employed states that one trumpet was allowed to each cavalry troop of 100 men, and a drum and fife to each 100 of foot. A *drumme* and *phife* were also employed at one shilling per diem for the "Trayne of Artillery." This was the nucleus of the modern military band.

FIFTH MONARCHY MEN, the name of a Puritan sect in England which for a time supported the government of Oliver Cromwell in the belief that it was a preparation for the "fifth monarchy," that is for the monarchy which should succeed the Assyrian, the Persian, the Greek and the Roman, and during which Christ should reign on earth with His saints for a thousand years Disappointed in their hopes they agitated against the government and Cromwell, but the arrest of their leaders and preachers, Christopher Feake, John Rogers and others, cooled their ardour After the Restoration, on Jan 6, 1661, a band of Fifth Monarchy men, headed by a cooper named Thomas Venner, who was one of their preachers, made an attempt to obtain possession of London Venner and ten others were executed and from that time the special doctrines of the sect died out

For an account of the rising of 1661 *see* Sir John Reresby, *Memoirs, 1634–1689,* edited by J J Cartwright (1875), and for the proceedings of the sect *see* S R Gardiner, *History of the Commonwealth and Protectorate,* passim (1894–1901).

FIG, the popular name given to various plants of the genus *Ficus,* of the mulberry family (Moraceae), comprising about 800 species which are characterized by a remarkable development of the pear-shaped fruiting receptacle, the edge of which curves inwards, so as to form a nearly closed cavity, bearing the numerous fertile and sterile flowers mingled on its surface The species vary



BY COURTESY OF THE COUNCIL OF THE ROYAL HORTICULTURAL SOCIETY

BRANCH OF THE COMMON FIG TREE (FICUS CARICA) BEARING RIPE FIGS
A. Longitudinal section through ripe fig showing seeds
B. Longitudinal section through unripe fig containing only scale leaves and long-styled female flowers

greatly in habit,—some being low trailing shrubs, others gigantic trees, among the most striking forms of the tropical forests to which they are chiefly indigenous They have alternate leaves, and abound in a milky juice, usually acrid, though in a few instances sufficiently mild to be used for allaying thirst This juice contains caoutchouc in large quantity

Ficus Carica (*see* fig), which yields the well-known figs of commerce, is a bush or small tree—rarely more than 18 or 20 ft high—with broad, rough, deciduous leaves, deeply lobed in the cultivated varieties, but in the wild plant sometimes nearly entire The green, rough branches bear the solitary, nearly sessile receptacles in the axils of the leaves. The male flowers are chiefly in the upper part of the cavity, and in most varieties are few in number. As it ripens, the receptacle enlarges greatly, and the numerous single-seeded pericarps or true fruits become imbedded in it. The fruit of the wild fig never acquires the succulence of the cultivated



FROM ENGLER AND PLANTL, "NATÜRLICHE PFLANZENFAMILIEN" (ENGELMANN)

THE BANYAN (FICUS INDICA), A TREE OF THE FICUS GENUS, SACRED IN INDIA. AERIAL ROOTS FORM SUPPORTING PILLARS, AND BY THEIR MEANS THE TREE REACHES ENORMOUS SIZE

kinds The fig seems to be indigenous to Asia Minor and Syria, but now occurs wild in most of the Mediterranean countries.

From the ease with which the nutritious fruit can be preserved, it was probably one of the earliest objects of cultivation, as may be inferred from the frequent allusions to it in the Hebrew Scriptures From a passage in Herodotus the fig would seem to have been unknown to the Persians in the days of the first Cyrus, but it must have spread in remote ages over all the districts around the Aegean and Levant The Greeks are said to have received it from Caria (hence the specific name); but the fruit so improved under Hellenic culture that Attic figs became celebrated throughout the East, and special laws were made to regulate their exportation The fig was one of the principal articles of sustenance among the Greeks; the Spartans especially used it largely at their public tables Pliny enumerates many varieties, and alludes to those from Ebusus (the modern Iviza) as most esteemed by Roman epicures, while he describes those of home growth as furnishing a large portion of the food of the slaves, particularly those employed in agriculture, by whom great quantities were eaten in the fresh state at the periods of fig-harvest In Latin myths the plant plays an important part Held sacred to Bacchus, it was employed in religious ceremonies; and the fig-tree that overshadowed the twin founders of Rome in the wolf's cave, as an emblem of the future prosperity of the race, testified to the high value set upon the fruit by the nations of antiquity.

The tree is now cultivated in all the Mediterranean countries,

but the larger portion of the market supply of figs comes from Asia Minor, the Spanish Peninsula and the south of France Those of Asiatic Turkey are considered the best In the United States, with protection in winter, it succeeds as far north as Pennsylvania, and is grown commercially in several Southern and South-western States, but chiefly in California, Texas and Louisiana Since about 1900 figs of Smyrna quality have been grown in California, whose total production of all dried figs in 1927 was about 24,000,000 pounds In Texas in the same year about 10,000,000 lb of fresh figs were utilized in the commercial manufacture of preserves The varieties are extremely numerous, and the fruit is of various colours, from deep purple to yellow, or nearly white Many of the immature receptacles drop off owing to imperfect fertilization, which circumstance has led, from very ancient times, to the practice of *caprification* Branches of the wild fig in flower are placed on the cultivated trees Certain hymenopterous insects, of the genera *Blastophaga* and *Sycophaga,* which frequent the wild fig, enter the minute orifice of the receptacle, apparently to deposit their eggs, conveying thus the pollen more completely to the stigmas, they ensure the fertilization and consequent ripening of the fruit When ripe the figs are picked, and spread out to dry in the sun,—those of better quality being much pulled and extended by hand during the process Thus prepared, the fruit is packed closely in barrels, rush baskets or wooden boxes, for commerce The best kind, known as elemi, are shipped at Smyrna, where the pulling and packing of figs form one of the most important industries of the people

This fruit still constitutes a large part of the food of the natives of western Asia and southern Europe, both in the fresh and dried state Alcohol is obtained from fermented figs in some southern countries; and a kind of wine, still made from the ripe fruit, was known to the ancients Medicinally the fig is employed as a gentle laxative, when eaten abundantly often proving useful in chronic constipation The wood is porous and of little value The fig is grown for its fresh fruit (eaten as an article of dessert) in the milder parts of Europe; and in the southern and south-western United States The tree lives to a great age, and along the southern coasts of England bears fruit abundantly as a standard, but in Scotland and in many parts of England a south wall is indispensable for its successful cultivation out of doors



THE BANYAN, SHOWING HUGE SIZE OF AERIAL ROOTS, WHICH GROW DOWNWARD TILL THEY REACH THE SOIL, WHICH IS SPECIALLY PREPARED TO RECEIVE THEM

Fig trees are propagated by cuttings, which should be put into pots, and placed in a gentle hotbed They may be obtained more speedily from layers, which should consist of two or three year old shoots, and these, when rooted, will form plants ready to bear fruit the first or second year after planting The best soil for a fig border is a friable loam, not too rich, but well drained; to correct the tendency to over-luxuriance of growth, the roots should be confined within spaces surrounded by a wall enclosing an area of about a square yard The fig tree naturally produces two sets of shoots and two crops of fruit in the season. The first shoots generally show young figs in July and August, but those in the climate of England seldom ripen, and should therefore be rubbed off The late or midsummer shoots likewise put forth fruit-buds, which, however, do not develop fully till the following spring; and these form the only crop of figs on which the British gardener can depend.

The sycamore fig, *F. Sycomorus,* is a tree of large size, with heart-shaped leaves. From the deep shade cast by its spreading branches, it is a favourite tree in Egypt and Syria, being often planted along roads and near houses. It bears a sweet edible fruit, somewhat like that of the common fig, but produced in racemes on the older boughs. The apex of the fruit is sometimes removed, or an incision made in it, to induce earlier ripenening

The sacred fig, peepul or bo (*F. religiosa*), a large tree with heart-shaped, long-pointed leaves on slender footstalks, is much grown in southern Asia The leaves are used for tanning, and afford lac, and a gum resembling caoutchouc is obtained from the juice; but in India it is chiefly planted with a religious object, being regarded as sacred by both Brahmans and Buddhists. A gigantic bo, growing near Anarajapoora, in Ceylon, is, if tradition may be trusted, one of the oldest trees in the world It is said to have been a branch of the tree under which Gautama Buddha became endued with his divine powers, and has always been held in the greatest veneration

Ficus elastica, the india-rubber tree, the large, oblong-shaped, glossy leaves, and pink buds of which are so familiar in our greenhouses, furnished previous to the cultivation of South American rubber trees in the Orient, most of the caoutchouc obtained from the East Indies. It grows to a large size, and is remarkable for the snake-like roots that extend in contorted masses around the base of the trunk The small fruit is unfit for food

Ficus benghalensis, the banyan, wild in parts of northern India, but generally planted throughout the country, has a woody stem, branching to a height of 70 to 100 ft and of vast extent with heart-shaped entire leaves terminating in acute points. Every branch from the main body throws out its own roots, at first in small tender fibres, several yards from the ground, but these continually grow thicker until they reach the surface, when they strike in, increase to large trunks, and become parent trees, shooting out new branches from the top, which again in time suspend their roots, and these, swelling into trunks, produce other branches, the growth continuing as long as the earth contributes her sustenance The tree usually grows from seeds dropped by birds on other trees. The leaf-axil of a palm forms a frequent receptacle for their growth, the palm becoming ultimately strangled by the growth of the fig, which by this time has developed numerous daughter stems which continue to expand and cover ultimately a large area The famous tree in the Royal Botanic Gardens, Calcutta, began its growth at the end of the 18th century on a sacred date-palm. In 1907 it had nearly 250 aerial roots, the parent trunk was 42 ft in girth, and its leafy crown had a circumference of 857 ft ; and it was still growing vigorously Both this tree and *F. religiosa* cause destruction to buildings, especially in Bengal, from seeds dropped by birds germinating on the walls The tree yields an inferior rubber, and a coarse rope is prepared from the bark and from the aerial roots

In North America two native species occur, the golden fig (*F. aurea*) and the short-leaved fig (*F brevifolia*), both found in southern Florida, while the common fig (*F Carica*) is sparingly naturalized in old fields and along roadsides from Virginia to Florida, Tennessee and Texas Numerous species are grown as greenhouse ornamentals

FIGARO, a famous dramatic character first introduced on the stage by Beaumarchais in the *Barbier de Séville,* the *Mariage de Figaro* and the *Folle Journée* Figaro soon seized the popular imagination and became the recognized representative of daring, clever and nonchalant roguery and intrigue Mozart chose the *Marriage of Figaro* as the subject of an opera, and the *Barber of Seville* was treated first by Paisiello and afterwards in 1816 by Rossini In 1826 the name of the witty rogue was taken by a journal which continued till 1833 to be one of the principal Parisian periodicals. Various attempts were made to restore the *Figaro* during the next 20 years; and in 1854 the efforts of M de Villemessant were crowned with success (*See* NEWSPAPERS)

See H. de Villemessant, *Mémoires d'un journaliste* (1867), Marc Monnier, *Les Aieux de Figaro* (1868)

FIGEAC, a town of south-western France, capital of an arrondissement in the department of Lot, 47 m E N E of Cahors on the Orléans railway. Pop. (1926) 4,333 It stands on the right bank of the Célé, here crossed by an old bridge Figeac grew up round an abbey founded by Pippin the Short in the 8th century, and throughout the middle ages it belonged to the monks At the end of the 16th century the lordship was acquired by the duke of Sully, who sold it to Louis XIII in 1622. The town is very rich in mediaeval houses, notably the Hôtel de Balène, of the 14th

century Another house, dating from the 15th century, was the birthplace of the Egyptologist J F. Champollion. The church of St Sauveur, once belonging to the abbey of Figeac, is 12th century restored. Notre-Dame du Puy belongs to the 12th and 13th centuries. The altar-screen is a fine example of carved woodwork of the end of the 17th century. Of the four obelisks which used to mark the limits of the authority of the abbots of Figeac, those to the south and the west of the town remain Figeac is the seat of a subprefect and has a communal college. Trade is in cattle, leather, wool, plums, chestnuts, walnuts and grain, and there are zinc mines in the neighbourhood

FIGUEIRA DA FOZ, a seaport of central Portugal, in the district of Coimbra, at the terminus of the Lisbon-Figueira and Guarda-Figueira railways Pop (1920) 6,787 Figueira da Foz is an important fishing-station, and one of the headquarters of the coasting trade in grain, fruit, wine, olive oil, cork and coal; but owing to the bar at the mouth of the Mondego large ships cannot enter Glass is manufactured, and the city attracts many visitors by its excellent climate and sea-bathing. A residential suburb, the Bairro Novo, exists chiefly for their accommodation, to the north-west of the old town Figueira is connected by a tramway running 4 m N W with Buarcos (pop 5,345) and with the coal-mines of Cape Mondego Figueira da Foz received the title and privileges of a city in 1882

FIGUERAS, a town of north-eastern Spain, province of Gerona, 14 m S of the French frontier, on the Barcelona-Perpignan railway Pop (1920) 13,192 Figueras is built at the foot of the Pyrenees, on the N edge of El Ampurdán, a fertile and well-irrigated plain, which produces grain, fruit and forage crops, and derives its name from the seaport of Ampurias, the ancient Emporiae The town, which is modern and rather dull, with leather, cork, glass, iron and other factories, is chiefly remarkable for the castle of San Fernando, built by Ferdinand VI (1746–1759), on a hill 1 m N.W. This irregular, pentagonal structure, with accommodation for 10,000 men and 500 horses, is still a key to the frontier owing to its position and rocky approach In 1794 Figueras was surrendered to the French, but it was regained in 1795 During the Peninsular War it was taken by the French in 1808, recaptured by the Spaniards in 1811, and retaken by the French in the same year In 1823, after a long defence, it was once more captured by the French

FIGUEROA, FRANCISCO DE (1536–1617?), Spanish poet, of whose life little is known, was born at Alcalá Although Figueroa ordered that his poems should be burnt at his death, the order does not seem to have been carried out for Luis Tribaldos de Toledo in 1625 edited over 60 of Figueroa's poems which exhibit his mastery over blank verse and his inclination to the pastoral tradition A facsimile of this edition was published by A M Huntingdon (1903)

See his *Poesías*, edit A de Cortes in "Bib de Autores Esp." vol xli (1857); *Poésies inédites de Figueroa*, edit R. Foulché-Delbosc in *Revue Hispanique*, vol xxv (1911), *Varias composiciones inéditas*, edit A Lacalle Fernandez in *Rivista crítica hispano-americana* (1919). *See* also J. Fitzmaurice-Kelly, *A New Hist of Span Literature* (1926).

FIGULUS, PUBLIUS NIGIDIUS (*c* 98–45 B C), Roman savant, next to Varro the most learned Roman of the age. He was a friend of Cicero, to whom he gave his support at the time of the Catilinarian conspiracy (Plutarch, *Cicero*, 20, Cicero, *Pro. Sulla*, xiv. 42) In 58 he was praetor, sided with Pompey in the Civil War, and after his defeat was banished by Caesar, and died in exile. According to Cicero (*Timaeus*, i), Figulus tried to revive the doctrines of Pythagoreanism, together with mathematics, astronomy and astrology, and even magic Suetonius (Aug 94) and Apuleius (Apol 42) tell of his supernatural powers Jerome (the authority for the date of his death) calls him *Pythagoricus et magus*. The indifference of the Romans to such abstruse and mystical subjects caused his works to be soon forgotten They included *De diis*, an examination of cults and ceremonials; treatises on divination and dreams; on the sphere, the winds and animals. His *Commentarii grammatici* in at least 29 books was an ill-arranged collection of linguistic, grammatical and antiquarian notes. He paid especial attention to orthography, and sought to differentiate the meanings of cases of like ending by distinctive marks In etymology he tried to find a Roman explanation of words (according to him *frater* was=*fere alter*) Quintilian (*Instit. orat.* xi. 3. 143) speaks of a rhetorical treatise *De gestu* by him

See Cicero, *Ad Fam* iv. 13; scholiast on Lucan I, 639, several references in Aulus Gellius, Teuffel, *Hist of Roman Literature*, 170, M. Hertz, *De N F studus atque operibus* (1845), *Quaestiones Nigidianae* (1890), and edition of the fragments (1889) by A Swoboda

FIGURATE NUMBERS. The early Greek mathematicians found that if groups of dots were used to represent numbers, they could be arranged so as to form geometric figures, examples of which are as follows —



Of these, the first represents a triangular number, there being 10 dots, 10 is a triangular number It is also seen that 3 and 6 are triangular numbers The second figure is a square, and from it we see that 4, 9 and 16 are square numbers From the third we see that 12 is a pentagonal number The triangular numbers may be represented by $\frac{1}{2}n\ (n+1)$, where n is any positive integer The square numbers are represented algebraically by n^2, and the pentagonal numbers by $n^2+\frac{1}{2}n\ (n-1)$. The Greeks also considered oblong (heteromecic) numbers, the sides (or factors) of which differ by unity. Thus, 3×4, 4×5, . . are oblong numbers There were also prolate (promecic) numbers, the factors differing by two or more, as in the case of 2×5, but these were often included under oblong numbers Besides various other types of plane numbers there are solid numbers For example, 8 is a cubic number, and 5 is a pyramidal one Numbers which are related to geometric figures in such ways are called *figurate numbers* or *figured numbers* Plane figurate numbers are also called *polygonal numbers*, the solid figurate numbers being designated as polyhedral The theory probably goes back to Pythagoras (*c* 540 B C) Such numbers were studied and described by Nicomachus (*c* 100), Theon of Smyrna (*c.* 125), Boethius (*c* 510) and many later writers

Bibliography —Sir Thos L Heath, *History of Greek Mathematics* (best source for Greek history), vol. 1, p 76 (1921), D E Smith, *History of Mathematics*, vol II p. 24 (1925) (Elementary discussion) *See* Numbers, Theory of

FIGURED BASS (also known as Thorough-Bass, General Bass and Basso Continuo) is a kind of musical shorthand, whereby the harmonies of a composition are indicated by means of figures above or below the bass part, instead of in the ordinary notation It came into existence early in the 17th century in Italy, being introduced in the first place for the use of the organist or cembalist accompanying a choral composition, and thereafter was very widely and generally employed for a long period, but nowadays it is retained in use only in harmony text-books and similar technical works The principle of the system is quite simple, the figures indicating the interval of the note to be played, reckoning from the bass upwards Thus a 3 represents a third, a 5 a fifth, a 6 a sixth, and so on, *e g*, $\frac{5}{3}$, $\frac{6}{4}$, $\frac{5}{3}$ and the like, chromatic signs being added when necessary to indicate the inflection of a given interval, *e g.*, $\frac{\sharp6}{5}$, $\frac{\flat9}{4}$, $\frac{\natural4}{3}$. Much skill and taste were none the less required for the proper interpretation of a figured bass, more especially as in course of time the signs used were still further abbreviated and simplified, leaving more and more to the knowledge and understanding of the performer, who was required further, not merely to provide the bare harmonies indicated, but to place and connect them in accordance with the laws of correct part-writing, to embellish them with runs, ornaments and so on, and generally to provide, on the strength of the mere indication of the essential harmonies, a complete and satisfying accompaniment

FIGUREHEAD, an ornamental figure placed under the bowsprit of a sailing ship. It took the form of a full-length figure or scroll handsomely carved and embellished—symbolical of the ship it represented In ancient times figureheads were placed on the prows of war galleys

FIJI, a British colony consisting of an archipelago in the Pacific Ocean, the most important in Polynesia, between 15° and 20° S, and on and about the meridian of 180°. The proper name is Viti as in the name of the principal island The islands number about 250, of which some 80 are inhabited The total land area is 7,435 sq m (thus roughly equalling that of Wales), and the population was estimated (1926), 171,644 The principal island is Viti Levu, 98 m in length (east to west) and 67 in extreme breadth, with an area of 4,112 sq m Forty miles north-east lies Vanua Levu, measuring 117 by 30 m, with an area of 2,432 sq m Close off the south-eastern shore of Vanua Levu is Taviuni, 26 m in length by 10 m in breadth, Kandavu or Kadavu, 36 m. long and very narrow, is 41 m S of Viti Levu, and the three other main islands, lying east of Viti Levu in the Koro Sea, are Koro, Ngau or Gau and Ovalau South-east from Vanua Levu a loop of islets extends nearly to 20° S, enclosing the Koro Sea North-west of Viti Levu lies another chain, the Yasawa or western group, and, finally, the colony includes the island of Rotumah (*q v*), 300 m NW by N of Vanua Levu

The formation of the larger islands is volcanic, their surface rugged, their vegetation luxuriant, and their appearance very beautiful, their hills often rise above 3,000 ft, and, in the case of a few summits, above 4,000, and they contrast strongly with the low coral formation of the smaller members of the group There is not much level country, except in the coral islets, and certain rich tracts along the coasts of the two large islands, especially near the mouths of the rivers The large islands have a considerable extent of undulating country, dry and open on their lee sides Streams and rivers are abundant, the latter very large in proportion to the size of the islands, affording a waterway to the rich districts along their banks The Rewa, debouching through a wide delta at the south-east of Viti Levu, is navigable for small vessels for 40 m The Dreketi is the chief stream of Vanua Levu

With few exceptions the islands are surrounded by barriers of coral, broken by openings opposite the mouths of streams Viti Levu is the most important island not only from its size, but from its fertility, variety of surface, and population, which is over one-third of that of the whole group The town of Suva lies on an excellent harbour at the south-east of the island, and has been the capital of the colony since 1882, containing the government buildings and other offices On the eastern shore of Ovalau, an island which contains in a small area a remarkable series of gorge-like valleys between commanding hills, is the town of Levuka, the capital until 1882 The chief islands on the west of the chain enclosing the Koro Sea are Koro, Ngau, Moala and Totoya, all productive, affording good anchorage, elevated and picturesque The eastern islands of the chain are smaller and more numerous. Vanua Batevu (one of the Exploring Group) being a centre of trade Among others, Mago is remarkable for a subterranean outlet of the waters of the fertile valley in its midst. For the geology, fauna and flora, economics and administration, etc., of Fiji, *see* comprehensive article PACIFIC ISLANDS

PEOPLE

The Fijians are a mixed people of Melanesian (Papuan) and Polynesian (Tongan and Samoan) elements They occupy the extreme east limits of Papuan territory and are usually classified as Melanesians Their dark colour and crisp hair, which is bleached with lime and worn in an elaborately trained mop, combine with the handsome features and well proportioned limbs of the Polynesians The chiefs are fairer and of a less negroid type than the people. This negroid type is especially marked on the west coasts, and in the interior of Viti Levu They wear a minimum of covering, are strictly decent and more moral than the Polynesians They are cleanly and particular about their personal appearance, care little for ornament, and only the women are tattooed A partial circumcision is practised The status of the women is also somewhat better, those of the upper class having considerable freedom and influence They are skilful cultivators and good boat-builders, the carpenters being an hereditary caste; there are also tribes of fishermen and sailors; their mats, baskets, nets, cordage and other fabrics are substantial and tasteful; their pottery, made by women, is superior to any other in the South Seas

The Fijians were formerly notorious for cannibalism, which may have had its origin in religion, but long before the first contact with Europeans had degenerated into gluttony. The Fijian's chief table luxury was human flesh, euphemistically called "long pig," and to satisfy his appetite he would sacrifice even friends and relatives Human sacrifices were of daily occurrence On a chief's death wives and slaves were buried alive with him When building a chief's house a slave was buried alive in the hole dug for each foundation post At the launching of a war-canoe living men were tied hand and foot between two plantain stems making a human ladder over which the vessel was pushed down into the water The people willingly met their deaths Affection and a firm belief in a future state, in which the exact condition of the dying is continued, are the Fijians' own explanations of the custom, once universal, of killing sick or aged relatives Cross cousin marriage was practised in parts and there are many features of note in the customs of the hill tribes indicating a strong Melanesian element Their code of social etiquette is minute and elaborate, and the graduations of rank well marked These are (1) chiefs, greater and lesser; (2) priests, (3) *Mata ni Vanua* (lit, eyes of the land), employees, messengers or counsellors, (4) distinguished warriors of low birth, (5) common people, (6) slaves

The family is the unit of society The families are grouped in townships or otherwise (*qali*) under the lesser chiefs, who again owe allegiance to the supreme chief of the *matanitu* or tribe The chiefs excel the people in physique, skill, intellect and acquirements of all sorts, and the reverence felt for them was very great and of a religious character All that a man had belonged to his chief On the other hand, the chief's property practically belonged to his people, and they were as ready to give as to take In a time of famine, a chief would declare the contents of the plantations to be common property The system of service-tenures (*lala*) on which their social and political fabric mainly depended, allowed the chief to call for the labour of any district, and to employ it in planting, house or canoe-building, supplying food on the occasion of another chief's visit, etc This power was often used with much discernment



BY COURTESY OF E GALLOWAY

A WARRIOR OF THE FIJI ISLANDS IN DANCE COSTUME AT SUVA
The Fijians resemble the Polynesians in stature and proportions, but in colouring and other minor respects they are entirely like the Melanesians

An allied custom, *solevu,* enabled a district in want of any particular article to call on its neighbours to supply it, giving labour or something else in exchange Although, then, the chief is lord of the soil, the inferior chiefs and individual families have equally distinct rights in it, subject to payment of certain dues; and the idea of permanent alienation of land by purchase was never perhaps clearly realized By the custom of *vasu* (lit nephew) the son of a chief by a woman of rank had almost unlimited rights over the property of his mother's brother or if a chief's nephew over his uncle's female subjects In time of war the chief claimed absolute control over life and property. Warfare was carried on with many formalities, and considerable skill was shown in the fortifications There were well-defined degrees of dependence among the different tribes or districts the first of these, *bati,* is an alliance between two nearly equal tribes, but

implying a sort of inferiority on one side, acknowledged by military service, the second, *qali*, implies greater subjection, and payment of tribute

The religion of the Fijians was a sort of ancestor-worship, had much in common with the creeds of Polynesia, and included a belief in a future existence There were two classes of gods—the first immortal, of whom Ndengei is the greatest, said to exist eternally in the form of a serpent, but troubling himself little with human or other affairs, and the others had usually only a local recognition The second rank (who, though far above mortals, are subject to their passions, and even to death) comprised the spirits of chiefs, heroes and other ancestors The gods entered and spoke through their priests, who thus pronounced on the issue of every enterprise, but they were not represented by idols, certain groves and trees were held sacred, and stones which suggest phallic associations The priesthood usually was hereditary, and their influence great, and they had generally a good understanding with the chief The institution of Tabu existed in full force. The *mburé* or temple was also the council chamber and place of assemblage for various purposes The square house with an occasional rounded variant is in the hill area associated with a Secret Society—the Nanga

The weapons of the Fijians are spears, slings, throwing clubs and bows and arrows Their houses, of which the framework is timber and the rest lattice and thatch, are ingeniously constructed, tastefully ornamented, and are furnished with mats, mosquito-curtains, baskets, fans, nets and cooking and other utensils Their canoes, sometimes more than 100 ft long, are well built Ever excellent agriculturists, their implements were formerly digging sticks and hoes of turtlebone or flat oyster-shells In irrigation they showed skill, draining their fields with built watercourses and bamboo pipes Tobacco, maize, sweet potatoes, yams, kava, taro, beans and pumpkins, are the principal crops

Fijians have various games, and dancing, story-telling and songs are especially popular Their poetry has well-defined metres, and a sort of rhyme Their music is rude, and is said to be always in the major key For their feasts preparations are sometimes made months in advance Mourning is expressed by fasting, by shaving the head and face, or by cutting off the little finger This last is sometimes done at the death of a rich man in the hope that his family will reward the compliment, sometimes it is done vicariously, as when one chief cuts off the little finger of his dependent in regret or in atonement for the death of another *See* W H R Rivers, *History of Melanesian Society* (1914), A. B Brewster, *Hill Tribes of Fiji* (1922)

HISTORY

A few islands in the north-east of the group were first seen by Abel Tasman in 1643 The southernmost of the group, Turtle island, was discovered by Cook in 1773 Lieut. Bligh, approaching them in the launch of the "Bounty" (*see* "BOUNTY," MUTINY OF THE) 1789, had a hostile encounter with natives In 1827 Dumont d'Urville in the "Astrolabe" surveyed them more accurately, but the first thorough survey was that of the United States exploring expedition in 1840 Up to this time, owing to the evil reputation of the islanders, European intercourse was very limited. The labours of the Wesleyan missionaries, however, who came from Tonga in 1835, must always have a prominent place in any history of Fiji

About 1804 some escaped convicts from Australia and runaway sailors established themselves around the east part of Viti Levu, and by lending their services to the neighbouring chiefs probably led to their preponderance over the rest of the group. Na Ulivau, chief of the small island of Mbau, established before his death in 1829 a sort of supremacy, which was extended by his brother Tanoa, and by Tanoa's son Thakombau, a ruler of considerable capacity

British Annexation.—However, attacks by the Tongans and financial troubles, including a claim of £9,000 by the United States for alleged injuries to their consul, reduced Thakombau to great difficulties In 1859 he in vain made a conditional offer to cede the sovereignty to Great Britain, but in 1874, after years of deeper complications, she accepted the unconditional cession then offered It had besides long been thought desirable to possess a station on the route between Australia and Panama; it was also felt that the Polynesian labour traffic, the abuses in which had caused much indignation, could only be effectually regulated from a point contiguous to the recruiting field, and the locality where that labour was extensively employed To this end the governor of Fiji was also created "high commissioner for the western Pacific" Rotumah (*q v*) was annexed in 1881

At the time of the British annexation the islands were suffering from commercial depression, following a fall in the price of cotton after the American Civil War Coffee, tea, cinchona and sugar were tried in turn, with limited success The coffee was attacked by the leaf disease, the tea could not compete with that grown by the cheap labour of the East, the sugar machinery was too antiquated to withstand the fall in prices consequent on the European sugar bounties In 1878 the first coolies were imported from India and the cultivation of sugar began to pass into the hands of large companies working with modern machinery With the introduction of coolies the Fijians began to fall behind in the development of their country Many of the coolies chose to remain in the colony after the termination of their indentures, and began to displace the European country traders With a regular and plentiful supply of Indian coolies, the recruiting of *kanaka* labourers practically ceased

Recent Progress.—The settlement of European land claims, and the measures taken for the protection of native institutions, caused lively dissatisfaction among the colonists, who laid the blame of the commercial depression at the door of the government, but with returning prosperity this feeling began to disappear In 1900 the government of New Zealand made overtures to absorb Fiji The Aborigines Society protested to the colonial office, and the imperial Government refused to sanction the proposal

The constitution, regulated by Letters Patent of Jan 31, 1914, as amended in 1916, provides for a legislative council consisting of the governor, some 14 nominated and six elected members, besides three Indian and three native representatives Mission schools for Fijians have existed for nearly a century In 1916 an official education department was created In 1926 an education commission published a Report containing recommendations for increased facilities for native and Indian education

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FILAMENT is the cathode in one of the common types of a vacuum tube for radio receiving sets. The filament may be the source of the electron (*q v*) emission which constitutes the current flowing through the vacuous space

FILANGIERI, CARLO (1784–1867), prince of Satriano, Neapolitan soldier and statesman, was the son of Gaetano Filangieri (1752–1788), a celebrated philosopher and jurist At the age of fifteen he was admitted to the Military academy at Paris After serving in the French campaign of 1803–05 he returned to Naples as captain on Masséna's staff to fight the Bourbons and the Austrians in 1806, and subsequently went to Spain, where he followed Jerome Bonaparte in his retreat from Madrid. In consequence of a fatal duel he was sent back to Naples; there he served under Joachim Murat with the rank of general. He fought against the Anglo-Sicilian forces in Calabria and at Messina, and against Eugène Beauharnais, and later in the campaign against Austria, and was severely wounded at the battle of the Panaro (1815) On the restoration of the Bourbon king, Ferdinand

IV. (I.), Filangieri retained his rank and command, but found the army utterly disorganized and impregnated with Carbonarism In the disturbances of 1820 he adhered to the Constitutionalist party, and fought under General Pepe (*q v*) against the Austrians On the re-establishment of the autocracy he was dismissed from the service, and retired to Calabria where he had inherited the princely title and estates of Satriano

In 1831 he was recalled by Ferdinand II. and entrusted with various military reforms On the outbreak of the troubles of 1848 Filangieri advised the king to grant the constitution, which he did in Feb 1848, but when the Sicilians formally seceded from the Neapolitan kingdom Filangieri was given the command of an armed force with which to reduce the island to obedience He reconquered Sicily, and remained there as governor until 1855, when he retired into private life, as he could not carry out the reforms he desired owing to the hostility of Giovanni Cassisi, the minister for Sicily On the death of Ferdinand II (May 22, 1859) the new king Francis II appointed Filangieri premier and minister of war He promoted good relations with France, then fighting with Piedmont against the Austrians in Lombardy, and urged an alliance with Piedmont and a constitution as the only means of saving the dynasty. These proposals being rejected, Filangieri resigned office After the downfall of the Bourbons Filangieri went into exile for some time. Although he adhered to the new government he refused to accept any dignity at its hands, and died at his villa of San Giorgio a Cremano near Naples on Oct 9, 1867

His biography has been written by his daughter Teresa Filangieri Fieschi-Ravaschieri, *Il Generale Carlo Filangieri* (Milan, 1902), an interesting, although somewhat too laudatory volume based on the general's own unpublished memoirs, for the Sicilian expedition *see* V Finocchiaro, *La Rivoluzione siciliana del 1848–49* (Catania, 1906, with bibliography), in which Filangieri is bitterly attacked, *see* also under NAPLES, FERDINAND IV , FRANCIS I , FERDINAND II , FRANCIS II

FILANGIERI, GAETANO (1752–1788), Italian lawyer, was born at Naples on Aug 18, 1752, and died at Vico Equense on July 21, 1788 He wrote *La Scienza della legislazione* (vols I and II , 1780, vol III , 1783, vols IV–VI , 1785), a book which had great influence throughout Europe Filangieri was an ardent reformer, who desired to sweep away those mediaeval institutions which hampered production and national well-being The third volume, relating to criminal jurisprudence, was placed on the Index

The best edition of the *Scienza* is that by Villari (3 vols , 1864–76) , the book was translated into most of the European languages (Eng trans by R. Clayton, *The Science of Legislation,* 1806)

FILARIASIS, the name of a disease due to the nematode *Filaria sanguinis hominis,* of which two varieties are known *nocturna* and *diurna* A milky appearance of the urine, due to the presence of a substance like chyle, which forms a clot, had been observed in tropical and subtropical countries, and it was proved that this condition is uniformly associated with the presence in the blood of microscopic eel-like worms, the embryo forms of a Filaria (*see* NEMATODA) Sometimes the discharge of lymph takes place from ulcers on the surface of the body, or there is naevoid elephantiasis of the scrotum, or lymph-scrotum More or less of blood may occur along with the chylous fluid in the urine Both the chyluria and the presence of filariae in the blood are curiously intermittent; with the nocturnal variety of parasite possibly not a single filaria is to be seen during the daytime, while they swarm in the blood at night This alternation may be inverted by causing the patient to sit up all night and sleep through the day

Sir P Manson proved that mosquitoes imbibe the embryo filariae from the blood of man; and that many of these reach full development within the mosquito, acquiring their freedom when the latter resorts to water, where it dies after depositing its eggs. Mosquitoes are thus the intermediate host of the filariae, and their introduction into the human body is through the medium of water (*see* PARASITIC DISEASES).

FILBERT, the name generally given to the oblong nuts of certain Old World species of hazel (*q v.*) chiefly *Corylus Avellana* and *C. maxima* The round nuts of these species are often called cob-nuts Numerous varieties are extensively cultivated in the Old World, the large nuts of the better kinds forming an important article of commerce, the imports of which into the United States in 1926 amounted to $2,954,000 Excellent varieties are now grown successfully in the States of Oregon and Washington The plants are trained in tree form, with a single trunk, and become as large as medium-sized apple trees In the Pacific North-west the trees should be planted about 25 ft. apart each way In the Eastern States these varieties and seedlings of them are grown in bush form The Constantinople hazel (*C Colurna*) is a large forest tree producing small nuts which are used for seedlings for stocks on which to bud or graft the choice European varieties The filbert is also propagated by layering the branches to form roots and by digging the suckers or sprouts from the roots. Seedlings are easily grown from nuts stratified over winter, an inch or two deep in soil and planted in the spring (C P C)

FILCHNER, WILHELM (1877–), German traveller, was born at Munich on Sept. 13, 1877. He was educated at the Prussian War academy, entered the army and was for some time attached to the general staff He travelled in the Pamir region in 1900, was head of the German China-Tibet expedition of 1903; conducted the German Antarctic expedition of 1910–12, which discovered the south-western continuation of Coats Land, and in 1913 made arrangements to accompany Amundsen on his polar expedition the following year The outbreak of the World War, however, recalled him to military duty In Dec 1925 he went on an expedition to Tibet, from which he returned in May 1928, after having made complete maps of the region traversed and established 157 magnetic stations

His works include accounts of his travels, among the most important being *Wissenschaftliche Ergebnisser der Expeditionen Filchner nach China und Tibet* (11 vols and four large maps, 1907–14).

FILDES, SIR LUKE (1844-1927), English painter, was born at Liverpool, and trained in the South Kensington and Royal Academy schools His "The Casual Ward" (1874), is at Royal Holloway college; "The Doctor" (1891), is in the National Gallery of British Art (Tate Gallery), London He painted a number of pictures of Venetian life and many notable portraits, among them the coronation portraits of King Edward VII and Queen Alexandra and of King George V He was elected A R A. in 1879, and R A in 1887, was knighted in 1906, and made K C V O in 1918

See David Croal Thomson, *The Life and Work of Luke Fildes, R.A.* (1895).

FILE. Originally a string or thread (through the Fr. *fil* and *file,* from Lat *filum,* a thread); hence used of a device, originally a cord, wire or spike on which letters, receipts, papers, etc , may be strung for convenient reference The term has been extended to embrace various methods for the preservation of papers in a particular order, such as expanding books, cabinets, and ingenious improvements on the simple wire file which enable any single document to be readily found and withdrawn without removing the whole series (*see* OFFICE APPLIANCES). From the devices used for filing the word is transferred to the documents filed, and thus is used of a catalogue, list, or collection of papers.

File is also employed to denote a row of persons or objects arranged one behind the other. In military usage a "file" is the opposite of a "rank," that is, it is composed of a (variable) number of men aligned from front to rear one behind the other, while a rank contains a number of men aligned from right to left abreast Up to about 1600 infantry were often drawn up 16 deep, one front rank man and the 15 "coverers" forming a file The number of ranks and, therefore, of men in the file diminished first to ten (1600), then to six (1630), then to three (1700), and finally to two (about 1808 in the British army, 1888 in the German). This formation is still retained for parade purposes in the British Army, extended order with wide intervals between men being used in the field, but most foreign armies have now adopted even for parade purposes a formation based on single file (*see* ORDER). In the 17th century a file formed a small command under the "file leader," the whole of the front rank consisting therefore of old soldiers or non-commissioned officers In the above it is to be understood that the men are facing to the front

or rear If they are turned to the right or left so that the company now stands two men broad and fifty deep, it is spoken of as being "in file" From this come such phrases as "single file" or "Indian file" (one man leading and the rest following singly behind him). The use of verbs "to file" and "to defile," implying the passage from fighting to marching formation, is to be derived from this rather than from the resemblance of a marching column to a long flexible thread, for in the days when the word was first used the infantry company whether in battle or on the march was a solid rectangle of men, a file often containing even more men than a rank

File is also the name of a common tool used for abrading or smoothing, *see* FILE MANUFACTURE In this sense, the word used has a different derivation, from O E *féol,* from an Indo-European root meaning to mark or scratch

FILE-FISH or **TRIGGER-FISH,** the names given to fishes of the genus *Balistes* (and *Monacanthus*) of the family *Balistidae* and sub-order Balistiformes, inhabiting all tropical and subtropical seas The body is compressed and not covered with ordinary scales, but with small juxtaposed scutes The first of the three dorsal spines is very strong, roughened in front like a file and hollowed out behind to receive the second much smaller spine, which, besides, has a projection in front, at its base, fitting into a notch of the first Thus these two spines can only be raised or depressed simultaneously, in such a manner that the first cannot be forced down unless the second, which has been compared to a trigger, has been previously depressed Both jaws are armed with eight strong incisor-like and sometimes pointed teeth, by which these fishes are enabled to break off pieces of madrepores and other corals, on which they feed and to chisel a hole into the hard shells of Mollusca, in order to extract the soft parts In this way they do much injury to pearl-fisheries. *Monacanthus* has only one dorsal spine and a velvety skin. Some 30 different species are known of *Balistes* and about 50 of *Monacanthus.*

FILELFO, FRANCESCO or **PHILELPHUS** (1398–1481), Italian humanist, was born on July 25, 1398, at Tolentino, in the March of Ancona He studied at Padua and in 1417 was invited to teach eloquence and moral philosophy at Venice In 1419 he became secretary to the Venetian consul-general (*baylo*) in Constantinople This appointment gave him the opportunity of acquiring the Greek language and of collecting Greek mss He studied under John Chrysoloras, whose daughter he married, and on whose recommendation he was employed in several diplomatic missions by the emperor John Palaeologus In 1427 he returned to Venice, to find that the city had almost been emptied by the plague, and that his scholars would be few. He removed to Bologna, and then to Florence There he lectured to large audiences of young and old on the principal Greek and Latin authors, and on Sundays he explained Dante to the people in the Duomo. He also translated portions of Aristotle, Plutarch, Xenophon and Lysias from the Greek His temper was arrogant, and when Cosimo de' Medici was exiled by the Albizzi party in 1433, he urged the signoria of Florence to pronounce upon him the sentence of death On Cosimo's return to Florence, Filelfo's position in that city was no longer tenable, and he moved to Siena, and finally (1440) to Milan, where he found a patron in the duke, Filippo Maria Visconti

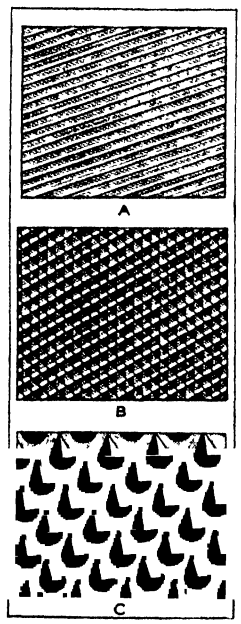
On the death of Visconti, Filelfo, after a short hesitation, transferred his allegiance to Francesco Sforza, the new duke of Milan; and in order to curry favour with this parvenu, he began his ponderous epic, the *Sforziad,* of which 12,800 lines were written, but which was never published When Francesco Sforza died, Filelfo turned his thoughts towards Rome He was now an old man of 77, recognized as the greatest of Italian humanists. He reached Rome in 1475, but within a year fell into disgrace with pope Sixtus IV, and returned to Milan. Lorenzo de' Medici invited him to teach Greek at Florence. He died two weeks after his arrival, on July 31, 1481

Filelfo deserves commemoration among the greatest humanists of the Italian Renaissance, for his energy and untiring activity. He had a large share in amassing and cataloguing the fragments rescued from the wrecks of Greece and Rome In the work of collection and instruction Filelfo excelled, passing rapidly from place to place, stirring up the zeal for learning by the passion of his own enthusiastic temperament, and acting as a pioneer for men like Poliziano and Erasmus.

See Carlo de' Rosmini, *Vita di Filelfo* (3 vols., Milan, 1808), Benaducci, *Contributo alla biographia di Francesco Filelfo* (1902), J A Symonds, *Renaissance in Italy* (1877) A complete edition of Filelfo's Greek letters (based on the Codex Trevulzianus) was published for the first time, with French translation, notes and commentaries, by E. Legrand in 1892 at Paris (C xii. of *Publications de l'école des lang. orient*) For further references, especially to monographs, etc., on Filelfo's life and work, *see* Ulysse Chevalier, *Répertoire des sources hist., bio-bibliographie* (1905), *s v. Philelphe, François.*

FILE MANUFACTURE. Like every other steel tool of modern manufacture, the file has been improved greatly in quality by metallurgical and engineering science The industry has been more especially developed in Sheffield and the United States, but it is also carried on in Switzerland, Germany, Sweden, France and Italy

There is a great variety of patterns, sizes and cuts of files. They are made from bars whose cross-sectional area may be either round, square, flat, triangular (three-square), half-round—*i e,* with one face flat, the back of the file being curved—and a large number of other shapes made for special purposes Each of these shapes may be made in various lengths, from the tiny watchmakers' and jewellers' file, to the heavy files used by the engineer —20 inches and upwards in length The sawmaker uses a "three-square" file, cut on the edges for sharpening hand-saws, but for the bandsaw the edge of the file must be thicker and rounded, to minimize the risk of breaking the bandsaw tooth The flat file with one or two rounded edges is used generally for sharpening circular saw teeth The locksmith uses a thin flat file varying in thickness, the jeweller has standard shapes drawn to a very fine point, while the dentist uses a very fine pointed, solid-handled, half-round file The "rasp," with its large, sharp, single teeth is used for wood, hot iron and soft metal, different varieties are the shoemaker's rasp, the horse rasp for farriers and rasps for cabinet-makers, workers in bone and other similar materials Each shape and size of file is made in a variety of cuts, the different cuts are known as — rough, middle, common or bastard, second, smooth, dead-smooth and double-dead-smooth



TYPES OF FILES
(A) Single cut file, (B) double cut file and (C) rasp

Processes of Production.—The metal used for the manufacture of files must be hard enough to cut steel, and at the same time of a quality to give maximum durability under rough treatment; the file teeth must be hard without being brittle The steel used for the purpose is, therefore, of very good quality with high carbon content. Such a steel, however, in its normal condition is a hard and difficult one to manipulate The six chief processes in the production of the file consist of —forging, annealing, grinding, cutting, hardening and scouring.

Forging and Annealing.—The steel is first received from the rolling mill where it has been rolled to the desired section, and is cut into suitable lengths These are then placed, a few at a time, in a furnace and heated to a bright red heat. They are then withdrawn separately and hammered under a machine hammer. The first operation of the hammer is to form the "tang" or sharp handle-end of the file, which is later to be inserted into the handle. The hammer is provided with shaping tools or dies to suit the special section of steel to be dealt with. The file is then returned to the furnace and the remaining part of the forging operation is completed. The forged file is known as a "blank" The power-hammer employed consists of a top tool or "tup" and a solid base, into which is fixed the shaping die or tool These hammers are

designed to deliver from 250 to 500 blows per minute according to the size of the file required The "blanks" from the hammer must now be brought to a ductile and uniform condition for the purpose of cutting the teeth They are, therefore, put into an annealing furnace and heated gradually to the desired temperature They are held at that heat, and then cooled This treatment produces a change in the physical condition of the steel, removing all internal strains and rendering the material suitable for the subsequent operation of the cutting of the teeth

Grinding—The object of grinding is to produce a smooth, even surface on the face of the blank, and to remove the scale from the surface to be cut This operation is largely carried out by machinery A grinding wheel is mounted in a machine which is made to rotate at a suitable speed, and in addition an oscillating motion is imparted to the axle of the wheel to prevent grooves being worn into the face of the wheel The files are fixed in a trough in the base of the machine, and are completely covered by water. The trough automatically moves to and fro under the grinding wheel, and provision is made for the grinding wheel to be lowered or raised to grind the files Special arrangements are made for grinding half-round and round files

Cutting—The operation of forming the teeth in files is known as "file-cutting," and is now almost entirely a machine operation Formerly the operation was performed by hand with flat chisels, and the process became an art in which the skilled file-cutter attained great efficiency The file-cutting machine is designed to reproduce by mechanical means the processes adopted by the file-cutter, except that the number of cuts per minute made by the machine is enormously greater than is possible by hand The file blank is placed on a lead bed made to the shape of the file to be cut The chisel employed for cutting the grooves in the blank has a straight sharp edge and is sufficiently long to overlap the file blank The edge is ground and shaped to the desired angles, whetted, and the sharp edge rubbed off The grooves are cut across the face of the blank at an angle to the side of the file, which varies for different materials Files are made either with a single series of cuts, known as "single-cut" files, or with a double series of cuts, crossing one another, known as "double-cut" files The single cut files are used for the softer materials such as brass, lead and wood, and the double cut file is the one commonly used in machine shops The crossing of the face of the file by the two series of cuts placed at different angles with one another, as described, has the effect of breaking up the long rows of single teeth, stretching across the width of the file, into a large number of separate small pointed teeth each presenting its sharpened point to the surface of the work to be cut (*See* figure for the single cut file, the double cut file and the rasp)

Hardening and Scouring—On the completion of the cutting operation the files undergo a process of hardening The teeth of the file are first protected from injury by a special plastic covering, and the file is then heated to the desired temperature for high carbon steel files It is then quenched by dipping into a brine bath out of which it is brought before the centre of the file is cold. Whilst in this condition, that is before complete cooling, the distorted files can be straightened After hardening, the file is subjected to a process of passing it over a sand-blast jet, through which steam and sand are forced at about 70 lb pressure This treatment leaves a perfectly clean surface on the finished file Files are tested in the works by passing, by hand, a "prover" which consists of a hard piece of steel, over the teeth of the new file, the effect of which must be to leave the teeth undamaged Further tests of files are made in file-testing machines, which have been designed to measure the amount of material which the file is capable of removing from a standardized test-bar during a given number of strokes of the file, and at a standard pressure upon the file.

Care of the File.—Many files are impaired by being improperly used. A very sharp file, for example, should not be used on an oxidized surface of cast iron, a surface which is itself as hard as the file teeth A partially worn file should first be used for the purpose, and the new file for finishing the work only Care should also be taken to avoid excessive pressure when using a sharp new file In using a file for cutting, just enough pressure should be put upon it during the forward stroke to make it cut freely, and the file should be slightly lifted from the work during the return stroke Files should be cleaned after use and put away carefully, not thrown among other metal tools.

(W R)

FILEY, an urban district and seaside resort, Buckrose parliamentary division, East Riding of Yorkshire, England, 9½ m S E of Scarborough by the L N E railway, and 7½ m by road. Pop (1921), 4,549 It stands upon the slope and summit of the cliffs above Filey bay, which is fringed by a fine sandy beach The bay stretches from Filey Brigg, formerly called "The File," a narrow and abrupt promontory extending, by dangerous reefs nearly ½ m out to sea, southwards and south-eastwards to the finer promontory of Flamborough head Roman remains have been discovered on the cliff north of the town The church of St Oswald is a fine cruciform building, with central tower, transitional Norman and Early English in date It is a coast-guard and life-boat station and has a red fixed light which is seen for 1 mile Its fisheries are important Filey is a quiet resort, with pleasant promenades and good golf links, also a small spa, to the north of the town, which has fallen into disuse

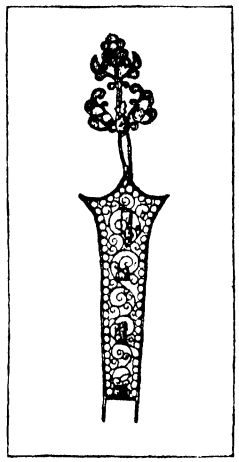
FILIBUSTER, a name originally given to the buccaneers (*q v*) The term is probably derived from the Dutch *vry buiter,* freebooter, it was revived in America to designate those adventurers who, after the termination of the war between Mexico and the United States, organized expeditions within the United States to take part in West Indian and Central American revolutions The modern use of the word denotes one who engages in private warfare against any state In the United States it is colloquially applied to legislators who practise obstruction

FILICAJA, VINCENZO DA (1642–1707), Italian poet, was born at Florence on Dec 30, 1642 He studied under the Jesuits at Florence, and then in the university of Pisa He then returned to Florence, married Anna Capponi, and devoted himself to literary pursuits His rhetorical genius was fired by the deliverance of Vienna from the Turks in 1683, and he wrote the canzoni which made him famous The grand duke of Tuscany, Cosmo III, conferred on him a useful sinecure, and he was named governor of Volterra in 1696 Both there and at Pisa, where he was governor in 1700, he was extremely popular He passed the close of his life at Florence, was nominated senator, and died in that city on Sept 24, 1707 Much of his verse was pretentious and artificial, but when he is thoroughly natural and spontaneous —as in the two sonnets "Italia, Italia, o tu cui feo la sorte" and "Dov' è, Italia, il tuo braccio? e a che ti serve", in the verses "Alla beata Vergine," "Al divino amore"; in the sonnet "Sulla fede nelle disgrazie"—the truth and beauty of thought and language recall the verse of Petrarch

Complete edition (Venice, 1762), selection, *Poesie e lettere* (Florence, 1864) *See* G Caponi, *Vincenzo da Filicaja e le sue opere* (1901)

FILIGREE, jewel work of a delicate kind made with twisted threads usually of gold and silver Though filigree has become a special branch of jewel work it was originally part of the ordinary work of the jeweller Signor A Castellani states, in his *Memoir on the Jewellery of the Ancients* (1861), that the jewellery of the Etruscans and Greeks was made by soldering together and so building up the gold, rather than by chiselling or engraving the material The art may be said to consist in curling, twisting and plaiting fine, pliable threads of metal, and uniting them at their points of contact with each other, and with the ground, by means of gold or silver solder and borax, by the help of the blowpipe Small grains or beads of the same metals are often set in the eyes of volutes, on the junctions or at intervals at which they will set off the wire-work effectively. The more delicate work is generally protected by framework of stouter wire Brooches, crosses, ear-rings and other personal ornaments of modern filigree are generally surrounded and subdivided by bands of square or flat metal giving consistency to the filling up, which would not otherwise keep its proper shape

The Egyptian jewellers employed wire, both to lay down on a background and to plait or otherwise arrange *à jour*. But, with the exception of chains, it cannot be said that filigree work was much practised by them Their strength lay rather in their cloisonné work and their moulded ornaments. Many examples, however, remain of round plaited gold chains of fine wire, such as are still made by the filigree workers of India, and known as Trichinopoli chains From some of these are hung smaller chains of finer wire with minute fishes and other pendants fastened to them In ornaments derived from Phoenician sites, such as Cyprus and Sardinia, patterns of gold wire are laid down with great delicacy on a gold ground, but the art was advanced to its highest perfection in the Greek and Etruscan filigree of the 6th to the 3rd century B C

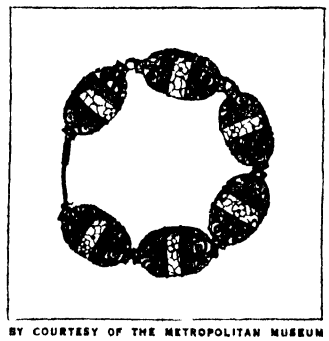


BY COURTESY OF THE METROPOLITAN MUSEUM OF ART
FILIGREE WORK ON A CHINESE ORNAMENT OF THE T'ANG DYNASTY

It is probable that in India and various parts of central Asia filigree has been worked from the most remote period without any change in the designs Whether the Asiatic jewellers were influenced by the Greeks settled on that continent, or merely trained under traditions held in common with them, it is certain that the Indian filigree workers retain the same patterns as those of the ancient Greeks, and work them in the same way, down to the present day Wandering workmen are given so much gold, coined or rough, which is weighed, heated in a pan of charcoal, beaten into wire and then worked in the courtyard or veranda of the employer's house according to the designs of the artist, who weighs the complete work on restoring it and is paid at a specified rate for his labour Very fine grains or beads and spines of gold, scarcely thicker than coarse hair, projecting from plates of gold, are methods of ornamentation still used

Passing to later times we may notice in many collections of mediaeval jewel work reliquaries, covers for the gospels, etc, made either in Constantinople from the 6th to the 12th century, or in monasteries in Europe, in which Byzantine goldsmiths' work was studied and imitated These objects, besides being enriched with precious stones, polished, but not cut into facets, and with enamel, are often decorated with filigree In the north of Europe the Saxons, Britons and Celts were, from an early period, skilful in several kinds of goldsmiths' work

The Irish filigree work is more thoughtful in design and more varied in pattern than that of any period or country that could be named Its highest perfection must be placed in the 10th and 11th centuries The Royal Irish Academy in Dublin contains a number of reliquaries and personal jewels, of which filigree is the general and most remarkable ornament The "Tara" brooch has been copied and imitated, and the shape and decoration of it are well known Instead of fine curls or volutes of gold thread, the Irish filigree is varied by numerous designs in which one thread can be traced through curious knots and complications, which, disposed over large surfaces, balance one another, but always with special varieties and arrangements difficult to trace with the eye The long thread appears and disappears without breach of continuity, the two ends generally worked into the head and the tail of a serpent or a monster. The relíquary containing the "Bell of St Patrick" is covered with knotted work in many varieties A two-handled chalice, called the "Ardagh cup," found near Limerick in 1868, is ornamented with work of this kind of extraordinary fineness



BY COURTESY OF THE METROPOLITAN MUSEUM OF ART
A 16TH CENTURY SPANISH BRACELET OF FILIGREE

Much of the mediaeval jewel work all over Europe down to the 15th century, on reliquaries, crosses, croziers and other ecclesiastical goldsmiths' work, is set off with bosses and borders of filigree Filigree work in silver was practised by the Moors of Spain during the middle ages with great skill, and was introduced by them and established all over the peninsula, whence it was carried to the Spanish colonies in America. The Spanish filigree work of the 17th and 18th centuries is of extraordinary complexity (examples in the Victoria and Albert Museum), and silver filigree jewellery of delicate and artistic design is still made in considerable quantities throughout the country. The manufacture spread over the Balearic islands, and among the populations that border the Mediterranean It is still made all over Italy and in Malta, Albania, the Ionian islands and many other parts of Greece. That of the Greeks is sometimes on a large scale, with several thicknesses of wires alternating with larger and smaller bosses and beads, sometimes set with turquoises, etc, and mounted on convex plates, making rich ornamental headpieces, belts and breast ornaments Filigree silver buttons of wire-work and small bosses are worn by the peasants in most of the countries that produce this kind of jewellery Silver filigree brooches and buttons are also made in Denmark, Norway and Sweden Some very curious filigree work was brought from Abyssinia after the capture of Magdala—arm-guards, slippers, cups, etc, some of which are now in the South Kensington museum (*See* SILVERSMITHS' AND GOLDSMITHS' WORK, JEWELLERY)

FILING DEVICES: *see* OFFICE APPLIANCES

FILIPESCU, NICHOLAS (1862–1916), Rumanian politician, was born at Bucharest and studied in Paris and Geneva He entered the Chamber of Deputies in 1885 as a member of the Conservative Party, to which his interests, as a rich landowner, attached him In 1910 he became the leader of the younger Conservatives, but an unfortunate personal feud with Palle Jonescu largely paralysed his activities, and ended in the secession of Jonescu, who formed the new Conservative-Democrat Government As minister of war in the Carp cabinet of 1910, Filipescu undertook a reorganization of the Rumanian army on a large scale. In 1913 he and Carp, then in the Opposition, were largely responsible by their agitation for Rumania's participation in the Second Balkan War and subsequent acquisition of Silistria On the outbreak of the World War Filipescu, with his followers, demanded Rumania's armed intervention on the side of the Allies The result was a split between Filipescu and Marghiloman's Germanophile party, the former joining Take Jonescu's group He lived to see the triumph of his policy, but not the subsequent debâcle, dying at Bucharest in 1916

FILLAN, SAINT or **FAELAN,** the name of the two Scottish saints, of Irish origin, whose lives are of a purely legendary character. The St. Fillan whose feast is kept on June 20 had churches dedicated to him at Ballyheyland, Queen's county, Ireland, and at Loch Earn, Perthshire The other, who is commemorated on Jan. 9, was specially venerated at Cluain Mavscua, Co Westmeath, Ireland, and about the 8th or 9th century at Strathfillan, Perthshire, Scotland, where there was an ancient monastery dedicated to him This monastery became a cell of the abbey of canons regular at Inchaffray, and was supposed to possess the Saint's crozier, the head of which is now deposited in the National museum of the Society of Antiquaries of Scotland

The legend of the second saint is given in the Bollandist *Acta SS* (1643), Jan. 9; *see* also D. O'Hanlon, *Lives of Irish Saints* (Dublin, 1825).

FILLET, a band or ribbon used for tying the hair, the Lat *vitta,* which was used as a sacrificial emblem, and also worn by vestal virgins, brides and poets. The word is thus applied to anything in the shape of a band or strip, as, in coining, to the metal ribbon from which the blanks are punched. In architecture, a "fillet" is a narrow flat band, sometimes called a "listel," which is used to separate mouldings one from the other, or to terminate a suite of mouldings as at the top of a cornice In a fluted column the fillet is often employed between the flutes It is a very im-

portant feature in Gothic work, being frequently worked on large mouldings (*q v*); when placed on the front and sides of the moulding of a rib it is termed the "keel and wings" of the rib.

In cooking, "fillet" is used of the "undercut" of a sirloin of beef, or of a thick slice of fish or meat; more particularly of a boned and rolled piece of veal or other meat, tied by a "fillet" or string

FILLING: *see* WARP AND WEFT

FILLMORE, MILLARD (1800–1874), 13th president of the United States of America, came of a family of English stock, which had early settled in New England His father, Nathaniel, in 1795 made a clearing within the limits of what is now the town of Summerhill, Cayuga county, N Y, and there Millard Fillmore was born, on Jan 7, 1800 Until he was 15 he could have acquired only the simplest rudiments of education, and those chiefly from his parents At that age he was apprenticed to a fuller and clothier, to card wool and to dye and dress the cloth Two years before the close of his term, with a promissory note for $30, he bought the remainder of his time from his master, and at the age of 19 began to study law In 1820 he made his way to Buffalo, then only a village, and supported himself by teaching school and aiding the postmaster while continuing his studies In 1823 he was admitted to the bar, and began practice at East Aurora, N Y Hard study, temperance and integrity gave him a good reputation and moderate success, in 1827 he was made an attorney and in 1829 counsellor of the supreme court of the State Returning to Buffalo in 1830, he formed in 1832 a partnership with Nathan K Hall (1810–74), later a member of Congress and postmaster general in his cabinet Solomon G Haven (1810–61), member of Congress from 1851 to 1857, joined them in 1836 The firm met with great success

From 1829 to 1832 Fillmore served in the State assembly, and, in the single term of 1833–35, in the National House of Representatives, coming in as anti-Jackson, or in opposition to the administration From 1837 to 1843, when he declined further service, he again represented his district in the House, this time as a member of the Whig Party In Congress he opposed the annexation of Texas as slave territory, was an advocate of internal improvements and a protective tariff, supported J Q Adams in maintaining the right of offering anti-slavery petitions, advocated the prohibition by Congress of the slave trade between the States and favoured the exclusion of slavery from the District of Columbia His speech and tone, however, were moderate on these exciting subjects, and he claimed the right to stand free of pledges, and to adjust his opinions and his course by the development of circumstances The Whigs having the ascendancy in the 27th Congress, he was made chairman of the House committee on ways and means Against a strong opposition he carried an appropriation of $30,000 to Morse's telegraph In 1844 he was the Whig candidate for the governorship of New York, but was defeated In Nov 1847 he was elected controller of the State of New York, and in 1848 he was elected vice president of the United States on the ticket with Zachary Taylor as president Fillmore presided over the Senate during the exciting debates on the Compromise Measures of 1850

President Taylor died on July 9, 1850, and on the next day Fillmore took the oath of office as his successor The cabinet which he called around him contained Daniel Webster, Thomas Corwin and John J Crittenden On the death of Webster in 1852, Edward Everett became secretary of State. Unlike Taylor, Fillmore favoured the Compromise Measures, and his signing one of them, the Fugitive Slave law, in spite of the vigorous protests of anti-slavery men, lost him much of his popularity in the North Commodore Matthew Calbraith Perry's expedition, which opened up diplomatic relations with Japan, occurred during his term In the autumn of 1852 he was an unsuccessful candidate for nomination for the presidency by the Whig National Convention, and he went out of office on March 4, 1853 In Feb. 1856, while he was travelling abroad, he was nominated for the presidency by the American or Know-Nothing party, and later this nomination was also accepted by the Whigs; but in the ensuing presidential election, the last in which the Know-Nothings and the Whigs as such took any part, he received the electoral votes of only one State, Maryland Thereafter he took no public share in political affairs Fillmore was twice married, in 1826 to Abigail Powers (who died in 1853, leaving him with a son and daughter), and in 1858 to Mrs Caroline C McIntosh. He died at Buffalo March 8, 1874, and was buried in Forest Lawn in that city

In 1907 the Buffalo Historical Society, of which Fillmore was one of the founders and the first president, published the *Millard Fillmore Papers* (vol x and xi of the society's publications, edited by F. H Severance), containing miscellaneous writings and speeches, and official and private correspondence Most of his correspondence, however, was destroyed in pursuance of a direction in his son's will *See* William E. Griffis, *Millard Fillmore* (Ithaca, N Y, 1915).

FILM, a thin skin, pellicle or lamina of any material, an opaque layer; a fine cobweb, gossamer or silk thread Body surface emanations in Epicureanism were films, supposedly perceptible objects. In physics it is a liquid or gaseous coating; botanically, a seed pod partition Verbally the word means to cover or be covered with film In photography (*q v*) a collodion or gelatin-coated paper or plate, or merely the coating is a film Popularly, in the United States, it is the sheet or roll of material, such as celluloid, recording a moving picture (*see* MOTION PICTURE) or still camera negative, the finished positive, or a completed cinema production. To "film a scene" is a very common term

FILMER, SIR ROBERT (d 1653), English political writer, champion of the "divine right" of kings, was born at East Sutton, Kent, and educated at Trinity college, Cambridge He was an ardent supporter of the king's party, and his house is said to have been sacked ten times during the Civil War Filmer held that God gave authority to Adam, an authority inherited by Noah and handed down to his three sons, from the patriarchs, kings and governors derived an absolute authority, founded on divine right The king was perfectly free from all human control These views were developed in a series of works of which the most complete, *Patriarcha*, was not published until 1680

The *Patriarcha* was reprinted (1883) in Morley's Universal Library.

FILMY FERNS, a general name for a family of ferns, the Hymenophyllaceae, with delicate, much-divided leaves and often moss-like growth, comprising the genera *Hymenophyllum* and *Trichomanes*, together comprising some 450 species, natives chiefly of the humid tropics and mainly epiphytic. Two species of *Trichomanes* occur in the south-eastern United States Various species are in greenhouse cultivation They require to be kept in close cases in a cool fernery, and the stones and moss amongst which they are grown must be kept continually moist so that the evaporated water condenses on the leaves

FILON, AUGUSTIN (1841–1916), French man of letters, son of the historian C A D Filon (1800–75), was born in Paris in 1841 His father became professor of history at Douai, and eventually *inspecteur d'académie* in Paris, his principal works were *Histoire comparée de France et de l'Angleterre* (1832), *La Diplomatie française sous Louis XV* (1843), *Histoire de la démocratie athénienne* (1854) Educated at the École normale, Augustin Filon accompanied the Prince Imperial, as tutor, to England, where he remained for some years He is the author of *Guy Patin, sa vie, sa correspondance* (1862); *Nos grands-pères* (1887); *Prosper Mérimée* (1894); *Sous la tyrannie* (1900); *Histoire de la littérature anglaise* (1883); *Le Théâtre anglais* (1896); *L'Angleterre d'Edouard VII.* (1911), *Souvenirs et documents* (1912), relating to the Prince Imperial He died at Croydon, England, on May 13, 1916

FILTER, ELECTRIC WAVE, a device used in radio sets, usually a selective circuit network, designed to transmit a direct current or alternating current within a continuous band or bands of frequencies It also attenuates currents of other frequencies (*See* ELECTRICITY and BROADCASTING)

FILTER-PASSING VIRUSES, organisms small enough to pass through a bacterial filter made of unglazed porcelain or compressed infusorial earth In these filters the grains of the china clay or infusorial earth used for their manufacture are sufficiently small and uniform to leave interstices, the cross section of which is 0·2 to 0·8μ in diameter If a liquid containing microbes whose

smallest diameter exceeds 0·2μ be pressed through the filter, the microbes remain impacted in the smaller crevices As 0·2μ is also the limit of size of a particle which can be resolved by the best microscopes (*see* MICROSCOPY) when white light is used, filter-passing organisms are either invisible or on the margin of visibility. Hence, most of them have been classed as "ultravisible viruses."

Discovery.—The first discovery, that an ultramicroscopic or filterable virus was the cause of an animal disease, was made by Loeffler in 1898 in the course of some experiments upon foot-and-mouth disease, in which a filter of infusorial earth was used to remove ordinary recognizable bacteria from the diluted contents of the superficial vesicles which are characteristic of this disease The filtrate was free from any particles visible by the microscope and no bacteria developed in it on cultivation Nevertheless, injection of this filtrate into animals caused disease Material removed from the vesicles of the animal so infected and filtered again reproduced the disease in a fresh animal. Similar experiments were carried out through a number of generations of animals, so that there was no doubt that a virus capable of propagation in the animal body was contained in the filtrates. In the next few years the filterability of the virus was established in the case of infectious pleuro-pneumonia of cattle, South African horse-sickness and fowl plague

Yellow Fever.—The cause of yellow fever has been shown by Noguchi to be a spirochaete which, owing to its thinness and motility, can pass through a bacterial filter

Human Diseases.—Up to 1927 the virus of about 40 diseases of man and domestic animals had been found to pass through a bacterial filter by reliable observers. The more important of these are the following foot-and-mouth disease, contagious bovine pleuro-pneumonia, African horse-sickness, fowl plague, yellow fever, cattle plague, sheep-pox, *epithelioma contagiosum* of birds, swine fever, rabies, cow-pox (vaccinia), *molluscum contagiosum* of man, equine infectious pernicious anaemia, canine distemper, "blue tongue" of sheep, dengue fever, papataci or sand-fly fever, smallpox, trachoma, poliomyelitis, measles, typhus fever, trench fever, mumps, Rocky Mountain spotted fever and *herpes labialis*

Influenza.—Recently, Olitzky has succeeded in propagating on special culture media seven varieties of small microbes from the filtrates through a "bacteria proof" filter of washings of the throats of individuals suffering from catarrhal diseases One of them is credited, on substantial grounds, with being the cause of pandemic influenza (*q v*), another is supposed by its discoverer to be responsible for our common colds The others do not appear to be of pathological significance

Cancer Research.—There is now reason to suppose that filterable viruses play some part in the origin of cancer (*see* CANCER RESEARCH) When a fragment of a malignant tumour is implanted in the tissues of an animal of the same species it generally grows and ultimately kills the animal The animal cells of which the cancer is composed are endowed with a faculty for growth, uncontrolled by those factors which determine normal tissue equilibrium The possibility that this property was due to infection of the cells by a microbe has, in the past, occupied the attention of investigators, but no experimental basis for this view was afforded till 1911, when Peyton Rous described a sarcoma of the fowl which differed from mammalian tumours in that it was transmissible from chicken to chicken by means of a filtrate from a filter which kept back all of the malignant cells (much too large to traverse its pores) and also any bacteria of ordinary dimensions This filtrate could be dried at a low temperature and the powder retained its activity for years It had no effect when injected into animals other than chickens, and it always produced the same type of tumour

As the same result could not be obtained with a filtered extract of other malignant growths, this very important discovery was interpreted to mean that this fowl-sarcoma was a thing apart, although in structure and behaviour it closely resembled the mammalian sarcomata. Subsequently, its discoverer found that two other malignant tumours of fowls possessed similar properties, and quite recently Carrel has recorded the formation of malignant tumours in fowls following local irritation of the tissues with tar or arsenic, filtrates from which were also infective for chickens Rous believed that the filterable agent which caused the tumours he studied was, probably, an extremely small microbe, but as he did not succeed in propagating it outside the body its nature remained undetermined The nature of the infective agent in the filtrate of Rous's tumour has recently been investigated by Gye, who believes he has succeeded in growing it in test tubes in a special medium The culture has been carried on through several generations of transplantations By this means the virus has been purified from the other constituents of the original implant. The inoculation of this purified virus alone did not give rise to a tumour, but if mixed with an extract of the fresh tumour, in which the virus has been killed by chemical agents and which alone was innocuous, a tumour occurred In other words, he holds that the conjunction of two factors, living virus and some non-living chemical substance or substances, is necessary to provoke the cells of the animal to that anarchical development which is characteristic of malignant growth.

Gye's Experiments.—Gye also maintains that chicken sarcoma is not peculiar, as hitherto believed, and that a particular mouse sarcoma will sometimes yield an infective filtrate In this case, however, a special technique had to be employed, the original method of Rous proving unsuccessful This is a discovery of much significance and it seems possible that an extrinsic origin may be found in the case of other cancers in the near future

The virus of Rous sarcoma has been presumed to be particulate as it is held back by the finer grades of filter, and recently Barnard, using ultra-violet light, has obtained photographs of small globoid bodies about 0·1μ in diameter from cultures of the virus These small bodies occurred in masses, suggesting colonies They were not discovered in the medium before inoculation or when the cultivation of the virus proved unsuccessful Whether they represent the microbes or aggregations of colloidal particles produced from the proteins of the medium by chemical changes associated with the growth of the virus occurring therein, is not at present determined

Plant Diseases.—Filterable organisms are also responsible for many diseases of plants (*see* PLANT PATHOLOGY) In fact, their existence was first brought to light by Iwanowski in 1892 in connection with the mosaic disease of the tobacco plant Iwanowski's discovery was lost sight of and the fact was rediscovered by Beijerinck in 1898. Many varieties of plants, including the potato, tomato, bean, peach, clover, pea, cucumber, turnip, spinach, *datura, hyoscyamus, capsicum,* sugar-cane, maize, sorghum and various grasses suffer from mosaic diseases In most mosaic diseases the only obvious lesion is bleaching of the leaves in patches of varying extent, but sometimes, as in "leaf roll" of potatoes, "curly top" of beet and "spike" disease of sandalwood trees, definite destruction of tissue leading to malformation occurs The loss of chlorophyll interferes with the nutrition of the plant by limiting the leaf area capable of utilizing the radiant energy of the sun for the building up of carbohydrate from carbonic acid and water To this handicap local necrosis of portions of the leaf and stalk is in some varieties superadded The economic effect of these diseases may be, as in the case of the mosaic of sugar-cane, almost negligible or, as in the case of "peach yellows" and the "spike" of sandalwood, serious, as it destroys these trees

Between these extreme instances, the infection results in more or less diminution of crop Only the growing leaves are affected Nevertheless the virus extends throughout the plant and sometimes to the seeds Mosaic diseases are very infectious. Mere handling of a healthy plant after touching an infected one is, in some instances, sufficient to transmit infection. The disease is spread by leaf flies or beetles and by grafting (*see* ENTOMOLOGY, ECONOMIC). The virus is not capable of maintaining itself in the soil. There is a large number of different viruses which produce mosaic diseases Some of them infect more than one species of plant. They can also inhabit resistant species of plants without these manifesting any symptoms, but the disease can be transferred from resistant plants to susceptible species by insects or grafting. Many attempts have been made to propagate these

plant viruses in the laboratory upon plant-juices without success, but the virus of one of the mosaic diseases of the potato appears to have been recently cultivated by Olitzky

Properties of Micro-organisms.—Little is known about most of these filterable viruses They appear to be of various natures, and the only property common to them is minuteness The parasite responsible for yellow fever is a small spirochaete, those occasioning bovine pleuro-pneumonia and human poliomyelitis are globoid in shape and just on the margin of visibility with the best microscopes

It is not improbable that many of them flourish only inside the cells of animals and plants, which may explain the difficulty in cultivating them in artificial media In some cases, small bodies of definite size, shape and staining characteristics are always to be seen in the cells at the seat of the lesion (trachoma, *molluscum contagiosum,* variola, vaccinia, bird-pox, typhus and Rocky Mountain spotted fevers) Whether these represent the microbe or granules in the cell contents produced under the influence of the virus is a matter of opinion Until cultivation outside the body is achieved this controversy will not be settled

Definite Results.—At present only the viruses of pleuro-pneumonia, poliomyelitis, yellow fever, chicken sarcoma and the microbe probably responsible for influenza have been certainly cultivated, although many claims to have accomplished this with other viruses have been made Some of these viruses occur in the blood of the patient during the acute stage of the illness and are transported to a fresh host by the bite of blood-sucking insects

Transmission of Infection.—The infections of yellow fever (*q v*) and dengue are conveyed by the mosquito (*Stegomyia fasciata*) That of papataci fever is transmitted by the sandfly (*Phlebotomus papatasii*) (*see* SANDFLY FEVER) and that of typhus and trench fevers by lice (*see* INFECTIOUS FEVERS) With these three fevers, and also in the case of some of the mosaic diseases of plants which are transferred by leaf flies, some days elapse before the insect is capable of handing on the infection, indicating that an interval for the multiplication of the parasite is necessary It is possible that a stage in the life-history of the parasite can only occur in the body of the insect host Some filterable viruses, such as smallpox, cow-pox, foot-and-mouth disease and *molluscum contagiosum,* give rise to superficial lesions, and are spread by contact, others occasion catarrh of the respiratory passages and are distributed by coughing and intimate contact, as in distemper, measles and pleuro-pneumonia

Conclusion.—Most filter-passing microbes which have been discovered hitherto cause disease of plants or animals It would be strange if only parasitic forms existed, for the majority of the larger microbes are not pathogenic but are concerned with the multifarious putrefactive and fermentative changes in organic matter on the surface of the earth Accordingly, it would be natural to suppose that sub-microscopic germs with similar activities would be ubiquitous The indications, at present, are, however, against this supposition, and sub-microscopic dimensions seem to be an attribute, more especially, of germs which are parasitic upon animals and plants (C J. M)

FILTERS, LIGHT. Light filters are used to modify the light which traverses them by absorbing some portion of it either partially or completely They may be used as liquid filters in the form of solutions or as solid filters, which may consist of coloured glasses or of films containing dyes In some special cases, gases have been used as filters Liquid filters are made by using solutions of salts or dyes held in glass troughs with parallel sides, while coloured glasses or stained films of gelatine or collodion are employed in a great variety of forms On a small scale, gelatine light filters are generally made by coating glass with dyed gelatine and then cementing a cover glass with Canada balsam on to the dried gelatine film On the large scale, however, they are prepared by coating the gelatine containing the necessary dyes upon plate glass and after drying, stripping the gelatine film off the glass, the filter being then used either as a gelatine film or cemented between optical glasses

The colour of a filter is conditioned by its selective spectral absorption Thus, a red filter absorbs the blue and green regions of the spectrum, a blue filter, the red, a yellow filter, the blue, and a green filter, both the red and blue regions (*see* COLOUR) This selective absorption is best expressed by means of the absorption curve of the filter, which can be measured by an instrument combining the properties of a spectroscope and a photometer and known as a *spectrophotometer*

Light filters may be classified as (1) Selective filters, which transmit only a selected region of the spectrum, more or less narrow, (2) compensating filters, which have a more gradual absorption and which transmit in greater or less intensity most of the spectrum, and (3) subtractive filters, which absorb only a small portion of the spectrum and transmit the remainder, so that for every selective filter we can have theoretically a corresponding subtractive filter

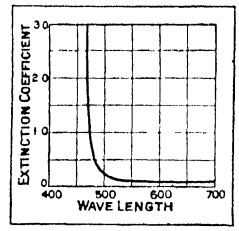


FIG 1—ABSORPTION SPECTRUM OF K-2 ORTHOCHROMATIC FILTER

Application of Light Filters.—Filters used in photography may be classified according to their use as

1 Orthochromatic filters, used to correct the selective sensitiveness of photographic materials in order give a reproduction of the brightness of coloured objects more closely approximating that perceived by the eye (*see* fig 1) These are yellow in colour and are often known as *colour screens* They are widely employed in practical photography

2 Contrast filters used to modify the brightness of some special colour or group of colours

3 Selective filters, for two or three-colour photography with their corresponding synthetic projection filters if the processes of colour photography used are of the additive type (*see* fig 2)

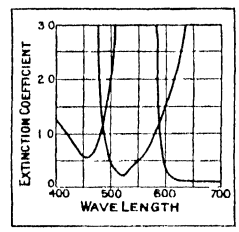


FIG 2—ABSORPTION SPECTRA OF THREE COLOUR FILTERS

4 Compensating filters, used to adjust the light entering a photographic system in order to fulfill some particular condition required in colour photography

For photomicrography, filters are used in the photography of stained sections and other objects displaying strong colours Thus, if any colour is to be rendered as dark as possible, it must be viewed or photographed by light which is absorbed by the colour On the other hand, in order to render detail, it must be examined by the light which it transmits, so that insect preparations, for instance, which are strongly yellow, are best photographed by yellow or red light Light filters are also employed for visual use with a microscope, blue and green filters being particularly valuable

FILTRATION. In many industrial processes it is necessary to separate finely divided solid materials from liquids The process of filtration consists in passing the liquid through a porous medium, which retains the solid particles In some cases the recovery of the solid material is the main object; in others the filtration is done for the sake of purifying the liquid Many types of filter are in use, differing in respect to (1) the various porous materials which are available for filtration, and (2) the construction of the apparatus in which these are applied

Filter Materials—The following are the main types of material which are in use

1 Sheets of woven or felted material These comprise porous filter paper, cotton, woollen or linen cloth, felt and woven metal

2 Unwoven fibrous material, such as cotton wool, linen fibre, cellulose pulp, metal fibres, sponge

3 Granular or powdered materials, such as gravel, sand, earth, coke, sawdust, cork

4 Porous plates of stone, porcelain, carbon, silica, etc.

The choice of material depends upon (*a*) the fineness of the substances to be filtered, (*b*) the chemical nature of the liquid, (*c*) convenience in collecting the solid material after filtration.

Laboratory Filtration—Porous paper is generally used as the filter medium, being resistant to most of the liquids which require filtration. The commonest method of filtration is to fold a circular filter paper twice at right angles, and open it out to a cone with

three thicknesses of paper at one side and one at the other This is placed in a conical glass funnel, and the liquid is poured into it In some cases, the filter funnel is provided with a hot-water jacket to keep the liquid warm during filtration Filter paper is also manufactured in the form of thimbles, for extractions with solvents, such as alcohol and ether, in special apparatus The Buchner funnel is made of porcelain and has a flat, perforated bottom on which a circular filter paper is placed This form of filter has the advantage that the filtration may be assisted by the application of suction below the filter The Gooch crucible is a porcelain cup with a perforated bottom A thin layer of asbestos serves as the filter, and the crucible can be weighed, after drying, to ascertain the weight of solid material collected Filters are now made for laboratory use in which the porous material consists of a fritted mass of hard glass, which has been ground and sieved to a definite degree of fineness This is made into discs, which are fused into various types of glass apparatus, and are resistant to almost all chemical reagents

Filtration of Drinking Water—Domestic filters are usually supplied in the form of earthenware vessels with filter beds of charcoal, in some cases filters of paper, asbestos or stone are used It was originally thought that charcoal filters would unfailingly remove micro-organisms, but the action was subsequently found to be less complete than had been believed Indeed, if the filter material be not removed at intervals, it may become the seat of organic growths Large-scale filtration of town supplies of water is generally effected in sand filters

Industrial Filtration—When possible, it is advantageous to allow the solid precipitate to settle in the liquor for some time, and to run off as much as possible of the clear liquid The sediment may then be stirred up with water, allowed to settle, and the liquid again decanted, so as to minimise the bulk of liquor to be filtered, and to facilitate the subsequent washing The design of industrial filters varies according to the requirements The chief considerations are that the filter shall present a maximum available surface without occupying too much factory space, that it shall withstand the required pressures, that it shall not be easily clogged, but shall be readily cleaned and easily controlled at all points In some cases filters are designed to work continuously Simplicity and economy of construction often outweigh all other considerations, thus for many purposes it is sufficient to filter through a bed of sand, or through a simple sheet of cloth resting on a flat, perforated support Suspended bags of cloth are also frequently used, and have the advantage that the bag can be squeezed or wrung out after filtration to remove as much liquor as possible from the solid material

Vacuum and Pressure Filters—As in laboratory filtration, suction is frequently applied to accelerate the flow of liquid A filter cloth is spread on a perforated plate of earthenware or other material, and the receiver into which the filtrate flows is connected with a vacuum pump Conversely, pressure may be applied to the surface of the liquid in the filter In place of cloth filters, porous plates are sometimes used, these may be either flat plates or cylindrical "candles" of porous material, presenting an increased filter area Leaf filters may be used either for suction or pressure A typical form of leaf consists of a rectangular frame of perforated pipes to which is attached a stiff, corrugated coating of coconut matting or other material, and the whole enveloped by a cloth bag The liquid passes from the exterior to the interior of the leaf, and is assisted either by external pressure or by internal suction A filtering unit consists of a number of parallel leaves, thus presenting a large filtering surface

Filter presses are somewhat similar in principle. In one form, recessed plates are supported on a framework, so that they can be firmly pressed together by a screw press Sheets of cloth are placed between the plates, and thus, when the filter press is assembled, it forms a series of narrow partitions separated by cloth filters Channels are provided so that the sludge to be filtered can be forced under pressure between the cloth sheets, and the filtered liquid is collected from taps at the bottom of the plates After filtration and washing, if necessary, the plates are separated, and the cake of solid material is removed In place of recessed plates, some filter presses have alternate plates and distance frames.

In centrifuges the filtration is assisted by the rapid rotation of a circular pan The periphery of the pan is perforated, and covered on its inner side with a filter cloth, supported by a basket of metal The rapid rotation (up to about 1,000 revs per min) whizzes the liquid through the filter, with a force several hundred times greater than in gravity filtration

Continuous Filters—In the above-mentioned filters, the solid material has to be collected at intervals, and this necessitates interrupting the filtering operation Continuous filtration can be effected by rotary filters A hollow drum is supported in such a way that it can be rotated on a horizontal axis The periphery of the drum is perforated and is covered with a filter cloth, and the drum dips into the liquid to be filtered By suction, the liquid is drawn through the filter cloth to the interior of the drum, and the solid remains on the outside The drum rotates slowly, and a scraper is fixed in such a position that it scrapes off the solid material continuously In some cases, rotating discs are similarly used A recent advance in filtration methods is the stream-line filter, which permits of the separation of extremely finely divided solid matter, which would pass through ordinary filter cloths The liquid is forced through the edge of a pack of sheets of paper pressed tightly together The channels between the sheets are so minute that the finest precipitates are retained The filter is made in various forms to permit of continuous filtration, etc

Coagulation as an aid to Filtration—The greatest difficulties in filtration are presented by slimy substances, which clog the filter Application of increased pressure only accentuates the difficulty, and considerable importance attaches to methods whereby the slimy material may be caused to clot together and settle out This can be effected by the addition of kieselguhr, fuller's earth, clay, talc, silica-gel and various carbonates Another procedure is to coat the filter with a layer of finely divided kieselguhr, boneblack, sawdust or other finely porous material, which retains the slime and prevents it from penetrating into the filter material

(R C F)

FIMBRIA, GAIUS FLAVIUS (d 84 B C), Roman soldier, partisan of Marius He was sent to Asia in 86 B C as legate to L Valerius Flaccus, but quarrelled with him and was dismissed Taking advantage of the absence of Flaccus at Chalcedon Fimbria revolted and slew Flaccus at Nicomedia He then took command of the army and obtained several successes against Mithridates, whom he shut up in Pitane on the coast of Aeolis, and would undoubtedly have captured him had Lucullus co-operated with the fleet. Fimbria treated most cruelly all people of Asia who had revolted against Rome or sided with Sulla Having gained admission to Ilium by declaring that, as a Roman, he was friendly, he massacred the inhabitants and burnt the place to the ground But in 84 Sulla crossed over from Greece to Asia, made peace with Mithridates, and turned his arms against Fimbria, who committed suicide His troops were made to serve in Asia till the end of the third Mithridatic War

See ROME *History*, and SULLA and MARIUS

FIMBRIATE, a zoological and botanical term meaning fringed (Lat *fimbriae*, fringe) In heraldry (*q v*) a bearing with a narrow edge or border is "fimbriate" or "fimbriated"

FINALE, a term in music for the concluding movement in an instrumental composition, whether symphony, concerto, or sonata, and in opera of the older type the concluding section of each act. Among instrumental examples the great choral finale to Beethoven's 9th symphony, and, among operatic finales, that of Mozart's *Nozze di Figaro*, to the second act, are famous

FINANCE is that part of practical affairs which is concerned with money taken in a broad sense, to include not only that which is legally money (such as coin and paper money) but also bank credit or "credit money" Without suggesting that a word of such extensive practical application can be adequately defined by any simple formula, we may indicate its significance by saying that finance is "the art of providing the means of payment." The immediate aim thereby assigned to finance in any business is simply that of maintaining at all times an adequate cash balance (in money or bank credit). But the means employed include all

the multifarious methods of borrowing money and of exchanging one sort of pecuniary right against another

Subdivisions of Finance.—The following are the principal categories of finance in commercial enterprise.

(1) *Banking.* Banks create credit money by lending, and supply their customers with the means of payment

(2) *The Money Market* Closely associated with the banks, but distinguishable from them, is the money market, an organization for dealing competitively with short-term lending in the form of bills of exchange or day-to-day loans

(3) *The Investment Market,* viz..

(a) *The Stock Exchange,* where stocks, shares, bonds and debentures are bought and sold,

(b) *New Capital Issues,* or the raising of funds from investors for the promotion of new capital enterprises

(4) *The Foreign Exchange Market,* where the means of payment in one country are exchanged for the means of payment in another

(5) *Insurance,* including life insurance, which is a form of investment, and insurance against risks (such as fire or shipwreck)

Public Finance.—This is in a class by itself Governments raise the means of payment

(*a*) by taxation,

(*b*) by borrowing

Taxation means compulsory contributions of money taken by authority of law from members of the community

Governments have other resources On the one hand they obtain money from state-owned enterprises, such as posts, telegraphs, telephones, railways or from state-owned property, such as forests or mines On the other hand they exact services in kind, such as compulsory military service But in any highly developed community taxation is the principal resource

If revenue fails to meet expenditure, the deficiency has to be made good by borrowing

Financial policy has to decide (1) how much revenue is to be raised and by what taxes, (2) how much public expenditure there is to be, and in what directions it is to be limited, (3) whether any of the expenditure is to be met by borrowing, and, if so, how much, and on what terms the money is to be borrowed

The generally accepted principle is that revenue ought to meet expenditure, except

(1) expenditure of a clearly capital character, such as public buildings or income-yielding plant;

(2) emergency expenditure, so large in amount that to cover it by taxation would be unduly burdensome or even entirely impracticable, *e g*, war expenditure

Control of Public Expenditure.—In order to secure a balance between revenue and expenditure outside these exceptional cases, some control over expenditure is needed

This control takes several forms

(1) *Parliamentary Control* Parliaments are given the right of voting the public expenditure under a number of separate categories (sometimes elaborately and minutely classified), and the executive government is required to keep within the vote under every head.

(2) *Executive Control* Every department is required to conform to the directions of the ministry of finance in regard to its expenditure (A particularly drastic and searching control is exercised by the Treasury in Great Britain)

(3) *Accountability* To be effective, all forms of control require some system which will bring to light any cases in which the directions given have been contravened There must be a thorough system of audit devised for this purpose

In limiting expenditure it is necessary to weigh in the balance the advantages of the expenditure which is in question, against the disadvantages of the taxation which would have to be imposed to meet it. The ministry of finance, in exercising control over the various heads of expenditure and in determining what taxes are to be imposed, retained or remitted, should constantly keep that comparison in view.

It is also the function of the ministry of finance to consider what items of expenditure may be met from borrowing, what form the borrowing should take, what provision should be made for sinking fund to pay off debt, and what arrangements should be made for dealing with debt maturities and conversions In all these matters, while it is for the ministry of finance to make proposals, the measures actually taken are usually regulated by statutory enactments

A minister of finance also requires authority for temporary borrowing. Primarily temporary borrowing is needed to meet a temporary lag of revenue behind expenditure, or to meet emergency expenditure in the interval before a permanent loan can be issued But there is a danger that it may extend beyond these limits Temporary borrowing can be effected through banks, which create the credit money which they lend An excessive floating debt is a great danger because it may lead on to inflation of the currency Inflation may be regarded as a breakdown of public finance The government, having failed to provide the means of payment by means of taxation and genuine borrowing, has resort to the creation of bank credit to fill the gap

Governments and legislatures take responsibility for the provision of currency for the community But sound principle generally requires this function to be kept as separate as possible from the finance of the public service The administration of the currency is (or ought to be) directed to the provision of the means of payment for the community generally and not for the government in particular

Public finance includes, besides the finances of governments, the finances of local authorities (municipalities, county councils, communes, etc) Local authorities are usually given limited taxing powers by statute and their borrowing powers are also restricted and supervised Sometimes they also receive subsidies from the government out of the national tax revenue

(R G H)

FINANCE, ARTICLES ON. The subject of finance is treated here in many different articles, to which the following notes, together with the references in the General Index, will be a guide

As to banking, reference should be made to the articles BANKING AND CREDIT, CENTRAL BANKS, BANK, BANKS, HISTORY OF, MONEY, CHEQUE; INFLATION AND DEFLATION, CURRENCY; INTERNATIONAL PAYMENTS

As to the money market, the relative articles are MONEY MARKET, BILL BROKER, DISCOUNT AND DISCOUNT HOUSES, MERCHANT BANKERS, BANK RATE, BILL OF EXCHANGE

As to the investment market, there are articles on STOCK EXCHANGE, STOCKBROKER, INVESTMENT, OPTIONS; DIVIDEND, CAPITAL, EXPORT OF, BUILDING SOCIETIES, FRIENDLY SOCIETIES, etc.

As to the foreign exchange market, articles can be consulted on EXCHANGE, FOREIGN, BALANCE OF TRADE, BILL OF EXCHANGE; ARBITRAGE

Upon insurance, a series of articles can be consulted covering every part of the subject; *see* INSURANCE, NATIONAL INSURANCE, UNEMPLOYMENT INSURANCE, INSURANCE, MISCELLANEOUS; FRIENDLY SOCIETIES and the related articles under EXPECTATION OF LIFE, ANNUITY, SUPERANNUATION, PENSIONS, WAR PENSIONS, LIFE TABLES, GENERAL AVERAGE

Turning to public finance, the general control of public expenditure is described under PARLIAMENT, BUDGET, EXCHEQUER; ESTIMATES, SUPPLY

Upon the important subject of taxation, articles will be found under TAXATION, INLAND REVENUE, BOARD OF, INLAND REVENUE DUTIES, CUSTOMS, STAMP DUTIES, INCOME TAX, ESTATE DUTIES; LAND TAXES There are separate articles on INCOME TAX (ECONOMIC ASPECT) and INCOME TAX (IN PRACTICE). The article INHERITANCE should be read in connection with the treatment of ESTATE DUTIES

As to public borrowing and public debt, a series of articles will be found under NATIONAL DEBT, INTER-ALLIED DEBTS, FLOATING DEBT; SINKING FUND, WAR FINANCE, REPARATIONS AND DAWES PLAN; DEBT CONVERSION It should also be observed that under the title of each country a section devoted to finance gives important details. LOCAL TAXATION is treated under that heading

A special article is devoted to the important subject of NA-

TIONAL SAVINGS

FINANCE ACT: *see* BUDGET

FINCH, a name applied (but almost always in combination, as bullfinch, chaffinch, etc.) to birds of the family *Fringillidae* Generally speaking finches are small birds with a hard bill, living mainly on seeds, and characteristic of the Palaearctic region, where most of the very numerous species live

See also BULLFINCH, CANARY, CHAFFINCH, HAWFINCH, SPARROW, GREENFINCH, GROSBEAK, LINNET, CROSSBILL, SISKIN, GOLDFINCH, REDPOLL, BOBOLINK, BUNTING

FINCH, FINCH-HATTON, English family Sir Thomas Finch (d 1563), who was knighted for his share in suppressing Sir T Wyatt's insurrection against Queen Mary, was the son and heir of Sir William Finch, who was knighted in 1513 He was the father of Sir Moyle Finch (d 1614), created a baronet in 1611, whose widow Elizabeth (daughter of Sir Thomas Heneage) was created a peeress as countess of Maidstone in 1623 and countess of Winchilsea in 1628, and also of Sir Henry Finch (1558–1625), whose son John, Baron Finch of Fordwich (1584–1660), is separately noticed Thomas, eldest son of Sir Moyle, succeeded his mother as first earl of Winchilsea, and Sir Heneage, the fourth son (d 1631), was the speaker of the House of Commons, whose son Heneage (1621–1682), Lord chancellor, was created earl of Nottingham in 1675 The latter's second son Heneage (1649–1719) was created earl of Aylesford in 1714 The earldoms of Winchilsea and Nottingham became united in 1729, when the fifth earl of Winchilsea died, leaving no son, and the title passed to his cousin the second earl of Nottingham, the earldom of Nottingham having since then been held by the earl of Winchilsea In 1826, on the death of the ninth earl of Winchilsea and fifth of Nottingham, his cousin George William Finch-Hatton succeeded to the titles, the additional surname of Hatton (since held in this line) having been assumed in 1764 by his father under the will of an aunt, a daughter of Christopher, Viscount Hatton (1632–1706)

FINCH OF FORDWICH, JOHN FINCH, BARON (1584–1660), generally known as Sir John Finch, English judge, was born on Sept 17, 1584, and was called to the bar in 1611 He became recorder of Canterbury in 1617 In 1626 he was appointed king's counsel and attorney-general to the queen, and was knighted In 1628 he was elected speaker of the House of Commons He was the speaker who was held down in his chair by Holles and others on the occasion of Sir John Eliot's resolution on tonnage and poundage In 1634 he became chief justice of the court of common pleas, and zealously upheld the king's prerogative As chief justice he displayed great brutality in the cases of William Prynne and John Langton He presided over the trial of John Hampden for non-payment of ship-money He became lord keeper in 1640 and was created Baron Finch of Fordwich One of the first acts of the Long Parliament, which met in the same year, was his impeachment He took refuge in Holland, and in 1660 was one of the commissioners for the trial of the regicides He died Nov 27, 1660

FINCHLEY, an urban district in the Finchley parliamentary division of Middlesex, England, 7 m N W of St Paul's cathedral, London, with stations, Finchley and East Finchley on the L N E railway Pop (1921) 46,716 The parish church of St Mary (restored 1873) has some interesting ancient brasses Finchley extends north from Hampstead and Highgate between Hornsey on the east and Hendon on the west, and consists of East Finchley or "East End," Finchley proper or Church End, and North Finchley or Woodside Park Its pleasant, healthy situation has caused Finchley to become a populous residential district Finchley Common was formerly one of the most notorious resorts of highwaymen near London, the Great North Road crossed it, and it was a haunt of Dick Turpin and Jack Sheppard, the latter was captured here in 1724 The Common has not been preserved from the builder In 1660 George Monk, marching on London, made his camp on the Common, and in 1745 a regular and volunteer force encamped here prepared to resist Prince Charles Edward, who was at Derby The gathering of this force inspired Hogarth's famous picture, the "March of the Guards to Finchley" Christ's college school, with two other secondary schools, is controlled by the county and district councils There is a memorial hospital and a branch of the National Hospital for the Paralysed and Epileptic Finchley council has its own electricity undertaking and controls a considerable acreage of open space and playing fields, besides having an extensive town-planning scheme

FINCK, FRIEDRICH AUGUST VON (1718–1766), Prussian soldier, was born at Strelitz on Nov 25, 1718 He had been a soldier of fortune in Austria and in Russia until in 1742 he became aide-de-camp to Frederick the Great of Prussia After the battle of Kolin (June 18, 1757) he was made colonel, and at the end of 1757 major-general At the beginning of 1759 Finck became lieutenant-general He commanded a corps at the disastrous battle of Kunersdorf, where he rallied the beaten Prussians Later in the year he fought, with General Wunsch, the action of Korbitz (Sept 21) in which the Austrians and the contingents of the minor states of the Empire were sharply defeated But the catastrophe of Maxen (*see* SEVEN YEARS' WAR) put an end to his active career, though he acted strictly on Frederick's orders Cut off by greatly superior numbers, he was forced to surrender with some 11 000 men (Nov 21, 1759) He was court-martialled, cashiered and imprisoned in a fortress At the expiry of this term Finck entered the Danish service as general of infantry He died at Copenhagen on Feb 22, 1766

FINCK, HEINRICH (d 1527), German musical composer, was probably born at Bamberg but nothing is certainly known either of the place or date of his birth Between 1492 and 1500 he was a musician in, and later possibly conductor of, the court orchestra of successive kings of Poland at Warsaw He held the post of conductor at Stuttgart from 1510 till about 1519 His works, mostly part songs and other vocal compositions, show great musical knowledge, and amongst the early masters of the German school he holds a high position

FINCK, HENRY THEOPHILUS (1854–1926), author and music critic, was born at Bethel, Mo., Sept 22, 1854 At Harvard he won highest honours in philosophy, next becoming a resident graduate at Cambridge, 1877–78 He secured a Harris fellowship, and studied psychology in Berlin, Heidelberg, and Vienna, 1878–81, then intending to become a professor in the subject It was a commission from the New York *World* to cover the Niebelungen performance, first Bayreuth festival, which changed his career In 1881 he was appointed music critic of the New York *Evening Post,* holding the position 43 years, until 1924 He championed Wagner, Chopin, Liszt, Grieg, and MacDowell, but was proudest of his work to popularize Grieg Of extraordinary versatility, he wrote on gardening, gastronomics (*Food and Flavour* being notable), travel, as well as voluminously on music, his books totalling 24 He died at Rumford Falls, Me., Oct 1, 1926

FINDEN, WILLIAM (1787–1852), English line engraver, was born in 1787 He served his apprenticeship to one James Mitan, but appears to have owed far more to the influence of James Heath His first employment on his own account was engraving illustrations for books, and among the most noteworthy of these early plates were Smirke's illustrations to Don Quixote His younger brother, Edward Finden, worked in conjunction with him, and as time went on and the number of their commissions increased, they employed several assistants, with a consequent deterioration in the later plates issued by them The largest plate executed by William Finden was the portrait of King George IV. seated on a sofa, after the painting by Sir Thomas Lawrence Finden's next and happiest works on a large scale were the "Highlander's Return" and the "Village Festival," after Wilkie A series of landscape and portrait illustrations to the life and works of Byron executed by the Findens appeared in 1833 and following years But by his *Gallery of British Art* (in 15 parts, 1838–40), the most costly and best of these ventures, he lost the fruits of all his former success Finden's last undertaking was an engraving on a large scale of Hilton's "Crucifixion" He died in London on Sept 20, 1852

FINDLAY, SIR GEORGE (1829–1893), English railway manager, was born at Rainhill, Lancashire, on May 18, 1829. He was originally a stonemason, rose to be in charge of railway con-

struction operations on the Shrewsbury and Hereford line, and eventually (1880) to the position of general manager of the L N W railway He died at Edgware, Middlesex, on March 26, 1893

FINDLAY, JOHN RITCHIE (1824–1898), Scottish newspaper owner and philanthropist, was born at Arbroath on Oct 21, 1824, and was educated at Edinburgh university He entered first the publishing office and then the editorial department of the *Scotsman,* became a partner in the paper in 1868, and in 1870 inherited the greater part of the property from John Ritchie, the founder He presented to the nation the Scottish National Portrait Gallery, opened in Edinburgh in 1889, and he contributed largely to the collections of the Scottish National Gallery He died at Aberdour, Banffshire, on Oct 16, 1898

FINDLAY, a city of north-western Ohio, U S A , on the Blanchard river, the county seat of Hancock county It is on Federal highway 25 and several State roads, and is served by the Baltimore and Ohio, the Big Four, the New York Central, and the Nickel Plate railways, and by three inter-urban electric lines The population was 17,021 in 1920 (95% native white) The city lies on gently rolling ground, 780ft above sea-level, surrounded by a rich agricultural and stock-raising region, in the heart of the Ohio oil and gas fields It is the seat of Findlay college (Church of God), chartered in 1882 The many manufactures (valued in 1927 at $20,460,906) include petroleum products, electric porcelain, ditching machines, rubber tires, railroad dump cars, beet sugar and cigars During the War of 1812 a fort was built here by Col James Findlay, commanding an advance regiment for General Hull The town was laid out in 1821, incorporated as a village in 1838 and chartered as a city in 1890 Oil and gas were discovered in 1886, and the population rose to 18,553 in 1890

FINE, in the legal sense, a pecuniary penalty inflicted for the less serious offences Fines are necessarily discretionary as to amount, but a maximum is generally fixed when the penalty is imposed by statute, and it is an old constitutional maxim that fines must not be unreasonable In Magna Carta, c iii, it is ordained *"Liber homo non amercietur pro parvo delicto nisi secundum modum ipsius delicti, et pro magno delicto secundum magnitudinem delicti"*

The term is also applied to payments formerly made to the lord of a manor on the alienation of land held according to the custom of the manor, to payments made by a lessee on a renewal of a lease, and to other similar payments Fine also denotes a fictitious suit at law, which played the part of a conveyance of landed property (*See* FICTIONS) This, with the kindred fiction of recoveries, was abolished by the Fines and Recoveries Act, 1833, which substituted a deed enrolled in the court of chancery (*See* also ENTAIL, EJECTMENT, PROCLAMATION)

FINE ARTS. In a general sense the fine arts are those among the arts and industries which man cultivates for his necessities or conveniences, and which minister also to his *love of beauty* Architecture, for example, providing shelter and accommodation, offers in its use and mechanic perfection visions of the strength, fitness, harmony and proportion of parts; but also by its dispositions and contrasts of light and shade, by colour and enrichments, and by variety and relation of contours, surfaces and intervals, has decorative competence and so is accounted a fine art. In the graphic arts we observe that love of beauty can cover the interest of visual excitement such as caricature and the grotesque The terrible, the painful, the squalid, the degraded,—in a word every variety of the significant,—may be brought within the province of fine art on the ground that the art of man springs from his impulse to create, and thereby associates with creation the kindred pleasure, that of witnessing and appreciating what is made to attract that interest In common usage there is often confusion between art-making and art-seeing as measures of art-values But the word *fine* has a special signification for aesthetic creation, as conditioning its power over material.

"God saw creation that it was good," and "in the image of God," we read, "man was created " The word *image* admits the power of the artist to fine art vision and in this connection *design* has a cognate association On the other hand when the spectator of art finds pleasure or satisfaction in an executed work of craft, his mental exaltation comes in seeing what the creator imaged and recognizing its *fineness* Such recognition may come in mutual co-ordination with the spirit of the age—acting as a mass instinct in the broad sense of the designer and his clients being of one mind But it may go on to the schooling of temperament, and so become the conscious *taste,* acting as a gauge or rule upon the *images* of craft Such alternating relations and the constant varieties in human *design* and *taste* have given rise to a formidable body of speculation and discussion The present article, dealing with concrete processes and the material results of the creative activities of man, defines them as fine art in general; classifies the fine arts in their main distinctions and discusses their historical aspects in various phases of image-design and taste-association

A popular and established theory distinguishes *art* from *nature,* in that man is deliberately the fabricator of art, while nature functions outside him Design itself is a dexterity of which one of the essential qualities is the will and premeditation of the artist We reckon the songs of birds as *instinctive,* and this "epithet colours the skylark's outpourings as of a different order from the poet's " The distinction is, however, modified as we realize that the power of *imaging* has grown by natural instinct in evolution out of the desire to make The earliest workers in sculpture or painting were the cave-dwellers of the prehistoric ages who scratched the outlines of animals of the chase on implements or who made models of them upon their cave walls Children can be seen still as innocent artists making for themselves, just for the pleasure of seeing what they make So the original or rudimentary type of the architect-artists was evolved when a savage found his satisfaction in tidiness and developed an instinct of fitness in his ordering of the skins or the tree branches that covered his tent or hut So the first artificer was a maker of club or spear to his pleasure in its handling—the primitive artmonger having small reason for pleasing anybody but himself

As early in history the primitive dancer and singer were seeking their audiences, so the artificer wrought, with an eye to please others too The historical sequences of art pass from *craft* to *style;* and it will be shown that as long as these were in full accord, the current association was working for an instinctive satisfaction and it has its *images* in the balanced economy of craft and taste, but when *taste* or some imported association of style began to lecture workmanship, art lost its creative will, and craft decayed

There is accounted also a disinterested sphere for the art instinct in that the spectator has a share in the designer's ideal and a sympathetic, indirect satisfaction for himself therefrom But the first-hand pleasure of design is that of the creative imagination, and in its spontaneous working we have engaged "incalculably complex groups of faculties, reminiscences, preferences, emotions," that constitute the *vision* of the artist The product is a finished work of craft, and so has its power to please, graded by craft capacity But skill in any useful art means a practised conduct of the hand, fashioning material to a particular end The artist differs from the mechanical workman in the nature of his *images* of beauty arising in the material associations of his craft, and so he is consciously solving aesthetic problems according to the excitation of an ordering as well as a creating instinct in himself

The conclusion is that images of beauty make the substance of the fine arts and create the several qualifications of architecture, sculpture and painting Architecture, for example, is a *mistress art* in that its occasions demand the full substance of aesthetic vision "The architect has liberty for the disposition of his masses, lines, colours, alternations of light and shadow, of plain and ornamented surface, and the rest." In him *material* association formulates his images, because in supplying definite accommodations, he has mechanical necessities to meet in laws of weight, thrust, support, resistance and other properties of solid matter The sculptor and the painter, too, have their spheres of action in physical appearance But the sculptor is creating surface aspects by a mechanical tooling. He materializes his *images* by cutting them into stone,

marble or wood, or by shaping them in metal, plaster, etc. The painter finds to his hand a more extended range of natural facts and appearances, because his pictorial images are flat on a plane surface, as worked in terms of his painting tools In all three fine arts, however, the artist's operation has its every bloom and virtue, in the nature of a material regulation The rank of artistry may be gauged by the spectator, but the working test has been the artist's power to grasp and realize his vision in the terms of his craft It is claimed for the fine arts that their ideality of form and colour is a sort of "play—a free vent for an energy over and above what is needed to be spent upon the conservation, perpetuation or protection of life" However, the superfluous or optional character of art is that it comes in the instinctive gratification of a free creative choice and by such transmitted pleasure, public taste is gratified

We are following in general terms R G Collingwood's *Outlines of the Philosophy of Art* in that he defines art (1) as the creation of objects, or the pursuit of activities called works of art by people called artists—works distinguished as products intended to be beautiful, (2) as the creation of objects or the pursuit of activities called artificial as opposed to natural—that is objects created or activities pursued by human beings consciously free to control their natural impulses and to organize their life on plan, (3) as creating that frame of mind which we call artistic, the frame of mind in which we are aware of beauty While the mechanical pleasure of tool-using bridges the distinction between art and industry—so the spiritual sense of the *image* brings fine art into line with literature and music—which are not arts of objective completion, but of powers of interpretation

The systematists of the 19th century thought themselves competent to grade the fine arts in terms of philosophical analysis Hegel ranged architecture, sculpture and painting as coming in a natural order of evolution—ancient architecture the expression of obscure symbolic ideas; sculpture the classic passage into clear-cut, lucid thought; painting the modern sum of romantic ideality Herbert Spencer seems to track out the passage from ancient to modern—as one from the hieratic simplicity of the architectural monument to the decorative complexity of the sculptural and pictorial uses of advanced city life, and finally in our civilization, the elaborate and emotional complex which moderns account as the art of the picture Such analysis can be seen to rank the painter's genius as the ultimate crystallization And in this sense art history is read nowadays as character analysis, and written up as a sublimation of temperament. Criticism was initiated when Vasari wrote the lives of the Renaissance painters in 1550, and to this day we have his successors, decorating the story of art with literary values The temperamental factor in the development of painting has been well studied by D S MacColl, who distinguishes three outstanding varieties "The Olympian painter," he says, "is king and master in a world made for his use, he is on the gods' side and his art mirrors their perfection of form, their happiness in majesty of calm possession The Titan is rebel against the Powers, his spirit is of passion and strife", and his art develops as a social revolution A third temperament is of the mystic who "seeks in humility and meekness values outside things visible," and recognizing the nothingness of assertion, surrenders his perception of reality to an inner sense of second-sight With increasing distinctness in the last 300 years the temperamental conditions of fine art have marbled the basal colouring of the picture habit in associations of schools and cliques Olympians, Titans and mystics appear master individualities, linking up the Renaissance with our painting. Olympian graces appear in pictorial procession from Raphael's allegories to the flattered portraits of humanity and circumstance which have in the 16th, 17th and 18th centuries made the staple of fashionable master craft In idyllic atmospheres have been stayed the contentments of the Dutch and French *genre*, its domestic atmosphere and homely landscape, and similarly the poetry and pleasantry of the English academicians has been steeped in a mild-mannered geniality Titan mentality must be allowed to the painter scientist, such as Leonardo da Vinci; to Rembrandt adventuring into untrodden paths of chiaroscuro, to Salvator Rosa brigand hunting in the wild; to Breughel sidling away to the fair-booth and *kermesse* dance. So too were the high-handed despisers of convention, Hogarth and Goya, handing on the torch to the rebellious anarchists of the French painting cliques Yet there was the line of mystics too—Giorgione painting he knew not what, Velázquez finding a new wonder in the focus of the eye; El Greco imagining a chaos of line and colour; Blake making his mystery of ghostly hope and fear, Turner adventuring flights into the glory of the air; or Corot painting a fairy light for spring-time willows

Temperament and circumstance have had to make literary standard values of fine art Taine has laid stress on the vicissitudes of racial and political development for initiating or repressing pictorial genius Fromentin, however, questions such deduction, observing how the Dutch innocence and simplicity were no reflection of the stirring life and dramatic heroism of the Netherlands revolt from Spain whereas French painting in the 19th century was moulded continually to the trend of revolutionary politics Latterly our experts are laying less stress on philosophical analysis and we may summarize the 20th century appraisement of art as, seeking practical definition, Sir C. J. Holmes in his *Notes on the Science of Picture-Making* gives the present-day conditions that govern picture practice

"All great art, being emphatically personal, is accompanied by variation from previously existing standards of excellence This personal variation is marked by a new intensity of feeling, by a new sense of vitality and by a new rhythm of pattern All great artists are pioneers possessing these characteristics In their followers, the second-rate artists, we find less intensity of feeling, less vitality and a feebler rhythmical sense Emotion is the keystone of painting as it is of poetry What is not strongly felt is no material for the artist The painter's emotion sums up and concentrates his experiences (imaginative or visual) in terms of rhythmical paint as the poet does in terms of rhythmical words Theory is not a substitute for talent, but its necessary teacher Principles of design are not rigid moulds into which the subject-matter of a work has to be squeezed Their task is to suggest to the artist the particular means, by which each given subject can be perfectly expressed Tradition is no more than the body of principles, which secure conformity between art and its contemporary environment What is a perfect tradition for one period or climate may thus be a fatal influence in another period or climate, because it does not fit the changed conditions Hence the danger of revivals of old methods Systems of art teaching have commonly failed from not recognizing the necessity of progress, from enslavement to a fixed canon of ideal beauty No such fixed canon of ideal beauty can be set up as a standard for future achievement We cannot do again what has already been done by a great artist, we must do something different Each field of artistic activity is exhausted by the first great artist who gathers a full harvest from it"

Art history in successions of style and in appraisement of art value has no verdict to offer as to what is *great art* in definition of greatness We may say that fine artistry is figuration, yet also transfiguration, but to be proficient in his craft is the artist's necessity for himself, to be ideal is his instinct, for so he assures partnership with the spectator. Art history has been a serial evolution of art instincts crystallizing into styles Their succession in world history may be indexed as ancient, classic, mediaeval and modern, but this is just to link up art manifestations with phases of human progress

PROGRESSIVE ASPECT OF ARTS AND CRAFTS

The Magic or Attributive.—The primitive instincts of fine art can be taken as promotions of physical advantage, in handling a weapon, say, or as required for the successful covering of a hut Then secondly, as adding to these instinctive joys the design-value of *taste* The imitative representation of deer and mammoth upon weapons, the modelling and painting of animals in cave interiors were purposed "power" in magic sense:—the aesthetic capacity was insurance to the "devotee" of success in the chase—or such a control over the quarry as would, by creating its image to the hunter's mind, bring it to his hand The visioned

reality was started in the sense of a religious exercise, as setting up profitable commerce with the unseen Prehistoric art in Europe had millenniums of evolution, and in the height of its accomplishment toned form and colour into "images," that sophisticated art calls primary elements of design Then in later cave paintings graphic sense loses touch with reality, passes into symbol and pattern, and so originates the alphabet—mind usurping the domain of craft

The Hieratic and Palatial.—Political and religious intention evolved art aspects for both palaces and temples in many eras of earliest Asian arts The cycles of Sumerian, Chaldean and Babylonian dominion illustrate the successions of conquering civilizations in the delta of the great rivers; on the back lands came the sinister aspects of Assyrian dominion, in central Asia Minor the Hittite, and later at Persepolis the Persian art In the Nile basin were mounting to artistic fruition and dying away five dynastic periods of Egyptian style—succeeding one another in eras of 800 years or so. Priest and Pharaoh in long tradition controlled architecture, painting and sculpture, up to and even past the Hellenistic development of Greek style. The linking up of Egyptian craft design with magic is illustrated in the tomb-tablet of the Egyptian Mertissen where we read—*c* 2200 B C "I was an artificer skilled in my art I knew my art, how to represent the forms of going forth and returning—so that each limb was in its proper place I knew how the figure of a man should go—the poising of the arm to bring the hippopotamus low—the carriage of a woman I knew to make amulets against fire burning or floods drowning No man could do this but I and the son of my body Him has the God decreed to excel in art and I have seen his perfection in every sort of precious stone—in gold, in silver, in ivory and in ebony"

However, in the discovery of the Akhenatan cult and the Tutankhamen tomb there is record of a curious but short-lived break away from the craft formality of the Egyptian tradition There came a generation of freer mentality and naturalistic observation before hieratic sway returned The Egyptian connection has not been made clear with what excavation has revealed in Crete and other parts of the eastern Mediterranean basin But a highly developed architecture of city building and palace decoration has been unearthed, showing *fresco* of high accomplishment, and works of relief modelling, that are of ordered and well-schooled taste The successive periods are dated beside the later Egyptian eras, and in domestic and graphic expressions there were anticipated the furnishing and decorative crafts of the Italian Renaissance The pottery, especially, was remarkable for a free rendering of flowers, the modelled animals in metal are distinct from the hieratic conventions of Egypt and Assyria But to its art era came the dissipation of craft interest following on the commercial distribution of art products There came, too, a razing of the Minoan palace-cities that had been the centres of this Mediterranean culture, and it passed away with small contribution to the genius of the "classic" style that was to register the next cycle of civilization.

The Classic Aspect.—Ancient art in Babylonia and Egypt was of local cult, its eras rose and fell with the dynastic empires and religions of the Near East A wider area than the Mediterranean basin was due to the European era of style that came in the Greek and Roman developments of Hellenic civilization A local nucleus of Dorian immigration and culture had descended from mid-Europe into a Mediterranean expansion in the 6th and 5th centuries B C, strong enough to displace kindred evolutions, Ionian, Phoenician and Etruscan After the Hellenic prime at Athens, there followed in Alexander's conquests the wide Hellenistic diffusion in displacement of Oriental survivals Then in the 1st century B C the Roman empire-making founded a world-art, under the tutorship of Alexandrian craft, but under the aegis of Greek literature also For 500 years the classic educations of society were controlling craft, and in them the classic arts flourished, declined and fell with the decay of the Roman empire of the west. In descent from it a decorative, aniconic graft of Greek craftsmanship remained to bear fruit in the Christian empire of Byzantium; so that in due course arch and dome with concrete surfacing of structure were propagated in the Arab overflow of the Moslem faith But neither Byzantine, nor Moslem art could secrete the *ethos* of Greek construction, nor the *images* of Greek humanism The sculptural and pictorial arts of west Europe may claim to be Byzantinesque, but never, till the modern revivals, could architecture as a fine art think itself Greekesque

The evolution, dispersion and decline of the Hellenic cult are a well-documented instance of a cycle with dominance for some centuries of culture The essential national creation had been that of settlers in Greece, Dorian and Ionian stocks whose issue was expressed in the marble temple that had a human beauty enshrined in the material of its exercise In humanity and simplicity Hellenic culture had an outlook on life that freed religion from the monster-godships which Minoan, Assyrian and Egyptian art had imaged Greek sense dethroned the witch-doctor, and in the national piety of a citizen priesthood achieved its marble Parthenon Hellenic sculpture was humanity in being, with the athlete as its model of manhood, and the maid as that of womanhood The painting crafts resolved line and tone into an intellectual analysis of light, which in the Greek vase was shaped and figured as a ritual music But the architect as chief craftsman, and the sculptor as priest of art came to be exploited abroad in literary translation of Hellenistic phrasing Commercial associations of artists were engaged to found new cities and to set up Hellenistic types and standards of human beauty In the grouping and arrangement of decorative themes the craftsman became a man of artistic choice. his dexterities were specialities in the sophisms of academic direction The sculptor set portraiture of emotion and dress by the side of traditional representations of the gods and heroes So the curve of Greek art passed on from Hellenic simplicity into Hellenistic elaboration and obtained the patronage of Roman culture, illustrating how craft associations first image style and then find their energy sapped by the extraneous association of learning Hellenic art made its temple the crown and centre of a city's devotion, but the city of Athens lost its art when the idealisms of the Greek worship obtained cultured and political currency Men and women had been deified in Greek sculpture—in Roman the imperial power was immortal, and for an emperor's divinity art formalized an imperial priesthood of fine art from Britain to Mesopotamia Greece had been content with a simple constructive system of columns and horizontal entablatures, and in marble unity had invented and perfected her three successive modes, or orders of architecture—Doric, Ionic and Corinthian (*qq v*) But the genius of Rome found her imperial destiny in the dome and the triumphal arch. Her conglomerate creed covered Europe even as the Pantheon ceiled the lounge of her public bath Her cosmos was graded as her amphitheatres were graded for her public shows. Indeed the triumphal arch, not the pediment, was symbol of her sovereignty. a vast constructiveness—temple, palace, bath, amphitheatre, forum and aqueduct, ordered and levelled her proletarian empire to be uniform in its imperial arts as in its legionary garrison In the Roman house memorial sculpture was its ancestral cult, and filled the atrium with portrait statutes and busts, and dilettante scholarship had a corresponding piety to the past in copies or studies of the ancient masterpieces in wall paintings of classic subject and perspective fancy In the crafts of ancient Rome was consummated a decorating capacity that passed on to Byzantium, in turn bequeathing its *récipés* to mediaeval church-building

Mediaeval Aspects.—The break up of west European civilization was completed in the barbarian over-runnings For one year (AD 410) the great Rome is said to have been without a single inhabitant Free painting and free sculpture ceased to exist and Italy lost or discontinued the crafts of building For 500 years Christian churches took derelict columns and architraves from Pagan pillar avenues, using for their halls of religious service, arcades and apses from the market places of deserted cities It was for the Byzantinesque Christians to use the big square bays of the Roman bath, and with dome construction to attach to its rubble surfaces mosaic pictures But the free statue, in the religious cult of the East had come under inter-

dict, and for 600 years the sculptural arts were degraded to rudimentary and subordinate uses, to a graphic pettiness of ivory-carving and metal-chasing Painting assumed a rigid hieratic imagery for the mosaic pictures of apses and vaults of churches, or was practiced in manuscripts and service-books according to the recipes of a cloistered monkish craft The Carlovingian clergy of Gaul and Germany had service-books and ivories as school text-books, but specially in earliest advance were the English crafts of sculpture and painting, appearing foremost in recovery of a religious freedom

In Celtic-Nordic genius there matured the new aspects of fine art, but for them Romanesque and Gothic had as trainers and instructors the monastic institutions, which in or about the year 1000 under the patronage of the papal hierarchy were dominating European culture Under the Cluniac expansion of abbey-building was propagated a gospel of craft practice for all the arts and sciences of life As Dorian stock and Ionian schooling established the marble accomplishment of Greece, so the fine art of stone found in the mixture of race and church culture the cradle of an era Stone was the preciosity wrought, masoned, sculptured and lifted to the sky The built church was the service-book of Christian civilization in which all the philosophy of four centuries wrote itself as art In Cluniac sculpture the figure grew out of the stone, and the statue out of the pillar, in the Cistercian abbey fine art was the mason's refinement of structural economy, in the secular and episcopal schooling of religious pomp and circumstance came the towering majesty of the Gothic cathedral In the 13th century the mason had taken fine art to the summit of craft execution But in France before the end of it the vitality of cathedral structure was ceasing to animate masonry and the tool of the carver became specious for the accomplishment of the ivory image or the enamelled casket The master-masonry of French architecture traversed Europe, but as inventive of style there had succeeded the decorated creation of the English 14th century to which associations of chivalry lent an aesthetic life This was especially distinguished in memorial tombs, and in the sculpture of recumbent effigies worked by the English masons In mid-14th century came the Black Death pestilences contributing such a set-back to the association of art and chivalry There succeeded commerces of art furniture, and shop-use dictating the architectural enrichments of sculpture and painting For two centuries Burgundian sculpture and Flemish painting acted as sponsors to a northern Renaissance, in which French Flamboyant with its veneers of decorative tracing made a last stand for continuance of Gothic style in architecture

The phases of fine art practice ran their course with little distinctions of individuality in the artist One mason or another made good in the quality of his work in association with the spirit of his time Sculpture as *imaging* thought was still work of a *coementarius* or builder After 1300 his capacity as king's mason, or goldsmith or as painter might take him into special appointment But it was *c* 1400 that the Sluters were sculptors, and the Van Eycks painters under the patronage of the dukes of Burgundy in formulating a new accomplishment for personal artistry In Italy Pisani, Siennese and Florentines, painters and sculptors, emerging from the body of church furnishers, claimed fine art consciousness among their fellow craftsmen, and established cities as centres of special craft For Italy had never taken Gothic style to its heart as the economic realization of stone construction, with enthusiasm for covering the greatest area and lifting the highest vault. By 1400 there had come to Italian art another quest, that of regathering the threads of the Byzantine arts of form and colour, to reweave the tapestry of classic scholarship

Following the migration westward of Greek scholars, the classic forms of architecture became the study of Roman architects such as Brunelleschi and Alberti But a more subtle sense of renewal attended the achievements of sculpture and painting, as Donatello and Masaccio took study of nature as a joy of life For this renaissance was the ascetic ideal giving place to the physical In power, beauty and grace the personages of the Christian faith and story were put into visible kindred with the heroes of ancient paganism. Not as pedantry merely, but in the experiment of craft was fine art the heir of both antiquity and Christianity The 15th century set Florence in the high place of art, in that she had become mistress of a culture at once scientific and religious, that had fine art and fine industry in united fellowship and competence to express the stirring life of republics, prince despots and church potentates, military captains and merchant princes vying with one another as patrons of the artist There came a wealth of occasions for sculpturing and picturing, for monuments of civic and personal commemoration, for representations of pageantry and battle, for the allegoric conception of sacred and profane story The Italian accomplishment of the *cinquecento* practised the heroic painting of fresco for the walls of council halls, for princes' palaces and popes' churches, classic loggias were furnished with marble and bronze statues; churches had pillared screens and monuments; while every city square showed its shrine or fountain, and every chapel its painted altar-piece We may speak of this as a rebirth of artistic crafts but it was also the discovery of the *artist* as a man A well patronized painter of illuminations, visiting Rome in 1536, has recorded himself as meeting Michelangelo and saying, "You Italians give the greatest honour, the greatest nobility and power to be more, to a man who is a splendid painter and sculptor, not as other nations do to generals and statesmen With you as compared with great princes it is a painter alone that is called divine"

In this golden age came the use by painters of oil prepared as a drying pigment With brighter and more facile brush technique than tempera-decorations, or the plasterer's art of wet fresco, studio or work-shop pictures became portable chattels in detachment from architectural structure Thus were lost the intimate religious connections of fine art with altar use, as well as its broad treatments on chapel wall-surfaces The brush attuned to new capacities of illustration and sensation, equipped the picture artist in Italy and northern Europe alike, for fresh fields of adventure, in which moral and aesthetic sensations had place In a new capacity Italian purveyors of accomplished design were brought into the service of German emperors and French and English kings The new art arrived for Europe in a succession of schools as Italian, Flemish, Dutch, Spanish, French and English "national" interpretations of a faculty that enriched the special fineness of the painter's art But when Leonardo da Vinci as the honoured artist passed into the service of the dukes of Milan, when Raphael at Rome was the accepted decorator of the papal court, the artist-painter was no longer of one city, or of one ideal Venetian colour had its commission as well as Florentine science and Titian was educated for a world-wide currency, as had been Michelangelo. They had become the representative European artists when subject-painting discovered that technical facility could replace religious idealization With Raphael, Titian and Coreggio, art made terms with classic allegory, and, in the discovery of the palette sense, Titian and Rubens founded the dynasties of temperamental artistry They were painters, courtiers and diplomats, as purveyors of authorized masterpieces Rubens with his pupils and assistants, Van Dyck, Snyders, Teniers, etc, at work on courtly portraiture, on fleshly allegory, on boars and tigers, on tavern scenes, landscapes and village fêtes was in all just the Renaissance expert, commissioned to furnish art pieces for princely and private galleries and alike for church, palace or civic hall His great work was a canvas fitted into the allotted space in wall surface, an exhibition entity in honour of the great art of painting

Portraiture beyond the Alps, however, long kept to its mediaeval economics, and serious workmanship Painters and engravers such as Durer and Holbein were vowed to associations of design in craft essentially Gothic The trades of the furniture arts in Brussels, Bruges or Antwerp, were scarcely touched by scholarship. But by 1600 the painter had been to Rome and Venice for his authorized education, and Rubens in the fire of his prodigious temperament, with true fusion of Flemish and Venetian qualities, in closing the Renaissance period was handing on an *art nouveau.* His Olympian creed, *Catholic* in its association with the Roman Church, and *Classic* in the doctrines of Roman virtuosity ruled

taste for half the world The gilded luxury of it became an accepted tradition for all the craft interests of civilization and, for some two hundred years, the fine arts in all European countries were accepting the Italian pedantries of design. The Palladian orders, popularized as patterns, or examples of ancient scholarship, and their materializing in stone, were propaganda for that new vision of art which established correctness to pattern that became the stock in trade of accomplished architectures in France and the Low Countries, in mid Europe and Spain, and at last in England, each country conforming its style to its assimilation of book knowledge, but still by means of material needs, instincts and traditions, capable of giving to classic uniformity a national economy of style

The 17th, 18th and 19th Centuries.—In Italy the outstanding figure of the 17th century was that of the architect and sculptor Bernini In works of fountain and monument he visioned a new sensibility for masonry, that has acquired the name of Baroque. The Palladian conventions were endowed with a specious virtuosity of curved and flowing rhythm that remained in the Latin countries for long the accepted trade-mark of classic decoration Its free modelling and clear colour scale was specially the birthright of Jesuit Rococo, which, born of the counter Reformation was carried round the world in the Catholic churches of the Spanish and Portuguese Indies In Baroque and Rococo was the era of fine workmanship that for two centuries adorned Italian, Flemish and French styles Art-workers grouped for the production of what is useful and fine in its degree—who deserved the place and name that the ancient Greek gave them in the word Τέκτων (artificers)—initiated a style of salon decoration and furniture, for which Louis XIV's minister Colbert organized a system of State factories and academies of art The architectural stylist had at his beck figure sculptors, picture painters, potters, weavers, smiths, gold workers, glass and china makers In forms of rococo artificiality every natural form was translated with no restraint of either structural or religious conscience The variety and exuberance of craft device, with its perfect finish, made the Louis periods text-books for decorative magnificence in Europe

Fashion and the grand sentiment of gala were ruling the technique of the art of painting, by the side of devotional and classical association The sentiment of parlour and tavern was translated by Fleming and Hollander into picture truth In the wide stretches of the Netherlands were shore and sea, and specially air vision indoor and outdoor In portraiture and landscape the Flemish-Dutch school of realists were painters of air from 1600 to 1670 The great magician was Rembrandt, able to conjure with the textures of light and darkness and to figure thereby not merely natural aspects but the problems of human individuality The shadow mystery of his world was progenitor of much that in modern painter's art has become orthodoxy.

A painter too of air and light contemporary in the Spaniard Velázquez, whom the Renaissance had bred with the Flemish sense of adventure Sensitive to the visual and subtle perspective of mutual values, he staged figures and objects in space—accepting the eye-focus as the interpreter of visible relations and reactions Another outstanding master of the aerial scholarship was the French painter Claude Lorraine, who avowedly went to Rome to found his radiant vision on the landscape of the Roman campagna and the adjacent hills and coasts The Poussin brothers beside him added to classical composition an impressionist figuring of sacred and profane images Such were new scholarships of art outside the Rococo currency of the Colbert workshops Then came the art engraver of the latter part of the 18th century with his golden age on the skirts of the traditions of the cinquecento At first the great masters of Italian and then of Dutch painting were circulated in black and white in a way their original work had not contemplated. Soon in many industrious crafts, draughtsmen of the 17th and 18th centuries discovered tone qualities and rendered black and white in the full body of mezzotint or in refinements of line texture such as copper engraving achieves The vast widening of the picture field for domestic walls or for illustrative connoisseurship made the dawning of the modern period; but there was a setting, too, of much of that sense of dedication that belonged to themes that had been those of religious and classic scholarship It was symptomatic of the cycle of art, that in breaking through its banks the fine art of painting ran afield into shallows

The 18th century era for English painting was to mature in the new horizons of pictorial adventure The aristocratic portraitures of Reynolds and Gainsborough had been those of close allegiance to the tradition of the Fleming Van Dyck, who, the immediate pupil of Rubens, had himself drawn from the Venetians Gainsborough and Wilson, too, English pastoral landscapists, were of the Claude school But Hogarth proclaimed himself a rebel spirit, with the petulant assertion that the English world was to his hand to give him picture sense uncommitted to classic prescriptions—with no Olympian serenity to gloss a "Cheapside" medley or a "Shrimp Girl's" portrait Then, too, in humble guise the typographical illustrator, for the pride of country gentlemen's seats, drew and coloured landscape settings to architectural views But from this low estate the English water colourist was to rise to esteem, and though his place in the English academy was denied him, yet by the end of the 18th century great masters, like Crome and Constable, were oil and water painters both and it was water-colour artistry that carried Turner into acknowledged pre-eminence as a great modern master of fine art

In Europe, eclectics of the 17th and 18th centuries had arisen outside the main Italian traditions, Carpaccio, Tiepolo, Canale and Longhi, errant stars rising and setting in the twilight of the Venetian decadence, Piranesi, a Roman etcher had a mystic sense of horror, his contemporary Blake in England toned visions of sanctified joy, toned to meek expressions of line and colour In Spain the forerunner, initiate to the mystic significance of the modern cult was Goya, at once impressionist and hypnotic, "smearing his canvas with paint as a mason plasters his wall," a composer of the "Caprices" and "Misères de la Guerre" with the protesting energy of a French Revolutionist

The antique graces of the old tradition still haunted the shrine of art, and in the latest years of the century we see a symptomatic return to severer principles and purer lines of scholarship from the Baroque and the Rococo The pure and rhythmic grace of the English Flaxman in its sense of classic design was scarcely sculpture In Italy came the over-honeyed accomplishments of Canova and his school, and with scarcely robuster fibre were the statue works of the Norwegian, Thorwaldsen, practising in Rome; in France were graphic appreciations of classic virtue as read in Livy, in England the 19th century opened with a mild classicality and much pastoral and idyllic work of agreeable but shallow elegance, and the Nazarene school of German painting expended itself in a religious expression of singular insipidity For French painting, however, the classic movement with roots in the associations of the French Revolution and attitudinizing as Roman virtue obtained a technical reality of picture force in David There were, too, an accomplished purity and sweetness in Prud'hon's "nude" idylls But the last and truest Classic of France, Ingres, who was at the same time in portraiture a modern realist, painted on into the romantic era With Géricault and Delacroix, romance had its literary associations rampant for two generations, but by side of them, French landscape painting had got inspiration from the English Constable Thus in the second quarter of the 19th century the curtain was being lifted for the drama of creative progress that was to be staged for French and English art

Modern Aspects of Art and Craft.—The 19th century was seeking its *vision* of fine art in the association of painting quality with representative mimicry The title artist had become the monopoly of the picture-making class committed to the figuring of nature, the architect was accounted just a draughtsman of style—and sculptors might shape and carve as nude model reproducers In literary use the word "art" came to be accepted for what is put into a frame or hung in an exhibition As a prophet of imitative reality the art critic established his reputation Europe recovered its power to breed artists in academies when word-power stocked studios; in architecture the battle of style was fought between the religious and the pagan; scientifically the Greek revival read itself into porticoed churches and pillared rail-

way stations; garden landscapes were primed with pepper-box "Parthenons"; *national* taste protested itself romantic in the Elizabethan lodge and the castellated *picturesque*—and Christian faith materialized in sham Gothic and in clearing out 18th century galleries and pews from historic churches. In literature England and the Continent were founding the "romantic" of history and the "wild" of nature, and for two generations Victorian picture habit sought pictorial success in tags of sentiment and took poetic description as accredited art material In period furniture arts and crafts revived an auctioneer's aptitude for descriptive title, and found credit in affected reproduction of the antique The popularity of the Gothic movement of church revival may be said to have baptized the pre-Raphaelite coterie of painters But with Ruskin's benison came the rejection of much time-honoured science of academic composition and brush handling, and there was new confirmation of the painter's colour-sense in the pictorial *vision* reforming itself Victorian art had an era of creative abundance with the slick summaries of Millais, and the stark realism of Ford Madox Brown; in the over-studied archaeology of Holman Hunt as in the poetry and impassioned mediaevalism of Rossetti and Burne-Jones, equally in Orchardson's historical and social occasions and in Whistler's "Nocturnes" or Albert Moore's mannequins—in fact, picture poetry stormed art as it had literature. There was novelette absorption, too, of both sculpture and painting in France, in the *Salon* exhibitions and the *place* and *boulevard* pieces of Carpaux and Dalon. We have Bartholemé in his procession of the dead entering the tomb staged as a Danhesque masterpiece, Rodin working stone or bronze into textured poems—as psychical occasions rendered, with the metre and terseness of a quatrain Though an ugly philosophy has distorted art in some continental schools we have had French caricature and English humour in *black and white* playing its part in social morality Daumier, and the woodcut illustrators of the English '60s and their successors cannot all be accused of Freudian tenets

Still the French experimenters were shifting all the practical tenets that had been gospel for the painting arts The craft vision of modern art-workers promulgated as science plays for the literary stage. Writing in the 11th edition of the *Encyclopædia Britannica,* Sir Sidney Colvin said "The movements of the Impressionists, the Luminists, the Neo-Impressionists, the Post Impressionists and Cubists, initiated in Paris, have been eagerly adopted and absorbed, or angrily controverted and denounced, or simply neglected and ignored according to the literary equipment of groups of artists and fashions of critics; there has been a vast amount of heterogeneous, hurried, confident and clamant innovating activity in this direction and in that, much of it perhaps doomed to futility in the ages of posterity but at any rate there has not been stagnation"

Written 25 years ago this should be supplemented by a further analysis of the 20th century aspects of art and craft Much of the hope that Morris and his coadjutors introduced into craft has been drowned in the increasing industrial flood Are we marking time for some new values of fine art to take their place in the social system? Perhaps so! But the associations of education are at present confining capacity to commercial specialities of knowledge, and as they have done so vocation and profession have grown neglectful of the universal issues. Learning has become fitted into grooves, running in which, craft—whether as labour or commerce is regardless of common appreciations, and only half educated for the practical purposes of life. If in such words, also, we rank the present output of all the fine arts, we necessarily accept as sponsor for it the social revolution of the 20th century which is rapidly bringing the whole world into a single community, and making fine art an individual pursuit, ceasing with the artist. (*See* ART; AESTHETICS; ARCHITECTURE; PAINTING, SCULPTURE; and kindred articles.)

In the writing of this article some use has been made of the article written by the late Sir Sidney Colvin for the 11th edition of the *Encyclopædia Britannica* (E. S P.)

FINE COTTON SPINNERS' AND DOUBLERS' ASSOCIATION, LTD. This British combination of companies and firms engaged in spinning the fine Sea Island and Egyptian cottons, and in doubling yarns made from those and other staples of cotton was formed in 1898 with a capital of £6,000,000, which had grown in 1928, to a capital of £11,100,000. In addition to cotton spinning and weaving, the Association has large interests in cotton plantations and coal-mines, and in bleaching, dyeing and rope-making works

The businesses amalgamated in 1898 were 31 in number, and further affiliations had by 1928 brought over 50 businesses within its scope, owning 3,279,000 spinning spindles and 989,500 doubling spindles The number of workpeople employed is about 27,000 The Association has become the chief factor in the markets of the world for fine-spun yarns, especially those which are known as combed qualities, in 1928 its average yearly output was returned at about 75,000,000 lb of yarn, which was exported to all parts of the world

It has been the principle of the Association from the start to preserve the identity of the old established firms whose interests it amalgamated, they trade under their old names, use their old marks and maintain their individual reputations (L C M)

FINFOOT, the name applied to members of an interesting family of birds (Heliornithidae) of grebe-like form, allied most closely to the rails (Rallidae) and inhabiting various parts of the Old World and South America (*See* ORNITHOLOGY)

FINGAL'S CAVE. A famous cave situated on the southern coast of Staffa, an island of the Inner Hebrides It was discovered in 1772 by Sir Joseph Banks and is of singular beauty The cave is 227 ft long and 42 ft. wide, each side being lined with a series of pillars It is the haunt of the sea birds and seals of the locality *See* STAFFA

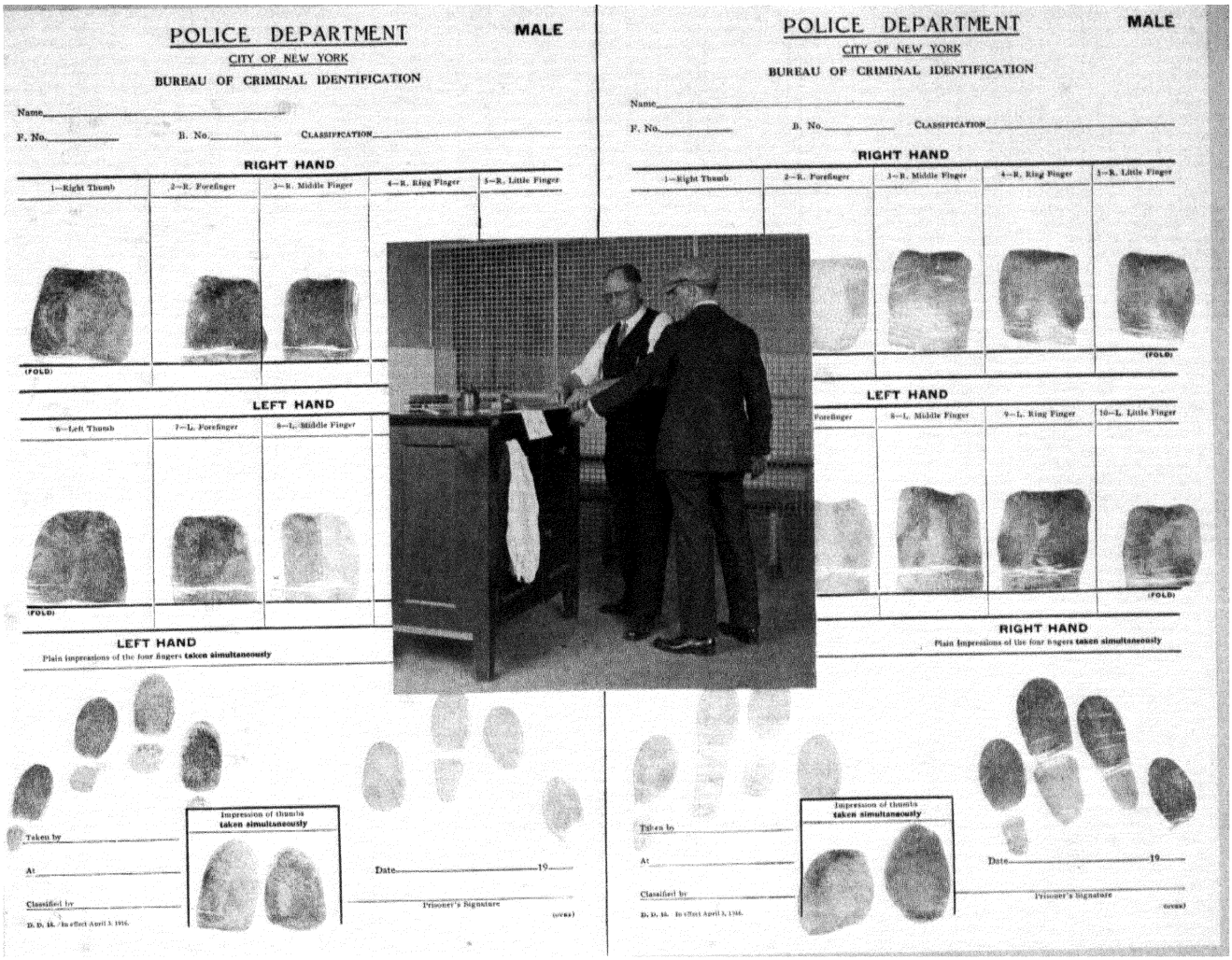
FINGER, one of the five members with which the hand is terminated, a digit, sometimes the word is restricted to the four digits other than the thumb (*See* SKELFTON *Appendicular*)

FINGER-AND-TOE, CLUB ROOT or ANBURY, a destructive plant-disease due to an organism known botanically as *Plasmodiophora Brassicae,* which attacks cabbages, turnips, radishes and other cultivated and wild members of the family Cruciferae It is one of the so-called slime-fungi (Myxomycetes or Mycetozoa) The presence of the disease is indicated by nodules or warty outgrowths on the root, which sometimes becomes much swollen and ultimately rots, emitting an unpleasant smell The disease is contracted from spores present in the soil, which give rise to motile germs which enter the root The parasite develops within the living cells of the plant, forming a glairy mass of living material known as the *plasmodium,* the form of which alters from time to time The cells which have been attacked increase enormously in size and the disease spreads from cell to cell Ultimately the plasmodium becomes resolved into numerous minute round spores which, on the decay of the root, are set free in the soil The disease is more frequent in acid soils A good dressing of lime (3–4 tons per acre) is thus useful in reducing or stopping the disease It is important that diseased plants should be burned and not fed to animals as the spores can pass in a living state into the manure

FINGERING, in music, the method of using the fingers in order to facilitate execution on a keyed, stringed, or wind instrument In the case of keyed instruments, the evolution of the keyboard—which originally consisted of keys from four to six inches wide—has necessitated corresponding changes in the system of fingering employed Thus for a very long period the thumb was never used at all, and the little finger scarcely more often Gradually, however, a recognized system developed. J S. Bach introduced the free use of both thumb and little finger, being one of the first to put the whole matter on a scientific and well thought-out basis, although the system which served its purpose has, with the ever increasing demands of pianoforte technique, undergone extensive further developments since his time.

In the case of stringed instruments, such as the violin and violoncello, the fingers are placed in certain positions on the strings according to the note required, while similarly, in the case of wind instruments, the disposition of the fingers as they close the holes or press down the keys is all-important.

FINGERPRINTS



RECORDING FINGERPRINTS FOR IDENTIFICATION

Photograph in centre shows method of recording fingerprints Facsimile records are shown on either side In making the record the thumb and fingers are pressed separately on an inked surface, then on spaces indicated on the identification card Classification of impressions according to shape and contours and the number of the ridges has reached a highly developed technique The value of fingerprints for purposes of identification rests upon the theory put forward by J E Purkinje in the early 19th century, and later established by Sir Francis Galton, of the *persistence* throughout the life of an individual of the shape or contour of his fingertips In many passport departments, labour offices, military and police organizations, and other branches of government, fingerprint records have been adopted as a means of identification

FINGER NUMERALS. The absence of inexpensive material upon which to write, cheap paper being a recent invention, led most early peoples to represent numbers by positions of the fingers, as is done by deaf mutes to-day The use of such symbols has survived until modern times, particularly in international trade in the Orient In the system inherited from the Greeks and Romans small numbers were usually represented on the left hand, the right hand being used for hundreds. When Juvenal wrote (*Satire X.*), "Happy is he indeed who has postponed the hour of his death so long and finally numbers his years upon his right hand," he referred to one who lives to be more than 100 years old. The illustration shows the finger symbolism as it was practiced in the middle ages.



FROM SMITH, "HISTORY OF MATHEMATICS"

FIG 1.—12TH CENTURY FINGER SYMBOLISM After a drawing on a ms. of Bede in the Biblioteca Nacional, Madrid

The finger numerals are related to the finger computations in use in the middle ages, referred to in various early printed books and still familiar in certain parts of the world The operation of multiplication was the one in which they played the most important part The purpose was to avoid the learning of the multiplication table as far as 10×10 For example, to multiply 8 by 6, turn down $8-5$ fingers on one hand and $6-5$ on the other There are then 3 turned down and 2 standing on one hand and 1 turned down and 4 standing on the other Add the fingers down $(3+1=4)$ and multiply those standing $(2\times4=8)$, and the result is 4 tens+8 units, or 48, that is, in terms of mathematics, $ab=[(a-5)+(b-5)]10+(10-a)(10-b)$. Numerous variants of the plan were in use, some having been brought to Europe from the Arab schools (D E S)

FINGER-PRINTS. The use of finger-prints as a system of identification is of very ancient origin, and was known from the earliest days in the East when the impression of his thumb was the monarch's sign-manual A relic of this practice is still preserved in the formal confirmation of a legal document by "delivering" it as one's "act and deed" The permanent character of the finger-print was first put forward scientifically in 1823 by J E. Purkinje, an eminent professor of physiology, who read a paper before the University of Breslau, adducing nine standard types of impressions and advocating a system of classification which attracted no great attention Bewick, the English draughtsman, struck with the delicate qualities of the lineation, made engravings of the impression of two of his finger-tips and used them as signatures for his work Sir Francis Galton, who laboured to introduce identification by finger-prints, points out that they were proposed for the identification of Chinese immigrants when registering their arrival in the United States In India, Sir William Herschel desired to use finger-prints in the courts of the Hugli district to prevent false personation and fix the identity upon the executants of documents. The Bengal police under the administration of Sir E R. Henry, afterwards chief commissioner of the London metropolitan police, usefully adopted finger-prints for the detection of crime, an example followed in many public departments in India.

The prints depend upon a peculiarity seen in the human hand and to some extent in the human foot. The skin is traversed in all directions by creases and ridges, which are ineradicable and show no change from childhood to extreme old age The persistence of the markings of the finger-tips has been proved beyond all question, and this universally accepted quality has been the basis of the present system of identification The impressions, when examined, show that the ridges appear in certain fixed patterns, from which an alphabet of signs or a system of notation has been arrived at for convenience of record As the result of much experiment a fourfold scheme of classification has been evolved, and the various types employed are styled "arches," "loops," "whorls" and "composites." There are subclasses, and all are perfectly distinguishable by an expert, who can describe each by its particular symbol in the code arranged, so that the whole "print" can be read as a distinct and separate expression

One of the first methods of identification was the adoption of anthropometry (*q v.*), which was invented by the French savant, A. Bertillon. The reasons that led to its general supersession may be summed up in its costliness, the demand for superior skill in subordinate agents and the liability to errors not easy to trace and correct. A still more potent reason remained, the comparative failure of results. It was found in the first four years of its use in England and Wales that an almost inappreciable number of identifications were effected by the anthropometric system; but in 1901 it was supplemented by the use of "finger prints," and this method of identification has proved an unqualified success

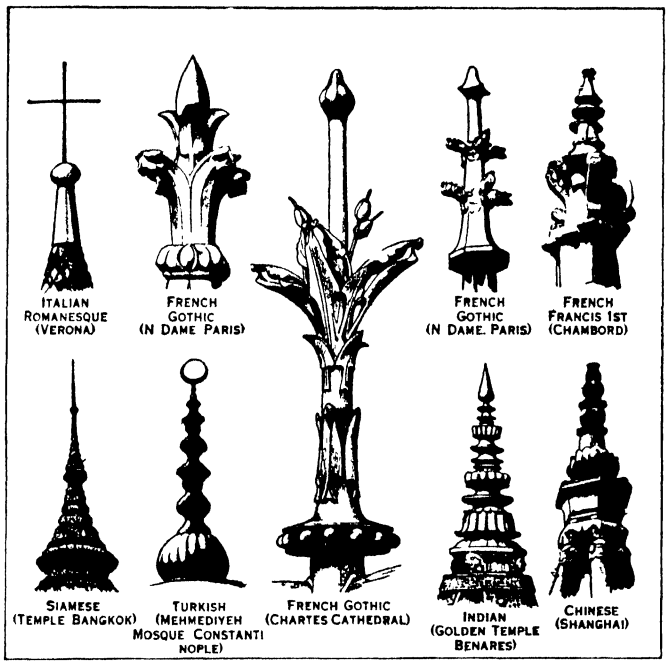
The record of finger prints in England and Wales is kept by the Metropolitan police at New Scotland Yard The advantages of the record system need not be emphasized By its means identification is prompt, inevitable and absolutely accurate. By forwarding the finger prints of all criminal prisoners to New Scotland Yard, their antecedents are established beyond all hesitation

Authority for taking finger-prints in England is given by the Penal Servitude Act 1891, which permits the secretary of State to make regulations as to the measuring of all prisoners who may for the time being be confined in any prison. Regulations have been made from time to time under that statute and a criminal prisoner can be measured at any time during imprisonment, which includes taking his finger-prints An untried criminal prisoner while in prison cannot have his finger-prints taken save by the order of the secretary of State, or upon an application made by a superintendent of police approved by a justice of the peace or in the metropolis by the commissioner or assistant commissioner. Finger-prints may lawfully be taken at any time by consent, but if an untried prisoner objects and it becomes necessary to use force there must be confirmation by the secretary of State or the commissioner or assistant commissioner. Where, however, an untried prisoner who has not been previously convicted is discharged or acquitted, all finger-prints taken must be forthwith destroyed or handed over to the prisoner himself Identity may be proved by means of finger-prints, and such evidence can be given by an expert on this subject.

FINGOES, a collective name applied to a number of Bantu-speaking tribes who formerly inhabited the greater part of Natal, but most of whom now live scattered about in the Eastern Province and Native Territories of the Cape The best-known are the amaBele, amaHlubi and amaZizi, but they include many others who were broken up and dispersed in the great inter-tribal wars at the beginning of the 19th century. The name is derived from *amaFengu*, "wanderers." Culturally they belong to the eastern division of Southern Bantu (*see* SOUTH AFRICA. *Ethnology*), but their tribal organization has been almost completely disintegrated, and they have advanced in the adoption of European culture.

FINIAL, in architecture, the decorative upper termination of a pinnacle, gable end, buttress, canopy or spire; especially in the Romanesque and Gothic styles It usually consists of a vertical pointed central element surrounded by four outcurving leaves or scrolls. When the form it decorates has crockets (*q v*) the finial may be formed of four or more crockets surrounding the central uprights. Finials in the form of candelabrum shafts occur frequently in early Renaissance work. The term is also applied loosely to any small pinnacle, knob or other decorative feature terminating a verticle motive (*see* EPI). (*See* illustration, p. 250.)

FINIGUERRA, MASO (*i.e.,* TOMMASO) (1426–1464), Florentine goldsmith, draughtsman and engraver, was born in March 1426 in Sta Lucia d'Ognissanti and died in Dec. 1464 He was the son of Antonio, and grandson of Tommaso Finiguerra or Finiguerri, goldsmiths of Florence, and was brought up to this profession, becoming early distinguished for his work in niello. In 1457 he was in partnership with Piero di Bartolommeo di Salì and the great Antonio Pollaiuolo, when they received an order for a pair of silver candlesticks for the church of San Jacopo at Pistoia. In 1463 Finiguerra drew cartoons for five or more figures



CHARTES CATHEDRAL, FROM VIOLLET LE DUC, "DICTIONNAIRE RAISONNE DE L ARCHITECTURE FRANCAISE", CHINESE BY COURTESY OF THE CANADIAN PACIFIC STEAMSHIPS

EXAMPLES OF VARIOUS TYPES OF FINIALS

for the sacristy of the duomo, which was being decorated in wood inlay by a group of artists with Giuliano da Maiano at their head He also worked under Ghiberti on the gates of the baptistery

Vasari erroneously represents Maso Finiguerra as having been the first inventor of the art of engraving (using that word in its popular sense of taking impressions on paper from designs engraved on metal plates) In the last years of the 18th century Vasari's account of Finiguerra's invention was held to have received a decisive and startling confirmation There was in the baptistery at Florence (now in the Bargello) a 15th century niello pax of the Coronation of the Virgin The Abate Gori, a connoisseur of the mid-century, had claimed this conjecturally for the work of Finiguerra, a later virtuoso, the Abate Zani, discovered first, in the collection of Count Seratti at Leghorn, a sulphur cast from the same niello (this cast is now in the British Museum), and then, in the National library at Paris, a paper impression corresponding to both This he proclaimed was proof positive of Vasari's accuracy

Zani's famous discovery is now discredited among serious students It has been proved that the art of printing from engraved copper-plates had been known in Germany, and probably in Italy also, for years before the date of Finiguerra's alleged invention Further, Maso's pax for the baptistery, if Cellini is to be trusted, represented not a Coronation of the Virgin but a Crucifixion, whose recorded weight does not agree with that of the pax claimed by Gori and Zani to be his Again all records agree in representing Finiguerra as a close associate of Antonio Pollaiuolo Nothing is more unlike their special style than the style of the Coronation pax, the designer of which must obviously have been trained in quite a different school, namely, that of Filippo Lippi So this identification has to be abandoned The only fully authenticated specimens of Finiguerra's work which exist are the above-mentioned tarsia figures, over half life-size, executed from his cartoons for the sacristy of the duomo But his hand has lately been conjecturally recognized in a set of drawings of the school of Pollaiuolo at the Uffizi, some of which are inscribed "Maso Finiguerra" in a 17th century writing, probably that of Baldinucci, and in a very curious and important book of nearly 100 drawings by the same hand, acquired in 1888 for the British Museum The hand is that of a draughtsman of the school of Pollaiuolo, some of whose drawings bear an ancient attribution to Finiguerra, while all agree with what is otherwise known of him, and one or two are exactly repeated in extant works of niello, the craft which was peculiarly his own; others being intimately related to the earliest or all but the earliest works of Florentine engraving, the kindred craft which tradition avers him to have practised, and which Vasari erroneously believed him to have invented Surely, it has been argued, this draughtsman must be no other than Finiguerra

BIBLIOGRAPHY.—*See* Bandinelli in Bottari, *Raccolta di lettere* (1754), 1, p 75; Vasari (ed Milanesi), 1. p. 209, III, p 206, Benvenuto Cellini, *I Trattati dell' orificeria, etc* (ed. Lemonnier), pp 7, 12, 13, 14, Zani, *Materiali per servire, etc* (1802); Duchesne, *Essai sur les nielles* (1824), Baldinucci, *Notizie dei professori di disegno* (1845), 1, pp 518, 519, 533, Dutuit, *Manuel de l'amateur d'estampes,* vol 1 pref and vol II (1884), and for a full discussion of the whole question, Sidney Colvin, *A Florentine Picture Chronicle* (1898), C Lewis Hind, *Catalogue of Early Italian Engravings in the British Museum* (1910)

FINING, a process for the clarification of liquors such as wine and beer, generally consisting of a solution of isinglass or a solution of tartaric or sulphurous acid In the fining of wine, gelatin, or in the case of high-class red wines, white of egg is employed After these have been added and the beer or wine well rolled, the fining matter subsides and is drained off carrying with it the suspended matters which cause turbidity *See* BREWING and WINE

FINISHING: *see* CLOTH FINISHING

FINISTÈRE, the most western department of France, formed from part of the old province of Brittany Pop (1926) 753,702 Area, 2,713 square miles It is bounded W and S by the Atlantic Ocean, E by the departments of Côtes-du-Nord and Morbihan, and N by the English Channel

Finistère is the west end of the worn down ancient fold region, axes of which still emerge slightly as the Monts d'Arrée (1,282 ft) in the north and Montagnes Noires in the south These run east and west, with the Aulne basin between them Small streams flow north from the Monts d'Arrée and south from the Montagnes Noires The Aulne and Elorn, and the other streams in lesser degree, have estuaries due to coastal sinking, and these estuaries form the harbour of Brest and other navigable entries Off the promontories prolonging the Monts d'Arrée are the Ushant islands and off that prolonging the Montagnes Noires the Îles de Sein in the south, with Batz off the north coast and many others Between islands and mainland are famous tide races which make navigation difficult The coasts are often steep and rocky

The climate is oceanic, average temperature 52°, rainfall heavy Though more than a third of the department is covered by heath, waste land and forest, it produces oats, wheat, buckwheat, rye and barley The neighbourhood of Roscoff and the borders of the Brest roadstead are extremely fertile and yield large quantities of asparagus, artichokes and onions, besides melons and other fruits The cider apple is abundant Hemp and flax are also grown The farm and dairy produce is plentiful, and cattle and horses are largely bred Honey and wax are produced The great pilchard fishery makes this department a nursery of seamen for the French navy. Coal, though found in Finistère, is not mined, there are quarries of granite, slate, potter's clay, etc The lead mines of Poullaouen and Huelgoat, which long yielded silver, are no longer worked The preparation of sardines is carried on on a large scale at several coast-towns The manufactures include ropes, agricultural implements, paper, leather, earthenware, soap, candles and fertilizers and chemicals derived from seaweed Brest has important foundries and engineering works, and shipbuilding is carried on there and at other seaports Brest and Morlaix are the most important commercial ports Trade is in fish, vegetables and fruit Coal is the chief import The department is served by the Orléans and Ouest-État railways The canal from Nantes to Brest traverses the department

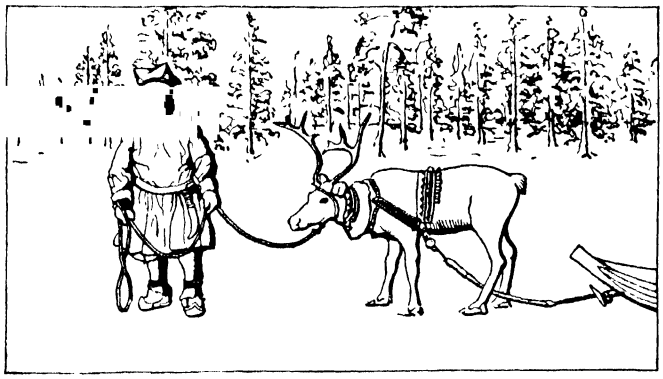
Finistère is divided into the following arrondissements of Brest, Châteaulin, Morlaix and Quimper (43 cantons, 299 communes), the town of Quimper being the capital of the department and the seat of a bishopric The north of the department belongs to the region of the X army corps (Rennes), and the south to the region of the XI army corps (Nantes) and the whole to the archiepiscopal province and académie (educational-division) of Rennes, where its court of appeal is also situated.

The more important places are the ports of Quimper, Brest, Morlaix, Quimperlé, Douarnenez, Concarneau, Roscoff and, inland, Landerneau and Châteaulin. Finistère abounds in menhirs

and other megalithic monuments, of which those of Penmarc'h, Plouarzal and Crozon are most noted The two religious structures characteristic of Brittany—calvaries and ossuaries—are frequently met with, *e.g*, the calvaries of Plougastel-Daoulas, Pleyben, St Thégonnec (17th century), and Guimiliau (16th century), and the ossuaries of Sizun and St Thégonnec (16th century) and Guimiliau (17th century) Daoulas has the remains of a fine Romanesque church and cloister Locronan and St Jean du Doigt have interesting churches and are among many centres of famous folk ceremonies called "pardons" St Pol de Léon has a fine granite Gothic cathedral Kerjean has a large 16th century château

FINITE DIFFERENCES: *see* CALCULUS OF DIFFERENCES

FINLAND (*Suomen Tasavalta*), "the land of a thousand lakes," formerly for a time a grand duchy under Russian sovereignty, but independent since Dec 6, 1917, extends from 59° 48′



BY COURTESY OF THE CONSULATE GENERAL OF FINLAND

A FINN WITH HIS NATIVE CONVEYANCE OF A REINDEER AND SLED

to 70° 6′ N and 19° 2′ to 32° 48′ E Its extreme length is 700 m from north to south Finland is bordered on the north by Norwegian Lapland, on the east by Russia, on the south by the Gulf of Finland and on the west by the Gulf of Bothnia and Sweden It includes part of Russian Lapland. In the south-west it is skirted by the numerous rocky Åland islands (*q v*) By the treaty of Dorpat, Oct. 14, 1920, Soviet Russia ceded the Petsamo district (68° 5′–69° 57′ N and 28° 25′–32° 20′ E) thus giving Finland access to the ice-free fjord of Petsamo and the Arctic Ocean This district is as yet connected with Finland by road transport only

Geography.—It has an area of 149,588 sq m, of which about 35% is forest, 11% lakes, 3% arable and 5% grass land Among the largest lakes are Ladoga, the largest in Europe, of which the northern half belongs to Finland, Saima, three and a half times larger than Lake Leman, whose outlet, the Vuoksen, flows into Lake Ladoga, forming the mighty Imatra rapids, lakes Kalla, Pajane, Nasi-jarvi, Pyha-jarvi, Enare, Torneå, Hauki, etc The surface of the country is tableland rising 400 to 600 ft above sea level, with elevations reaching 2,000 feet In the extreme north-west, 4,115 ft is attained in the Haldit jokko The coastline (1,646 km) is generally low The rivers are unimportant, the chief being the Muonio which flows between Finland and Sweden, the Kemi and the Uleå, which is navigable throughout.

In its geological structure Finland is closely related to the Scandinavian Peninsula, showing granite and archaean rocks covered with glacial and post-glacial deposits (partly of lacustrine and partly of marine origin)

The climate of Finland is rigorous, but in the west and south-west, owing to the moderating influence of the Baltic, less severe than farther east in corresponding latitudes Everywhere, especially in the interior, the winter lasts very long; the summer from two to two and a half months Spring and autumn are of short duration

Flora and Fauna.—Finnish botanists have divided the country into 28 different areas, giving the numbers of phanerogam species for each These vary from 318 to 400 species in Lapland, 508 to 651 in Karelia, to 772 in Finland proper The chief forest trees are: the Scotch fir (*Pinus sylvestris*), the fir (*Picea excelsa*); two species of birch (*B verrucosa* and *B odorata*), birch-bush (*B nana*), two species of Alnus (*glutinosa* and *incana*) The oak (*Q pedunculata*) grows only on the south coast The Siberian larch was introduced in culture in the 18th century The forest area comprises 62,429,000 ac, of which 40% is State-owned In 1926, the lumber cut by the Department of Forestry was valued at 61,600,000 marks, the erect timber sold was valued at 97,900,000 marks, the lumber sold from State sawmills at 77,800,000 marks

Agriculture, Industries, Shipping, etc.—Owing to the rigorous climate and the limited cultivable area, Finland's home supply of agricultural products falls far short of the demand The principal items in the order of their importance are. hay, cultivated and natural, potatoes, oats, rye, barley, wheat, *i e*, a total harvest and to the value of approximately five million marks. Live-stock horses number 399,998; cattle 1,860,479, sheep 1,413,697, pigs 390,535, goats 11,076 The output of butter totals 20,060,000 kg, of cheese 5,290,000 kg The number of dairies is 596, giving a butter production of 20,062 tons

Finland had, in 1926, 3,526 large factories, employing an aggregate of 149,367 workers, and yielding 10,935,000 marks The chief industries in the order of their importance are. wood industries, paper, iron and mechanical works, textiles, leather, tobacco, graphic arts, electricity, water and gas, chemicals There were 513 sawmills with 97 water motors, 537 steam, 26 oil and gas and 1,994 electric motors

The mercantile marine of Finland on Jan 1, 1927, aggregated 4,930 vessels of 477,329 net registered tons There were two airlines Helsinki–Stockholm and Helsinki–Reval, carrying, in 1926, 3,218 passengers and 52,661 kg goods and mail.

The numerous lakes are utilized freely for transport, and joined by short canals, so as to constitute continuous waterways About 60,000 vessels pass along the canals, and about 15,000 timber-rafts; the net revenue from the canals amounting to about 5,000,000 marks There are approximately 15,700 m of high roads and 16,000 m of secondary roads The first railway in Finland was completed in 1862—the Helsinki–Häme line, about 80 m in length By 1927 there were 2,886 m of railway, all but 160 m State-owned The gauge is 4 9 feet The traffic (in 1926) was 22,000,000 passengers and 10,200,000 tons of goods carried, representing a net revenue of 129,873,000 marks Connection with the Swedish railways has been established since the World War Telegraph offices number 2,811, there being 14,170 m of telegraph and 5,264 m of telephone, all State-owned



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YOUNG FINNISH WOMAN SPINNING IN THE SAME WAY HER GRANDMOTHER DID

Population.—The population of Finland in 1926 amounted to 3,558,059, of whom 17 1% lived in towns, the remainder in country districts Classification according to language is as follows Finnish 88 7%, Swedish 11 0%, others 0 3%, according to religion Protestant 97%, Greek Orthodox 1 7%, Roman Catholic 0 02%, others 1 28%; according to occupation agriculture 65%, industry 15%, transport 3%, commerce 3%, public administration 2%, professions 2%, miscellaneous 10% In 1926, the birth-rate was 21 7 per 1,000; the death-rate 13 4 per 1,000 This meant an excess of births by 29,349 per annum

The leading cities are Helsinki (Helsingfors), capital of Finland and capital of the province of Uusimaa, principal seaport, 215,829 inhabitants, Turku (Åbo), capital of the province of Turku-Pori (Åbo-Björneborg), university town of 61,664, Tampere (Tammerfors), principal manufacturing town, 52,394, Viipuri (Viborg), capital of the province of the same name, 48,990; Vaasa (Vasa), 24,218, Oulu (Uleåborg), 23,020; Kuopio

22,716, Pori 17,576; Kotka 14,768; Tavastehus 5,545

Education.—Education in Finland is both cheap and thorough, and it is somewhat closely modelled on the German system There are three universities, of which the premier was founded at Turku in 1640, but transferred to Helsinki in 1827 It has a teaching body of 272 professors and 2,946 students (838 women) Turku was provided, in 1919, with a Swedo-Finnish academy, which, three years later, was raised to the status of a national university Further, a technical high-school and two commercial schools are established in Helsinki Throughout the country there are 181 secondary schools with a teaching staff of 2,926 and 44,643 pupils Primary education, public and denominational, has a teaching staff of 11,591, and 426,169 pupils Compulsory education has only existed since 1921

See the *Annuaire Statistique de Finlande; Constitution de la Finlande* (1920), *The Republic of Finland an Economic and Financial Survey* (1920), *Atlas de Finlande* (3 vols 1911) The above are published by the government at Helsinki *See* also *Bulletin of the Soc Geographique de Finlande* (Helsinki), Th Homen, *East Carelia and Kola Capmark* (Helsinki, 1921), K W Hopper, *Finnish Harbours* (Helsinki, 1922) (W L. B)

Defence.—The detachment of Finland from Russia dates from the World War of 1914–18 Finland has land frontiers with Soviet Russia and with Sweden extending for 3,039km, and a coast-line of 1,646km In October 1920 a treaty was contracted with Soviet Russia which prevents the construction of fortifications on certain islands, or their use for any military purpose (Treaty Series, League of Nations, vol 3, No 91) In 1921 Finland undertook not to fortify the Aaland islands (*ibid.* vol. 9, No 255)

All male Finnish citizens are liable for military service in war from Jan 1 of the year in which their 17th birthday falls until the completion of their 52nd year Service in peace in the active army begins in the year in which their 21st birthday falls Total service is for 35 years Those of ages from 17 to 21 form the 3rd class of the "Landwehr"; those conscripted at 21 join the active army, pass into the active army reserve at 22, and into the first class of the Landwehr from 29 to 52, others pass into the second class of the Landwehr from 21 to 52 The training at 21 to 22 is for 12 months in the infantry and for 15 months in cavalry, air force, artillery, technical troops, etc Reservists attend occasional training

The budget effective strength of the peace-army is about 28,000 including 1,500 officers and 450 officials The army is organized in 3 divisions of all arms, one machine gun company being included in each division, a tank battalion in the 1st division, 2 cyclist battalions in the 2nd division, and one in the 3rd division There is also a cavalry brigade, technical troops and coast artillery Officers are trained at a cadet school at Helsingfors under the Ministry The President of the Republic is Commander-in-Chief He can delegate his powers to a general in war, and has a general to command the active army under him in peace, with a Chief of the General Staff and Ministry of Defence There is a military Air Force of 5 squadrons, an aviation school and a recruit company When Finland joined the League of Nations an establishment of 69 aeroplanes was approved by that body which reserved for consideration proposals for increasing this force

See also League of Nations *Armaments Yearbook*, 1928 (G. G. A)

Navy.—The only naval force of Finland is a collection of patrol-boats (4), torpedo-boats (2), minelayers (4) and minesweepers (2) (X)

ECONOMICS AND FINANCE

Until 1917, Russia remained a very considerable buyer of Finnish goods, but the revolution brought about a complete reversal of conditions, and trade with Finland became insignificant After the World War, Finland, accordingly, had to shoulder the task not only of regaining her old markets in the West, but also of creating new markets to set off the loss of Russian trade Similar difficulties were met in the import trade.

Imports and Exports.—The adjustment to the changed conditions was achieved with surprising rapidity, in spite of the unfavourable business conditions which prevailed on the leading markets It was temporarily helped by the declining tendency of the Finnish exchange, which in the autumn of 1921 brought quotations down to a bottom level

	Exports.		Imports	
	Value mill Finnish marks	Percentage of volume of 1913.	Value mill Finnish marks	Percentage of volume of 1913
1913	404 8	100 0	405 4	100 0
1919	880 4	47 6	2,509 9	77 8
1920	2,926 4	68 6	3,626 5	52 8
1921	3,389 4	69 0	3,585 7	54 5
1922	4,467 6	93 5	3,969 9	74 7
1923	4,302 5	94 8	4,600 3	101 5
1924	4,070 6	112 7	4,715 5	99 3
1925	5,573 5	123 9	5,519 5	105 0
1926	5,636 5	127 5	5,607 7	116 3

Great Britain took about 38% of Finnish exports in 1926 In the import trade the part played by Great Britain (13% in 1926), though considerable, is inferior to that of Germany (35% in 1926) The trade with Great Britain during recent years has gained ground when compared with pre-War conditions, but trade with Russia has not yet recovered Timber products have long been of paramount importance in Finnish export trade, and timber exports after the War reached, and even exceeded, the record level of 1913. In 1926 the timber industry contributed about 56% of the total exports The paper and pulp exports are second in importance only to the timber exports, the share of this industry in total exports amounting in 1920 to about 29% Agricultural exports gradually revived, but the import of cereals, a very large item in Finnish foreign trade, showed some tendency to decline

Currency.—When, at the end of 1917, Finland gained her independence, she had to cover the increased expenditure imposed by her new position as an independent state, and that incurred in the suppression of the Red rebellion in the spring of 1918 As the taxes could not be punctually collected, the government resorted to increased borrowing Part of this demand for credit was met by means of new note issues by the State Bank

During the course of the years 1919, 1920, and 1921 the Finnish exchange declined seriously In the latter part of 1922 the Bank of Finland embarked on a policy of stabilizing the Finnish exchange in relation to the dollar, and since that date variations have been slight At the end of 1925 the Finnish monetary system was put on a gold basis, the level of parity being approximately 193 23 Finnish marks to the £ sterling

Finnish Monetary Statistics

	Rates of exchange on New York. Par 5 18 mks = 1 dollar		Index of wholesale prices.
	Highest	Lowest.	Annual average base 1913 = 100
1921	80 50	28 00	1263
1922	54 50	35 25	1219
1924	40 44	39·70	1100
1925	39 70	39·70	1129
1926	39 70	39 70	1088

Banks.—The leading banking institutes are at present Nordiska Föreningsbanken, Kansallis Osake-Pankki, Helsingfors Aktiebank and Unionbanken, which at the end of 1926 held above 70% of the total home deposits of the 19 joint stock banks in existence The note circulation of Finland's Bank, the bank of issue, at the end of 1926 amounted to 1,346,000,000 Finnish marks, backed by a gold reserve of 327,000,000 marks and foreign assets exceeding 1,000,000,000 marks

National Budget.—The improved conditions of production and trade formed a firm basis for financial reorganization. Before the War the bulk of the Finnish State revenue was derived from customs duties and other indirect taxes and from the earnings of

government enterprises, mainly the railways The chief change in finance since the World War has been the introduction of an income and property tax The customs duties still form the main part of the state revenue, but direct taxes now yield about a quarter of the total tax revenue The income from state enterprises is relatively less than before the World War The public debt, foreign and internal, in Sept. 1927, was estimated at a sum equivalent to $94,100,000. The debt is balanced by state forests, railways and other state property

Tariff Policy.—The pre-War tariff might be characterized as a Protectionist one, but it granted practically no protection to grain-growing Post-War legislation has provided agricultural protection and, with the elimination of the special facilities formerly existing between Russia and Finland, the grain duties now established were expected sensibly to influence agricultural conditions The new policy made no radical change in the tariff on manufactured goods, but sought to promote a more scientific distribution of duties and to secure as large an income as possible to the state But the revision of the tariff was not completed in 1927

Social Legislation.—An active policy aiming at improving the position of the numerous landless agricultural population had been set on foot before the World War After gaining her independence Finland adopted laws which with certain limitations gave tenants the opportunity of purchasing their holdings at a price below their value in the open market, and a large number of tenants have been turned into small owners Recent social legislation further includes the adoption of an eight-hour day Financial considerations have limited the scope of actual legislation for social insurance, but workmen's compensation for accidents has been put on a new and more comprehensive basis by legislation in 1917 and 1925 The co-operative movement has made considerable progress in Finland (A Mo)

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HISTORY

The Finns as a group under this name come into history at the beginning of the 8th century They were brave and hardy colonists who defied the forces of nature, "Ukho" as god of the air, "Tapio" of the forests, "Ahti" of water, etc But their repeated raids on the coast of Scandinavia, caused the Swedish king Eric IX (St Eric) to conquer the country in 1157, thus bringing it into contact with civilization He left behind Henry, bishop of Uppsala (believed an Englishman) with priests and soldiers to complete the conversion Henry was killed, but was afterwards canonized and, as St Henry, became the patron saint of Finland The country relapsed into paganism until, in 1209, another bishop and missionary, Thomas (also an Englishman), recommenced the work of St Henry He nearly succeeded in detaching Finland from Sweden and making it a province subject to the Pope The famous Birger Jarl compelled the Tavastians, one of the subdivisions of Finlanders, to accept Christianity in 1249, Torkel Knutson conquered the Karelians in 1293 and built the castle of Viborg Henceforth Finland became the cockpit of Northern Europe in the almost continuous struggle between Russia and Sweden which lasted until 1809.

Swedish Rule.—The Swedes spread civilization and accorded to the Finns the same civil rights as belonged to themselves About 1528, Gustavus Vasa introduced the Reformed religion, and King John III. raised the country to the dignity of a grand-duchy. Gustavus Adolphus at the beginning of the 17th century established the Diet of Finland, composed of the four orders of the nobility, clergy, burghers and peasants He and his successors did much for learning, but the country suffered terribly from war, famine and pestilence

In 1710 Peter the Great set out to wrest Finland from Sweden, and six years later the whole country was in his power. Thousands perished in the wars of Charles XII, but by the Treaty of Nystadt in 1721 the Russians retained the province of Viborg, the eastern division of Finland Twenty years later the Swedes attempted reconquest, but suffered disaster. In 1788 Gustavus III. confirmed those "fundamental laws" which the Finns succeeded in maintaining against kings and tsars for over two centuries Latin disappeared as the academic language, and Swedish was adopted The same year war again broke out between Sweden and Russia, and was carried on for two years without result In 1808, under Gustavus IV, peace was again broken, but this time the war ended by the cession to Russia in 1809 of the whole of Finland and the Åland islands.

Russian Rule.—Finland did not enter Russia as a conquered province. The emperor Alexander I granted her a free constitution and fundamental laws, and she became a semi-independent grand-duchy with the emperor as grand-duke A senate was created and a governor general named The province of Viborg was reunited with Finland in 1811 Åbo remained the capital till 1821, when the seat of government was transferred to Helsingfors The university was also transferred thither in 1827 The diet, which had not met for 56 years, was convoked by Alexander II at Helsingfors in 1863; but it was only under his successor, Alexander III, that the Slavophil movement, with the motto "one law, one church, one tongue," acquired influence in official circles Politics in Finland were complicated by the rivalry between the Swedish party, hitherto dominant, and the Finnish "nationalist" party which was asserting itself linguistically and politically

First Period of Russification, 1899–1905.—Nicholas II, by the "February Manifesto" (Feb 15, 1899) virtually abrogated the legislative power of the Finnish Diet A new military law, practically amalgamating the Finnish with the Russian forces, followed in July 1901, Russian officials and the Russian language were foisted on Finland wherever possible, and in April 1903 the Russian governor, Gen Bobrikov, was invested with dictatorial powers To the Russian system of spies, domiciliary visits, illegal arrests, banishments and the suppression of newspapers, the Finns opposed a dogged resistance which culminated in the famous "national strike" of Nov 1905 After six days the unconstitutional government—already much shaken by the events in Russia and Manchuria—capitulated An imperial manifesto of Nov 7, 1905, restored the *status quo ante* 1899 The new diet remodelled the constitution on the basis of universal suffrage, with freedom of the press, speech, meeting and association

Second Period of Russification, 1908–14.—After "two glorious years of peace" and internal progress, the tsar peremptorily fixed an annual contribution in lieu of military service (Ukase of Oct 7, 1909) and the Imperial Duma approved of the principle (Imperial law, Jan 23, O S, 1912) The Finnish Diet, though ready to compromise, was twice dissolved, and all the large measures of domestic reform which it had passed were never heard of again. Such was the fate of the bill for the prohibition of alcohol, of measures relating to the care of children, insurance, old-age pensions, education, public health, the betterment of the landless workers upon the soil Civil marriages, however, were instituted, illegitimate children placed on a better basis, the principle of "equal pay for equal work" was applied in the teaching profession, in the printing trade and, in 1913, in the State service The Duma alone considered itself competent to decide the questions affecting the interests of the Russian empire Accordingly it passed the "Imperial Legislation Act" on June 30/17, 1910, amid shouts of "Finns Finlandiae" Two imperial laws were laid before the Diet which refused them both, and was dissolved In one, the Duma affirmed the principle of an annual indemnity in lieu of service; in the other, full civil rights were accorded to temporary Russian residents in Finland The last-named measure, apart from its injustice, caused the overlapping of two different codes of law Judges resigned, high officials went into exile, every provisional governor left voluntarily or under compulsion The country was ruled by a packed Senate, the Diet was peremptorily dismissed, the press censored The Russification inflicted by the Duma was as oppressive as that imposed by the tsar

The World War and the Russian Revolution.—Lt -Gen F. Seyn, the governor-general, supervised the harassing restrictions of liberty which the World War brought with it Finland, protected by two systems of fortified lines, escaped invasion, but

the mercantile marine remained locked in the harbours of the Bothnian gulf There being no leaks in the Allied blockade—as in Sweden and Denmark—the price of living rose by 25% But industries connected with military supply attained unexampled prosperity The Russians, sporadically anxious to please, abolished the annual military indemnity and merely imposed a 5% tax on property and mortgage Finland naturally feared that a victorious Russia would again turn oppressor Only some 2,000 volunteered for the Russian army About the same number enlisted on the German side, ostensibly only for service on the eastern front

Nicholas II abdicated on March 15, 1917, and the Provisional Government restored representative government in Finland The Russianized Senate was disbanded and a temporary body of 12 (half Social Democrats, half representing the bourgeoisie) assumed executive power Stakovich became governor-general, Rodichev, a tried friend, secretary of state for Finland The Socialist speaker of the Diet, M Tokoi, was nominated president of the Senate, Kullervo Manner, of the same party, speaker of the Diet But the propertied classes in Finland quailed before the rising power of the Social Democratic Party—orientated towards Russia The intense industrial development had strengthened hooliganism, and the war had brought some 40,000 Russian refugees from food shortage and incipient riot The Swedo-Finns aimed at complete independence, and the Finnish Government proclaimed that such was its policy The Diet resolved that it alone was competent to pass and put into practice all laws in Finland relating to home affairs and finance This law of July 18, 1917, reflected the standpoint of the Social Democratic majority which was ready to recognize Russia's supremacy in military matters and foreign policy The deadlock which ensued, the dilatory Russian Provisional Government never succeeded in settling The Finnish Diet passed *en bloc* all bills previously held up by the tsar, including the total prohibition of alcohol and the eight-hour day Yet it failed to relieve the food-shortage which was due to the neglect of agriculture in the immediate preceding years From March 1917 to Feb 1918 repeated strikes threatened the existence of the nation Meanwhile, the advent of the Bolsheviks to power in Oct 1917 deepened the pro-Russian sympathies of the Social Democrats, while the Swedo-Finn and Finno-Finn propertied classes sought to cut adrift from a Russia which had no settled government On Dec 6, 1917, the Diet and the now bourgeois Senate drew up a declaration of independence which is held to mark the birth of Finnish freedom The Bolsheviks, on Jan 4, 1918, declared that the step conformed with their policy, whereupon Sweden and the other Scandinavian countries acknowledged the independence of Finland France followed The treaty of Brest Litovsk (March 3, 1918) confirmed Finland's independence, and four days later she concluded a treaty which made her Germany's ally and vassal (*See* BREST LITOVSK, TREATIES OF)

The Finnish Social Democrats, almost all Maximalists and anti-militarists, pinned their faith on the Muscovite connection to save the country from invasion But the garrisons, starving and unpaid, banded themselves together as "Red Guards" (reinforced from Russia) and ransacked the country A hurriedly organized White Army, under Baron Carl Gustav Emil Mannerheim, proved insufficient to maintain order Sweden refused to help, but the Germans did not hesitate They sent a composite division, initially some 12,000 strong, under Gen Count Rudiger von der Goltz, and held the Red forces in a successful action near Karis on April 6 This enabled Gen Mannerheim to win the battle of Tammerfors, whereupon Goltz entered Helsingfors on April 14 Finally, the German victory over the Reds (April 30–May 2) at Lahti-Tavastehus contributed to Mannerheim's decisive victory near Viborg (April 28–29) But the cruelty of the Red insurrectionaries led to a White counter-terror Some 15,000 men, women and children were slaughtered, and by June 27, 1918, 73,915 Red rebels, including 4,600 women, were prisoners of war.

The Diet, which met in June 1918, was moderate, since the Socialists who formed 46% of the electorate were excluded from the register It authorized the Germanophil senator, Pehr Evind Svinhufud, to exercise the supreme power in so far as it had not already been conferred on the Senate, which offered the crown to Prince Frederick Charles of Hesse, brother-in-law of the German emperor Prince Charles accepted the crown, but never proceeded to Finland and the question was allowed to lapse

The Germans pursued the ulterior object of securing Finnish military co-operation against the Murman railway, which was guarded by a British expeditionary force The claim of the liberators upon the gratitude of the Finns was assuming the most peremptory forms known to diplomacy when, on July 18, the Allied offensive in the West diverted Germany's forces Thus valuable time was gained until the Armistice of Nov 11, 1918, orientated Finland towards the democratic régime associated with England and America Svinhufud was succeeded on Dec 12 by Mannerheim as regent, who formed a coalition government composed of six Republicans and six Monarchists The German troops, in part mutinous, were conveyed back to Germany In 1919 Mannerheim organized the "Skyddskorps" of 100,000 men to maintain order In the general election of March 1, 80 Social Democrats, 42 Agrarians, 28 Coalitionists, 26 Progressives, 22 Swedes and 2 Christian Labour members were returned The Agrarian party, composed of small land-owners, opposed the Swedish-speaking monarchist section The Social Democrats lost 12 seats owing to the disfranchisement of 40,000 voters for participation in the Red revolt

When, at the end of May 1919, the British 237th Brigade (of the expeditionary force under Maj-Gen Maynard's command) reached Lake Onega, Mannerheim offered co-operation in return for Petrozavodsk The offer being declined, a Finnish volunteer force nevertheless assaulted the town, but without success Again, at the close of the year, when the White Russian Gen Yudenitch marched on Petrograd, Mannerheim sounded the Allies on Finnish intervention He received no encouragement from Paris or London, nor from the Moderates at home

Establishment of the Republic.—On June 17, 1919, the Finnish Diet established a republic The new constitution came into force on July 17 There is a single chamber, the Diet, in which the sovereign power is embodied The executive power is vested in a president who is chosen by 300 presidential electors nominated by the citizens He ratifies new laws or withholds consent, dissolves the Diet, orders new elections and conducts foreign affairs All his powers are exercisable through the ministers and his decisions have to be taken in the council of State consisting of 10 ministers, who are legally and politically responsible There are nine departments for local government, closely following the linguistic distribution Both Finnish and Swedish are official languages On July 25, Prof Kaarlo Juho Ståhlberg was chosen first president A Coalition anti-Socialist Government under Erich held office till April 9, 1921 The Vennola Government, a coalition of Progressive and Agrarian parties, then came into power and passed the Amnesty bill On May 6, 1919, Great Britain recognized the independence of Finland *de jure*

A peace treaty was signed with Soviet Russia at Dorpat on Oct 14, 1920 Pechenga was ceded to Finland, which thus obtained an outlet on the Arctic ocean On Dec 16, 1920, Finland was admitted as a member of the League of Nations As such it claimed sovereignty over the Åland islands (*q v*) which was disputed by Sweden In June 1921 the League of Nations decided in favour of Finland

Despite the Treaty of Dorpat, relations with Soviet Russia did not improve In Oct 1921 the Karelians, racially allied to the Finns, revolted against Moscow, but the rising was crushed The Karelian question, at the instance of Finland, occupied the League of Nations all through 1923. The Permanent Court of International Justice decided in July not to deal with this matter, as Russia was not a member of the League and might not recognize its competence The Council of the League, however, determined that this view of the Permanent Court should not hinder a settlement, which resolve the Assembly of the League strongly supported But the Commissar for Foreign Affairs, M Chicherin, declared Karelia part of Soviet Russia His argument had the support of the red battalions

In these years, Finnish foreign policy remained in the hands

of Dr R Holsti, under successive administrations In March 1922, this statesman signed at Warsaw an agreement with Estonia, Latvia and Poland "to observe benevolent neutrality towards any of the signatory states which might be attacked without provocation and to consult immediately with regard to subsequent steps to be taken" The Finnish Diet, in its spring session, refused to ratify this agreement, and Dr Holsti relinquished office The principle of policy enunciated upon this occasion by the Diet—the avoidance of treaty commitments of a military nature, continued to rule Finland's Baltic policy On June 27, 1924, Finland signed bilateral conventions with Sweden, Norway and Denmark for compulsory arbitration

Internal Policy.—The Karelian dispute reacted on Finnish internal politics The long land-frontier made it impossible to keep out Russian propagandists and the discontent, thus fomented, threatened the economic recovery of the country. In May 1922 the Vennola administration was superseded by Professor Cajander's "Government of Officials," but it did not long outlive the general election held in July The Social Democrats returned only 53 seats, while the Agrarians and the Union Party showed small gains The Communists secured 27 seats

In Nov 1922, therefore, the Agrarians, who had held their ground, formed a Centre Government under Kyosti Kaalio, which passed the Religious Liberty Act, the Military Service bill and the "Lex Kaalio" which made provision for the landless population In Oct 1923 the Communist Party was suddenly dissolved, its newspapers were suppressed, and 25 of its parliamentary representatives imprisoned But this stroke reduced the Diet to a rump, and the Kaalio Government resigned on the eve of the new elections in April 1924, handing over to Prof Cajander's (second) "Government of Officials" The Social Democrats obtained 60 seats (+7), Communists 18 (−9), Agrarians 44 (−1), Union Party 23 (−2) On May 31, Prof Lauri Ingman (Union Party) formed a Government M Lauri Relander was elected President on Feb 16, 1925

The Government of Professor Tulenheimo, in which the Union Party and the Agrarian Union were represented, took office on March 31, 1925 It had to pass the military and naval estimates, which represent approximately 17% of the national expenditure The refusal of the Diet to sanction the programme of naval construction brought into office M Kyosti Kaalio with the support of the Coalition and the Agrarian Parties Holding only 82 seats in a Diet of 200, its legislative achievements were meagre It survived until Nov 23, when allegations were made in the Diet of illegal dealings between the Ministry of Defence and a Finnish ammunition factory M Tanner, after a prolonged crisis, succeeded on Dec 11 in forming a purely Socialist Government It had the support of the Progressive and Swedish Parties On April 11, 1927, Hr Irkonen, minister of the interior, resigned because he was accused of having spent money on the fisheries protection ship in excess of the amount sanctioned, the Government nevertheless carried the Amnesty bill by 96 votes against 94, and the last persons, still penalized for taking part in the revolution of 1918, 1,175 in all, regained their liberty and civil rights The general election on July 2, resulted as follows: Swedish Party 24 (−1), Finnish Coalition 34 (−8), Progressives 10 (−7), Agrarians 52 (−8), Socialists 60 (same), Communists 20 (−2) The new diet met on Sept 1 to pass the budget and, in particular, the increased army estimates The double property tax was dropped On Dec 9, the Labour Government was defeated on the question of import duties on rye, and resigned A new Government was formed with Hr J E Sunila as premier It is the first purely Agrarian Government in Finland In Sept 1927 Finland was elected to the Council of the League of Nations

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Music.—Music in Finland has been, despite the country's store of earlier folk-song, a plant of somewhat recent growth, dating back indeed not much earlier than about the middle of the 19th century Since then, however, Finland has produced a number of composers of genuine worth, headed by Jan Sibelius (*q v*) who has taken his place by general consent among the foremost masters of his time Whether in his sombre and intensely individual symphonies, in his beautiful songs or in his more popular occasional works, such as "En Saga" and "Finlandia," Sibelius, who has enjoyed a life grant from the State since 1897, has indeed long since established his claims as a national composer of the first rank and as such has won universal recognition both at home and abroad Other Finnish composers of outstanding note have been Toivo Kuula (1883–1918) whose career was unhappily cut short by his assassination during the Finnish War of Independence, Erkki Melartin (b 1875), Oskar Merikanto (1868–1924), Armas Jarnefelt (b 1869) and Selim Palmgren (b 1878) (X)

FINLAY, ROBERT BANNATYNE FINLAY, 1ST VISCOUNT, (1842–), British lawyer and politician, was born at Edinburgh July 11, 1842 He was educated at Edinburgh academy and university, and graduated in medicine In 1867 he was called to the bar, in 1882 becoming a Q C and a bencher of the Middle Temple From 1885 to 1892 he sat as a Conservative for Inverness Burghs, and in 1895 regained the seat and was made Solicitor-General in Lord Salisbury's Govt, when he was knighted In 1900 he became Attorney-General, remaining in the Govt. until the Conservative defeat of 1906, and from 1902 to 1903 was lord rector of Edinburgh university In 1910 he was elected M P for Edinburgh and St Andrews universities, and in 1916, on the formation of Mr Lloyd George's Govt, became Lord Chancellor and received a barony He retired in 1918, and in 1919 was created a viscount In 1920 he was appointed British member of the Permanent Court of Arbitration at The Hague, and in 1921 became a member of the Permanent Court of International Justice established by the League of Nations

FINLAY, GEORGE (1799–1875), British historian, was born of Scottish parents at Faversham, Kent, on Dec 21, 1799 He studied for the law in Glasgow, and about 1821 went to Gottingen In 1823 he went to Greece, being interested in the struggle for Greek independence, and spent 14 months studying the country At Missolonghi he met Byron, and for two months spent nearly every evening discussing Greek affairs with him After a short visit to Scotland he returned to Greece, where he spent the rest of his life In 1827 he took part in the unsuccessful operations of Lord Cochrane and Sir Richard Church for the relief of Athens When independence was secured in 1829 he bought an estate in Attica, and tried, without much success, to

introduce better methods of agriculture in Greece He then turned to the systematic study of Greek history with which he occupied himself until his death in Athens on Jan 26, 1875

The first part of his great work appeared in 1844, under the title of *Greece under the Romans*, and was followed by *History of the Byzantine and Greek Empires from 716–1453* (2 vols, 1854), *History of Greece under the Ottoman and Venetian Domination* (1856) and *History of the Greek Revolution* (2 vols, 1861) From 1864 to 1870 he was correspondent of *The Times*

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FINNER, the name used by whalers to denote the rorquals (*q v*) (*see* CETACEA)

FINNISH LITERATURE. The earliest writer in the Finnish vernacular was Michael Agricola (1506–1557), who published an *A B C* book *c* 1542, and, as bishop of Abo, a number of religious and educational works A version of the New Testament in Finnish was printed by Agricola in 1548, and some books of the Old Testament in 1551–52 A complete Finnish Bible was published at Stockholm in 1642 The dominion of the Swedes was very unfavourable to the development of anything like a Finnish literature, the poets of Finland preferring to write in Swedish and so secure a wider audience It was not until, in 1835, the national epos of Finland, the *Kalewala* (*q v*), was introduced to readers by the exertions of Elias Lonnrot (*q v*) that the Finnish language was used for literary composition During the last quarter of the 19th century there was an increasing literary activity in Finland A noted contribution to a history of Finnish literature is Krohn's *Suomenkielinen runollisuus ruotsinvallan aikana* (1862) A great work in the revival of an interest in the Finnish language was done by the *Suomalaisen Kirjallisuuden Seura* (the Finnish Literary Society), which from the year 1841 has published a valuable annual, *Suomi* The Finnish Literary Society has also published a new edition of the works of the father of Finnish history, Henry Gabriel Porthan (d 1804)

In imaginative literature Finland has produced several important writers of the vernacular Alexis Stenwall ("Kiwi") (1834–72), the son of a village tailor, was the best poet of his time; he wrote popular dramas and an historical romance, *The Seven Brothers* (1870). Among recent playwrights Minna Canth (1844–97) has been the most successful Other dramatists are P Cajander (1846–1913), who translated Shakespeare into Finnish, and Karl Bergbom (1843–1906), the first manager of the Finnish national theatre Among lyric poets is J H Erkko (1849–1906) The earliest novelist of Finland, Pietari Paivarinta (1827–1913), was the son of a labourer, he is the author of a grimly realistic story, *His Life* Many of the popular Finnish authors of our day are peasants The most gifted of the writers of Finland, however, is certainly Juhani Aho (1861–1921), the son of a country clergyman His earliest writings were studies of modern life, very realistically treated Aho then went to reside in France, where he made a close study of the methods of the leading French novelists of the newer school About the year 1893 he began to publish short stories, some of which, such as *Enris, The Fortress of Matthias, The Old Man of Korpela* and *Finland's Flag*, are delicate works of art, while they reveal to a very interesting degree the temper and ambitions of the contemporary Finnish population. It has been well said that in the writings of Juhani Aho can be traced all the idiosyncrasies which have formed the curious and pathetic history of Finland in recent years.

The most notable of the younger prose writers are Johannes Linnankoski (1869–1913) and F E Sillanpää (b 1888). Linnankoski achieved European renown by his novel *Laulu tulipunaisesta kukasta* (1905)—"The Song of the Blood-Red Flower"—which has been translated into a number of languages His best work from an artistic point of view is *Pakolaiset* (1908) Sillanpää has written several collections of short stories dealing with peasant life, and one great novel dealing with the time of the Red insurrection, which is an important document of social history. His strength lies in psychological descriptions of subconscious states. No other Finnish writer has been so successful in depicting the atmosphere in which the peasant lives his everyday life

Of the numerous women writers, the following deserve mention: Aino Kallas (b 1878), short-story writer, two of her volumes being published in English in 1924 and in 1927 The wife of an Estonian scientist and diplomat, she obtained an intimate knowledge of Estonian life, which forms the subject of many of her stories Mailo Talvio (b 1871) has written numerous novels concerning life among the peasants and higher ranks of society Maria Jotuni (b 1880) possesses a realistic power and a robust humour which inform all her stories, novels and comedies L. Onerva (b 1882) is best known for her lyric poetry, but has also written fiction and plays

Among the poets writing in Finnish, Eino Leino (1878–1925) was unusually productive He published dramas in prose and verse, novels short stories, literary studies and numerous volumes of lyric poetry His most successful works are his *Helkavirsia*, historic poems in ballad form of a strongly national colour Leino has also translated Dante's *Divine Comedy* into Finnish blank verse Larin Kyosti (b 1873) is another prolific writer who has achieved a well-deserved popularity by his popular poetry The lyric poetry of Otto Manninen (b 1872) is highly esteemed by connoisseurs Manninen did invaluable work as translator of the Iliad, the Odyssey, Molière's metric comedies and other works V A Koskenniemi (b 1885), professor of literature at the Finnish University of Turku (Åbo), has published numerous volumes of poetry

Literature in Swedish.—The Swedish literature of Finland includes a number of poets who have gained reputations both in their own country and in Scandinavia The greatest poet of Finland was Johan Ludwig Runeberg (*q v*; 1804–77), whose reputation rivals that of Tegnér The most popular author at the close of the 19th century was Zachris Topelius (*q v*; 1818–98) Mikael Lybeck (1864–1925) achieved his first successes with lyric poetry, but abandoned verse for prose during the last 20 years of his life Bertel Gripenberg (b 1878) is the chief master of form among the poets writing in Swedish The characteristics of his first volumes were dark passion, sensualism, pessimism and an aristocratic romanticism, but he has also found words to sing of the Finnish wildernesses, and has written patriotic lyrics, inspired by the Red insurrection and the war of independence, in which an echo of Runeberg's heroism may be heard Jacob Tegengren (b 1875) writes in an elegiac key, and descriptions of nature occupy a large part of his works Hjalmar Procopé (b 1868) is best known as a lyric poet Arvid Morne (b 1878) sings of the archipelago, peasant life and the scenery of the Swedish-speaking districts in the south of Finland But Morne's writings also reflect his deep, radical opinions. He was ardently interested in social reform and the movement for popular education. Morne also achieved success as a dramatist and novelist

Emil Zilliacus (b 1878) published some highly appreciated collections of lyric poetry. Jarl Hemmer (b 1893) is the most lyrical and spontaneous of the Swedish poets of Finland His poetry still preserves something of the melodiousness characteristic of Topelius's lyrics Hemmer's verse has a winning, youthful charm, which yet does not preclude the expression of loftiness of thought. He also wrote a play, short stories and a novel dealing with the time of the war of independence.

Runar Schildt (1888–1925) was the most eminent writer of Swedish prose in Finland His short stories are characterized by a highly developed style, penetrating psychological insight and a humane, tolerant view of life The subjects of some of them were taken from the war of independence and the Red insurrection Schildt was also a very successful dramatist Vers libre and expressionist prose also found enthusiastic and, in some cases, gifted champions among the writers of Finland both in Swedish and Finnish

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FINN MAC CUMHAILL (fĭn mă-kōōl') was probably the general to whom Cormac mac Airt, king in Tara (*fl c.* AD 250) entrusted the task of organizing a standing army, whereby he sought to establish a suzerainty over the whole of Ireland But he has attracted to himself a vast body of popular legend, and has thus become a mythological figure which dominates the folklore of the Gaelic peoples, in Ireland, Scotland and the Isle of Man It is difficult to trace the growth of the legend, owing to a paucity of early materials The tales told of the hero were of a popular nature, transmitted by word of mouth, and did not assume a literary form so soon as the mythologies of the Tuatha Dé Danann or the sagas of Cú Chulainn. In these tales Finn is represented as being the leader of a band of braves, of strongly contrasted characters—which the story-tellers generally manage to preserve with remarkable consistency and with no little humour. They wander about with a seeming lack of aim, but they are employed in defending Ireland against foreign invaders (as in the well-known tale of the *Battle of Ventry*), and in the intervals devote themselves to the pleasures of the chase They are not always united, they belong to opposing families; and the best-known tale of the cycle is that of Finn's pursuit and destruction of his lieutenant Diarmait, who had eloped with his destined bride, Gráinne, daughter of Cormac mac Airt

The best collection of material for studying the growth of the Finn legend will be found in Kuno Meyer's *Fianaigecht* (Royal Irish Academy, 1910). Specimens of tales about Finn will be found in every collection of Irish or Scottish Gaelic folklore. (R A S M)

FINNO-UGRIAN, the designation of a division of the Ural-Altaic family of languages and their speakers The term Finn is the name given by their neighbours, though not used by themselves, to the inhabitants of the eastern shores of the Baltic It is probably the same word as the Fenni of Tacitus and Φίννοι of Ptolemy, though it is not certain that those races were Finns in the modern sense It possibly means people of the fens or marshes, and corresponds to the native word *Suomi,* which appears to be derived from *suo,* a marsh Finn and Finnish are used of the inhabitants of Finland and of similar tribes found in Russia and sometimes called Baltic Finns and Volga Finns In this sense the Estonian tribes (Baltic), the Lapps, the Cheremiss and Mordvins (Volga), and the Permian tribes are all Finns The Ostiaks, Voguls and Magyars form a separate subdivision called Ugrian, from Yura or Ugra, the country on either side of the Ural Mountains.

The name Finno-Ugric is primarily linguistic The Finno-Ugrians form, with the striking exception of the Hungarians, a moderately homogeneous whole They are nomads, but are hardly ever warlike and have no power of political organization Those of them who have not come under European influence live under the simplest form of patriarchal government.

In Russia the Finno-Ugric tribes are widely spread in the wooded country, especially on the banks of lakes and rivers They form a considerable element in the population of the northern, middle and eastern provinces of Russia, but are not found much to the south of Moscow (except in the east) or in the west (except in the Baltic provinces). The Finno-Ugric (or Palaeo-Arctic) people have black or even reddish hair, sparse beards, yellowish to whitish skin, short stature, flat heads, flat faces, high cheek bones, oblique eyes and straight or concave noses. The head index varies from long to round.

The following are the principal Finnish peoples. The *Permians* and *Syryenians* (Syrjenian, Sirianian, Zyrjenian, Zirian) may be treated as one tribe They both call themselves Komi and speak a mutually intelligible language, allied to Votiak. The name Bjarmisch is sometimes applied to this sub-group. Both Permians and Syryenians are found chiefly in the governments of Perm, Vologda and Archangel. The Syryenian headquarters are at the town of Ishma on the Pechora, whereas the name Permian is more correctly restricted to the inhabitants of the right bank of the upper Kama The *Votiaks* dwell chiefly in the south-eastern part of the government of Viatka They call themselves Ud-murt or Urt-murt The Cheremiss, who call themselves Mari, inhabit the banks of the Volga, chiefly in the neighbourhood of Kazan

The *Mordvinians,* also called Mordvá, Mordvins and Mordvs, are scattered over the provinces near the middle Volga, especially Nizhni Novgorod, Kazan, Penza, Tambov, Simbirsk, Ufa and even Orenburg Though not continuous, their settlements are considerable both in extent and population They are the most important of the Eastern Finns, and their traditions speak of a capital and of a king who fought with the Tatars They are mentioned as Mordens as early as the 6th century, but now call themselves after one of their two divisions, Moksha or Erza Their language (two dialects) is derived from Early Finnish, and has constructions peculiar to itself

The *Lapps* are found in Norway, Sweden and Finland They call themselves Sabme, but are called Finns by the Norwegians They are the shortest and most roundheaded race in Europe. The majority are nomads who live by pasturing reindeer, and are known as Mountain Lapps, but others have become more or less settled and live by hunting or fishing. From ancient times the Lapps have had a great reputation among the Finns and other neighbouring nations for skill in sorcery

The *Estonians* are the peasantry of the former Russian province Estonia and the neighbouring districts. They have reddish flaxen hair with a tall element They are practically a branch of the Finns, and are hardly separable from the other Finnish tribes inhabiting the Baltic provinces. They call themselves Mā mēs, or country people, and their land Rahwama or Wiroma (*cf* Finnish, Virolaiset, Estonians).

Livs, Livlanders or *Livonians* is the name given to the old Finnish-speaking population of west Livland or Livonia and north Kurland. They were a warlike and predatory pagan tribe in the middle ages, and it is possible that they were a mixed Letto-Finnish race from the beginning They have become almost completely absorbed by Letts, and their language is only spoken in a few places on the coast of Kurland, if indeed it still exists It is known as Livish or Livonian and is allied to Esthonian. The *Votes* (to be distinguished from the Votiaks), are also called southern Chudes and Vatjalaiset. They now occupy only a few parishes in north-west Ingria The *Vepsas* or *Vepses,* also called Northern Chudes, another tribe allied to the Esthonians, are found in the district of Tikhvinsk and other parts of the former government of Old Novgorod.

The *Finns* proper or Suomi, as they call themselves, inhabit Finland and the Olonetz, Tver and governments of Leningrad Formerly a tribe of them called Kainulaiset was also found in Sweden, whence the Swedes call the Finns Qven At present there are two principal subdivisions of Finns, the Tavastlanders or Hamäläiset in the south and west and the Karelians or Karjalaiset in the east and north The Tavastlander has a round head, a broad face, concave nose, fair complexion, frequently light hair and blue or grey eyes The Karelians have broader heads and are shorter.

CIVILIZATION AND RELIGION

Finno-Ugric tribes have not progressed so much. The Finns and Magyars, have adopted, at least in towns, the civilization of Europe; others are agriculturists; others still nomadic The wilder tribes, such as the Ostiaks, Voguls and Lapps, mostly consist of one section which is nomadic and another which is settling down. Traces of ancient conditions survive sporadically but are nowhere universal. Few except the Hungarians have shown themselves warlike. But most Finno-Ugrians are astute and persevering hunters, and the Ostiaks still shoot game with a bow The tribes are divided into numerous small exogamous clans and are generally patrilineal. Marriage by purchase of the bride is the more general form Women are often excluded from religious ceremonies. The most primitive form of house consists of poles inclined towards one another and covered with skins or sods, so as to form a circular screen round a fire; winter houses are partly underground. Long snow-shoes are used in winter and boats are

largely employed in summer The Finns in particular are very good seamen The Ostiaks and Samoyedes still cast tin ornaments in wooden moulds The deities are chiefly nature spirits and the importance of the several gods varies as the tribes are hunters, fishermen, etc Sun or sky worship is found among the Samoyedes and *Jumala*, the Finnish word for god, seems originally to mean sky The Ostiaks worship a water-spirit of the river Obi and also a thunder-god We hear of a forest-god among the Finns, Lapps and Cheremiss There are also clan gods worshipped by each clan with special ceremonies Traces of ancestor-worship are also found The Samoyedes and Ostiaks are said to sacrifice to ghosts, and the Ostiaks to make images of the more important dead, which are tended and honoured, as if alive, for some years Images are found in the tombs and barrows of most tribes, and the Samoyedes, Ostiaks and Voguls still use idols, generally of wood Animal sacrifices are offered, and the lips of the idol sometimes smeared with blood Quaint combinations of Christianity and paganism occur, thus the Cheremiss are said to sacrifice to the Virgin Mary The idea that disease is due to possession by an evil spirit, and can be both caused and cured by spells, seems to prevail among all tribes, and in general extraordinary power is supposed to reside in incantations and magical formulae Almost every tribe has its own collection of prayers, healing charms and spells to be used on the most varied occasions A knowledge of these formulae is possessed by wizards (Finnish *noita*) corresponding to the Shamans of the Altaic peoples They are exorcists and also mediums who can ascertain the will of the gods, a magic drum plays a great part in their invocations, and their office is generally hereditary The non-Buddhist elements of Chinese and Japanese religion present the same features as are found among the Finno-Ugrians—nature-worship, ancestor-worship and exorcism—but in a much more elaborate and developed form

History.—Most of the Finno-Ugrian tribes have no history or written records, and little in the way of traditions of their past. In their later period the Hungarians and Finns enter the course of ordinary European history For the earlier period we have no positive information, but from archaeological and philological data an account of the ancient wanderings of these tribes may be constructed Barrows containing skulls and ornaments may mark the advance of a special form of culture But clearly all such deductions contain a large element of theory, and the following hypothesis has been proposed by Peake (*J R A I* xlix 1919) In late Palaeolithic times various types of long-headed men occupied the plain of N Europe Then came in Solutrian times a nomadic people from Eurasia, hunters of wild horses Then a broadheaded race of perhaps Mongol affinities pressed to the Baltic The Nordic Steppe folk spread north and about the middle of the Bronze age came into touch with the Mongoloids who were reinforced by later waves "Thor must have led his red-haired followers from the banks of the Volga, while Woden brought his fair-haired warriors from the Russian Steppes"

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FINNO-UGRIAN LANGUAGES. This family of languages comprises (1) The *Lapp* language, spoken by about 30,000 reindeer nomads, fishermen and peasants in the northern parts of Norway, Sweden and Finland and on the Kola peninsula in Russia with numerous dialects and several written languages of which the chief is Norwegian Lappish (2) *Baltic-Finnish languages*: (*a*) the *Finnish* language spoken in Finland, except certain districts in the south and west and on the Åland isles where Swedish is spoken, in certain parts of north Sweden, Norway and Russia near the Finnish boundary, as well as in U S A ; in all by more than 3,000,000 persons Since the middle of the 19th century Finnish has developed into a modern culture-language with a comprehensive literature The Finnish dialects in east Finland are connected with (*b*) the *Karel* or Russian-Karel language, nearly allied to which is (*c*) *Olonets*, spoken on both sides of the boundary north of Ladoga, east of which are (*d*) the *Lydi* dialects, forming on their side the transition to (*e*) the *Vepse* language on the western edge of Lake Onega and in some smaller groups of villages farther to the south, (*f*) *Vot*, an expiring idiom in the north-western part of Ingermanland, spoken by about 1,000 peasants; (*g*) *Estonian*, used by about 1,000,000 people in the republic of Estonia and by about 400,000 in colonies in Russia, Siberia and Lettland During the last two decades this language has developed energetically towards a modern culture-language and has a fairly comprehensive literature The south-east or Dorpat dialect was used earlier as a written language, but at present only the north-west (Reval) dialect is in use (*h*) *Liv*, spoken by about 3,000 fishermen and peasants on the north promontory of Courland, formerly spoken round the whole coast of Livonia and Courland (3) *Mordvin*, with two dialect groups, *Moksha* and *Erza*, spoken by about 1,000,000 peasants in a large number of language-islands on both sides of the Volga, south of its bend (4) *Cheremiss*, spoken by about 375,000 peasants, on both sides of the Volga and in the south part of Ural (5) The Permian languages (*a*) *Votiak* is spoken by about 425,000 peasants, between the rivers Kama and Vjatka, (*b*) *Zyrian* is spoken by about 250,000 people, scattered along the rivers Vychegda, Mezen, Pechora and Kama, and on the peninsula of Kola and in the south called Permiaks Owing to the Russian revolution the Mordvins, Cheremiss, Votiaks and Zyrians obtained the right to use their own languages in schools and press, so that a large number of books and newspapers printed in these idioms now appear (6) The *Ob-Ugrian* languages (*a*) *Vogul* is spoken by about 5,000 peasants, hunters and reindeer breeders, scattered over an extensive tract on both sides of the central Ural, (*b*) the allied *Ostiak* language is used by about 20,000 fishermen, hunters and, in the north, reindeer nomads, along the middle and lower courses of Ob and Irtysh and their tributaries (7) *Hungarian* (*q v*) The Ob-Ugrian languages and the Hungarian taken together form the Ugrian group of languages, from a tribe *Ugra* mentioned in ancient Russian chronicles

The Finno-Ugrian languages are distantly related to the *Samoyed* languages and with them form the *Uralian* family of languages It is said that this family is related to the *Altaic* family of languages, consisting of the *Turko-Tataric*, *Mongolian* and *Manchu-Tungus* languages and according to some scholars the *Japanese* language, under the term the *Uralo-Altaic* family of languages No valid reasons for this classification have yet been produced The term "Turanian" is equally devoid of value It is possible that the Finno-Ugrian languages are distantly related to Indo-European, this question, however, is far from being finally solved In any case Hungarian and Finnish, etc , are not Slavonic languages but independent, with their own structure and their own vocabulary From time immemorial, however, they have adopted large numbers of loanwords from the adjacent Indo-European idioms, evidence of the early contacts between the Finno-Ugrians and their more civilized neighbours, which is of the greatest value for the historical investigation of these languages The Iranian loanwords are the oldest of them all Lithuanian words in Finnish were partly adopted during the bronze age The oldest Germanic loanwords in Finnish and Lapp date from before the Viking age and the Slavonic loanwords in Hungarian and Finnish and the Turko-Tataric words in Hungarian and other eastern Finno-Ugrian languages came in historic conditions

Finnish and Hungarian, though related, are about as widely separated from each other as English and Persian Finnish stands in about the same relationship to the Estonian and Liv languages as German does to the Scandinavian languages The linguistic relationship between the peoples who speak these languages does not always signify that the peoples themselves are racially related From an early period the Finno-Ugrian languages seem to have been associated with an east European race, often called the East Baltic which probably is preserved in its purest form among the Finns The Lapps, however, who belong to quite another, primitive and isolated race, adopted their present language from some Finnish group long before the birth of Christ, and this, too, was perhaps the case with the Ob-Ugrian speakers

The Finno-Ugrian languages are in an eminent degree suffixing languages and construct their grammatical forms by the addition

of a great number of endings. The declension includes many cases, *e g*, in Finnish about fifteen Gender is not marked Some languages possess a dual form as well as plural The verbs are abundantly developed, and in some languages subjective and objective conjugation are sharply distinguished. Instead of negative adverbs most languages have a negative conjugation The grammar shows many complicated phonetic alternatives, *e g*, the intricate alternation of "strong" and "weak" stem consonants in Lapp and Finnish and the laws of vocalic harmonization in many languages In the Finno-Ugrian languages, which still retain their original syntax, the sentence structure has many infinitive and participial constructions

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FINSBURY, a metropolitan borough of London, England, bounded north by Islington, east by Shoreditch, south by the City of London, and west by Holborn and St Pancras Pop (1901) 101,463, (1921) 75,995, area 587 ac, being the smallest borough in London except Holborn The main outlines of the borough are Pentonville road on the north, from King's cross to the Angel, Islington, thence south along the City road to the confines of the City at Finsbury pavement in Moorgate, from here westward to Farringdon street, and thence north along Farringdon and King's Cross roads "The 'Angel,' at Islington," once a famous 17th century coaching inn, lies within the borough, and from here Goswell road, the residence of Dickens's Pickwick (continued as Aldersgate street), St John street, and Rosebery avenue radiate through the borough Clerkenwell road and Old street cross it from west to east The old distinctions of Clerkenwell on the west and Finsbury on the east of the borough are still commonly used The commercial character of the City extends into the borough, accounting for the decline of its resident population Local industries include tobacco manufacture, printing, and the optical glass and jewellery trades Owing to the proximity of the City markets, it is an important centre of the transport trade The large modern parcels dépôt of the General Post Office is at Mount Pleasant in Rosebery avenue, close by are the head offices of the Metropolitan Water Board, with the former reservoirs of the New River Head, and the Finsbury town hall Watch-making, once a leading industry, has declined, but is still represented by the British Horological Institute situated in the borough

Finsbury is supposed to take its name from the extensive marshland or "fens," anciently known as Vynesbury Moor and Moorfields, which lay outside the city walls at Moorgate This was drained in the 16th century, and subsequently laid out as public grounds Chalybeate springs were discovered here at the end of the following century, so that it became a popular resort and even a spa, as the names of Spa Fields and Sadler's and other wells commemorate Pepys mentions its houses of entertainment and that it furnished a refuge for many whose houses were destroyed in the fire of London Bookstalls and other booths were numerous at a somewhat later date

The borough includes several memorials of historical interest In the old parish of Clerkenwell (*q v*) is the former priory of the Order of St John of Jerusalem, the English headquarters of the Order West of Aldersgate street stand the buildings of the Charterhouse (*q v*), originally a Carthusian monastery, subsequently a hospital and a school, out of which grew the great public school, removed to Godalming in 1872. Bunhill fields, City road, is the famous burial-ground used by the Dissenters from the middle of the 17th century until 1852. Among eminent persons interred here are John Bunyan, Daniel Defoe, Susanna, mother of John and Charles Wesley, and William Blake, the poet and engraver George Fox, founder of the Society of Friends, is buried close by in the grounds attached to the Memorial buildings of the society. Facing Bunhill fields is the chapel associated with the Wesleys, and the house of John Wesley, opened as a museum bearing his name In Bunhill row John Milton died South of the fields lies the Artillery ground (6 ac) of the Honourable Artillery Company, so occupied since 1641, with barracks and an armoury house (1735). Sadler's Wells theatre, Rosebery avenue, preserves the name of the fashionable medicinal spring, music room and theatre opened in 1683 by Thomas Sadler In 1765 a new theatre was built, notable in its connection with the names of Joseph Grimaldi the clown (d 1837) his father the ballet master, and others, and the era of Shakespeare representations under Samuel Phelps (1844–62) The theatre walls still stand and public efforts were being made (1928) to restore its traditions

Among the educational institutions are Merchant Taylors' school, founded in 1561, and removed here from the City in 1875 to new buildings on the former site of Charterhouse school, the Northampton Polytechnic institute (1898), and the Dame Alice Owen secondary schools for boys and girls founded in 1612 and supported by the Brewers' company St Luke's printing works in Old street, erected in 1751 as a hospital, are now the Bank of England printing works The Smithfield Martyrs' Memorial church (1871) is in St John street Other institutions are St. Mark's, the City of London Maternity and the Royal London Ophthalmic hospitals The metropolitan borough of Finsbury was formed in 1900 out of the vestries of Clerkenwell, the Charterhouse and other parishes By the Representation of the People Act, 1918, its parliamentary representation was reduced from two members to one member As a county division it returns two members to the London County Council The acreage of its open space (11 ac including Bunhill fields) is one of the smallest of any of the London boroughs The borough council consists of a mayor, nine aldermen and 56 councillors

FINSEN, NIELS RYBERG (1860–1904), Danish physician and originator of the Finsen lamp for treatment of skin diseases, was born on Dec 15, 1860, at Thorshavn, in the Faeroe islands His parents were Icelandic, and the boy spent his early years at school in Reykjavik The contrasts in the light and darkness of the north interested him very early, and the discovery that he worked better in a well-lighted room started him on a study of the effect of light on physical organisms He graduated from the University of Copenhagen in 1890 as a doctor of medicine, and was prosector there for three years He resigned to conduct experiments on the physiologic effect of light, and in 1893 published a paper on the treatment of smallpox by red light to exclude the actinic (blue, violet and ultra-violet) rays of ordinary light and thus prevent suppuration of the lesions with subsequent scar formation Later he found that the actinic rays of sunlight, which were detrimental to smallpox, were responsible for the bactericidal property of sunlight This knowledge enabled him to develop the effective treatment of *lupus vulgaris* by ultra-violet rays

The publication in 1896 of Finsen's best known work "on the employment in medicine of concentrated chemical light rays" brought him immediate fame and a small pension from the Government, on which he lived while he continued his experiments In 1895 he published his general theory of the effect of light on living organisms, *i e*, that it is the actinic rays found in the blues and violets of the spectrum which possess curative value and stimulating influence, and not, as had been hitherto supposed, the physical action of light and heat. After practical tests for two years, he published *The Treatment of Lupus Vulgaris by Concentrated Chemical Rays* (1897)

Through the generosity of two wealthy Danes, G A Hagemann and Vilh Jorgensen, and with a Government loan, his Light institute was founded in Copenhagen in April 1896 It had a capacity for treating 200 patients daily, and equipment for making and supporting scientific research concerning the action of light upon living organisms, with the purpose of applying the results to the service of practical medicine In 1910 98% cures had been accomplished in the treatment of 2,000 patients Finsen was awarded the Nobel prize of 100,000 crowns in 1903, half of which he gave to the institute, and arranged that the other half should revert to it on the death of his heirs From the age of 23 Finsen was practically an invalid. For the last few years of his life, he had to direct the work of the institute from his home in Copenhagen.

He died on Sept. 24, 1904

See *Canadian Institute Transactions*, vol viii, pp. 99–135 (Toronto, 1905), Cleveland Moffett, "Finsen and the Story of His Achievement," *McClure's Magazine* (Feb 1903), and *Nature*, vol lxx, p 532 (A U. D.)

FINSTERWALDE, a town of Germany, in the Prussian province of Brandenburg, on the Schackebach, a tributary of the Little Elster, 28 m W S W. of Cottbus by rail Pop (1925) 13,434. The town, which is first mentioned in 1288, came into the possession of electoral Saxony in 1635 and of Prussia in 1815 It has a Gothic church (1581), a château, cloth, rubber and cigar factories, saw mills and factories for machine building.

FIORENZO DI LORENZO (*c* 1445–1525), Italian painter of the Umbrian school, born at Perugia, where he was a member of the gild of painters, and in 1472 was elected decemvir of the city On Dec 9 of the same year he was commissioned to paint an altarpiece for Santa Maria Nuova, this work has been identified with a pentatych representing the "Madonna and Saints," now in the Pinacoteca of Perugia It resembles in style Fiorenzo's only signed picture, dated 1487, which is also at the Pinacoteca, having been removed from S Francesco al Prato It represents St. Peter and St Paul standing on either side of a niche, with the "Virgin and Angels" in the lunette These are the only two authenticated pictures of the master extant Recent art criticism has ascribed to him without sufficient reason some fifty pictures, differing widely in style; of these only about a dozen can with any degree of certainty be given to him on stylistic evidence Most of them are in the Pinacoteca of Perugia, very few can be found outside his native city The Staedal Institute at Frankfurt possesses a fine "Madonna with Saints"; the London National Gallery portions of a polyptych representing the "Madonna with Saints and Angels" In comparison with the work of his Umbrian predecessors, Fiorenzo's style displays a marked advance in the definition of form His drawing is vigorous and sure. His rendering of drapery, with sinuous sharply defined folds, and of landscape with finely constructed river scenes and towns, recalls the art of Benozzo Gozzoli It seems probable, therefore, that Fiorenzo derived his training indirectly from this great Florentine He may have worked under Niccolò da Foligno, whose picture, dated 1458, at Deruta, the National Gallery Fiorenzo closely resembles both in style and arrangement. Following on the primitive art of Umbria it was one of Fiorenzo's merits to have introduced the ideas of the Florentine Renaissance to Perugia, and thereby to have prepared the way for the great age of Perugino and Pintoricchio. Soon after 1475 Pintoricchio probably worked as an assistant in Fiorenzo's workshop, and to the co-operation of master and pupil may be ascribed the fine "Adoration of the Magi" in the Pinacoteca

See Crowe and Cavalcaselle, *History of Italian Painting*, G Morelli, *Italian Masters in German Galleries* (1883), J C Graham, *The Problem of Fiorenzo di Lorenzo* (1903), W. Bombe, *Gesch der Peruginer Malerei* (1912) (I A R)

FIORILLO, JOHANN DOMINICUS (1748–1821), German painter and historian of art, was born at Hamburg on Oct. 13, 1748 In 1784 he became keeper of the collection of prints at the university library at Gottingen He was appointed professor extraordinary in the philosophical faculty in 1799, and ordinary professor in 1813 He died at Gottingen on Sept 10, 1821 His works include *Geschichte der zeichnenden Kunste* (5 vols, 1798–1808), and *Geschichte der zeichnenden Kunste in Deutschland und den Vereinigten Niederlanden* (4 vols, 1815–20)

FIR, the Scandinavian name originally given to the Scotch pine (*Pinus sylvestris*) and now sometimes employed as a general term for the whole of the true conifers (Abietoideae), but in a more exact sense, it has been transferred to the "silver firs," the genus *Abies* of modern botanists (*See* GYMNOSPERMS)

The firs are distinguished from the pines and larches by having their needle-like leaves placed singly on the shoots, instead of growing in clusters from a sheath on a dwarf branch. Their cones are composed of thin, rounded, closely imbricated scales, each with a more or less conspicuous bract springing from the base. The trees have usually a straight trunk, and a tendency to a conical or pyramidal growth, throwing out each year a more or less regular whorl of branches from the foot of the leading shoot, while the buds of the lateral boughs extend horizontally The cones are erect, and their scales drop off when the seed ripens, the leaves spread in distinct rows on each side of the shoot

There are about 25 species of the true fir (*Abies*), widely distributed in the Northern Hemisphere. The silver fir (*A pectinata*), a representative Old World species, is a lofty tree, sometimes 150 ft. high, with large spreading horizontal boughs curving upward toward the extremities. The flat leaves are arranged in two regular distinct rows, they are deep green above, but beneath have two broad white lines, which, as the foliage in large trees has a tendency to curl upwards, give it a silvery appearance from below. The large cones stand erect on the branches, are cylindrical in shape, and have long bracts, the curved points of which project beyond the scales When the tree is young the bark is of a silvery grey, but gets rough with age It is abundant in most of the mountain ranges of southern and central Europe, but is not found in the northern parts of that continent In Asia it occurs on the Caucasus and Ural, and in some parts of the Altaic chain Extensive woods of this fir exist on the southern Alps, where the tree grows up to nearly 4,000 ft, in the Rhine countries it forms a great part of the extensive forest of the Hochwald and occurs in the Black Forest and in the Vosges, it is plentiful likewise on the Pyrenees and Apennines The wood is inferior, but, being soft and easily worked, is largely employed in the countries to which it is indigenous for all the purposes of carpentry Deficient in resin, the wood is more perishable than that of the spruce when exposed to the air, though it is said to stand well under water The bark contains a large amount of a fine, highly resinous turpentine, which collects in tumours on the trunk during the heat of summer. After purification by straining, it is sold as "Strasbourg turpentine," much used in the preparation of some of the finer varnishes Burgundy pitch is also prepared from it by a similar process as that from the Norway spruce A fine oil of turpentine is distilled from the crude material, the residue forms a coarse resin Introduced into Great Britain at the beginning of the 17th century, the silver fir has become common there as a planted tree, though, like the Norway spruce, it rarely comes up from seed scattered naturally; it is also planted as an ornamental tree in eastern North America



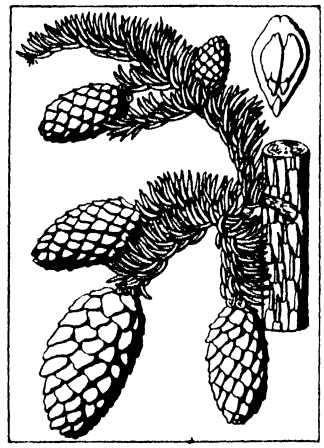
BY COURTESY OF "AMERICAN FORESTS AND FOREST LIFE MAGAZINE"

DOUGLAS FIRS IN VIRGIN FORESTS OF NORTHWESTERN UNITED STATES

Several other Old World firs are successfully grown for ornamental purposes in Europe and North America Among these are the Spanish fir (*A. Pinsapo*), the Greek fir (*A cephalonica*); the Algerian fir (*A numidica*), the Cilician fir (*A cilicica*), of Asia Minor, the Nordmann fir (*A Nordmanniana*), of the Caucasus, and the Momi fir (*A. firma*), the Nikko fir (*A. homolepis*) and the Veitch fir (*A. Veitchu*), of Japan

In North America there are ten native species of fir, found chiefly from the Rocky Mountains westward and attaining their maximum development in the Sierra Nevada and Cascade ranges Of the two firs occurring in the Eastern States and Canada, the best known is the balsam fir (*A. balsamea*), which is found from Newfoundland to Virginia and northwestward to Labrador and the Yukon It is a widely branching tree, 40 ft. to 60 ft high, with fragrant resinous leaves; it is extensively used for pulp-wood, sparingly for lumber and yields the valuable oleoresin known as Canada balsam (*q.v.*). The smaller southern balsam fir or she-balsam (*A. Fraseri*) is confined to the southern Appalachian Mountains. Several firs of the western United States attain immense size. The white fir (*A. concolor*), sometimes 250 ft. high,

with a trunk diameter of 6 ft., ranges from Wyoming to the Sierra Nevada and southward to Mexico. The lowland white fir (*A grandis*), occasionally 300 ft. high, is a valley species found from Montana west to Vancouver island and south near the coast to central California. The western silver fir (*A amabilis*), a beautiful tree native to the Cascade and Olympic ranges from Oregon to British Columbia, reaches a height of 250 ft. and a trunk diameter of 4 ft. to 6 feet. The California red fir (*A magnifica*), often 200 ft. high, is a handsome tree of the northern Sierra Nevada and the southern Cascade mountains. The noble fir (*A nobilis*), usually 150 ft. to 200 ft. high, but sometimes 250 ft. high, with a trunk 6 ft. to 8 ft. in diameter, forms large forests in Washington, Oregon and northern California. The smaller alpine fir (*A lasiocarpa*), commonly 80 ft. to 100 ft. high, is found in the Rocky Mountains from New Mexico to Alaska, and westward to Oregon, Washington and British Columbia. With the exception of the noble fir, the wood of most western firs is inferior to that of pine or spruce, but is used to some extent for lumber and pulp-wood. (*See* DOUGLAS FIR, HEMLOCK, SPRUCE.)



BRANCH OF THE SPRUCE FIR (PICEA EXCELSA) BEARING FEMALE CONES. Small figure shows single scale with two winged ovules.

FIRDOUSĪ, Persian poet. Abu 'l Kāsim Mansur (or Hasan), who took the *nom de plume* of Firdousī (Firdausī or Firdusī), author of the epic poem the *Shāhnāma,* or "Book of Kings," a complete history of Persia in nearly 60,000 verses, was born at Shadab, a suburb of Tūs, about the year 329 of the Hegira (A.D. 941), or earlier. Firdousī was profoundly versed in the Arabic language and literature and had also studied deeply the Pahlavi or Old Persian, and was conversant with the ancient historical records which existed in that tongue.

The *Shāhnāma* of Firdousī (*see also* PERSIA *Literature*) is perhaps the only example of a poem produced by a single author which at once took its place as the national epic of the people. During the reign of Chosroes I. (Anushirvan) the contemporary of Mohammed, and by order of that monarch, an attempt had been made to collect, from various parts of the kingdom, all the popular tales and legends relating to the ancient kings, and the results were deposited in the royal library. During the last years of the Sassanid dynasty the work was resumed, the former collection being revised and greatly added to by the Dihkan Danishwer, assisted by several learned mobeds. His work was entitled the *Khoda'ināma,* which in the old dialect also meant the "Book of Kings." On the Arab invasion this work was in great danger of perishing at the hands of the iconoclastic caliph Omar and his generals, but it was fortunately preserved, and we find it in the 2nd century of the Hegira being paraphrased in Arabic by Abdallah ibn el Mokaffa, a learned Persian who had embraced Islam. Other Guebres occupied themselves privately with the collection of these traditions; and, when a prince of Persian origin, Yakūb ibn Laith, founder of the Saffarid dynasty, succeeded in throwing off his allegiance to the caliphate, he at once set about continuing the work of his illustrious predecessors. His "Book of Kings" was completed in the year 260 of the Hegira, and was freely circulated in Khorasan and Irak. The Samanid princes who succeeded applied themselves zealously to the same work, and Prince Nūh II., who came to the throne in 365 A.H. (A.D. 976), entrusted it to the court poet Dakiki, a Guebre by religion. Dakiki's labours were brought to a sudden stop by his own assassination, and the fall of the Samanian house happened not long after, and their kingdom passed into the hands of the Ghaznevids. Mahmūd ibn Sabuktagin, the second of the dynasty (998–1030), collected a vast amount of materials for the work, and after having searched in vain for a man of sufficient learning and ability to edit them faithfully, he at length made choice of Firdousī. The sultan ordered his treasurer, Khojah Hasan Maimandi, to pay to Firdousī a thousand gold pieces for every thousand verses, but the poet preferred to allow the sum to accumulate till the whole was finished, with the object of amassing sufficient capital to construct a dike for his native town of Tūs, which suffered greatly from defective irrigation, a project which had been the chief dream of his childhood. Owing to this resolution, and to the jealousy of Hasan Maimandi, who often refused to advance him sufficient for the necessaries of life, Firdousī passed the latter portion of his life in great privation, though enjoying the royal favour and widely extended fame.

At length, after thirty-five years' work, the book was completed (1011), and Firdousī entrusted it to Ayāz, the sultan's favourite for presentation to him. Mahmud ordered Hasan Maimandi to take the poet as much gold as an elephant could carry, but the jealous treasurer persuaded the monarch that it was too generous a reward, and that an elephant's load of silver would be sufficient. 60,000 silver dirhems were accordingly placed in sacks, and taken to Firdousī by Ayāz at the sultan's command, instead of the 60,000 gold pieces, one for each verse, which had been promised. Firdousī in a rage gave 20 thousand pieces to Ayāz himself, the same amount to the bath-keeper, and paid the rest to a beer seller for a glass of beer (*fouka*), sending word back to the sultan that it was not to gain money that he had taken so much trouble.

He gave a sealed paper to Ayāz, begging him to hand it to the sultan in a leisure moment after 20 days had elapsed, and set off on his travels with no better equipment than his staff and a dervish's cloak. At the expiration of the 20 days Ayāz gave the paper to the sultan, who on opening it found the celebrated satire which is now always prefixed to copies of the *Shāhnāma,* and which is perhaps one of the bitterest and severest pieces of reproach ever penned. Mahmud, in a violent rage, sent after the poet and promised a large reward for his capture, but he was already in comparative safety. Firdousī directed his steps to Mazandaran, and took refuge with Kabus, prince of Jorjan, who at first received with great favour, and promised him his continued protection and patronage, learning, however, the circumstances under which he had left Ghazni, he feared the resentment of so powerful a sovereign as Mahmud, who he knew already coveted his kingdom, and dismissed the poet with a magnificent present. Firdousī next repaired to Baghdad, and found refuge at the court of the caliph. Firdousī composed a poem of 9,000 couplets on the theme borrowed from the Koran of the loves of Joseph and Potiphar's wife—*Yūsuf and Zuleikha* (edited by H. Ethé, Oxford, 1902; complete metrical translation by Schlechta-Wssehrd, Vienna, 1889). This poem, though rare and little known, is still in existence—the Royal Asiatic Society possessing a copy.

Mahmud finally decided not to pursue Firdousī further and to give him full reparation. The change, however, came too late; Firdousī, now a broken and decrepit old man, had in the meanwhile returned to Tūs, and, while wandering through the streets of his native town, heard a child lisping a verse from his own satire in which he taunts Mahmud with his slavish birth.—

> Had Mahmud's father been what he is now
> A crown of gold had decked this aged brow,
> Had Mahmud's mother been of gentle blood,
> In heaps of silver knee-deep had I stood

He was so affected by this proof of universal sympathy with his misfortunes that he went home, fell sick and died. He was buried in a garden, but Abu'l Kasim Jurjani, chief sheikh of Tūs, refused to read the usual prayers over his tomb, alleging that he was an infidel, and had devoted his life to the glorification of fire-worshippers and misbelievers. The next night, however, having dreamt that he beheld Firdousī in paradise dressed in the sacred colour, green, and wearing an emerald crown, he reconsidered his determination; and the poet was henceforth held to be perfectly orthodox. He died in the year 411 of the Hegira (A.D. 1020), aged about eighty, eleven years after the completion of his great work.

The *Shāhnāma* (which only existed in ms. up to the beginning of the 19th century) was published (1831–68) with a French translation in a

magnificent folio edition, at the expense of the French government, by Julius von Mohl The size and number of the volumes, however, and their great expense, made them difficult of access, and Frau von Mohl published the French translation (1876–78) with her husband's critical notes and introduction in a more convenient and cheaper form Other editions are by Turner Macan (Calcutta, 1829), J A Vullers and S Landauer (unfinished, Leiden, 1877–83) There is an English abridgment by J Atkinson (London, 1832, reprinted 1886, 1892), a verse translation by A G and E Warner (1905–15), with an introduction containing an account of Firdousī and the Shāhnāma, the version by A Rogers (1907) contains the greater part of the work The episode of Sohrab and Rustam is well known to English readers from Matthew Arnold's poem The only complete translation is *Il Libro dei Re*, by I Pizzi (8 vols, Turin, 1886–88), also the author of a history of Persian poetry

See also E G Browne's *Literary History of Persia*, I, II (1902–06), T Noldeke, *Das iranische Nationalepos* (Strasbourg, 1896) for a full account of the Shāhnāma, editions, etc, and H Ethé, *Neupersische Litteratur* (Strasbourg, 1896)

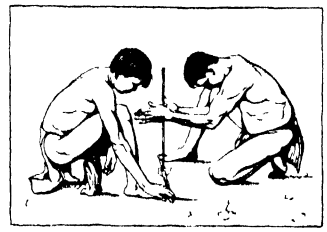
FIRE is so familiar that it scarcely needs definition Its extraordinary usefulness and equally extraordinary dangers impress practically every human being from infancy onward Ordinary fire is the rapid chemical combination of oxygen with the carbon and other elements of organic substances in such a way that heat, flame and light are produced In a broader sense fire is the process whereby the combination of one chemical element with another, when reduced to a gaseous condition, produces heat and flame

Among all the discoveries and inventions made by men, only a few, such as speech, writing and agriculture, have borne such momentous fruit as has the discovery of how to make and use the type of combustion commonly known as fire The use of fire is the basis of practically all forms of modern manufacturing and transportation, it has been a powerful agent in determining the spread and present distribution of mankind and of civilization, it has perhaps been a major, although indirect agent in causing racial differences in mentality It is the background and basis of our modern industrial life

Universality of Fire.—Traces of fire appear among the earliest human relics, far back at the beginning of Paleolithic times During historic times it is doubtful whether any race or tribe has ever been completely without knowledge of fire Early travellers, to be sure, have brought back tales like that of the missionary Krapf in East Africa He heard from a slave that a tribe in southern Shoa lived like monkeys in the bamboo jungles and were totally ignorant of fire That was in the middle of the 19th century, but no competent observer has yet seen such a tribe In the same way Wilkes of the famous United States Exploring Expedition in the Pacific reported that no sign of places for cooking, nor any appearance of fire was found in Bowditch Island (Fakaafo), but Hale, the ethnographer of the same expedition, reports the native word for fire We now know that these people not only talked about fire, but have a legend as to its origin and could kindle a blaze Since other reports of fireless people fare in the same way, Sumner and Keller seem justified in saying that "it is certain that over the whole earth no fireless tribe of men has been found . Man is scarcely man till he is in possession of fire"

Original Use of Fire.—Although we have no real knowledge as to the original use of fire or as to man's discovery of the art of kindling a flame, primitive legends, the usages of primitive people and ancient religious ceremonials give some clue to the major facts One of the most important conclusions derived in this way is that fire was used long before it could be artificially generated Lippert even goes so far as to argue that the use of fire enabled man's ape-like progenitor to descend from the trees and walk erect because it gave him protection from other animals Even if this idea is untenable, as it probably is, one of man's earliest discoveries must have been that he could make profitable use of the fires engendered naturally by lightning, falling meteors, the materials ejected from volcanoes, friction developed by avalanches and boulders and other natural occurrences He probably soon realized the value of a blaze not only for warmth, but for cooking food, warding off wild beasts and driving game out of the jungle Thus early man presumably cherished fire long before he learned how to make it

Preservation of Fire.—Even in modern times many tribes have been observed which carefully preserve their fire year after year and suffer serious loss if it is extinguished The people of the Andaman islands, who are said to be ignorant of the art of producing fire, take a smouldering stick with them and keep it burning if they go away from their huts for more than a few hours on a hunting or fishing expedition Among certain Papuans who have no means of kindling a blaze, live coals of a very slow-burning wood are constantly preserved in the huts If by chance the fire goes out, these coast dwellers have to go to the mountains where the inhabitants understand the art of fire-making, and bring thence some live coals Even where the art of kindling a fire is understood, the technique is often so crude or the difficulties because of damp weather are so great that the fire is preserved with extraordinary care The Australian aborigines prefer to make long journeys to get fire from another tribe rather than undertake the labour of making it themselves Among the Herero, to cite one of the many examples given by Sumner and Keller, the difficulty of making fire by friction was formerly so great that the daughters of the household were regularly charged with the care of the flame If the fire went out, it was regarded as an evil omen



FROM FARABEE, "THE CENTRAL ARAWAKS"

WAPISIANA BOYS OF SOUTHERN BRITISH GUIANA MAKING A FIRE

The device employed is that of rotating a stick in a round hole in the piece of wood lying on the ground

Fire and Religious Rites.—A great number of facts of this kind agree with some of the most widespread and primitive legends and religious practices According to the familiar Greek legend, Prometheus brought fire to earth Sometimes he is said to have lighted a torch at the sun's chariot, and sometimes to have gone underground In the Cook islands near New Zealand, the Polynesian hero Maui is said to have obtained fire for man by going down to hell where he learned to generate a spark by rubbing two pieces of wood together Perhaps the multitudinous legends of this sort are reminiscent of the period when the art of making fire was unknown In such circumstances there must have been repeated periods when prolonged rainy spells or other accidents put out all the fires among the very scanty population of a large area In such a case no fire may have been available for many years, and the bringer of new fire would be a hero Perhaps a late relic of the periodic loss of fire is found in certain ceremonies of both the Roman Catholic and Greek Orthodox churches According to the traditional method, all the lights in the churches are gradually extinguished during Passion Week When the last light has been extinguished, "new fire" is made, formerly this was done by some primitive means, such as friction of wood, long after flint and steel were understood From this "new fire" all the lights to be used throughout the next year are supposed to be kindled At Jerusalem the rush of the Eastern Orthodox pilgrims to light their candles at the newly created blaze has often made it necessary to employ soldiers to preserve order Another reminiscence of the early necessity for extreme care in preserving fire is found in the Vestal Virgins who tended the undying fire in Rome Elsewhere, as in ancient Peru, a similar custom is reported

Worship and Sentiment.—While ceremonies connected with fire play at least a subordinate part in almost every religion, they sometimes become dominant In the ancient Jewish religion and many others fire is the means whereby offerings are transmitted to the deity or to departed souls as among the Greeks In many cases fire itself is worshipped, and often the worship of the sun can scarcely be distinguished from that of fire The ancient Mexicans had a fire-god Xiuheuctli, closely related to the sun-god; the Kamchadals and Ainus of north-eastern Asia make fire their chief deity Among more civilized people the ancient Assyrians, Chaldaeans and Phoenicians practised fire-worship; Abraham was perhaps a reformer who refused to sacrifice his son Isaac in the consuming fire; the Israelites of later times were often scourged by their prophets for offering their children as sacrifices to Moloch, the god of fire Among the ancient Aryans, if we may use so

indefinite a term, Agni (Latin *ignis*) was the chief god Even to-day fire-worship is a notable feature of Hinduism, which is an offshoot of the old Aryan cult, and is the dominant factor in the religion of the Zoroastrians or Parsees Among the oppressed remnant of the Parsees who still survive in the parts of Persia near Yezd and Kirman, and among many more primitive people, it is considered most irreverent to throw into the fire anything impure or disagreeable or to spit into it The modern Parsees do indeed regard fire as merely a symbol, but in the beginning fire itself was probably the real object of worship This is not surprising for there is probably no agency more powerful for good and ill, and motives of both gratitude and fear must have mingled in the minds of the early worshippers

Although the worship of fire has largely disappeared in our day, its symbolism is still widely spread The fire of love, the fire of ambition, are common similes

Discovery of the Art of Fire Making.—In many of the legends which centre around the origin of fire, the interesting figure of the serpent-fighter occurs The native Australians of Victoria say that a certain Karakorok, the good daughter of the good old man Pundyil, went abroad to kill the serpents which filled the land Before she had killed them all, her staff snapped and a flame burst out of it According to the ancient *Shahnama* of Persia, a hero called Hushenk hurled a prodigious stone at a snake, the snake escaped, but the stone struck a rock whereupon "light shone from the dark pebble, the heart of the rock flashed out in glory, and fire was seen for the first time in the world "

A North American legend states that the buffalo gave fire to man, as he raced in great herds across the plains at night, he lighted up the darkness with sparks and set the brush ablaze as his hoofs hit the rocks The Dakota Indians replace the buffalo by a friendly panther which struck fire from its claws as it scampered up a stone hill In South America the Quichés claim to have received fire from Tohil who produced it by shaking his sandals His sign, like that of the Mexican god, Quetzalcoatl, is a flint The vital point in all these legends is that the movements of men or animals cause stones to crash together, thus producing a spark which gives rise to fire Such occurrences, together with his own experience in breaking rocks in order to discover which make the best tools, may have led some savage genius to discover that when flint and iron pyrites are struck together they produce sparks which will ignite dry grass or leaves That mode of making fire is especially likely to originate in regions where rocks and dry grass are abundant

In moist regions where the soil is so deep and the vegetation so dense that rocks are rare, or in places where flinty rocks are not present, another kind of natural occurrence is more likely to have helped in the discovery of fire Now and again in the dry season two dead branches, rubbing together in the wind, become so hot that they ignite Such accidents are not common, but during the hundreds of thousands of years of man's early development they presumably occurred often enough to be observed by men who possessed not only the ability and vision to see their significance, but also the curiosity and energy to make experiments

Methods of Making Fire.—These two methods, percussion and friction, have always been the chief ways of making fire, but concentration of the sun's rays and the electric spark have also come into use Friction has been by far the most widespread method among primitive people In one of the simplest frictional methods the blunt end of a stick is rubbed back and forth along another piece of wood lying on the ground The stick makes for itself a groove, and ultimately a spark is developed This method formerly prevailed among the savages in New Zealand, Hawaii, Tonga, Samoa and elsewhere In Tahiti Charles Darwin saw a native produce fire thus in a few seconds, but he himself succeeded only after long effort In a somewhat more advanced frictional method the movable stick is rotated as rapidly as possible in a stationary piece of wood that lies on the ground Such a fire drill, as it is commonly called, is sometimes rotated by rubbing the vertical stick between the palms of the hands. This device in one form or another has been observed among the primitive people in Australia, Kamchatka, Sumatra and the Caroline islands. It is common among the Veddahs of Ceylon and in much of southern Africa as well as in large parts of both Americas Various improvements have been devised in order to increase the speed of rotation On the Pampas of South America the Gaucho formerly took an elastic stick about 18in long, placed one end in a hole in a stationary piece of wood, pressed the other to his breast, leaned down to bend the stick, and then rapidly turned the curved part like a carpenter's bit A better method is to wind a string around the rotating stick or drill and pull it back and forth In order to make it possible for one man to do this effectively, the Eskimos place the upper end of the drill in a socket of ivory or bone which can be held firmly in the teeth Other Eskimos, as well as some Indians, fasten the two ends of the string to a bow and saw the bow back and forth In our own day a device of this kind, with sawdust or some such material in the bottom of the hole to make the sparks catch quickly, is one of the first things taught to boy scouts Still more ingenious than the bow drill is the pump drill of the Onandaga Indians Here a string is fastened in such a way that when a small board is repeatedly pushed down the drill stick twirls rapidly, first one way and then the other. Many modifications of these methods are described and illustrated in the works of Tylor and Pauschmann

In all the simpler frictional methods the two great difficulties have always been to create a spark and then to bring it into immediate contact with a sufficient amount of easily combustible tinder In the most modern method—the match—both of these were first obviated by coating the ends of the movable stick with sulphur, which ignited at low temperature, and tipping the end with phosphorus which can be still more easily ignited by a single stroke By the substitution of potash and non-poisonous forms of phosphorus for the earlier ingredients the modern safety match has at last been evolved as the latest successor of the two sticks rubbed together

The method of making fire by percussion does not appear to have been of great importance until the Iron Age was so far advanced that steel was available Its development was delayed by the difficulty in finding natural products such as pyrites which can be relied on to produce a spark when struck with a flint After iron became common, the flint and steel became the best method of creating a fire This method, however, was dominant for only a short time compared with the frictional method, for as soon as matches tipped with sulphur and phosphorus came into use (soon after 1830), it ceased to be of importance except in more backward regions There it survives widely, in Central Asia flint-lock guns are still common

Another method of making fire, namely, the concentration of the sun's rays by means of a lens or mirror, also belongs to a fairly high stage of civilization, but has never been used to any great extent Aristophanes mentions a burning-lens in *The Clouds;* although the mirrors of Archimedes may not actually have set fire to the ships of the Roman besiegers of Syracuse, they show that the art of generating fire in this way was well understood In Peru the sacred fire is said to have been kindled by means of a concave cup set in a great bracelet. In China the burning-glass has long been well known

The latest important method of making fire is by means of the electric spark According to one common device, a gas jet is arranged so that when it is opened an electric circuit is closed and then broken, and a spark passes through the escaping gas and ignites it It should be noted in this connection that the intense heat generated by the electric current is beginning to displace fire not only in cases where an extremely high temperature is desired, but in various household appliances and elsewhere This is only a partial displacement, however, for in most cases the electric current itself is generated by means of a fire in which coal is burned

Fire and Material Progress.—When once the art of using and making fire became established, it must have altered human development in at least three ways First, it must have stimulated the inventive faculty, thereby leading to material progress; second, it must have led to an increase in the density of population, third, it must have enabled primitive man to inhabit areas which had

previously been too cold These three changes must have had a profound effect upon the location of the centres of civilization and progress, and perhaps upon the mental development of the various human races

One invention commonly leads to another. Fire must have been peculiarly important in this respect Although no exact knowledge is possible, we can infer with considerable certainty that after people once mastered what was then the extremely difficult art of using fire, it required only a moderate degree of inventiveness to make many other important discoveries The primitive fire-users must soon have learned that sticks which are partly burned in the fire become pointed and hardened, thereby becoming more serviceable as weapons Even if the effect of fire on food was not previously known, bits of flesh, green fruit, edible roots or other kinds of food must inevitably have fallen accidentally into the fire and been cooked as soon as fires became common Their improved flavour and tenderness when rescued must have led persons with the keener type of mind to make experiments The range of opportunities thus opened is enormous, for practically every growing thing which had the least semblance of edibility must have been subjected to the process of roasting As time went on, and it became possible to heat water in skin bags by means of hot stones or in earthen vessels, the art of boiling food must have been discovered At some time or other an earthenware jar which boiled dry, or some other accident must have suggested the possibilities of baking food by enclosing it within non-combustible receptacles In our own day experiments in the use of fire for cooking are perhaps more numerous and vigorous than ever before

Food is only one of the ways wherein fire obviously stimulated experiments During the long period when the use of fire was known but the art of generating it unknown, the desire to create a blaze must have stimulated men's inventive faculties even more persistently than we are now stimulated by the desire to secure new and better sources of power Again, having seen that animals are so averse to a blaze, he must have asked himself "How can I best use fire to keep away animals during the night?" Then he presumably found that a flaming torch is a most effective weapon when thrust into the face of a wild animal Thus the stimulus to invention must have gone on so that men discovered that firebrands hurled into the huts of their enemies are a good weapon, or that when a patch of jungle is burned, the wild animals can be driven out and easily caught In later days when civilization had advanced far higher, similar reasoning and experiment showed that flaming pitch, red hot balls of metal or explosive projectiles are effective ways of lighting fires in the midst of the enemy

In connection with metallic ores fire has been a main agency in stimulating the inventive faculty The first inkling as to the possibility of smelting presumably arose from the accidental melting of bits of ore in a hot fire When once the significance of that fact was grasped by some genius, and when the highly valuable qualities of the resultant metals were realized, the stimulus toward melting all sorts of stones must have been enormous Here, too, we see a line of experiments which has continued with increasing intensity to our own day Thousands upon thousands of skilled inventors have worked upon the problem of making hotter and hotter fires Thus we have melted more and more refractory stones, thereby enormously increasing the number of available metals and other valuable compounds In this respect, as in many others, fire and its possibilities are still among the greatest agencies in stimulating human progress

Greater perhaps than any of the preceding—or at least later and more striking in its effect—is the relation of fire to power As soon as the first savage saw a yam or other bit of vegetation pop in the fire because steam was escaping, the principle of the development of power from fire was brought to man's attention For hundreds of thousands of years thereafter many a boy presumably experimented by holding the lid down over a boiling vessel of water until the steam puffed it violently up Many a man in addition to Hero, who made what was really a steam engine more than 2,000 years ago, must have realized that the expansive force of steam possesses energy which might be of high value But only in modern times did progress along other lines finally make the steam engine a practical invention. Then the attempt to use t energy liberated by fire suddenly gave an almost incredible stim lus to the world's inventive faculties. Our whole modern syste of manufacturing, transportation, lighting and heating is based the utilization of fire

Pyrotherapy and Sterilization.—One of the most extrao dinary features of fire is the way in which its use continues increase even in our own day This is especially true in the fie of health The value of cauterization in preventing harm fro poisonous bites like those of snakes or mad dogs, and in preventir the spread of infection from wounds or sores has long been know and was practised by the ancients The value of hot baths in sk disease and in those of the joints has also been appreciated, least since the days of the Romans Only in modern times, ho ever, have two other therapeutic uses of fire become known O is the process of baking whereby a limb or other member is ke for a while at a temperature as high as it can endure with r sults which are said to be highly beneficial The other is the u of fire for sterilization The knowledge that heat, either in t form of flame or through the medium of steam or hot water, w kill bacteria has been one of the most revolutionary discoveries modern times To it, perhaps, as much as to any other sing factor, is due the wonderful progress of modern surgery

Dangers of Fire.—In spite of all the benefits derived fro fire, the mere word "Fire!" is one of the most dreaded expressio in every language, for fire is as dangerous as it is useful Some the greatest disasters in all history have been fires such as tho which Nero started in Rome, and the one which ravaged Londc for four days in 1666 and gave Sir Christopher Wren a chance plan many important improvements Chicago suffered a simil fire in 1871 and 100,000 people were rendered homeless, Sa Francisco experienced a similar fate after the great earthquake 1906 Earthquakes have been the cause of some of the mo terrible fires, as in Tokyo in 1923 There the style of architectu renders fires especially dangerous, for the houses are constructe of wood with paper walls and heavy thatch of straw. At Toky the fire killed 60,000 or 70,000 people, burned 25 sq m an drove away nearly 1,000,000 persons In all countries the annu losses by fire are enormous In England they amount to abo £12,000,000 annually In the United States, partly becaus wooden houses are more common than in Europe, the losses a far greater, amounting to over half a billion dollars every ye from 1922 onward, and to $560,000,000 in 1926, or approximatel $5 per person In that same year the fear of fire led the peop of the United States to pay $635,000,000 in premiums to fire i surance companies, while $352,000,000 was returned to cov losses Forest fires are amazingly frequent and some of them la waste thousands of square miles From 1916 to 1925 the averag number of such fires in the United States alone was about 51,00 Nearly half of these devastated at least ten acres; the averag damage to trees and property amounted to about $21,000,00 but the real damage was enormously greater because the fires k the young growth, expose the soil to erosion, and alter the cha acter and density of the new growth In 1825 one of the greate forest fires burned an area of 3,000,000ac in Maine and Ne Brunswick, while fires that burned more than 1,000,000ac in th United States and Canada occurred in 1853, 1871 (two totallin 3,280,000ac), 1881 and 1910 Such fires may still occur in re gions like Siberia, but are impossible in the more advance countries because of the improved methods of fire-protection

The Effect of Fire on Density of Population.—One of th most noteworthy facts in the history of civilization is the wa in which many of the greatest inventions increase the density o population Inventions connected with fire are pre-eminent in thi respect. One of the first effects of the original discovery of th art of using fire must have been to increase the available foo supply It did this directly, through the art of cooking, whereb many previously inedible or indigestible products became goo articles of diet, and also by making it possible to smoke and pre serve food that otherwise would have been wasted. Indirectly th use of fire still further increased the food supply by improvin man's tools. It not only enabled him to use sharpened sticks a

described above, but helped him to break up the stones from which he procured flint implements, and kept him warm and dry so that he could work more effectively in cool weather It enabled him to smelt metals and ultimately to make machines of all sorts Thus fire has been a major agent in the process whereby man has multiplied his labour so that one man with the help of fire-made and fire-driven machinery can do as much work as scores or hundreds who have only their naked hands and no help from fire In recent centuries no factor has exceeded the use of coal in fostering the growth and concentration of population; in earlier times the use of fire in other ways produced similar although less obvious results

Fire and the Coldward March of Civilization.—One of the most extraordinary results of the use of fire is the way in which it has enabled the centres of human progress to move from warmer to cooler regions According to the most recent studies the best climate for primitive savages without fire, clothing or shelter, is one where the temperature averages not far from 70° at all seasons, but yet has a fair degree of variability The nearest approach to such a climate is by no means found in equatorial regions but at a distance of 25° or more to the north or south Even there, however, although the winters are admirable, the summers are much too long and warm for the best health and greatest efficiency Now man is so constituted that up to a certain point he can endure too much heat more easily than too little Among naked savages, for example, a temperature of 90° is far less uncomfortable than one of 60° Therefore unless people possess artificial means of warming themselves they tend to live in regions that are too warm rather than too cold This retards progress, for people usually overcome the adverse effect of high temperature by inactivity rather than activity

The introduction of fire changed all this In conjunction with discoveries as to clothing and shelter, it enabled people to be comfortable in cool climates Each new discovery meant a step away from low latitudes The invention of the hearth to replace the bare ground as a place for a fire was one of the earliest reasons for such a step The invention of a protected opening in the roof to carry off the smoke was another Still another was the combination of the hearth with a chimney in such a way as to give an efficient draft, eliminate smoke and throw the heat out into the room, then came the enclosed oven or stove of mud as in China, later the stove of metal; then central heating by means of furnaces supplying hot air, steam or hot water and heated first by wood, then by coal, and lately by oil or gas Each of these improvements in the use of fire, together with the corresponding advances in clothing and architecture, reduced the difficulties due to low temperature, for they helped to create an artificial climate in which people were approximately as comfortable, healthful and energetic as in the ideal climate Thus to-day we can live comfortably and in good health in climates so cold that people without fire would perish

One of the greatest benefits of man's conquest of fire has been that the human race has gradually been able to migrate into the cooler and hence more healthful and energizing parts of the world At every stage of this process of expansion there has been a definite zone of highest comfort, best health and greatest activity. Beginning not far beyond the tropics, the zone shifted to Mediterranean lands, and then to higher latitudes To-day it is coincident with the zone of greatest progress, highest civilization and world dominance, a condition which also appears to have been true in the past A further advance in the use of fire may possibly carry the zone of greatest progress as far north as southern Scandinavia and southern Canada, but not beyond, for there the summers as well as the winters become too cool The ultimate location of this most favoured zone will doubtless be the regions where the following three conditions are most nearly fulfilled (1) the summer climate is ideal for civilized people who wear clothes and live in houses; (2) the use of fire creates ideal atmospheric conditions within doors during the rest of the year; and (3) the degree of variability arising from the weather on the one hand and the use of fire on the other produces the maximum stimulus, but does not injure health. With our present skill in the use of fire a climate like that of London comes as near as any to satisfying these three conditions, but the regions surrounding Paris, Berlin, New York and Chicago do not lag far behind.

From all this it appears that the "coldward course of progress" as GilFillan has called it, or the "northward course of empire" to use Stefansson's phrase, has depended upon the use of fire more fully than on any other factor that is yet clearly defined It has involved a migration of the centres of power from regions where the *winter* climate is ideal but the summers debilitating, to those where the *summer* climate is ideal, and the disadvantages of the winter can be obviated by the use of fire together with clothing and shelter

Fire and Racial Inheritance.—The possible biological effect of fire upon mankind ought not to be overlooked, although it is highly speculative. At first, and perhaps for many generations, the users of fire probably comprised only a small group of unusually intelligent, competent and progressive people The first persons to use almost any revolutionary discovery are usually of that sort, no matter whether the discovery be the aeroplane, the electric motor, the art of weaving or the alphabet During the long period when the technique of fire was new and crude its users must have had great need of intelligence, skill, patience and material prosperity, for otherwise they would not and could not have devoted to the art the many hours each day that must inevitably have been required Among primitive hunters who are constantly obliged to change their abode it is by no means easy to maintain a fire that must never be allowed to go out, and the new arts of cooking and drying food and making fire-hardened weapons must also have been difficult But the people who were sufficiently wise, active and patient to master all these difficulties must have reaped great advantages Their food supply, as we have seen, became more abundant, more reliable and more nutritious, their improved weapons lessened the danger from both beasts and men, and their children must have enjoyed a freedom from hunger, exposure, disease and danger hitherto unknown. Such advantages, in a day when there was no such thing as birth control, must have caused the descendants of the fire-users to increase in number faster than did the people who lacked the wit, energy or resource to use the new invention Thus, if there is any truth in the inheritance of mental traits, the inherent intelligence and progressiveness of the population must have been improved

The degree of improvement must have differed from place to place Near the equator the people presumably made little use of fire; the warmth of their climate not only prevented them from feeling much need of it, but made them loathe the necessary exertion Thus in such regions fire had little effect in causing the intelligent people to increase in numbers In the cooler parts of man's primitive habitat, on the contrary, the use of fire presumably caused the descendants of the more intelligent and progressive people to be numerous in proportion to those of the more stupid and indifferent, thus altering the average level of innate intelligence Beyond the limits of the old inhabited area the use of fire enabled people to migrate into regions previously too cold for occupancy Since all the migrants must have been of the intelligent fire-using class, whatever innate superiority they may have possessed must have been segregated and thereby perpetuated Thus there must have been a gradation of innate ability from the unaltered people of the hottest regions to the selected new settlers in cooler regions. If such a differentiation occurred once, it must have occurred repeatedly when further progress in the mastery of fire enabled mankind to move into still cooler regions The result would correspond exactly with the temperamental differences which now seem to be innate in the people of tropical as compared with temperate regions All this is indeed speculative, but it ought not to be overlooked in considering the part played by fire in the development of mankind

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FIREARMS: *see* GUN and PISTOL

FIREBACK, the ornamented slab of cast iron protecting the back of a fireplace The date at which firebacks became common probably synchronizes with the removal of the fire from the centre to the side or end of a room They never became universal, since the proximity of deposits of iron ore was essential to their use In England they were confined chiefly to the iron districts of Sussex and Surrey, and appear to have ceased being made when the ore in those counties was exhausted They are, however, occasionally found in other parts of the country, and it is reasonable to suppose that there was a certain commerce in an appliance which gradually assumed an interesting and even artistic form The earlier examples were commonly rectangular, but a shaped or gabled top eventually became common

English firebacks may roughly be separated into four chronological divisions—those moulded from more than one movable stamp, armorial backs, allegorical, mythological and biblical slabs with an occasional portrait, and copies of 17th and 18th century continental designs, chiefly Netherlandish The fleur-de-lys, the rosette, and other motives of detached ornament were much used before attempts were made to elaborate a homogeneous design, but by the middle of the 17th century firebacks of a very elaborate type were being produced Thus we have representations of the Crucifixion, the death of Jacob, Hercules slaying the hydra, and the plague of serpents Coats of arms were very frequent, the royal achievement being used extensively—many existing firebacks bear the arms of the Stuarts About the time of Elizabeth the coats of private families began to be used, the earliest instances remaining bearing those of the Sackvilles, who were lords of a large portion of the forest of Anderida, which furnished the charcoal for the smelting operations in early British iron-fields To the armorial shields the date was often added, together with the initials of the owner The method of casting firebacks was to cut the design upon a thick slab of oak which was impressed face downwards upon a bed of sand, the molten metal being ladled into the impression

Firebacks were also common in the Netherlands and in parts of France, notably in Alsace At Strasbourg and Metz there are several private collections, and there are also many examples in public museums The museum of the Porte de Hal at Brussels contains one of the finest examples in existence with an equestrian portrait of the emperor Charles V, accompanied by his arms and motto When monarchy was first destroyed in France the possession of a *plaque de cheminée* bearing heraldic insignia was regarded as a mark of disloyalty to the republic, and on Oct 13, 1793, the National Convention issued a decree giving the owners and tenants of houses a month in which to turn such firebacks with their face to the wall, pending the manufacture by the iron foundries of a sufficient number of backs less offensive to the instinct of equality Very few of the old plaques were however removed, and to this day the old châteaux of France contain many with their backs outward

FIRE-BRAT, a small insect (*Thermobia domestica*) related to the silverfish (*q v*), and found in bakehouses, where it feeds upon bread and flour

FIREBRICK. Under this term are included all bricks, blocks and slabs used for lining furnaces, fire-mouths, flues, etc, where the brickwork has to withstand high temperature (*see* BRICK)

The conditions to which firebricks are subjected in use vary greatly as regards changes of temperature, crushing strain, corrosive action of gases, scouring action of fuel or furnace charge, chemical action of furnace charge and products of combustion, etc, and in order to meet these different conditions many varieties of firebricks are manufactured

A firebrick suitable for ordinary purposes should be even and rather open in texture, fairly coarse in grain, free from cracks or warping, strong enough to withstand the pressure to which it may be subjected when in use, and sufficiently fired to ensure practically the full contraction of the material. Very few fireclays meet all these requirements, and it is usual to mix a certain proportion of ground firebrick, ganister, sand or clay with the fireclay before making up The fireclay or shale or other materials are ground either between rollers or on perforated pans, and then passed through sieves to ensure a certain size and evenness of grain, after which the clay and other materials are mixed in suitable proportion in the dry state, water being generally added in the mixing mill, and the bricks made up from plastic or semi-plastic clay in the ordinary way

The proportion of ground firebrick, etc, used depends on the nature of the clay and the purpose for which the material is required, but generally speaking the more plastic clays require a higher percentage of broken firebrick or "grog" than the less plastic clays, the object being to produce a clay mixture which shall dry and fire without cracking, warping or excessive shrinkage, and which shall retain after firing a sufficiently open and even texture to withstand alternate heatings and coolings without cracking or flaking For special purposes special mixtures are required and many expedients are used to obtain fireclay goods having certain specific qualities In preparing clay for the manufacture of ordinary fire-grate backs, etc, where the temperature is widely variable but never very high, a certain percentage of sawdust is often mixed with the fireclay, which burns out on firing and ensures a very open or porous texture Such material is much less liable to splitting or flaking in use than one having a closer texture, but it is useless for furnace lining and similar work where strength and resistance to wear and tear are essential

Furnace Firebrick.—For the construction of furnaces, fire-mouths, etc, the firebrick used must be sufficiently strong and rigid to withstand the crushing strain of the superimposed work at the highest temperature to which the firebrick is subjected

The wearing out of a firebrick used in the construction of furnaces takes place in various ways according to the character of the brick and the particular conditions to which it is subjected The firebrick may waste by crumbling—due to excessive porosity or openness of texture, it may waste by shattering, it may gradually wear away by the friction of the descending charge in the furnace, of the solid particles carried by the flue gases and of the flue gases themselves, it may waste by the gradual slagging of the surface through contact with fluxing materials, in cases where it is subjected to very high temperature it will gradually vitrify and contract and so split and fall away from the setting It is a well-recognized fact that successive firings to a temperature approaching the fusion point, or long continued heating near that temperature, will gradually produce vitrification, which brings about a very dense mass and close texture, and entirely alters the properties of the brick

Where firebricks are in contact with the furnace charge it is necessary that the texture shall be fairly close, and that the chemical composition of the brick shall be such as to retard the formation of fusible double silicates as much as possible Where the furnace charge is basic the firebrick should, generally speaking, be basic or aluminous and not siliceous, *i e*, it should be made from a fireclay containing little free silica, or from such a fireclay to which a high percentage of alumina, lime, magnesia, or iron oxide has been added For such purposes firebricks are often made from materials containing little or no clay, as for example mixtures of calcined and uncalcined magnesite, mixtures of lime and magnesia and their carbonates; mixtures of bauxite and clay, mixtures of bauxite, clay and plumbago, bauxite and oxide of iron, etc

In certain cases it is necessary to use an acid brick, and for the manufacture of these a high siliceous mineral, such as chert or ganister, is used, mixed if necessary with sufficient clay to bind the material together Dinas fireclay, so-called, and the ganisters of the south Yorkshire coalfields are largely used for making these siliceous firebricks, which may be also used where the brickwork does not come in contact with basic material, as in the arches or other parts of many furnaces It is evident that no particular kind of firebrick can be suitable for all purposes, and the manufacturer should endeavour to make his bricks of a definite com-

position and texture to meet certain definite requirements, recognizing that the materials at his disposal may be ill-adapted or entirely unsuitable for making firebricks for other purposes In setting firebricks in position, a thin paste of fireclay and water or of material similar to that of which the brick is composed, must be used in place of ordinary mortar, and the joints should be as close as possible, only just sufficient of the paste being used to enable the bricks to "bed" on one another

It has long been the practice on certain works to wash the face of firebrick work with a thin paste of some very refractory material—such as kaolin—in order to protect the firebricks from the direct action of the flue gases, and a thin paste of carborundum and clay, or carborundum and silicate of soda has been extensively used for the same purpose So-called carborundum bricks have been put on the market, which have a coating of carborundum and clay fired on to the firebrick, and which have a greatly extended life for certain purposes It is probable that the carborundum gradually decomposes in the firing, leaving a thin coating of practically pure silica which forms a smooth, impervious and highly refractory facing (X)

UNITED STATES PRACTICE

The classification of fireclay bricks used in America is as follows high duty, fuses not lower than cone 31 (approximately 1,750° C), intermediate duty, not lower than cone 28 (1,690° C), moderate duty, not lower than cone 26 (1,650° C), low duty, not lower than cone 19 (1,510° C) The highest grade fireclay fuses at cone 35–36 (1,830–50° C) Bricks made from materials more refractory than fireclay are designated *super-refractories*

Refractoriness.—The term firebrick intimates resistance to the softening effects of heat, but refractory brick is the better term Firebricks must withstand metallurgical heats and resist the fusing action of slags A silica brick is acid and is used in furnaces developing acid slags, lime, dolomite and magnesite (*qq v*), on the other hand, are strongly basic Between these extremes every gradation occurs A fireclay brick made from a siliceous clay is more or less acid, from pure clay slightly basic, from bauxite or diaspore (*qq v*) still more basic. Besides the basic and acid firebricks there are neutral bricks made from chrome ore In an open hearth steel furnace, for example, the hearth may be built of dolomite or magnesite, then at the slag line a band of neutral bricks is built, upon which rests the silica brick crown

The best American fireclays, *et seq*, quartzite, bauxite, diaspore, cyanite and all calcined materials are without plasticity and to make them into bricks some kind of bonding material is required A plastic clay in quantity of 10% and upward is most commonly employed to give the necessary plasticity, but in numerous products it is not suitable, so lime, tar, powdered slags, such as glass and cement, silicate of soda and other chemicals are used In the designation of siliceous bricks there is considerable confusion *Ganister,* the English term for a clay bonded sandstone brick, in America is called *quartzite* and in Germany, *Dinas* The lime bonded silica brick in England is the *dinas* brick and in America the *silica* brick

New Jersey, because of its fireclay deposits and its location on the early settled eastern coast, was the first locality in America to produce firebricks It is said that a firebrick was produced in New Jersey as early as 1812, but there is no authentic record of this In 1825 a factory was established in Woodbridge, N J ; in Connecticut in 1835, in Pennsylvania in 1836, and in Maryland in 1839 The older grinding and pugging of hard materials with the wet-pan is being replaced by dry-pan grinding, and the wet-pan is used only for pugging Pug-mills as used in other clay industries are not commonly used for soft-mud firebricks

Dry-pressed Firebricks.—In 1886 at Union Furnace, O, firebricks of flint and plastic fireclays, and ganister rock, were made by the dry-press process (*see* BRICK), but because of the prejudice in favour of the hand-moulded product it was not commercially successful More recently the dry-press has been introduced into many factories to supplement the soft-mud product and there are a number of factories that limit their product to the dry-press process Because of the high pressure given to the material by the dry-press a manufacturer is enabled to make bricks from a non-plastic material such as flint clay, magnesite, etc, with less, and indeed often without any primary bonding material. The dry-press has been especially useful in the manufacture of magnesite bricks

Stiff-mud Process.—Until recently, except in the manufacture of special shapes and, in one or two instances, a *straight brick* product, the stiff-mud auger machine process (*see* BRICK) made no headway, but in 1928 a number of large firebrick factories were using this process The clays are ground in a dry pan, pugged in a pug-mill, made into bricks through an auger machine, then re-pressed, dried in tunnel dryers, and finally burned in kilns, identically as in making other types of bricks

Drying.—The early hot floors dryer consisted of a series of long covered ducts, each with a furnace at one end, connecting with a stack at the other end This type of floor has given way to steam-heated concrete or iron floors, on the surface of which the brick are dried

Burning.—The intermittent down-draft kiln is most widely used for burning firebrick The round down-draft kiln is the favourite type and the more modern plants are so equipped In 1928 the car-tunnel type was being widely adopted

The latest Government bulletin (1926) available gives the following statistics

	Annual output	
	Quantity	Value
Fireclay bricks, blocks, and tile in 9 in standard equivalent	1,007,784,000	$40,013,394
Silica bricks	220,400,000	13,614,033
Magnesite and chrome	16,150,000	4,762,645
Other refractories		5,065,373
Special shapes in short tons (2,000 lb)	61,909	1,714,914
Clay sold, raw and prepared, short tons	476,070	2,666,843

(E Lo)

FIRECLAY. Clay of highly refractory character, capable of resisting a very high temperature without fracture, fusion or softening This quality is due to comparative freedom from fluxing impurities, such as soda, potash, lime, iron, and magnesia. There is no fixed standard of refractoriness for these clays, but no clay should be classed as a fireclay which has a fusion point below 1,600° Centigrade

Fireclays vary considerably in chemical composition, but generally the percentage of alumina and silica (taken together) is high, and the percentage of oxide of iron, magnesia, lime, soda, and potash (taken together) is low Other materials, such as lime, bauxite, etc, are also used for the manufacture of firebricks where special chemical or other properties are necessary

Fireclays are abundantly distributed in Great Britain, mainly in the extensive coalfields A typical fireclay is composed of 67% silica, 22% alumina, 2% oxide of iron, 2% potash, 0 5% magnesia, 0 5% lime, 5 5% water, 0 5% organic matter *See* FIREBRICK.

FIRE CONTROL: *see* GUNNERY, NAVAL.

FIREDAMP, the most prevalent of the noxious and inflammable gases found in mines The chief constituent of this gas is methane, also known as marsh gas (*q v*) Firedamp is commonly termed "gas" by the coal miner, and a mine in which its occurrence is common is known as a "gassy" or "fiery" mine Firedamp is never found as pure methane in mines Analyses in seams in the north of England made by Sir H de la Beche and Mr (afterwards Sir) Lyon Playfair in 1846 showed the gas to contain —

	Percent	Percent
Methane	77 5 to	98 2
Nitrogen	1 3 to	26 1
Carbonic Acid	0 3 to	2 1
Oxygen	0 0 to	3 0
Hydrogen	0 0 to	3 0

Sometimes, besides methane, firedamp contains a small quantity of another highly inflammable gas, ethane (*q v*) Thus samples of mine atmospheres taken in a working place (a dip drift) at the Gluckhilf colliery at Waldenburg in 1881 and analysed by Dr. Poleck for the Prussian Firedamp commission, showed its composition to be as follows —

	1. Percent	2 Percent
Methane (CH_4)	34 93	32 65
Ethane (C_2H_6)	2 89	3 99
Carbonic Acid (CO_2)	41 49	41 49
Carbon Monoxide (CO)		1 87
Nitrogen (N) }	20 69	20 00
Oxygen (O) }	100 00	100 00

The considerable quantity of carbon dioxide points to the sample being the result of decomposition The carbon monoxide was discovered by the aid of the spectroscope Methane is odourless, colourless and tasteless It burns with a bluish flame forming carbonic acid and water As it is lighter than air it rises upwards to the roof and is found in the higher parts of the workings When mixed with air to the extent of 6 1%, the atmosphere becomes just ignitable, so that 6 1% is spoken of as the lower limit of inflammability, the most explosive mixture, however, is that which contains 9 47% of methane, that is, where there is present just sufficient methane to consume all the oxygen in the air Eight to 14% may be regarded as the high explosive range At 22% the mixture ceases to be explosive Though firedamp is found chiefly in coal mines, where it exudes from the pores and cavities in the coal, its occurrence is not restricted thereto In 1886 two explosions of firedamp occurred in the Mill Close Head mine at Darley Dale in Derbyshire, by which five persons lost their lives, its occurrence in metalliferous mines has also been reported It probably occurs in all coal mines, though some are commonly described as exempt, *e g*, the coal mines of the Forest of Dean, but is probably generated in such small quantity as not to be detectable on the flame of a lamp or candle The usual way of determining the presence of firedamp in the mine atmosphere is by the pale violet-blue "cap" above the flame of the safety lamp It is detectable by this means when present to as low a percentage as ½ (*see* SAFETY LAMP)

In some seams firedamp exists in a state of considerable pressure, as determined by the late Mr (afterwards Sir) Lindsay Wood in experiments conducted by him in 1880 for the royal commission on accidents in mines For this purpose holes were driven into the solid coal, plugged and fitted with a pressure gauge, when pressures as high as 461 lb per sq in were obtained after some days The greatest volume of gas given off was equivalent to 5,927cu ft per hour These, however, are abnormal figures Sudden outbursts of firedamp, the *dégagements instantanés* of the Belgian miner, are an infrequent occurrence in British coal mines, usually taking place in the neighbourhood of a fault "Blowers" of gas, the *soufflards* of the French miner, are more common, a blower being a stream of gas frequently accompanied by water, continuing at a constant pressure sometimes for years (*See* also COAL AND COAL MINING) (R R)

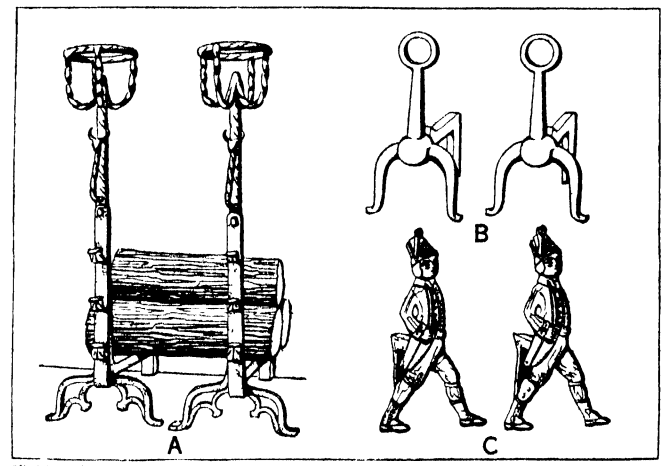
FIRE-DOG, one of a pair of supports for wood that is burned in an open fireplace (*see* ANDIRON) It has an upright standard to which is attached a horizontal bar which raises the logs above the hearth level. The spreading base gives the support an appearance similar to that of a dog, hence fire-dog Various materials are used, such as cast-iron, wrought-iron, steel, brass and cast-brass Wrought-iron fire-dogs, with little or no ornament, were used in the simple homes, whereas the more expensive materials, with every conceivable adornment, belonged to the élite The 17th century was noted for its rich and elaborate andirons, some of which stood 4 ft high and were tipped with such decorations as bronze discs, shields of arms and statuettes.

FIRE ENGINES. The modern "fire engine" (also termed "motor pump") has a petrol power unit driving a pump which takes suction from a water supply and forces the water through lines of flexible hose to nozzles from which streams are directed upon the flames In most cases, the engine is in the form of a motor vehicle having a four or six cylinder internal combustion motor of the usual type, but designed for the most severe kind of heavy duty service, the motor being employed not only to propel the apparatus along the road, but also to drive the fire pump when required, while the vehicle itself remains stationary (*See* INTERNAL COMBUSTION ENGINE.)

Such a vehicle is usually provided with a body for carrying hose and may be equipped also with ladders, pike poles, fire axes, crowbars, lanterns, hand fire extinguishers, nozzles, chemical fire engines and other accessories. In the larger cities fire-fighting equipment may also include ladder trucks which carry ordinary ladders as well as aerial ladders that are permanently attached to the vehicle and may be raised or lowered by a mechanism on the ladder truck. Water towers somewhat similar to the aerial ladders may also be used High pressure fire engines have been developed to deliver water to the upper floors of high buildings in large cities

History.—The earliest method of fighting fires consisted of throwing water on the fire from buckets or other vessels. It is not known what fire-fighting facilities were available at the time of the burning of Rome in A D 64 The first use of a device for applying water on to a fire in the form of a stream dates back as far as the 2nd century B C The science of fire extinction was still in a very elementary stage in the year 1666, when the great fire of London occurred The only fire engines, used at this fire were those of the hand-operated type The early squirting devices were usually in the form of a mammoth syringe This later developed into a receptacle for holding water which was filled and replenished during the fire by a bucket brigade, the water being withdrawn and ejected by means of an early form of pump

The pumps on the early fire engines were hand-operated and the range and force of the stream were poor In many instances the engine was destroyed by the fire owing to the fact that the short range of the stream made it necessary to take the apparatus close to the flames This led to the development of better pumps which could squirt a much longer distance Subsequently, the development of a flexible pipe or hose made it possible to locate the engine well away from the fire and to convey the water under pressure from the engine to the fire. A still later development



BY COURTESY OF (A) MUSEE DE CLUNY, (B, C) METROPOLITAN MUSEUM OF ART

FRENCH AND AMERICAN FIRE-DOGS OF THE 18TH CENTURY
(A) French fire-dogs, (B & C) American fire-dogs

was the employment of suction hose to enable the pump to feed from other sources other than its own suction

Steam Fire Engines.—The first mechanically operated fire engines appear to have been developed early in the 19th century when steam was first used for operating a fire pump—the vehicle on which the pump and steam boiler were mounted being drawn to the fire either by the firemen or by horses. About 1860 steam fire engines were being made in England and the United States. Public interest in steam fire engines was greatly stimulated by competitions held in England at the Crystal Palace in 1863, in which engines from the United States took part.

Steam fire engines were used almost exclusively at the Chicago,

ll., conflagration in 1871. Toward the end of the 19th century orse-drawn steam fire engines had been brought to a state of igh perfection both in Europe and in the United States, when ngineers began the development of the self-propelling vehicle 'he earliest self-propelled machines were those of steam fire ngines.

Motor Fire Engines.—The first self-propelled fire engines mploying an internal combustion motor (other than as a tractor) 'ere built about 1903 By 1910 a considerable number of motor re engines were in successful service in various parts of the 'orld and in 1928 practically every large city in the United tates and many of the large cities in Europe had discarded orse-drawn and steam fire engines, in favour of self-propelled iotor fire engines. However in some cases the old horse-drawn nd steam fire engines are still sometimes used as reserve equip- ient Normally, a motor fire pump chassis is very strongly con- tructed in view of the fact that a fire engine is heavy and ecessarily has to travel at high speed

Various types of pumps are employed The rotary gear type a positive action pump which will draw its water from a depth f 20 to 25 ft without being primed The centrifugal pump is lso employed but as this has no power of suction in itself it is ther fitted with some form of priming device or with an auxiliary ositive action pump for suction purposes Piston pumps are lso used and are very satisfactory under some conditions In some ases a shaft is placed in line with the motor shaft which is used) drive the pump as well as the vehicle, through the use of eparate transmissions

Chemical Fire Engines.—These engines may be a part of a iotor fire engine or may be mounted separately on a motor ehicle either alone or in combination with a body for carrying ose or other equipment Chemical fire engines are of two types. oda-acid and foam The soda-acid engine consists of one or iore cylindrical vessels charged with a solution of bicarbonate f soda dissolved in water Enclosed in this cylindrical vessel also a receptacle for holding a quantity of sulphuric acid A ose line generally ¾ or 1 in. in diameter is connected to the outlet f the cylindrical vessel and when the chemical engine is required or use, the sulphuric acid is caused to be discharged from its eceptacle into the bicarbonate of soda solution This admixture f the acid with the soda solution within the cylindrical vessel orms carbonic acid gas under pressure, which forces the solution irough the hose In the soda-acid machines various methods for ausing the acid to be discharged into the soda solution are em- loyed. (1) inverting the acid bottle by means of an operating andle, (2) revolving the cylindrical vessel on its trunnions, thus iverting the acid receptacle The invention of these chemical re engines has been especially helpful in fighting fires where iere is a shortage of water, a problem which must often be faced i the out of town districts.

The foam chemical engines are a development from the soda- id chemical engine The foam type of machine is somewhat milar to the soda-acid excepting that the acid ingredient is a olution of aluminium sulphate dissolved in water The admix- ire of aluminium sulphate solution with bicarbonate of soda olution produces a froth, but its bubbles are very easily broken own To make the bubbles tougher and more stable a stabilizing gredient is added to the bicarbonate of soda solution. The dis- harge from a foam chemical engine is therefore a tough and nacious foam made up of minute bubbles containing carbonic id gas This foam has the property of adhering to any burn- g solid surface upon which it is thrown and will even adhere to vertical wall or to a ceiling, it also floats on any inflammable quid. This foam completely excludes air from the surface which covers and deprives the fire of the oxygen which would other- ise feed the flames, thus extinguishing the fire by suffocation. i the foam chemical engine as used on motor fire apparatus the vo solutions are forced into two separate hoses which are joined gether at their end into a common nozzle. The usual method forcing the solutions from their vessels into the hose is by eans of an inert gas contained in a pressure cylinder or by eans of separate pumps. A more recent development of the foam chemical method of fire extinction consists in dispensing with the solutions and using the chemicals in their dry form With this method a so-called foam generator is employed A water supply under pressure is connected to one end of the generator and discharge hose at the other end. The dry chemicals are poured into the hopper of the generator as required at the time of fire. As the stream of water passes through the generator it automatically draws the dry chemicals into the water stream, re- sulting in chemical action by means of which foam is discharged from the nozzle

Fire Boats.—A very important feature of the fire-fighting equipment in large river, lake and sea ports is the fire boat They are essentially large tug-boats equipped with fire pumps of 3,000 to 12,000 gal capacity The older boats were steam-propelled and the pumps steam-driven The newer boats are propelled by internal combustion motors such as the very efficient Diesel engine which are not only employed to propel the boat but also utilized to drive the fire pumps when required A boat recently built has a pumping capacity of 12,000 gal. of water per minute at about 100 lb pressure, is 123½ ft long, 26 ft beam and 7½ ft draught, and has been designed to travel at a speed of about 14 knots per hour

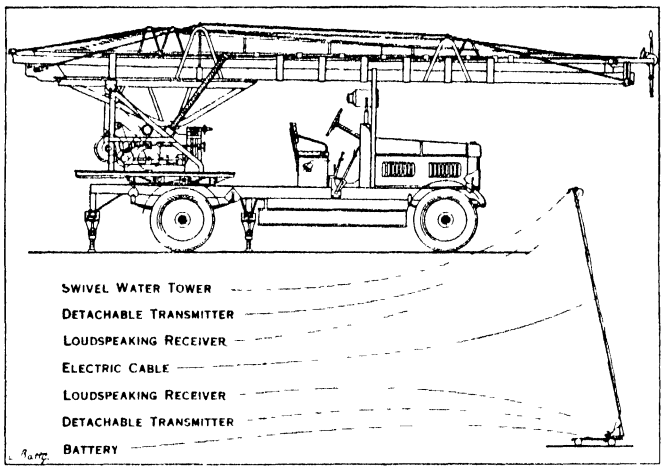
Fire Extinguishers.—It is not uncommon for motor fire ap- paratus to carry fire extinguishers of the soda-acid or foam type which are variants of the chemical fire engines described above and small enough so that they can be carried into a burning build- ing by the fireman Fire apparatus may also carry fire extin- guishers of the carbon tetrachloride type which are particularly useful in connection with fires in electrical generating stations, etc, owing to the fact that the fluid is a non-conductor of electricity (J H Os, C B R)

FIRE ESCAPES in England refer to constructing ladders mounted on wheels which are intended to be used exclusively for the purpose of enabling people to escape from burning buildings. Abraham Wivell invented the first portable fire escape ladder of this kind about 1837 Before Wivell's time, however, various smaller fire escapes were in use There is in existence a very interesting drawing by C Geissler, dated 1789, showing three types employed in Geneva at that date, consisting (a) of the cloth or canvas "chute," (b) the rope and basket (or sling), and (c) sec- tional ladders fitted with sockets so that several could be joined together to make one long length, the top section having running wheels to travel easily up the walls of a building Sectional lad- ders of somewhat similar build were the first fire escapes to be used in London, when John Braidwood, the famous first Chief of the London Fire Engine Establishment, put them into service there in 1832 They were made in short lengths of about 6 ft for carrying upon the fire engines of the period.

Wivell's wheeled fire escape was not officially adopted, though it was put into service in London by the Royal Society for the Protection of Life from Fire A few years later another type of wheeled escape known as the "fly-ladder" was evolved and this, being an improvement upon Wivell's machine, gradually super- seded it The "fly-ladder" had a main ladder about 35 ft in length mounted upon a spring carriage, with large wheels At about 10 ft from the top of the main ladder a folding ladder of about 20 ft. was joined by hinges, and was raised when required for use by ropes attached to projecting levers It was possible also to detach this folding ladder when required; and in the event of greater heights having to be negotiated than the combined height of the main and fly-ladders, a separate short ladder was placed at the top of the folding ladder, and by this means a height of about 60 ft. could be reached At the under-side of the ladder was affixed a canvas chute protected externally by copper wire netting, this was used to pass persons down when it was possible to get the top of the chute upon a suitable window-sill For greater heights the persons had to be carried down the ladders in the same way as is done in the present day

Telescopic Escapes, 1890.—The fly-ladder escape held the field in England until about 1890, when telescopic escapes were intro- duced embodying the sliding body principle, which enables the ladders to be carried in a horizontal position and elevated to the

vertical on arrival at a fire These ladders were arranged to slide in a framework attached to the axle, and were held in position by means of hand-driven gear arranged on the backfly. They could be pitched at any angle to the building, thus enabling a wide forecourt to be bridged, which could not be done with the older types of fire escapes, but it was found that for service of this kind it was necessary to strengthen the sides of the ladders, and in 1896



BY COURTESY OF MESSRS MERRYWEATHER AND SONS LTD

A MODERN FIRE LADDER THAT CAN BE USED AS A WATER TOWER
It can be raised 90 feet into the air, and adjusted to any position by one man in less than one minute It is equipped with loud-speaker telephones

J C Merryweather patented a system of bowstring girder trussing which also formed a convenient hand-rail on each of the ladders Other makers, notably Shand Mason & Co, introduced other forms of trussing to achieve the same object Soon after these sliding carriage escapes were introduced the motor system began to make headway in service, and it became customary to arrange brackets at the rear of the motor vehicles to carry fire escapes, which could then be dismounted upon the arrival of the engine at a fire, and wheeled by hand to any convenient position for use This is still the practice in most large British fire brigades Before arriving at this stage of development, however, there had been an intermediate stage when sliding carriage fire escapes were carried upon horse vehicles, some being of the dog-cart pattern, and others being four-wheeled horse drawn vehicles generally known in the service as "tenders" Many fire brigades now carry light trussed ladders (35 to 40 ft dismounted ladders) in an overhead position on their motor vehicles, these are very serviceable where buildings of moderate height are concerned

Another form of escape which, although introduced many years ago, is still popular, is the "pompier" ladder, as its name indicates, it is of French origin It is an exceptionally light ladder usually from 16 to 18 ft in length, and at the end an iron or steel hook is fixed for the purpose of reaching over and holding on to window-sills In expert hands the pompier ladder is very useful, but it can only be safely worked by trained firemen It is not always employed in the ordinary way as a fire escape, but is used for the purpose of enabling firemen to scale walls of burning buildings, and persons to be saved are lowered to the ground by ropes which the firemen carry

Recent Methods.—In Great Britain and on the Continent of Europe, the most modern type of fire escape is that known as the "turntable" ladder It is mounted upon an automobile chassis, and, the ladders can be slewed round to any required position A good example is a machine built at the end of 1927 for the Leicester Fire Brigade The chassis has a six-cylinder engine of 60 B H P, which not only provides the power for road travelling but also, through special gearing, elevates, extends and revolves the ladders, so that they can be moved into any desired position. The movements of the ladders are controlled by three levers, and a graduated quadrant shows automatically the angle of elevation, while an indicator gives the height of extension Plumbing gear is provided to enable the ladders themselves to remain vertical even when the carriage is standing on uneven ground At the top of the ladders is fitted a swivelling monitor nozzle, for use as a water tower, from which a jet can be sent in any direction. Upon the turntable platform is a powerful searchlight which will throw a beam up the ladders whatever their position may be, thus lighting up the man who is controlling the jet or effecting a rescue, and this man is in communication, by means of a loud speaker telephone, with his comrades on the ground In the centre of the chassis is fixed a "Hatfield" fire pump, capable of delivering 250 gal per min, and at the top of this pump is mounted a monitor swivelling nozzle from which a jet can be thrown direct upon a fire The delivery of the pump is also arranged in such a way that the water can pass up through hose carried up the ladders for the purpose of attacking the fire from above, by means of the water tower just mentioned It will be seen that it is possible for this machine to be used as a water tower and fire engine simultaneously, since the pumps can be working on the main monitor which is mounted upon the pump itself, while the ladders are being used for rescue purposes

Every possible precaution has been taken to secure safety in operation Trussing is employed to increase the strength of the ladders, and an ingenious device ensures that when either of the three controlling levers are released by the operator, no matter at what angle or extension the ladders may be, the power is cut off and the ladders remain absolutely secure Again, if either of the levers is pulled down, or kept down too long, over-elevation or over-extension is automatically prevented by a device which forcibly returns the levers to the free position before the point of danger is reached The outstanding feature of this machine is that, contrary to the practice in some of the earlier types, the one engine performs every operation This system was patented by Merryweathers' in 1908, and although in the interval many machines have been built in which the movements of the ladders were controlled by a separate motor, the use of the main engine for all purposes is now practically universal, Continental makers having followed English practice

Motor turntable ladders are built in various lengths, but as they are expensive machines it is the general practice to construct them to command very considerable heights The longest ladder of this type built up to the year 1928 was one made by Merryweathers' for the Cairo Fire Brigade in 1926, which is capable of reaching a vertical height of 95 ft from the ground level

The fire ladder is usually equipped with revolving screws which raise or lower the ladders round a pivot Steel cable is used for extending the telescopic ladders Bracing rods are provided to stiffen the ladders when in use In the accompanying diagram may be seen the nozzle of the "water tower" and the revolving platform on which the mechanism and ladders are mounted

These are the principal types of escapes in general use by public fire brigades, but of course, many smaller appliances, or domestic escapes, are used independently of the assistance of trained firemen These range from a simple knotted rope, and a plain rope with a fluffy surface to avoid chafing the hands, through various types of rope ladders, iron folding ladders, etc, to the most popular form of all, the canvas "chute" fire escape Such patent self-help fire escapes, which are many, do not, however, come within the scope of the present article (J H Os)

THE UNITED STATES

In America the term "fire escape" is seldom used in the sense in which it is used in England American fire apparatus analogous to that of the English fire escape is discussed elsewhere in another article The term fire escape in the United States is restricted in a narrow sense to the railed balconies with iron stairways which give access from storey to storey in time of emergency These fire escapes usually lead from the roof to the street Such fire escapes will be found everywhere, except in the smallest towns Nearly every city has minute rules covering fire escapes, the regulations being promulgated by the fire department, the building department or the tenement house department In this article attention is not confined to this type of escape, but is also directed to the building exit in a broader sense, which conforms to the building codes of most States and cities The problem of proper exits is related to alarms and fire-drills where factories are con-

sidered The ordinary iron fire escape has proved a snare on so many occasions that its real value is doubted by many authorities. Where the access to it is gained through metal doors, or wire-glass windows in metal frames, and where there is no opening directly against the ladder portion this type of escape is effective Fire and smoke coming through windows make many fire escapes impassable, except for trained firemen

Regular outside stairways give better protection for factories, but are not recommended for buildings over six storeys high Wherever possible, the stairs should be placed against a blank wall High railings filled in with wire mesh give a feeling of security No encumbrances should be placed on the platforms or stairs, and entrances should not be through private offices or wash rooms In winter the steps and platforms should be kept free from snow and ice, for the escape may be needed any minute The lower portion of the smaller fire-escapes often consists of a ladder, but a counterweighted section of the stairs is better practice Straight and spiral chutes are sometimes used and are valuable for the rapid evacuation of a building Poles are in use in powder factories, but they are not adapted for general use Fire escapes are designed to carry a safe load of 100 lb per sq ft , with a factor of safety of six

The best fire escape is a "smoke-proof tower," where each exit from the occupied floor gives access to an open air vestibule, or outside balcony, which, in turn, leads to a portion of the building separated by a fire wall which serves to enclose a platform and fireproof stairs This tower cannot be obstructed by smoke from a fire on a lower floor As such stairways must be reached from each floor by means of an outside balcony they are not generally suitable for every-day use Such fire towers are in use in many office buildings The interior enclosed stairway, if surrounded by fire-resisting walls or partitions and the entrance to each floor being protected by a fire-door, affords an efficient fire-exit for every-day use They are not quite as safe as the smoke-proof tower, but a combination of both is excellent Both types are lighted at all times by a current from an independent circuit In summer hotels, rope fire escapes were formerly frequently used but this practice has largely disappeared

BIBLIOGRAPHY —National Fire Protective Association, *Building Exits Code* (Boston, 1927), National Safety Council, "Exits, Fire Alarms and Fire Drills." No 19 of *Safe Practice* See also publications of National Board of Fire Underwriters and of State department of labour and local departments, as mentioned above (A A H)

FIREFLY, a term popularly used for certain beetles (*Pyrophorus)* on account of their power of emitting light The insects belong to the family *Elateridae* (*see* COLEOPTERA) The genus *Pyrophorus* contains about 90 species, and is confined to America and the West Indies, ranging from the southern United States to Argentina and Chile Except for a few species in the New Hebrides, New Caledonia, and Fiji, the luminous *Elateridae* are unknown in the eastern hemisphere The light proceeds from a pair of conspicuous, smooth, ovoid spots on the pronotum and from an area beneath the base of the abdomen Beneath the cuticle of these regions are situated the luminous organs, consisting of layers of cells which may be regarded as a specialized portion of the fat-body Both the male and female fireflies emit light, as well as their larvae and eggs, the egg being luminous even while still in the ovary The inhabitants of tropical America sometimes keep fireflies in small cages for purposes of illumination, or make use of the insects for personal adornment Some cases have been observed of large numbers of fireflies flashing in unison The function of the flashing is probably to facilitate the meeting of the sexes The name "firefly" is often applied also to luminous beetles of the family *Lampyridae,* to which the glow-worm (*q v*) belongs

FIRE INSURANCE. Fire insurance is an economic service which distributes over a large part of the community fire waste which might cripple the immediate sufferers and provides an atmosphere of security against catastrophe By operating on a sufficient scale the insurer is able from the contributions of the many to make good the losses of the few and to the individual the ever-present risk of fire loss is replaced by a relatively insignificant payment

Fire insurance may be said to date from the Great Fire of London (1666). The widespread havoc wrought by this disaster created a demand for protection, and the remaining years of the 17th century saw the formation of several companies for this purpose. Without experience to guide them their operations were largely experimental, but the enterprise succeeded and at the beginning of the next century more companies were formed, some of which still exist

Abroad progress was not so rapid and it was not until the middle of the 18th century that fire insurance appeared in Germany and North America In France the first company formed was in 1816 and in Russia 1827.

Throughout the 18th century development in England was steady in spite of an increasingly heavy Government duty and further companies were formed soon after 1800 Sufficient experience had now been accumulated to put the business on a scientific footing and the offices began to pool their results to obtain a more accurate basis for the calculation of rates, this led, in 1858, to the formation of the Fire Offices Committee In London the fire extinguishing appliances of the companies were also combined into a brigade for common protection In 1865 the appliances were taken over by the municipality and formed the nucleus of the London Fire Brigade In 1869 the Government duty was reduced to a nominal amount In 1909 the Assurance Companies Act was passed The principles which govern fire insurance in Great Britain have not been laid down by statute but have developed from cases decided in the courts

Insurable Interest.—Any person wishing to insure property against fire must have an insurable interest in it, which has been defined somewhat as follows.—"That he shall stand in such lawful relation to it that he will be benefited by its preservation or prejudiced by its loss " The importance of this is readily apparent, as without it fire insurance might become a gamble with the consequent inducement to incendiarism and other evils. The interest must exist at the time of insuring and at the time of any claim.

The definition quoted above is wide enough to include more than simple ownership and among others the following may have an insurable interest —

Mortgagees (since their security may vanish or be impaired).

Tenants (either for life or who may, under their lease, be responsible for loss or damage)

Bailees or persons who have charge in any capacity of the goods of others (They may accept liability for loss under a contract or custom of a trade or negligence may be proved against them or their agents.)

Persons taking charge of goods for repairs, etc , have also a lien on them for work done and this they may also insure. Special classes of bailees are pawnbrokers (who are liable for fire loss under the Pawnbrokers Act, 1872), common carriers and innkeepers (whose respective liabilities at Common Law are limited by the Carriers Act of 1830 and the Innkeepers Act of 1863)

Trustees may insure the trust property. A bona fide interest, however slight, is insurable, but an expectation, however strong, is not

Good Faith.—Fire insurance is a contract of the utmost good faith (*uberrima fides*) as opposed to an ordinary contract where the parties, in the absence of actual fraud, must protect themselves.

The duty of good faith devolves equally on the insured and the insurer but operates mainly for the protection of the insurer, who must usually rely on the information given him A contract of fire insurance is void if the insured has failed to disclose any fact that would influence the insurer in his estimate of the risk involved This is called a "material fact" and it is no defence that the insured did not know it as such Whether a fact is material or not will depend on the circumstances of the case, but in practice the position is modified by the insurer submitting a list of questions to be answered and sometimes by his inspecting the property to be insured It is sufficient if the information given by the proposer is substantially correct, but any fact that appears on the policy as a "warranty" must be literally accurate, and the business of insurance, on the wide scale practised to-day, would be impossible were this provision not respected.

Indemnity.—Fire insurance is a contract of indemnity, which is to say that the insured, after a fire, shall be in such a position that he is neither better nor worse off than before (subject, of course, to adequate insurance) This principle is vital, as to allow a man to profit from the destruction of his property would be an incentive to arson and contrary to public interest

A logical extension of the principle of indemnity is that of Subrogation which is the right of an insurer who has paid an indemnity to stand in the place of the insured when there exists a right of action, arising out of a fire, against a third party In such a case the insured has the choice of claiming from the insurer or the offending third party, and the former is usually the easier course He must then allow the insurer, at his own expense, to prosecute the claim against the party responsible Should the insured for any reason, such as under insurance, fail to recover the full amount of the loss from the insurer, the latter may only benefit from the third party claim after the balance of the loss has been made up

BRITISH PRACTICE

Fire insurance in Great Britain is subject to remarkably little legislation and has been allowed to develop along its own lines

The Assurance Companies Act (1909) stipulates that a deposit of £20,000 must be made by companies commencing business after that date, but a deposit is not necessary for fire insurance if one has been made for any other class of business Accounts must be prepared in a specified form and submitted to the Board of Trade within a prescribed period The remainder of the act has but little bearing on fire insurance By the Metropolitan Fire Brigade Act (1865) companies insuring property in the City of London must contribute at the rate of £35 per £1,000,000 insured towards the expenses of the brigade

Organization.—Fire insurance in Great Britain is mainly conducted by large "composite" companies, that is, companies dealing with several classes of insurance They have usually a head office in London or a large provincial town and branch offices in the more important towns, each of which controls the agents in its area Agents are remunerated on commission and are not empowered to sign policies Beside the big composite companies there are a number of *mutual* companies (usually confining their operations to a special trade or business) and the members of Lloyds

The majority of British fire insurance companies are members of the Fire Offices Committee, an association formed and controlled by the member companies for the pooling of experience and fixing adequate rates for important classes of property Other branches of the committee's activities deal with standards for fire-resisting materials and construction, extinguishing appliances, commission and agency arrangements, etc The London Salvage Corps is maintained by the fire insurance companies and attends outbreaks with the special object of reducing loss to property by expert treatment of damaged merchandize, disposal of water, etc

The Policy.—Before accepting property for fire insurance the company usually requires the proposer to complete and sign a proposal form This form is a list of questions designed to elicit a full description of the property to be insured, the insurance record of the proposer, etc , and correct answers are of the utmost importance, as they form the basis of any subsequent contract If further information is required the company may send a surveyor to inspect the property

The policy is the formal expression of the contract, which it sets out in detail It bears a sixpenny stamp and is signed for the company by a director or other authorized representative On the face of it appear the perils insured against, which are usually fire (with certain exceptions, such as fire caused by war, earthquakes, etc), lightning, explosion of boilers used for domestic purposes, and explosion of gas used for lighting or heating or other household purposes in any building not forming part of a gas works

It is further declared that the company have the option of reinstating the damaged property instead of making a payment and that the contract is subject to the conditions printed on the back of the policy

A standard form of conditions is in use by most of the companies and the salient points of these may be summarized as follows:—

Misdescription Any material misdescription of the property insured or concealment of material fact invalidates the policy.

Increase of risk, transfer of interest or removal of the property. In these cases the insurer must be notified and his consent to the alteration endorsed on the policy, otherwise the policy is void from the date of the change

Excepted goods and perils Certain special classes of property, such as money, stamps, securities and documents, plans and models are not covered by a general description but must be specially mentioned Explosives and goods in trust must also be specified and damage by explosion (except as stated on the face of the policy) is not covered (This must not be confused with *fire* damage caused by explosion, which is covered)

Notice of claim and proof of loss Notice of loss must be given immediately and a detailed claim submitted within 30 days The insured must, if required, furnish reasonable proof of loss

Fraudulent claim invalidates the policy

Reinstatement Should the company elect to reinstate the insured must give them reasonable assistance in the form of plans, specifications, etc Reinstatement need not be exact but only reasonably sufficient and is limited to the sum insured

Right of entry The company are authorized to enter and take possession of premises which have been the scene of a fire likely to give rise to a claim and to take possession of and deal with insured goods in a reasonable manner In doing so they do not admit liability but obstruction by the insured invalidates the policy (This condition appears rather drastic but considerable discretion is used in its application Its intention is to allow the company to minimize the loss by prompt treatment of damaged goods and to investigate details of suspicious outbreaks before they can be obliterated)

Contribution If the property is insured by more than one company the liability under this policy is limited to the proportion which the insurance bears to the total, *i e* , the insured must claim on all his insurers instead of selecting one or more

Subrogation This condition sets out the rights of the company under this heading (*see* INDEMNITY)

Arbitration All differences arising out of this policy must be submitted to arbitration and an award made before action in the courts is taken (This tends to reduce expensive litigation)

FIRE INSURANCE IN THE UNITED STATES

The outstanding feature in fire insurance in the United States of America is the extent to which the business is Government controlled The control is vested in the 48 State Governments, and their regulations and requirements vary considerably Certain features are, however, common to most of them A company must make a deposit and obtain a licence in each State in which it wishes to operate Each State has its own form of policy conditions, usually based on the New York standard form but with minor differences An annual statement of operations, in considerable detail, must be filed by each company and a periodical audit is conducted by the State insurance commissioner

The supervision of the State extends to rates of premium and each company must file with the State Rating Office a schedule of rates covering every risk in the territory, which can only be altered by permission Such a schedule is necessarily complicated and its application to single risks involves considerable labour and expense, so that usually all the companies operating in the State combine to share it A system of rates is agreed upon and a rating and inspection bureau is set up, whose function it is to work out, on demand, the standard rate for any single risk, an inspection being made if necessary Several organizations are maintained by the fire insurance offices for the collection of technical and statistical data, the most important being the National Board of Fire Underwriters The organization of a fire insurance company differs somewhat from English practice The larger areas involved have resulted in wider powers being given to local agents who are allowed to sign policies Control of agency organization for a large territory is often vested in a general agent, instead of a branch, his remuneration being an over-riding commission on the business

done in his area Special agents are company officials who maintain contact between the agents and the head office The meticulous State control, the enormous areas covered and the wide range of climatic and occupational conditions make fire insurance in the United States a highly specialized service, calling for an unusual degree of technical efficiency

FEATURES OF INTEREST IN OTHER COUNTRIES

Fire insurance outside of Great Britain and the United States is conducted on similar principles but offers some interesting modifications in practice In many countries the business is regulated by sections of the commercial code and there is often a national form of policy conditions In one or two countries, notably Uruguay and Costa Rica, the Government undertakes fire insurance, while in others such as Brazil and Mexico, insurance on property in the country may not be effected abroad A characteristic feature in France and Belgium is the inclusion in the contract of various civil liabilities under the code of Napoleon Policies in these countries are usually issued for ten years, with annual payments of premium, and fines are imposed if the insurance is not continued for the full period

British fire insurance companies do a large business abroad and there are few countries where they are not represented In the Dominions and India branches are often established but normally business is conducted through agents, who have full powers to issue policies and in all respects act for their companies Supervision from the head office can only be exercised after considerable delay and the reliability of the agent is of the utmost importance both to his company and the prestige of British insurance In many countries a deposit must be made and income tax is payable on profit earned A considerable amount of insurance is effected in England on British undertakings abroad and there is a large market in London for foreign fire insurance of all kinds

Insurance Against Loss of Profits Following Fire.—This form of insurance is designed to give protection against reduction or extinction of profits and the continued payment of standing charges when a business is wholly or partly stopped after a fire Alternately an increase in the cost of running the business will be met providing it does not exceed the full amount of the profit and standing charges

A profits policy provides for a specified "period of indemnity" which is the maximum time after a fire during which the loss of profits, etc , will be made good This period, usually six to 12 months, is decided by the insured and should represent the maximum time necessary to restore the business to full activity

The sum insured should then be ascertained on the basis of the net profits and standing charges for a similar period up to the end of the last financial year, provision being made if necessary for an expansion of business The proposer must also specify the standing charges which he wishes to insure

The basis on which the amount of the loss is calculated is usually "turnover," that is, money received or due on goods sold or work done Each period for which a payment is to be made is compared with the corresponding period in the 12 months immediately before the fire (an adjustment, if necessary, being made for unusual circumstances, such as strikes, effecting the business during the time) and the shortage in turnover found The sum insured is then compared with the turnover for the named period up to the fire and a percentage obtained, which must not, however, exceed the proportion of profits and standing charges to turnover for the last complete financial year The lower of these two percentages of the shortage in turnover is the sum recoverable for the period Some modification of this method must, however, be adopted to obtain an equitable result for an expanding business. The policy conditions stipulate that the business property must be insured against fire and that liability under the fire policy must be admitted before a claim is paid on the profits policy No payment will be made if the business is liquidated or permanently discontinued after the fire The assessment of losses in the manner described sometimes involves considerable difficulty and it is usually arranged that the services of a qualified accountant be employed

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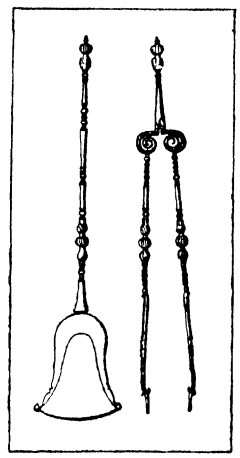


BY COURTESY OF THE METROPOLITAN MUSEUM, N Y CITY

ENGLISH FIREPLACE SHOVEL AND TONGS OF THE 19TH CENTURY

FIRE-IRONS, the implements for tending a fire Usually they consist of poker, tongs and shovel, and they are most frequently of iron, steel, or brass, or partly of one and partly of another The more elegant brass examples of the early part of the 19th century are much sought after for use with the brass fenders of that date They were sometimes hung from an ornamental brass stand. The fire-irons of our own times are smaller in size and lighter in make than those of the best period A typical example of the fireplace furnishings of the 18th and 19th centuries is shown in the accompanying illustration In addition to the above, the bellows, the various cooking utensils, the hearth broom, etc , as well as the containers and receptacles about the mantel, make an interesting collection of fireplace furnishings.

FIRELESS COOKER. A device, smaller than the brick oven (*q v*), for cooking by conserved heat, and consisting of a food container packed by means of insulating material in an air-tight compartment The food in the container is first brought to a good heat over a fire and then placed in the cooker, which is tightly closed Baking is done by placing the food in a wire basket, under and over which are placed "stones" heated over a fire The first fireless cookers used hay as the insulating material—the Norwegian haybox, and the homemade cookers in the United States generally have excelsior (wood-shavings) or crushed newspaper as packing. Manufactured fireless cookers, however, are now in general use; the insulating material is of various kinds, and these cookers are more sanitary than the homemade, as the lining—usually of aluminium—is nowhere penetrable by liquid or food Gas and electric ranges are now made with insulated ovens, which act as fireless cookers. Any fireless cooker conserves cold as well as heat, and may be used for "still frozen" dishes. The advantages of the fireless cooker are: (1) economy of fuel, (2) economy of time and labour, since the food needs no attention while cooking, (3) economy of utensils, (4) absence of heat and odours

FIRENZUOLA, AGNOLO (1493–*c.* 1545), Italian poet and littérateur, was born at Florence on Sept. 28, 1493 He studied law at Siena and afterwards at Perugia, where he became the associate of the notorious Pietro Aretino, and copied his licentious way of living, though he is stated to have worn the monastic habit for a time Firenzuola practised for some time as an advocate at Rome, and eventually settled at Prato as abbot of San Salvatore His writings are of great importance in the history of Italian literature because they are written in Tuscan just as the literary style began to emerge from popular speech He wrote *Discorsi degli animali,* imitations of Oriental and Aesopian fables; *Dialogo delle bellezze donne* (Eng trs 1892), *Ragionamenti amorosi,* a series of short tales in the manner of Boccaccio (Eng trs 1889), *Discacciamento delle nuove lettere,* a controversial piece against Trissino's proposal to introduce new letters into the Italian alphabet; a free version of the popular *Golden Ass* of Apuleius, and two comedies, *I Lucidi,* an imitation of the *Menaechmi* of Plautus, and *La Trinuzia,* which in some points resembles the *Calandria* of Cardinal Bibbiena. His poems are chiefly

satirical and burlesque

The best edition of his collected works is that by Bianchi (Florence, 1848).

FIRE PREVENTION AND EXTINCTION. Every fire involves a permanent and absolute loss of national capital, but the loss is usually so well distributed by the existing system of insurance that its incidence is not often seriously felt. Fire losses are in reality borne by the community, insurance offices being merely the medium by which the loss is distributed The enormous annual fire wastage passes unnoticed and it is only when a conflagration occurs by which the accumulation of years of wealth of property is swept away in a few hours that the imagination is moved

The following is a list of notable fires

GREAT BRITAIN AND IRELAND

Year A D

798 London, nearly destroyed
982 „ greater part of the city burned
1212 „ greater part of the city burned
1666 „ "The Great Fire," Sept 2nd
It began in a wooden house in Pudding lane, and burned for three days, consuming the buildings on 436 acres, 400 streets, lanes, etc, 13,200 houses, with St Paul's church, 86 parish churches, 6 chapels, the guild-hall, the royal exchange, the custom-house, many hospitals and libraries, 52 companies' halls, and a vast number of other stately edifices, together with three of the city gates, four stone bridges, and the prisons of Newgate, the Fleet, and the Poultry and Wood street Compters The fire swept from the Tower to Temple church, and from the north-east gate to Holborn bridge Six persons were killed The total loss of property was estimated at the time to be £10,730,500
1834. London, Houses of Parliament burned
1137 York, totally destroyed.
1292. Carlisle, destroyed
1544 Leith, burned
1700 Edinburgh, "The Great Fire"
1612. Cork, greater part burned and again in 1622
1614. Stratford-on-Avon, burned
1675. Northampton, almost totally destroyed
1694. Warwick, more than half burned, rebuilt by national contribution
1893 Liverpool, Canada dock, timber yard Loss, £1,000,000
1920 „ damage by Sinn Feiners Loss, £1,000,000
1921. London, Hackney Wick, timber yard Loss £500,000
1922 West Hartlepool, docks, timber storage ground Loss, £600,000
1923 London, Victoria dock, tobacco Loss, £1,000,000
1924 London, Butlers' wharf Loss, £350,000

FRANCE

59 Lyons (Lugdunum) burned to ashes Nero made an offer to rebuild the city
1118 Nantes, greater part of the city destroyed
1862. Marseilles, destructive fire
1871. Paris Suppression of the Commune (*q v*) Property destroyed, £32,000,000
1922. Paris, "Printemps" store Loss, £750,000

CENTRAL AND SOUTHERN EUROPE

64 Rome burned during 8 days Ten of the 14 wards of the city were destroyed
1106 Venice, greater part of the city was burned
1577 Venice, fire at the arsenal, greater part of the city ruined by an explosion
1379 Memel was in large part destroyed, and again in 1457, 1540 1678, 1854
1491 Dresden was destroyed
1758. Pirna was burned by Prussians. 260 houses destroyed.
1811 Forest fires in Tyrol destroyed 64 villages and hamlets
1842 Hamburg A fire raged for 100 hours May 5–7 During the fire the city was in a state of anarchy 4,219 buildings including 2,000 dwellings were destroyed One-fifth of the population was made homeless, and 100 persons lost their lives The total loss amounted to £7,000,000 After the fire, contributions of varying amounts from all Germany were received to assist in the rebuilding of the devastated areas of the city
1883 Vienna. Loss, £1,000,000
1901. Antwerp, L'Entrepôt Royal. Loss, £1,000,000
1910. Brussels, Brussels Exhibition Loss, £1,750,000
1922 Geneva, Northern railway station destroyed Loss, £400,000
1926 Bacau (Rumania). Loss, £1,000,000.

NORTHERN EUROPE

1624. Oslo, nearly destroyed, Christiania was built on the site.
1728. Copenhagen, nearly destroyed, 1,650 houses burned, 77 streets.
1794. Copenhagen, royal palace with contents burned.
1751. Stockholm, 1,000 houses destroyed
1790 Carlscrona, 1,087 houses, churches, warehouses, etc, destroyed.
1858 Christiania Loss estimated at £250,000
1865. Carlstadt (Sweden), everything burned except the bishop's residence, hospital and jail Ten lives lost.

RUSSIA AND SIBERIA

1862. St Petersburg, great fire. Loss, £1,000,000
1752 Moscow, 18,000 houses burned
1812. Moscow, the Russians fired the city on Sept 14 to drive out the army of Napoleon The fire continued five days Nine-tenths of the city was destroyed Number of houses burned 30,800 Loss, £30,000,000
1786 Tobolsk, nearly destroyed
1812 Riga, partly destroyed
1850 Cracow, large part of the town burned
1879 Irkutsk Loss, £4,500,000

TURKEY AND THE NEAR EAST

1750 Constantinople In Jan 10,000 houses burned, in April property destroyed estimated from £1,000,000 to £3,000,000. Later in the year 10,000 houses were destroyed
1756 Constantinople, 15,000 houses and 100 people destroyed During the years 1761, 1765 and 1767 great havoc was made by fire
1782. Constantinople, Aug 12 a fire burned three days 10,000 houses, 50 mosques and 100 corn mills destroyed, 100 lives lost In Feb 600 houses burned, in June 7,000 more
1784 Constantinople, Aug 5 a fire burned for 26 hours and destroyed 10,000 houses, most of which had been rebuilt since the fires of 1782 In the same year, March 13, a fire in the suburb of Pera destroyed two-thirds of that quarter Loss estimated at 2,000,000 florins
1870 Constantinople, June 5, the suburb of Pera, occupied by the foreign population and native Christians, was swept by a fire which destroyed over 7,000 buildings, many of them among the best in the city, including the residence of the foreign legations Loss estimated at nearly £5,000,000
1871–1926 Constantinople Fires of greater or less severity have continued to be of almost annual occurrence, particularly in Stamboul, where hundreds of acres have been swept clear time after time, large areas never being rebuilt and becoming permanently deserted Constructed mostly of timber, whole quarters are always at the mercy of a minor accident which elsewhere would be quenched at the outset.
1772. Smyrna, 3,000 dwellings burned 3,000 to 4,000 shops, etc, consumed Loss, £4,000,000
1923 Smyrna, conflagration attributed to the war between the Turkish and Greek armies. Loss, £20,000,000

INDIA, CHINA AND THE FAR EAST

1799 Manila, vast storehouses were burned
1803 Bombay, loss by fire of £600,000
1822 Canton (China), was nearly destroyed by fire
1866 Yokohama (Japan), two-thirds of the native town and one-sixth of the foreign settlement destroyed
1919 Yokohama Loss, £5,000,000
1923. Tokio and Yokohama As a result of an earthquake about seven-tenths of the city of Tokio and most of the city of Yokohama were destroyed by fire Loss estimated at £200,000,000.
1924. Canton, conflagration as a result of insurrection Loss, £4,000,000
1925 Kumagaya (Japan), central portion of town burned out Loss unknown
1927. Kanazawa (Japan) Loss, £400,000

AUSTRALIA AND NEW ZEALAND

1888 Brisbane Loss, £400,000
1897 Melbourne, Flinders lane Loss, £1,000,000
1901. Sydney, Anthony Hordern & Sons Loss, £400,000.
1909. Christchurch (New Zealand). Loss, £300,000
1921 Kirribilli, about 32,000 bales of wool burned Loss, £750,000.
1925 Melbourne, Lincoln Knitting Mills. Loss, £1,000,000
1926 Adelaide, Colonial Sugar Refining Company. Loss, £700,000.

SOUTH AFRICA

1902 Cape Town, City chambers Loss, £250,000.

UNITED STATES OF AMERICA

1911 Albany, State Capitol building. Loss, $5,500,000.
1908 Atlanta (Georgia) Loss, $11,500,000.
1917. „ „ Loss, $5,000,000.



BY COURTESY OF (1) THE DAILY MIRROR LONDON (2 5) A DREYFOUS AND CO , (3) THE DAILY SKETCH, LONDON, (7) THE NATIONAL FIRE PROTECTION ASSOCIATION, PHOTOGRAPHS, (4) INTERNATIONAL NEWSREEL, (6) TOPICAL PRESS AGENCY

MARINE AND LAND FIRE FIGHTING APPARATUS IN ACTION

1. Extinguishing a fire along the London waterfront Firemen on barge roof direct stream at high pressure on burning building at left
2. New York fire department apparatus in action Right, fire-fighting tower, adjustable to required height, with nozzle controlled from the motor truck on which it rests Left, life-saving ladder which is raised to the windows or roof of burning building. Six streams of water are being directed at the fire four from the street, one each from water tower and power ladder
3. Motor fire barge playing a stream of water on a timber fire, London. In background two streams from shore are extinguishing fire in a vessel near right bank of canal Fire boats protect harbours and ships
4. Aerial view of fire in the business district of Fall River, Massachusetts, 1928, loss $6,000,000
5. Fighting a fire from tracks of the elevated railway, New York city
6. Extinguishing a fire in a narrow London street Apparatus includes water tower (*see* fig 2) and scaling ladders attached to motor truck
7. Ravaged section of Salem, Massachusetts, in June 1914 This conflagration swept over two hundred and fifty acres, destroying 1600 buildings at a loss approximating $13,000,000

1922. Astoria (Oregon), business quarter destroyed. Loss, $15,000,000.
1904. Baltimore (Maryland), 80 city blocks involved. Loss, $50,000,000.
1922. Baltimore, grain elevators Loss, $5,000,000.
1923 Berkeley (California), forest fire which destroyed 600 buildings Loss, $12,500,000.
1760. Boston, a fire caused a loss estimated at $500,000
1872. Boston, Great Fire, Nov. 9-10 By this fire the richest quarter of Boston was destroyed. The fire commenced at the corner of Summer and Kingston streets. The area burned over was 65 acres 776 buildings, comprising the largest granite and brick warehouses of the city, filled with merchandise, were burned. The loss was about $75,000,000 Before the end of the year 1876 the burned district had been rebuilt more substantially than ever.
1889 Boston. Loss, $10,900,000.
1926. Brea (California), oil reservoirs Loss, $8,500,000
1871. Chicago. One of the greatest fires of modern times It began in a barn on the night of Oct 8 and raged until the 10th The area burned over was 2,124 acres, or 3¼ sq m. of the very heart of the city. 250 lives were lost, 98,500 persons were made homeless, and 17,430 buildings were consumed The buildings were one-third in number and one-half in value of the buildings of the city Before the end of 1875 the whole burned district had been rebuilt The loss was estimated at $195,000,000
1874 Chicago, new post office, etc Loss, $5,000,000
1922 Chicago, office premises Loss, $8,000,000
1900 Hoboken (New Jersey), dock fire Loss, $5,000,000
1901 Jacksonville (Florida) Loss, $10,000,000
1916 Jersey city, warehouses and steamers Loss, $20,000,000
1917 Kingsland (New Jersey), munition factory Loss, $12,000,000
1882 Leadville (Colorado) Loss, $10,000,000.
1918 Minnesota, forest fire—Colquet and 25 other towns involved. Loss, $25,000,000
1922 New Orleans, warehouses Loss, $5,000,000
1835 New York The great fire of New York began in Merchant street, Dec 16, and burned 530 buildings in the business part of the city 1,000 mercantile firms lost their places of business The area burned over was 52 acres The loss was $15,000,000
1845 New York A fire in the business part of the city, July 20, destroyed 300 buildings. The loss was $7,500,000 35 persons were killed
1916. Paris (Texas) Loss, $11,000,000
1850 Philadelphia 400 buildings burned July 9 30 lives lost Loss, $1,000,000
1845 Pittsburgh A large part of the city burned April 11 20 squares, 1,100 buildings destroyed Loss, $10,000,000
1866. Portland (Me) Great fire on July 4 One-half of the city was burned, 200 acres were ravaged, 50 buildings were blown up to stop the progress of the fire. Loss, $10,000,000 to $11,250,000
1851 San Francisco On May 4–5 a fire destroyed 2,500 buildings A number of lives lost More than three-fourths of the city destroyed Loss, upwards of $10,000,000.
1906 San Francisco This calamity, which will count among the worst ever experienced by the cities of America, started at a quarter past five in the morning, a shock of earthquake swaying buildings throughout the city Hotels, theatres, wholesale warehouses, factories and stores toppled over, caught fire, and were demolished The city hall, erected at a cost of $4,000,000, containing a free library of 85,000 volumes, was completely wrecked. The Grand Opera House, Majestic, Columbia and Orpheum theatres fell to pieces, each being consumed by the flames. The Palace hotel, an enormous building constructed to resist earthquakes, survived the earlier shocks, only to fall a prey to the conflagration The Valencia hotel fell over, burying 70 or 80 people beneath its ruins Total loss of life about 1,000. Area of fire seven square miles. Total damage, about $250,000,000
1926. San Luis Obispo (California) Union Oil Company's property. Loss, $8,750,000.
1849. St. Louis 23 steamboats at the wharves and the whole or part of 15 blocks of the city burned, May 17. Loss, $3,000,000
1851. St. Louis More than three-quarters of the city was burned, May 4 2,500 buildings. Loss, $11,000,000.
1851. St. Louis. 500 buildings burned. Loss, $3,000,000.
1862. Troy (New York), was nearly destroyed by fire.
1875. Virginia City (Nevada) Loss, $7,500,000
1851. Washington. Part of the Capitol and the whole of the Congressional library were burned

West Indies

1873. Havana (Cuba). Loss, £600,000.
1882. Kingston (Jamaica). Loss, £6,000,000.
1927. St. Lucia, 17 blocks of business premises burned at Port Castries. Loss, £300,000

Canada and Newfoundland

1825. New Brunswick A tract of 4,000,000 acres, more than 100 miles in length, was burned over, it included many towns 160 persons killed and 875 head of cattle. 590 buildings burned Towns of Newcastle, Chatham and Douglas destroyed Loss about $300,000
1923. New Brunswick, forest fires Loss, $20,000,000
1837. St John (New Brunswick) 115 houses burned, Jan. 13, and nearly all the business part of the city Loss, $5,000,000.
1877. St John (New Brunswick) This fire extended over an area of 600 acres Loss, $15,000,000
1892 St John's (Newfoundland) Loss, $15,000,000
1900 Ottawa (Hull) (Ontario) Loss, $7,500,000.
1904 Toronto (Ontario), general conflagration involving 120 mercantile buildings Loss, $7,500,000
1922 Ontario, forest fires Loss, $15,000,000

A conflagration is but the development of a small fire, and a study of the great fires in history shows that certain conditions, or a combination of circumstances, have on each occasion permitted the individual fire to spread A convulsion of nature, insurrection, or interference with the civic authorities, a strong wind, scarcity of water, lack of fire-fighting appliances, defective construction of buildings, all contribute to the disaster An earthquake may destroy the water supply and leave a city to the mercy of the flames This happened in the great conflagration in San Francisco in 1906, while defective construction fed the fires which wiped out Yokohama and large districts of Tokio following the terrible earthquake in September 1923

Where timber buildings predominate, high winds are dreaded by firemen almost as much as a scarcity of water, but, even in the absence of wind at the outbreak a conflagration creates its own wind as it gains in volume, which adds to the difficulty of confining the disaster

Discipline and good housekeeping in shop and factory reduce the danger of fire, and every appliance devised whereby fires are confined to the seat of outbreak is a step forward in the progress of fire protection

"Fire protection is a combination of fire prevention, fire combating and fire research"

Fire Prevention.—By the common law of England every householder was bound so to keep his fire as to prevent it from causing injury to others A statute was passed in the reign of Queen Anne which enacted that after a day named no action should be maintained against any person in whose house any fire should *accidentally* begin, and these provisions were re-enacted under the Fire Prevention (Metropolis) Act 1774, which is general in its application and not confined to the Metropolis The responsibility for damage by fire is particularly expressed in the law of France under the Code Napoleon This code, which took effect in 1804, was adopted in many lands conquered by Napoleon and it has also had great influence on the legislation of countries outside Europe, particularly in Central and South America. The following are the special provisions:—

Recours des Voisins (neighbours' risk) —The owner of property or goods which are burned may become responsible for any damage sustained by his neighbours through the burning. This is called "recourse by the neighbours" In order to obtain the benefit of this recourse the neighbour must prove that his loss was caused by the fault of him on whose premises the fire started. It should, perhaps, be especially emphasized that the "onus probandi" rests on the neighbour and not on the owner himself

Risque Locatif (tenants' risk).—A tenant is responsible for a fire unless he proves that it happened through unforeseen circumstances, by act of God, or through faulty construction of the premises, or that the fire had been communicated from a neighbouring house. If there are several tenants, all are responsible for the fire proportionately to the value of the part of the premises which they occupy except in the two following cases:

(*a*) where it is proved that the fire originated in the part occupied by one particular tenant, in which case he alone is held responsible

(*b*) where it is proved by some of the tenants that the fire did not originate in the part occupied by them, in which case they free themselves from liability, which falls on the remaining tenants.

This is called the "tenant risk" and in virtue of the law the owner of the house has a right to sue the tenant of the house for payment of the damage which his house has sustained, and in order that he may recover the law only requires proof of the *damage,* without any reference to the *cause*

Risque Locataires (landlords' risk) The law having put this burden on the tenant also contains some provisions for his protection.

The landlord of a building is responsible for the damage caused by this destruction when it happens in consequence of want of maintenance or by fault of its construction The landlord is bound to guarantee the tenant for all the defects in the building which would prevent the use of it, even although the landlord may not have known of them at the time of the lease being made If there result to the tenant any loss through these defects the landlord is bound to indemnify him This provides for the recourse of the tenant against the landlord

But quite apart from legal liability, it is the moral duty of every citizen to see that his building is erected or maintained in such a manner as to reduce the danger of fire and of every occupier to guard against such a danger and, in the event of an outbreak, to take every step possible to extinguish it and prevent it from spreading

Town planning acts with their provisions for minimum widths of streets, fire prevention and building acts and municipal by-laws based on the practical experience and research of builders, engineers and fire experts have done something to reduce fire waste Such enactments regulate the materials used in the construction, fix the dimensions and particularly the height of buildings, and control the conditions under which hazardous processes of manufacture may be carried on, but they are not of universal application From a fire prevention point of view, the general acts are inadequate in their provisions and in some cases they are permissive only and not compulsory

The origin of many fires may be traced to lack of attention to details of construction Defective chimneys, want of care in the construction of hearths, and insecure stoves and boilers are common causes of fire, while open wells, hoists and stairways with timber linings and partitions cause it to spread rapidly

Loss by fire can be reduced and the safety of a building favourably affected by the following

No timber or other combustible material should be used in the external walls or windows, large areas should be avoided, by properly constructed division walls and cut offs carried well through the roof to a height regulated by the nature of the building; Mansard roofs or high-pitched roofs are a fruitful source of extra risk, both on account of the excessive amount of wood used in their construction and the steep angle at which they are built; the use of wood should be reduced to a minimum, all vertical openings (hoists, shafts, stairways, etc) should be enclosed with fireproof materials—such openings are well known to be the most active factors in the rapid development of a fire, metal posts and girders must be insulated against severe heat, walls should not be lined with wood as the spread of a fire is accelerated by the air draughts which this mode of construction promotes and partitions should be made of non-inflammable materials; flues should only be used for the purpose for which they were designed and stoves and smoke pipes should be securely erected and free from contact with woodwork; windows should be of wired glass or protected by metal shutters where there is exposure to another building

Every care should be taken to see that the lighting system is properly installed Gas brackets should be securely fixed A gas burner has been known to fire a ceiling 28 inches from it and light fabrics are frequently fired at a greater distance Electricity, although apparently the safest method of lighting has from the mysterious and subtle nature of its working been found by experience to be dangerous when not properly installed Even under the most approved methods, there is always the danger of short circuits, leaks and contacts, and numerous fires are due to these causes Such installations should only be installed according to the rules of the institute of electrical engineers and they should be inspected at intervals by established and reputable firms of electrical engineers.

Carelessness.—But the majority of fires are due to carelessness a match carelessly thrown away or the cigarette end left in close proximity to combustible material The "no smoking" sign in factory or warehouse is often ignored and the guilty individual fails to realize how his act is a menace to life and property

In the report of the royal commission on fire brigades and fire prevention published in 1923, the commissioners say.

"We also observe that, in the report of the chief officer of the London fire brigade for 1921, 2,054 fires out of 5,281, or nearly 40% of the whole number, are attributed to carelessness The factor of carelessness, it is safe to say, can never be wholly eliminated, but in view of the very serious loss of life and property due to fires which could have been avoided by the exercise of reasonable care, we would urge the importance, in the national interest, of efforts being made in all possible directions to inculcate a more general and better instructed regard to the consequences of carelessness and negligence in matter of fire prevention In this country the annual average direct loss of property caused by fires, attributable to all causes, amounts to about £12,000,000 per annum If it be assumed, as we think it safe to do, that of this a considerable proportion could have been avoided by the exercise of a proper care, it will be seen that there is a wide field for further warning and instruction"

In Great Britain it is difficult to interest public opinion in the subject of fire prevention In the United States of America the tremendous annual fire wastage has roused the authorities to action, and in the press and in the school they are endeavouring to create a public sentiment against what has become a national disgrace.

The danger of arson is ever prevalent and bad trade is one of the chief factors which give rise to the temptation to turn an insurance policy into a source of gain It is remarkable how, in all parts of the world, the curve of falling business is consistently offset by the curve of rising fire losses From this it must not be taken that moral hazard is bad all over the world, but that bad trade reveals inherent weaknesses in a community which normal or good business leaves unsuspected When trade is bad, carelessness, to give it no worse name, increases, and the tendency is to pare down expenses in every direction until, in some cases, the safety line is passed—and the fire which results will not be at all unwelcome to the owner who finds himself in financial difficulties

On the outbreak of a fire it is, in the first instance, the duty of the person on whose property the fire takes place to take all reasonable steps to extinguish it or to prevent it from spreading The two most important aids to fire suppression are early discovery of the outbreak and an immediate application of the means of putting it out Automatic appliances are the best, as they fulfil both these requirements Failing these, every building should be provided with some other ready means for dealing with an outbreak A pail of water is the most primitive fire extinguisher known and is valuable if available during the first few minutes For a chimney fire a few pounds of salt thrown in at the top is probably the best handy extinguisher. A pail of sand, dry earth, salt or even sawdust is also useful in extinguishing fires in inflammable liquids If such fires are not too large they may often be smothered by covering with a rug or blanket, but water will spread such burning fluids rather than extinguish them

A garden hose stored where handy for quick attachment to a service pipe is an excellent fire protective appliance.

Fire Extinguishing Appliances.—Chemical extinguishers, of which there are many satisfactory types on the market, are most effective in the early stages of a fire Their cost is not excessive and their intelligent use is often more valuable than a fire brigade which must first be summoned and then perhaps travel half a mile or more to reach the scene

They should be placed on different floors and be easily accessible Such extinguishers should be recharged periodically because, if this is neglected, they may fail to act in an efficient manner when they are most needed

If petrol or other inflammable liquids not easily extinguished by water are stored in the building, a foam type of chemical extinguisher should be provided and this type should be installed in every garage

Automatic Fire Alarms.—There are several useful automatic fire alarms on the market, their purpose being to ring an alarm gong fixed outside the building or to convey a danger signal to a fire brigade station

These alarms are brought into action whenever the temperature in the room is raised to a point well above what may be regarded as the highest natural temperature to be expected The apparatus works by means of thermostats fixed at frequent and suitable points in the upper parts of all rooms, staircases, etc , where the heat rising from a small fire would concentrate causing expansion and electrical contact Within a few seconds of an outbreak, alarm bells are set ringing and the position of the fire shown on an indicator board.

Automatic Sprinkler Installations.—The most effective system for automatic fire extinction and warning of fire is the sprinkler installation, which originated in America and was introduced into Great Britain about the year 1880 The invention has been successfully applied to almost every kind of building and has undoubtedly averted much destruction of property and considerably reduced the cost of fire insurance where it is installed; insurance companies always being willing to grant substantial premium rebates where efficient installations have been fitted

The protected building is provided with a system of piping containing water under pressure and fixed near the ceiling of every room and into this piping the sprinkler heads are inserted at such intervals that every part of the area will be commanded and drenched These sprinkler heads are constructed to open at a temperature of 155° F (=68° C) and when so open discharge water directly on to the fire within a few seconds of its outbreak To the installation is attached an automatic alarm bell fitted outside the building which operates simultaneously with the sprinkler head, thus giving the alarm in the very act of operating The existence of fire is notified and extinguishing operations commence, therefore, practically instantaneously, and as efficient means are provided for turning off the water supply as soon as the fire is extinguished, the water damage is a minimum

The safety secured by such an equipment fully justifies the expenditure, while the premium rebates referred to above are usually sufficiently substantial to repay the cost of initial installation in the course of a very few years

The fixtures can be so placed as not to interfere with decorations or be otherwise obtrusive, as can be seen when visiting most of the larger departmental stores in England or abroad In the majority of cases it takes a practised eye to detect the presence of sprinkler heads

An extension of the sprinkler system is used when a building is subject to the risk of fire spreading from adjacent premises In such cases external drenchers are fitted to the exposed windows and provide a curtain of water, effectually preventing entry of sparks or flame and keeping air temperature below ignition point of any inflammable goods near the openings (E M M)

A special automatic fire extinguisher system, in use since 1917, is a method by which a sprinkler system (and also an alarm system, if desired) is actuated when a fire causes a predetermined rate of rise of temperature This has been approved by underwriters as preaction and deluge sprinkler system Rate of rise principle utilized by Lowe Release to close fire doors (X)

Fire Escapes.—The protection of life from fire is quite as important as the saving of property Certain building acts provide for the maintenance of means of escape in case of fire by the owner of the building Such regulations apply more particularly in connection with public buildings and the like Under the Factory and Workshop Act in Britain similar provision is made for factories where any considerable numbers are employed. Each individual tenant or occupier of a building has, however, a duty to perform in making provision for the escape of those employed by him or under his care

Fire brigades in large towns are usually provided with fire escape ladders, but these may not reach the scene in time to save the lives which may be in danger In many buildings escape by a single stairway is sometimes impossible and at least one additional means of safe exit should be provided, particularly for the upper storeys The logical and natural solution of the problem is the introduction of an additional stairway, but, should this be impossible, a "chute" or rope ladder may save a tragedy.

The "chute" fire escape consists of a strong canvas bag fitted on a wrought iron frame specially made for each window The rope ladder type is attached to a hook fixed in the wall and provides a ready means of quickly leaving a burning building Another fire escape consists of a canvas seat, the lowering rope being attached to a hook and break-rod The individual is strapped in securely and by this means persons can be lowered and hoisted as easily and readily as by an ordinary rope over a pulley (*See* also FIRE ESCAPE)

Fire Brigades.—The gradual evolution of the modern fire brigade with its appliances in the United Kingdom from the primitive "*Couvre Feu*" used in the reign of King Alfred would be a very long story That on the Continent and other countries would be a very much longer one, for it is certain that organized brigades existed in civilized countries many centuries B C , and they existed at a much later period with the Romans With the decay of wealth they gradually fell into disuse, and one would suppose on the principle that there was not much to protect, and in the exact opposite direction they have risen again to their high state of efficiency proportionately to the wealth that they have to protect

The organized fire brigades of most countries, therefore, follow very much in the same direction as that of Great Britain, proportionately to the wealth of such other countries. There is an international exchange of ideas, and very little distinction in the principles of all fire brigades in civilized countries A short history, therefore, of the fire brigade of the greatest city in the world, namely London, will suffice to indicate the general trend of things in relation to fire brigades all over the world so far as the large towns are concerned

The establishment of fire insurance companies in Great Britain naturally brought about the question of minimizing loss by fire by preventing its spread, and as the public authorities had been diffident in this connection the offices set about establishing brigades of their own Probably the first insurance office to possess fire engines was the "Royal Exchange," and an announcement was made by them in 1722 that they had provided several engines with firemen and watermen and their implements for extinguishing fires They were followed by many other offices who placed fire marks on the buildings they insured, and no doubt each particular brigade gave special attention to any premises insured in their own company In 1833 the London fire engine establishment was formed by a combination of offices, this consisted of 76 officers and men who took upon themselves practically the fire protection of London A year later the Houses of Parliament were destroyed by fire, and in 1861 the great fire in Tooley street occurred, when damage estimated at £1,200,000 was done. In the following year a parliamentary committee was formed "to enquire into the existing state of legislation, and of any existing arrangements for the protection of life and property against fires in the metropolis" The result of this enquiry was to show a total inadequacy of appliances should a great fire occur in the metropolis, and in 1865 the fire offices handed over to the metropolitan board of works the fire protection of London which for over 30 years they had carried on at their own cost.

Various statutes were subsequently passed by parliament, not only in relation to London but to other towns throughout the country, by which parliament recognized as a public duty the maintenance of a proper equipment to local authorities, the cost of which is to be borne from the rates The Metropolitan Fire Brigade Act of 1865 provided for the handing over of the fire stations, engines and property of the London fire engine establishment, together with the force of firemen, to the board of works, and this formed the nucleus of the new metropolitan fire brigade The insurance companies being relieved from the burden of the onus of extinguishing fire, not only handed over their freehold and leasehold properties and valuable appliances worth many thousands of pounds, but consented to an arrangement whereby they became liable to contribute to the upkeep of the brigade.

Every insurance company that insures the risk of fire on any property within the metropolitan area must pay annually the sum of £35 per million on the gross amount insured At the date of the passing of this act contributions made by the insurance offices thereunder amounted to a sum of £10,000 per annum, and some idea may be gleaned of the wealth in the metropolitan area from the fact that this contribution had in 1925 amounted to no less a sum than £73,159 per annum, being at the same rate of £35 per million on sums assured of no less than £2,090,280,942 This latter sum is double the amount of the gross sum assured in 1904

The staff of the London fire brigade at Dec 31, 1926, consisted of one chief officer, two divisional officers, two assistant divisional officers, one senior superintendent, seven superintendents, nine district officers, 74 station officers, 195 sub-officers, 1,620 firemen and probationary firemen and 13 pilots

The stations and chief appliances were as follows 62 land fire stations, three floating river stations, one river repairing depot, 87 petrol motor fire engines, 69 petrol motor escape vans, five electrically driven motor escape vans, two electrically driven motor ladders, six petrol-electric motor ladders, three petrol motor ladders, one petrol-electric emergency tender, one petrol-electric foam tender, one petrol emergency tender, five petrol motor tenders, 62 miles of hose (including first-aid hose), two steam fire floats, three motor fire floats, four store barges, 114 fire escapes, one long fire ladder, 55 smoke helmets, three cellar pipes, 399 hook ladders, 293 hook belts, 1,654 street fire-alarm posts, 108 telephone lines from fire stations to other fire stations, etc , 43 telephone lines between telephone exchanges and fire stations, 362 telephone lines to public and other buildings

During 1926 there were 4,919 fires, of which 21, or 43%, were serious, 4,111, or 83·57%, were slight, and 787, or 16·0%, were chimney fires, 7,433 calls were received, of which 2,514 were false alarms Of the false alarms 728 were malicious, 1,080 were due to defective electric circuits, one to automatic alarm and 705 to other causes The number of serious and slight fires compared with 1925 shows a decrease of 43 The probable causes were· Structural defects, 228, lighting (electricity), 259, lighting (gas), 104, lighting (oil), 222, heating, 696, in the exercise of business or industry, 1,121, carelessness, 1,376, suspicious, 36; unknown, 90

No less than 265 officers and men were injured in the execution of their duty

The quantity of water used for extinguishing fires was approximately 14,202,442 gallons or 63,403 tons

In brigades in the United Kingdom apart from London, conditions and regulations vary very considerably, and the report of the royal commission on fire brigades and fire prevention, 1923, states that "the existing provisions on the subject, apart from any question of their being inadequate or ill-adapted to modern conditions, are somewhat fragmentary and scattered over a number of statutes, and it would be a great advantage if, when the law is amended to meet its present defects, the opportunity were taken at the same time to consolidate the whole of the provisions relating to equipment, maintenance and operations of fire brigades in one comprehensive measure "

They find that the maintenance of the fire service in all cases where authorized is a matter for the discretion of the authorities, and the extent to which that discretion has been exercised varies considerably

Apparently there are some 1,500 fire brigades of every description in England and Wales

Considerable improvement in the standard of fire protection generally has taken place throughout Great Britain in the last two decades, and broadly speaking the large cities and boroughs are fairly well protected as regards their own fire risks In the smaller boroughs and urban districts the conditions vary very widely Some of these authorities have built up an efficient organization, whilst others seem to have regarded the subject of fire protection as of minor importance In the rural areas generally, probably owing to defective legislation, the fire protection provided is on the whole quite inadequate for the needs of the districts.

The report goes on to say: "In the industrial areas round Birmingham and in that portion of England which lies between Preston, Lancaster and Liverpool on the west, and Hull and Grimsby on the east there are many towns well provided with appliances, and probably, if all the fire brigade resources of this area were available for service independently of the local authorities areas to which, for the most part, their operations are confined, reasonably adequate provision would be made for most areas in this part of the country On the other hand, taking a general view of the counties of Lincoln, Norfolk, Suffolk and Essex, we find a section of the country in which, if we apply the test of motor appliances, there are conspicuous blanks or deficiencies in equipment "

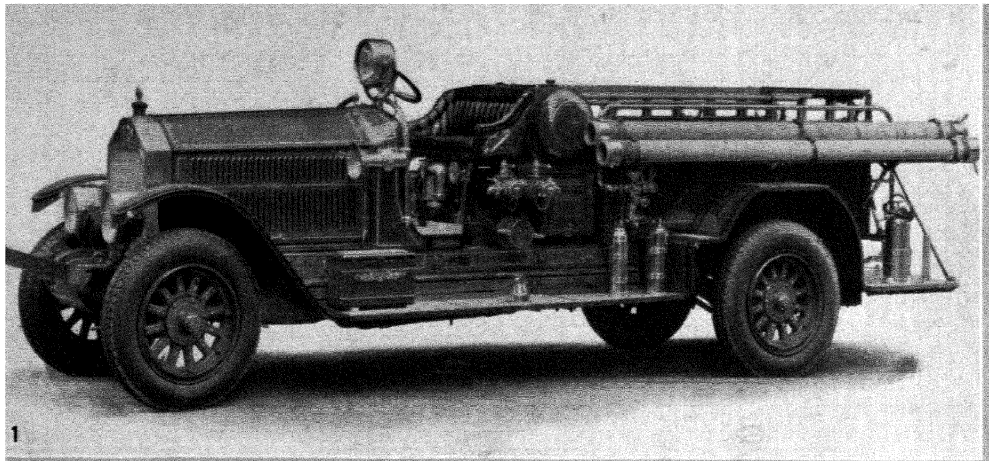
With regard to the protection of Wales a rather pessimistic view is taken The county of Glamorgan, which embraces more than one-half of the population of the principality, appears to be the only bright spot To quote the report "In fact, in the whole of the principality, outside Glamorgan, only five motor pumps are mentioned in the returns "

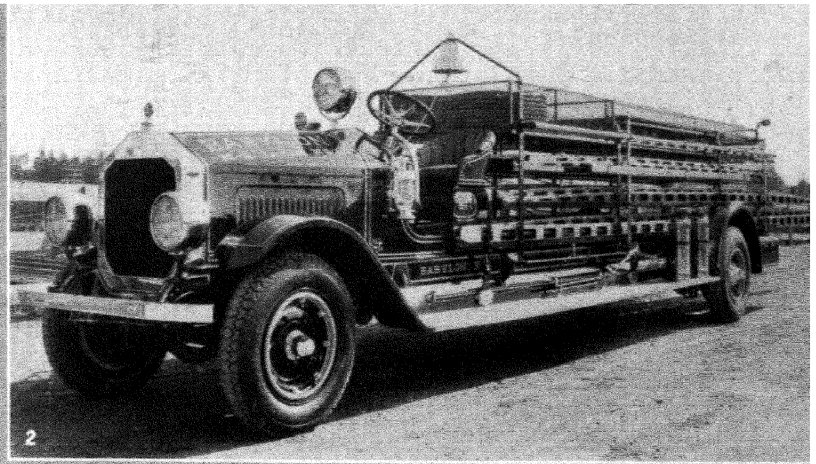
So far as Scotland is concerned, "it would appear that the largest centres of population, such as Glasgow, Edinburgh, Dundee and Aberdeen are well protected against their own fire risks and that some effort has been made to assist in the protection of neighbouring areas The counties of Lanark and Renfrew, which are in a special position as being protected by brigades organized on a county basis, may also be considered as favourably situated as regards their arrangements for fire defence There are in other parts of Scotland some few burghs with brigades of moderate size, mostly on a retained footing, equipped with mobile appliances, which adequately serve for the protection of the township itself and afford to a greater or less degree a measure of protection for the surrounding districts, though in Scotland, as in England, the possibilities of co-operation for this purpose do not appear to have received the attention the matter deserves Perhaps, however, the most striking feature of the distribution of fire brigades under the present organization is the wide extent of the areas without any mobile fire equipment of any kind This, however, is in a large measure unavoidable, on account of the nature of the country, the difficulties of communication, scanty water supplies and the very limited number of centres where there is sufficient aggregate fire risk to justify the maintenance of any costly fire brigade organization In the Highlands, particularly, there are great stretches of mountain, moor and forest, where destructive fires from time to time occur, but against which it seems impracticable to devise any systematic protection on an economic basis

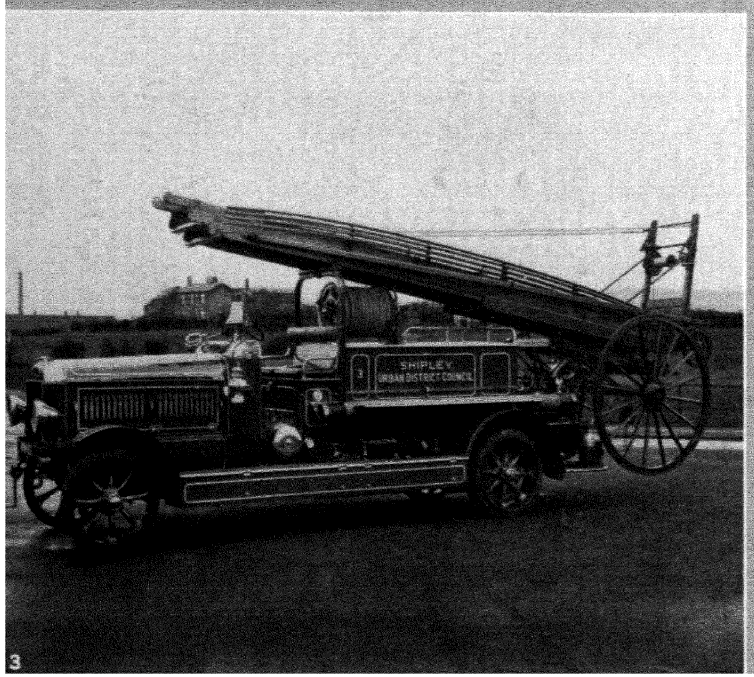
The advent of the motor pump has done much to facilitate the solution of the problem of efficient protection of the country as a whole, in particular it has enabled an efficient brigade in any given centre to protect a much wider area than was formerly possible with horse appliances, and has introduced entirely new possibilities in the direction of the rapid concentration of brigades in the event of any fire brigade finding itself unable to cope with an outbreak, or series of outbreaks, within its district A brigade thus equipped can now provide normal protection over a radius up to, say, eight miles, including for example, a town of moderate size and surrounding rural area, more effectively than a brigade equipped only with horse appliances could have protected an area of half that radius

There is no doubt that public opinion is moving in the direction of compulsory fire protection, to be controlled by the borough and urban and rural councils, with the co-ordinate authority of the county councils The effect of this would be that the cost of the up-keep of brigades would in all cases be made payable out of the rates, so that insured and uninsured persons would be able to contribute alike, not only for the protection from fire, but against loss of life.

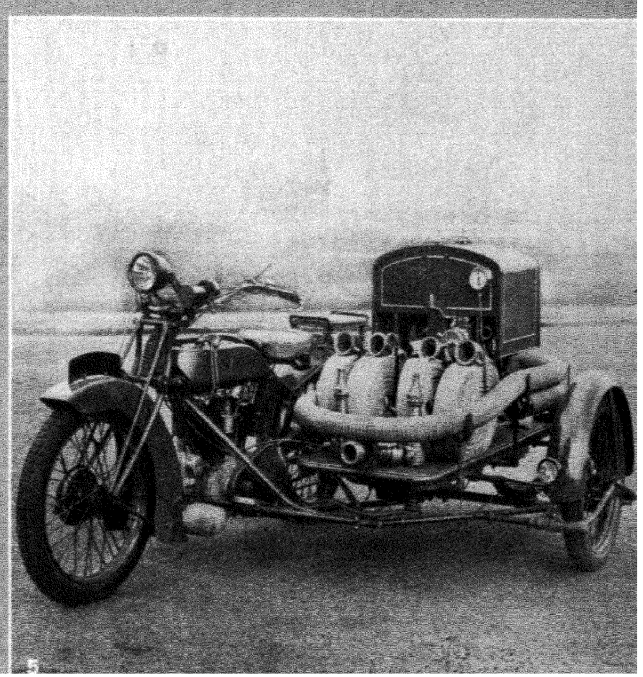
The following is a table of local authorities in Great Britain showing their statutory powers for the provision and maintenance of fire brigades, and indicating recovery of charges for services rendered at fires:—











MODERN APPARATUS FOR FIRE CONTROL AND PROTECTION

1 Triple combination pumping, chemical and hose motor car equipped with 40 gal chemical tank and 1,200 ft hose. The rotary gear fire pump, shown beneath seat of car is capable of delivering 1,000 gals of chemical per minute at 120 lb pumping pressure, hose connections at right

2 Service truck carrying extension ladders and chemical tanks Hose in basket behind seat is used for extinguishing localized blazes with chemical stored in tanks beneath the ladders

3 English type ladder and hose car serving same purpose as those in figs 1 and 2. The large wheels raised from ground at end of the car are used in moving the detachable ladder to any location

4 Fireman wearing gas mask for protection against smoke

5 Portable fire pump mounted on motorcycle chassis, for extinguishing small fires. Apparatus includes chemical tank and pump in rear of car, with four lengths of hose

Local authority	Statutory powers	Right to charge in district	Statutory liability for outside district
England and Wales			
Boroughs (a few)	Special	Special	Special
Boroughs, Urban District Councils	Town Police Clauses Act 1847 Secs 32 and 33	None	Owners of lands and buildings
County Councils	None	None	
Rural District Councils	Lighting and Watching Act 1833, Public Health Act 1875, Sec 276 Public Health Acts Amendment Act 1907	None	*See* note at foot
Parish Councils	Local Government Act 1894, Lighting and Watching Act 1833, Poor Law Amendment Act 1807	None	Parish Councils have no statutory powers to charge for services *See* remarks Contracting Brigades
Parish Councils	Parish Fire Engines Act 1889, Public Health Acts Amendment Act 1907	None	
Scotland			
Burghs (a few)	Special	Special	Special
Burghs, towns and villages with population of 700 and upwards	Burgh Police (Scotland) Act 1892	None	Owner and Occupier
County Councils	Local Government (Scotland) Act 1908	None	
Ireland			
Boroughs (a few)	Special	Special	Special
Boroughs and Towns	Town Improvement (Ireland) Act 1854	None	Owner of premises

Note—A rural district council can obtain, on application to the local government board, the powers of an urban authority under section 276 of the Public Health Act In such a case their powers for fire protection would be under the Town Police Clauses Act

The fire brigade committee of 1900 suggested that insurance companies should pay for brigade services rendered at fires but the commissioners in the report of 1923 came to the conclusion that "there appears to be no more reason for the fire department of an insurance company to subsidize fire brigades, than for the marine department to subsidize lighthouses, or the burglary department to subsidize the police"

In 1923 a scale of charges for Great Britain was drawn up by the National Fire Brigades Association which is now being adopted increasingly by brigades—it is in the next column

1—The scale of charges given covers wear, tear, fuel, cleaning and all other normal expenses incidental to the use of appliances or sustenance allowances for men and all other out-of-pocket expenses

2—The turn-out fee in every case is only chargeable if the appliance or appliances and their crews actually leave the station If the call should be cancelled before the departure of the appliance, the charge will be the same as if for standing by at a fire for a period of one hour or less The fees for stand-by at station or turn-out shall be limited to 1 officer and 12 men The turning-out fee includes the time occupied in travelling to and from the fire

3.—The brigade shall be entitled to the mileage charge for motor appliances on the total distance covered to and from the fire or other place to which the appliance is ordered The charge shall be additional to the charge for turning out, and in the case of a steamer or manual the charge shall be the actual cost of horse hire

4—No charge is payable for the appliances if such are provided and maintained by the Local authority when attending fires in the local area, and in certain instances, where a local authority enters into an agreement with a neighbouring authority which may contribute a subsidy or grant in aid towards the maintenance of the fire brigade, the charges to be made shall be in accordance with the terms of the joint agreement.

Water Supply at Fires.—The supply of water for extinguishing fires has, of course, a very large bearing on the efficiency or otherwise of the brigade So far as England, Wales and Ireland are concerned urban authorities are compelled by statute to secure an adequate supply of water for extinguishing or preventing the spread of fire, and shall cause fire plugs and all necessary works, machinery and assistance for securing a sufficient supply of water in the case of fire

Water companies cannot be compelled to increase the pressure other than that necessary for supplying water for domestic purposes, but where the fire service and water supply are both in the hands of the local authorities the pressure of water is usually adjusted to the circumstances of the case

Without the consent of the owner a fire brigade cannot take water from a stream, pond or other private source for the purpose of extinguishing a fire, and the owner can either withhold his consent or make a charge for the water supplied

In rural districts the water supply is a great difficulty, and so far nothing has been done to make it compulsory for an adequate supply of water to be maintained for extinguishing fires

The march of modern science, while assisting the fire fighter by the provision of more efficient apparatus, is ever creating new problems The motor car, which enables the brigade to reach the fire in a fraction of the time taken by horse-drawn vehicles, has, by its very existence, made petrol a commodity of almost universal use whose storage and manipulation have created special problems which still await satisfactory solution It is a platitude

Appliances	For turning out	For run out and back per mile	For appliances or men at fire (standing by) Per hour or part thereof	For engine while pumping Per hour or part thereof
	£ s. d.	£ s d.	£ s. d.	£ s d.
Motor pump				
300 gals per minute or over	2 10 0	7 6	1 1 0	2 2 0
Under 300 gals per minute	1 10 0	5 0	1 1 0	1 10 0
Fire float				
1,500 gals per minute or over	5 0 0	10 0	2 2 0	3 3 0
Under 1,500 gals per minute	3 0 0	7 6	1 1 0	2 2 0
Motor-hauled steamer or petrol-driven steamer or trailer pump including hauling same	2 0 0	4 0	1 1 0	1 10 0
Steamer on railway truck	1 10 0	4 0	15 0	1 1 0
*Horsed steamer	1 5 0		15 0	1 1 0
*Manual	15 0		5 0	10 0
Motor escape	1 5 0	4 0	1 1 0	
Motor lorry	1 0 0	2 6	5 0	
Motor tender	1 5 0	4 0	1 1 0	
Motor car not included above	7 6	1 6	3 6	
			Up to first 5 hours	After 5 hours
Officer in charge of brigade at fire	10 0		per hr. 10/	per hr 7/6
Fireman (each) in motor or steamer brigades	5 0		3/6	2/6
Fireman manual and other brigades	5 0		2/6	1/6

Any additional assistance or damage to apparatus by or arising from the direct result of the fire- the actual cost

*Horse-hire additional

to say that "plus ça change, plus c'est la même chose," but it seems to be certain that whatever advances the future may hold, the risk of fire will be always with us. (*See* also SALVAGE CORPS.)

(E M M)

NORTH AMERICA

The excessive fire waste of the United States and Canada is generally credited to the lavish supplies of building lumber available in North America, which have made it appear more economical to use wood in building construction even at the cost of frequent rebuilding than to use fire-resisting materials. The uncertain stability of town sites in the pioneering days was also a factor in retarding the erection of more permanent buildings. During the past quarter century, however, the cities of the United States and Canada have been largely rebuilt with a liberal use of fire-resisting materials and considerable thought to their protection, both within and without, against fire attack. During this period there has also been general municipal improvement in certain items, such as water supplies for fire extinguishment, the housing of fire alarm headquarters in isolated fire-resisting buildings and the standardization of hose coupling and hydrant fittings to permit outside fire departments to operate effectively when called upon for help in fighting conflagrations.

North American Fire Losses.—For the past decade the United States has shown a steady increase in fire losses with the exception of the year 1919. The total and per capita fire losses for this period are as follows:

Fire Losses in the United States

(Reports of National Board of Fire Underwriters)

Year	Property Loss	Per Capita	Year	Property Loss	Per Capita
1917	$289,535,050	$2 79	1922	$506,541,001	$4 63
1918	353,878,876	3 36	1923	535,372,782	4 84
1919	320,540,309	2 99	1924	549,062,124	4 90
1920	447,886,677	4 23	1925	559,418,184	4 85
1921	495,406,012	4 47	1926	560,548,024	4 79

Canada shows in contrast to the United States a decline in fire waste for the last four years of this decade as follows:

Fire Losses in Canada

(Reports of Dominion Fire Prevention Association)

Year	Property Loss	Per Capita	Year	Property Loss	Per Capita
1917	$26,298,400	$3 32	1922	$54,390,000	$6 11
1918	33,870,000	4 12	1923	48,282,000	5 36
1919	25,216,300	3 00	1924	45,906,500	4 99
1920	28,081,200	3 27	1925	40,729,724	4 35
1921	45,015,900	5 22	1926	38,395,096	4 15

Fire loss statistics, while not conclusive if taken for a single year are, however, valuable for comparison if taken over several years. A bad record for a single year may be the result of a single large fire. A continued high-burning record over several years is, however, an almost certain indication of the true conditions. Additional statistics compiled by the Dominion Fire Prevention Association are interesting as indicating the actual cost of fires to the Dominion by inclusion of other factors.

The following table shows the total cost of fire increased about 2½%, despite the 30% decrease in the actual fire losses. While the fire losses have been decreasing, the savings on this account have been balanced by the progressive increase in insurance premiums in excess of losses paid, and by somewhat increased expenditures for public and private fire protection.

Methods of Fire Prevention and Protection.—The principal causes of fires in buildings and stock are defective chimneys, accumulations of rubbish, carelessness in handling fire and flammable materials, defects in electric, gas and oil installations, and exposure, that is, ignition from fires in adjacent property. The use of wooden shingles on roofs and, in mercantile districts, wooden window trim in otherwise fire-resisting buildings facilitates the spread of flames.

In order to educate the public in fire safety its prevention is taught in the schools of many of the States and Canadian provinces, and a "fire prevention week" has been instituted in the United States and Canada to call attention to this form of preventable waste. There is no doubt that the American mind is better informed on this subject than ever before. The fact that the aggregate of fire losses has steadily increased during recent years of active public education is due partly to increased property values, but principally to the fact that the popular and engineering knowledge now available has not yet been generally applied to the problem. While the impoverishing effect of the fire waste is national, every fire is itself local, and until in every community the impulse and the machinery exist to attack local fire hazards, public education is only of potential value.

National Fire Protection Association.—Among the agencies promoting fire prevention in North America is the National Fire Protection Association, which formulates regulations governing special hazards such as gases, oils and electricity and for the required performance of automatic sprinklers, fire doors, extinguishers and other fire appliances. Since 1924 this association has maintained a field-engineering service to study conditions in cities having especially unfavourable fire-loss records and to create and stimulate local agencies for their improvement. Over one hundred cities have been visited since the inauguration of this project and improvements initiated. In a number of these cities marked reductions in fire losses have been shown in official reports as the direct result of an awakened civic consciousness, as is shown in the accompanying table:

City	Per capita fire loss			
	1923	1924	1925	1926
	$	$	$	$
Grand Rapids, Mich	8 03	6 90	4 98	1 90
Norfolk, Va	4 91	3 04	2 52	1 79
Concord, N H	11 14	4 91	4 90	4 17
Utica, N Y.	5 01	3 00	3 01	1 94
Indianapolis, Ind	4 23	3 47	3 38	1 82
Springfield, Mass	6 14	2 82	2 76	3 10
Providence, R I	7 21	4 79	2 28	3 78
Memphis, Tenn	6 04	4 13	5 44	3 36
St. Paul, Minn	5 13	4 99	4 16	3 10
Detroit, Mich	3 99	3 17	3 16	2 73
Average for United States	4 81	4 90	4 85	4 79

The U S Chamber of Commerce acting through a fire waste council conducts an annual contest among local chambers for superiority in fire prevention activities, awarding prizes therefor. The National Board of Fire Underwriters maintains laboratories for the testing of devices and materials falling within the scope of its services, and makes city surveys covering water supplies, fire department equipment and other similar items.

In most cities desirability of action along the following lines

Canadian Fire Losses

	1922	1923	1924	1925	1926
	$	$	$	$	$
Value of property destroyed	54,390,688	48,282,354	45,906,531	40,729,724	38,395,096
Insurance premiums in excess of losses paid	16,529,907	20,472,375	21,590,380	27,246,031	30,884,862
Maintenance cost of municipal fire protection	23,247,950	24,170,420	24,659,204	25,103,246	25,970,803
Installation and maintenance cost of private fire protection	8,431,050	8,873,200	8,994,500	9,374,815	9,846,725
Total	102,599,595	101,798,349	101,150,615	102,453,816	105,097,486

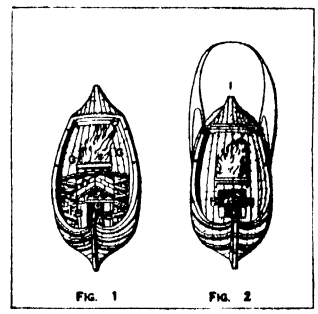
has been indicated: (*a*) competent inspection by the fire department; (*b*) a more general use of fire-resisting roof coverings, protected window and door openings and automatic sprinklers; (*c*) adequate ordinances governing the storage and use of explosives and inflammable substances, (*d*) adequate means for the conviction of incendiaries; (*e*) public education in the use of fire-alarms and use of first-aid extinguishing devices. (F H WE)

FIREPROOFING. This term is applied to methods of making normally combustible materials fireproof as far as may be, but in practice the most that can be done with them is to subdue or retard inflammability The subject is one of great importance, especially in connection with the construction of theatres and other buildings where large numbers of people are collected together and where special illumination is required The nature of or disposition of materials used in theatres has become the subject of public regulation in many countries and it is usual to provide that no combustible scenery shall be employed unless it has been treated with flame-retarding solutions The London County Council regulations, for instance, provide that in theatres materials such as wood, canvas, textiles, etc , must be rendered non-inflammable by impregnating them with solutions, and names the following as having been found suitable —(1) for scenery and coarse fabrics a solution of 1 lb. of phosphate of ammonia and 2 lb chloride of ammonia (sal ammoniac) in 1½ gal water; (2) for delicate fabrics and cotton wool. 10 oz borax and 8 oz boracic acid in 1 gal of water Stage woodwork must be thoroughly impregnated with phosphate of ammonia It is, however, quite impossible to make wood-work really fireproof and the council therefore insist, as far as possible, upon the use of incombustible materials such as asbestos

Such precautions have only been taken in recent times, the London County Council's regulation requiring stage wood-work to be rendered non-inflammable having first come into force in 1901 In 1923 special conditions were laid down with regard to the use of plywood, and at the present time (1928) the construction of theatres is governed by a long series of safety regulations which experience has shown to be necessary Floors, tiers and roofs, fittings in dressing rooms, all floors and linings to scene stores, workshops, etc , have to be formed of fire-resisting material, soft wood or other inflammable wall linings, decorations, partitions, screens or barriers must not be used, and cavities must not be left behind any linings or decorations. No fire-place may be used and no heating system involving use of a naked flame may be installed in any portion of the auditorium or stage, the stage and cellars below must not be congested with scenery and properties, and the regulations do not stop at fireproofing There are stringent rules as to hydrants, fire appliances, fire drills, light installations, etc., and it is required that a competent fireman with practical experience in fire prevention and extinction should be on the staff. (A. F H)

United States.—The building code recommended by the National Board of Fire Underwriters is commonly used as a basis in the preparation of building ordinances of many cities A solution which has been widely recognized for the fireproofing of fabrics, is one made of three parts of ammonium phosphate, two parts of ammonium chlorate and one part of ammonium sulphate and about 40 parts of water. Lumber impregnated with fire-retardant chemicals is termed "fireproof wood " The industry had its beginning in the United States in 1895 The principal market for fireproof wood has been in New York city Its building code prohibits the use of wood for floors and interior trim for buildings in excess of 150 ft in height unless fireproofed in accordance with rules prescribed by the superintendent The treatment of the wood is commonly done by impregnating it with fire-retardant chemicals in closed cylinders under artificial pressure (*See* TIMBER PRESERVATION) (C. T B)

FIRESHIP, a vessel laden with combustibles, floated down on an enemy's ships to set them on fire Fireships were used in antiquity and in middle ages The highly successful employment of one by the defenders of Antwerp when besieged by the prince of Parma in 1585 brought them into prominent notice, and they were used to drive the Armada from its anchorage at Gravelines in 1588 They continued to be used, sometimes with great effect, as late as the first quarter of the 19th century Thus in 1809 fireships designed by Lord Cochrane (earl of Dundonald) were employed against the French ships at anchor in the Basque Roads, and in the War of Greek Independence the successes of the Greek fireships against the Ottoman navy, and the consequent demoralization of the ill-disciplined Turkish crews, largely contributed to secure for the insurgents the command of the sea In general, however, it was found that fireships hampered the movements of a fleet, were easily sunk by an enemy's fire, or towed aside by his boats, while a premature explosion was frequently fatal to the men who had to place them in position They were made by building "a fire chamber" between the decks from the forecastle to a bulkhead constructed abaft the mainmast. This space was filled with resin, pitch, tallow and tar, together with gunpowder in iron vessels The gunpowder and combustibles were connected by trains of powder, and by bundles of brushwood called "bavins " When a fireship was to be used, a body of picked men steered her down on the enemy, and when close enough set her alight, and escaped in a boat which was towed astern As the service was peculiarly dangerous a reward of £100, or in lieu of it a gold chain with a medal to be worn as a mark of honour, was granted in the British navy to the successful captain of a fireship A rank of *capitaine de brûlot* existed in the French navy of Louis XIV., and was next to the full captain—or *capitaine de vaisseau*



BY COURTESY OF A C H MACPHERSON
THE CONSTRUCTION OF FIRESHIPS
Fig 1 —Fireship containing space 1 ft x 5 ft. filled with gunpowder
Fig 2 —The same ship equipped with a large sail which, fastened below the middle of the ship, when inflated by the current pulled the craft along

FIRE-WALKING, a religious ceremony common to many races, and widespread in all ages It still survives in Bulgaria, Trinidad, Fiji Islands, Tahiti and India, the Straits Settlements, Mauritius, and Japan Indian settlers in Natal performed the rite in Pietermaritzburg in the autumn of 1927, in fulfilment of a vow The details of its ritual and its objects vary in different lands, but the essential feature of the rite, the passing of priests, fakirs, and devotees barefoot over heated stones or smouldering ashes, is always the same Fire-walking was usually associated with the spring festivals and was believed to ensure a bountiful harvest.

The interesting part of fire-walking is the alleged immunity of the performers from burns On this point authorities and eye-witnesses differ greatly In the Natal case no injuries were seen The bulk of the reports certainly leave an impression that there is something still to be explained in the escape of the performers from shocking injuries The preparations, perhaps physical in part, produce a feeling of intense nature associated with the phenomenon of possession. In some way anaesthesia is induced

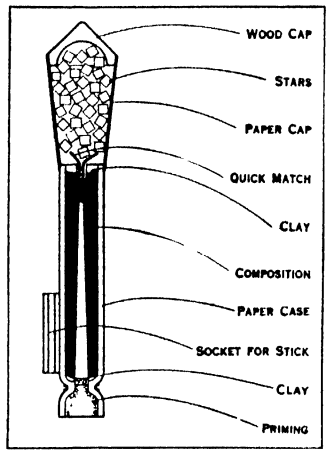
FIRE-WEED, the name given in the United States to various plants which spring up quickly and profusely in burnt-over areas in forest regions, especially to the great willow-herb (*q.v.*), which almost throughout the continent is exceedingly abundant after forest fires. Its rapid spread is effected by the blowing about of its small downy-tufted seeds by the wind

FIREWORKS. The history of pyrotechny may be said to have begun when a prehistoric firemaker first mixed saltpetre from his cooking with charcoal from his fire, to use as tinder In subsequent ages other ingredients were added as pyrotechnic mixtures developed, and eventually, when the principle of the gun was evolved by Berthold Schwartz in the 13th century, the pyrotechnic mixture most suitable for his needs was named gunpowder

About the date of the introduction of artillery the military fireworker came into existence, whose business was to provide pyrotechnic engines of war, to which duty was subsequently added the provision of spectacular fireworks in celebration of victory or peace. During the 17th and subsequent centuries most occasions

of national rejoicing were celebrated by displays of fireworks; these were generally provided by the military fireworkers.

In earlier displays a limited number of pyrotechnic effects were eked out with others of a scenic or theatrical nature and the use of merely inflammable substances, in the form of torches and flares, which cannot, strictly speaking, be classed as pyrotechnics It was not until the early part of the 18th century that displays of any considerable pyrotechnic merit were produced.



CROSS SECTION OF A SKYROCKET
The solid black portion represents the composition, which, when ignited, produces a recoil that starts the rocket on its spectacular upward flight

During the 17th century there were two schools of pyrotechnic thought, that of northern Europe, with Nuremberg as its centre and Clarmer as its leader, and the Italian school The former, although producing probably better results from a purely pyrotechnic point of view, could not vie with the southern school in artistic elaboration and the scenic accessories introduced In the earlier part of the 18th century the brothers Ruggieri, Bolognese firework artists, attracted no doubt by the lavish expenditure of Louis XV, visited Paris and produced displays at Versailles and elsewhere on a hitherto unprecedented scale One of the Ruggieris, in conjunction with one Santi, carried out the display in London which celebrated the Peace of Aix-la-Chapelle in 1749, an event which appears to have been celebrated in most of the capitals of western Europe During the remainder of the century firework displays increased both in number and scale, in addition to official exhibitions celebrating national events, the popular places of resort, the tea gardens and bowling greens began to add fireworks to their list of attractions Those in the London resorts, Vauxhall, Ranelagh and Marylebone gardens, are still remembered.

As yet no real advance had been made in pyrotechnic mixtures; no colour had been introduced, the art still relied on saltpetre, which had been its foundation (The importance attached to this salt by early writers, such as Biringoccio, is reflected in the long and elaborate dissertation they give on its preparation and refinement) Although some pyrotechnists claimed to produce various tints, there is no doubt De Frezier, in his two books published in 1707 and 1747, came nearest to the truth in describing the flame produced by his compositions as "reddish," "greenish," etc

In the first quarter of the 19th century, however, the era of modern pyrotechny began with the introduction into the art of potassium chlorate, which had been discovered by Berthollet in 1788 Genuine colour effects were now possible and a field of research was opened which, even yet, has not fully been explored The subsequent introduction of the two metals, magnesium (about 1865) and aluminium (in 1894) also gave a brilliancy never before attained, and added greatly to the variety of effects produced.

The famous displays at the Crystal Palace, near London, instituted in 1865, have been one of the greatest factors in the development of the modern display. Old-fashioned limitations and scenic accessories have been discarded and a scale and method, both in aerial and ground fireworks, have been reached which had never previously been attained, eclipsing any official effort, with the exception of the "National Peace display" in Hyde park in 1919, which was probably the greatest display produced up till that time.

Firework Compositions.—The phenomenon we know as fire is produced by the combination of certain substances, which have a tendency so to do, with oxygen in so rapid a manner as to produce intense heat. When such inflammable substances are set on fire in the ordinary way they obtain the necessary oxygen from the air. The art of the pyrotechnist is in the production of mixtures of ingredients which do not depend on atmospheric oxygen for their combustion. These mixtures are known as pyrotechnic compositions Every pyrotechnic composition contains at least one ingredient having a supply of oxygen with which it readily parts and others which receive and combine with that oxygen and in so doing produce the effect for which the particular composition has been designed The most used oxygen-supplying ingredients are potassium nitrate (saltpetre) and potassium chlorate. Compositions may be divided into two classes, those designed to produce force and sparks and those producing flame, either white or coloured. There are also certain compositions which are designed to produce special effects such as noise, a dense cloud of smoke for military or other purposes, or a whistling sound as that produced by picrate of potash in the familiar whistling rocket

Force and Spark Compositions.—The basis of these compositions is a mixture of potassium nitrate, sulphur and charcoal, ground to a fairly fine powder. In some cases "mealed," or finely ground gunpowder is added to give extra fierceness when required, as for sky rockets, turning cases (used to turn wheel devices) and similar fireworks Additional ingredients are included to produce sparks of various forms. The nitrate of lead and barium are also used sometimes in these compositions; also aluminium in an extremely finely divided dust to produce a very brilliant white fire

Flame Compositions.—In this class are included those compositions which give colour to pyrotechny, the "stars" in rockets, shells and roman candles, the decorations on revolving and stationary devices and set pieces and the outlines in pictorial, or (as they are technically called) lancework pieces *White Fire,* which varies in its composition according to the purpose for which it is used, generally consists of the ingredients potassium nitrate, salts of antimony, or arsenic and sulphur With the exception of white fire and a few others of little importance, such as the portfire and blue light used at sea, flame compositions rely for their combustion and their colour on the presence of potassium chlorate, or occasionally perchlorate *Coloured Fires* The combustion of potassium chlorate, or perchlorate, in combination with a metal salt has the effect of turning the metal present into a gaseous state and produces a coloured flame The following are the salts used — Red, the nitrate, carbonate or sulphate of strontium, green, the nitrate, chlorate or carbonate of barium, yellow, oxalate or carbonate of sodium, and for blue the carbonate, sulphide or arsenite of copper in combination with calomel, mercurous chloride. It is interesting that, although copper burnt in a blowpipe flame produces a green colour, in pyrotechny copper salts are only used to produce blue, as in the presence of chlorine, which must be present with potassium chlorate, the flame is blue, this is deepened by the addition of calomel, which produces still further chlorine

Magnesium powder is used with colour compositions where extra brilliancy is aimed at Most colour compositions have, in addition, some burnable substance which serves to increase the mass and effect without detracting from the brightness or colour The most commonly used are shellac, sterine, sugar of milk, pitch and paraffin Sometimes the burnable substance serves also as an agglutinant, as shellac and spirit, starch paste, gum water, linseed oil or dextrine

Firework Cases.—The composition of each firework is enclosed in a "case" formed of paper, pasted and rolled round a cylindrical former, they are either "dry rolled," that is, only the edge of the paper is pasted, or "wet rolled" in which case the paste covers the whole surface of the paper. Generally the case used for force and spark compositions remains intact during the burning of the firework and that enclosing a flame composition is consumed as the firework burns

Compositions are introduced into the cases in two ways, either by "charging" (when a succession of small quantities of composition are poured in from a scoop of suitable size, each scoopful being consolidated by a number of blows delivered by a mallet on a cylindrical wooden tool exactly fitting the bore of the case, known as a "drift"), or by "filling" with a small copper funnel having a spout of suitable size to fit the case and provided with metal rod of somewhat less diameter than the inside of the spout, having a knob for the hand at the upper end. Composition is placed in the funnel, the spout inserted in the case and a rapid up

FIREWORKS



BY COURTESY OF [illegible] BROCK AND CO PHOTOGRAPHS (5) JAMES S PRESS AGENCY (6) TOPICAL PRESS AGENCY

MANUFACTURE AND DISPLAY OF FIREWORKS

1 Firework display near the Serpentine in Hyde Park, London

2 A display at the Crystal Palace, London The displays at the Crystal Palace, which have become world famous, were instituted in 1865 They have been an important factor in the development of modern fireworks

3 View of a modern firework celebration In which rockets, shells and Roman candles are used The rocket, as shown in this display, is the most elaborately constructed of any firework It is driven into the air by the recoil produced by a jet of fire thrown out from its burning composition

4 'Fountains of Fire,' a Roman candle display at the Crystal Palace

5 A set piece which, when ignited, gives the impression of a racing motor car These devices consist of frameworks of wood on which are secured firework units connected by a quickmatch

6 Making maroons The paper or pasteboard shells are first wound with strong twine, they are then filled with the explosive and the fuse is attached In this work manual methods have never been satisfactorily replaced by mechanical means

and down movement of the rod alternately releases a small quantity of composition and consolidates it in the case. This method is only used with cases of small diameter.

It may be as well to mention here that these manual methods have never been superseded satisfactorily by mechanical means, although many experiments have been made In pyrotechny, as in some other crafts, hand work maintains its superiority.

Rockets.—The rocket, which is the most elaborate in construction of any single firework, also requires the highest degree of technical skill in manufacture The sky-rocket (its most familiar form) is driven into the air by the recoil produced from a jet of fire thrown out by its burning composition In order to make this jet as strong as possible the case, which is wet rolled, is choked, or constricted, by pulling in with a cord near one end before drying In addition, the composition is so charged into the case that a conical cavity is left from the choke or vent, nearly to the top of the case, by so doing, when the rocket is ignited, as large an area as possible of composition is burning at the moment when it is required to give the rocket its initial impetus This cavity is produced by charging the rocket on a tapering spindle and using drifts of varying lengths, pierced with a hole of suitable size Above the composition in the body of the rocket is a diaphragm of compressed clay, bored with a central hole through which the fire from the top, or "heading," of the composition is communicated to the "garniture" contained in a case, usually in the form of a truncated cone, which forms an extension of the body of the rocket and is known as the "cap" The garniture consists of "stars" of colour, or other suitable composition, either contained in short cylindrical cases, when they are known as "pinched stars" from their method of manufacture, or compressed into cylindrical form without a case, when they are known as "pumped stars" *Gerbs and Fountains* are charged without a central cavity, the choke generally being formed by a clay diaphragm The compositions are similar to those of the rocket, with the addition of spark-producing ingredients The composition for gerbs (formerly known as Chinese fire) contains iron filings; for fountains (formerly known as brilliant fire) steel filings, and for flower pots, lampblack, producing remarkable sparks, which, from their form, gave to this composition the name of spur fire *Devices and Set Pieces* consist of frameworks of wood on which are secured firework units which are connected together by quickmatch and take the form of wheels moving in the vertical or horizontal plane; stationary, or, as they are called, fixed devices, of various geometrical forms, waterfalls, tree pieces and "lancework" pieces The outline of a lancework piece is constructed in cane on a wood lattice framework and the design picked out in appropriate colouring with lances (small cases of colour, or "bright" composition, about the size of a cigarette), by this means almost any pictorial design can be carried out At the Crystal Palace, London, where this type of set piece has been most highly developed, pictures have been produced over 600ft long and 50ft high, carried out entirely in lines of fire

See Vannuccio Biringoccio, *Pirotechnia* (Venice, 1540 and 1553), De Frezier, *Traité des Feux d'Artifice* (1707 and 1747), Ruggieri, *Elémens de Pyrotechnie* (1801 and 1821), Chertier, *Nouvelles recherches sur les feux d'artifice* (1843 and 1854), Websky, *Lustfeuerwerkkunst* (Leipzig, 1878), Kentish, *The Pyrotechnist's Treasury* (1878), Denisse, *Traité pratique complet des feux d'artifice* (1882), A St H Brock, *Pyrotechnics, The History and Art of Pyrotechny* (containing a complete bibliography) (1922). (A. St H. B)

FIRM, originally dense or close, hence steady, unchanging or fixed. From a late Latin use of *firmare,* to confirm by signature, *firma* occurs in many Romanic languages for a signature, and the English "firm" was thus used till the 18th century From a transferred use came the meaning of a business house. In the Partnership Act, 1890, persons who have entered into partnership with one another are called collectively a firm, and the name under which their business is carried on is called the firm name.

FIRMAMENT, the sky, the heavens In the Vulgate the word *firmamentum,* which means in classical Latin a strengthening or support (*firmare,* to make firm or strong) was used as the equivalent of στερέωμα (στερεόειν, to make firm or solid) in the Septuagint, which translates the Heb. *rāqīya'*. The Hebrew probably signifies literally "expanse," and is thus used of the expanse or vault of the sky, the verb from which it is derived meaning "to beat out" In Syriac the verb means "to make firm," and is the direct source of the Gr στερέωμα and the Lat. *firmamentum.* In ancient astronomy the firmament was the eighth sphere containing the fixed stars surrounding the seven spheres of the planets

FIRMAN, an edict of an oriental sovereign, used specially to designate decrees, grants, passports, etc, issued by the sultan of Turkey and signed by one of his ministers. (The word is an adaptation of the Per *fermān,* a mandate or patent.) A decree bearing the sultan's sign-manual and drawn up with special formalities was termed a *hatti-sherif,* Arabic words meaning a "line, writing or command," and "lofty, noble" A written decree of an Ottoman sultan was termed an *irade,* the word being taken from the Arab *irādā,* will, volition, order

FIRMICUS, MATERNUS JULIUS, a Latin writer, who lived in the reign of Constantine His *De erroribus profanarum religionum,* written *c* 346 and still extant, attacks the false objects of worship among the Oriental cults and discusses a number of formulae and rites connected with the mysteries Its declamatory tone contrasts with his eight books on astronomy (Libri VIII. *Matheseos*) written *c* 336

The best editions of the *De Erroribus* are those by C. Bursian (Leipzig, 1856), by C Halm, in his *Minucius Felix* (*Corp. Scr Eccl. Lat* II) (Vienna, 1867), and by K Zeigler (1907) The astronomical work was first printed at Venice in 1499, the last edition being by W Kroll and F Skutsch (Leipzig, 1897–1913) *See* G Ebert, *Gesch. der chr lat Litt* (ed 1889), O Bardenhewer, *Patrologie* (ed 1901).

FIRMINY, a town of central France in the department of Loire, 8 m S W of St Etienne by rail Pop (1926) 18,192 It has important coal mines known since the 14th century and extensive manufactures of iron and steel goods

FIRST AID TO THE INJURED. First aid refers to measures to be taken immediately after an accident not with any idea of cure but in order to prevent death by prompt action, or in less dangerous cases to prevent further harm being done, and put the victim in the best possible condition for later and more extensive treatment

General Directions for Giving First Aid.—The American Red Cross gives the following brief summary of first aid instruction for cases of emergency. (1) one who understands first aid, or the person in authority, should take charge, (2) keep cool; (3) keep the crowd away, (4) send for a doctor or ambulance; (5) meantime do what you can to help the victim. Unless special attention is needed, proceed to put the patient in a safe and comfortable position, which usually is lying down with head low, although, if the face is flushed, the head should be raised on a pillow To avoid the possibility of choking never attempt to give water or stimulants to an unconscious person In all serious cases, be sure to keep the patient lying down Other important points to remember are. loosen tight clothing, avoid giving whiskey or brandy, but cold water may be given slowly if the patient can swallow, rip or cut clothing away to examine injury. Avoid disturbing the patient, especially in the case of fracture, when the patient should not be moved before the bone is set, unless absolutely necessary; keep the patient warm, especially in case of severe shock

Treatment for Shock.—Shock is present to some degree in all serious injuries, being greatly increased by severe bleeding and pain Shock may be recognized by pallor of the face, clammy skin, rapid weak pulse and shallow breathing of the patient. After calling a doctor the first essential of treatment is to keep the patient warm with blankets, hot water bottles, hot drinks, etc. (being careful to avoid scalds and burns). If the patient is conscious, about a cupful of hot strong coffee, hot milk, or hot water, containing a half teaspoonful of aromatic spirits of ammonia, may be used as a stimulant, and repeated in a half hour if necessary, remembering always never to pour liquid down the throat of an unconscious person Place the patient on the back with the head low and the clothing loosened around the neck, chest and abdomen. In case of the presence of some more severe symptom than shock, such as dangerous bleeding, that should of course receive

first attention.

Fractures.—Among the most common severe injuries are fractures, *i e*, broken bones While a fracture is not always easily recognizable, symptoms are a localized pain, tenderness, limitation of motion or deformity of a part, a grating sound from the broken ends, or an inequality of the bone which sometimes may be felt through the skin A fracture must be set as soon as possible, of course, but because of the danger of further injury to tissues from the sharp edges of the broken bones, treatment before the doctor's arrival best consists chiefly in very careful handling of the injured part, and the application of a simple splint to hold the part in position Splints may be improvised from narrow boards, heavy pasteboard, umbrellas, canes, and the like, but must be padded when applied next to the skin, must not be bound so tightly as to restrict circulation and should be long enough to prevent movement at the nearest joints In any case of fracture, the patient should not be moved before the broken bone is firmly held in a splint Although it may be possible and even necessary, if a physician cannot be reached, for the first aider to set the bones, the danger of cutting tissues in exerting sufficient force to bring the ends together is so great that whenever possible it is much better to await a physician's treatment If in addition to the break there is a wound leading down to the broken bone, or a broken end of bone protruding through the skin, a compound fracture has occurred, and must first be treated as a wound (*see* "Wounds"). In such cases always treat the patient for shock, and be sure to let nothing touch the abrasion but a surgically clean dressing In fractures of collar bone, ribs, jaw, nose, etc, bandaging obviously must be substituted for splints If fracture of the skull is possible, the patient should be placed lying down with head slightly raised, and treated for shock until the doctor's arrival No stimulant should be given unless the patient is very weak, in which case spirits of ammonia may be used

Dislocations.—Dislocations of jaw and of the fingers, except that of the second joint of the thumb, which must be treated by a doctor, may be successfully reduced by the first aider, if care is exercised In case a finger is dislocated, simply grasp firmly on the hand side, and pull the end straight out away from the hand The bone will usually slip easily into place In case of a dislocation of the jaw, the thumbs of the person giving first aid should be well wrapped, placed on the back teeth with fingers grasping the outside of the lower jaw Pressure exerted first down and then backward will usually cause the jaw to snap into place, so that the one giving the treatment should be careful to avoid having his thumbs caught by the snap A dislocated shoulder should always have a physician's attention within four hours

Sprains.—Sprains, which are injuries of the joints, causing severe pain and swelling, should be treated immediately and a doctor called. Absolute rest is necessary The joint should be elevated and when possible heat or cold applied, heat being preferred in case of severe shock or if the patient is a child or an older person This treatment should continue for from 24 to 28 hours

Wounds.—Wounds, including all injuries in which the skin is pierced or broken, always involve the danger of pus germs entering from outside the body As there is no danger from pus germs in the air or within the body, they must come from the surface of the body or from foreign objects For this reason a wound which bleeds freely lessens danger by carrying out foreign germs in the wound The vast majority of wounds wherein bleeding is comparatively slight chiefly require that the surrounding clothing be removed and that nothing be allowed to touch the wound If a physician is called, a course which should be adopted in the case of every deep wound, nothing further should be done Exposure to air is much safer than application of anything not surgically clean It is desirable to make an ordinary wound bleed sufficiently to cleanse itself. Adhesive plaster should never be used to cover directly anything more than a trivial scrape Nearly all wounds require a dressing, which must be surgically clean and should cover the wound thoroughly If foreign bodies, such as splinters, remain in the wound, they should be gently pulled out In removing a splinter from under a nail, put a knife blade against the splinter, holding it on the blade with the thumb nail after scraping the injured nail thin and cutting out a small V-shaped piece in order to reach the splinter Small splinters may be removed with a needle All care should be taken to avoid infection, using preferably iodine to sterilize (*See* "How and When to Use Iodine") Also it should be remembered that the majority of serious cases of blood poisoning result from quite small cuts or scratches

Haemorrhages or Severe Bleeding.—In the event of severe bleeding (haemorrhage) the patient should be kept lying down with head low, be kept warm, have plenty of good air to breathe and be supplied with stimulant only if absolutely necessary The bleeding can usually be stopped by the application of a small pad of gauze and a tight bandage over the wound or by pressure with the thumbs on the main blood vessel between the wound and the heart, the limb being at the same time elevated—if it be a limb which is involved The points for pressure are just in front of the ear (for bleeding from the temples), the inner side of the arm below the arm pit, about where the inner seam of a shirt comes, the inner side of the thigh near the groin, and in the hollow back of the knee In arterial bleeding a tourniquet should be used This may be improvised from a handkerchief in which a small stone or other hard object has been wrapped The tourniquet should at all times be applied between the wound and the heart, with the hard object above the wound, and twisted with a stick until the constriction shuts off the bleeding Care should be taken always to loosen the tourniquet every 15 minutes in order to avoid death of the part resulting from complete loss of circulation When the tourniquet is loosened watch closely to see if bleeding has stopped If so it may remain loosened Bleeding from veins can usually be checked by applying a compress tightly to the wound, but lacking a surgically clean compress and if severe bleeding is present, pressure must be made with the fingers, at the risk of infecting the wound Any tight bands preventing the return flow of blood to the heart should be loosened immediately, and if the injury is in a limb it should be elevated A doctor should always be called If there is internal haemorrhage the patient should lie down, with his head lower than his body, a doctor should be sent for, and in the meantime ice or a cloth wrung out in very cold water should be applied to the point from which the haemorrhage seems to come The proper application of bandages requires special study (*see* BANDAGE)

Nose Bleeding.—In severe nose bleeding, the patient should be placed in a chair, with his head hanging backward and any tight clothing round his neck loosened, and cold applied to the back of his neck by means of a key, or cloth wrung out in cold water A roll of paper placed under the upper lip, between it and the gums may help If bleeding continues, salt and water, one teaspoonful to a cup of water, should be snuffed up the nose If bleeding still continues call a doctor, plug the nostril with a small piece of cotton or gauze, and pinch the soft part of the nose below the bone Do not give stimulants

Burns.—For slight burns, common baking soda, dry or dissolved as a paste, may be applied, or picric acid gauze, wet with water or 2% solution of picric acid, or plain gauze may be used Extensive burns on which blisters have formed should be covered, preferably with gauze or a clean soft cloth saturated with baking soda solution, carbolized vaseline, unguentine or, in an emergency, any clean pure oil Deep burns require prompt attention from a physician A solution of Epsom salts makes a soothing dressing If burns come from acids they should be washed off under a water tap as quickly as possible and then washed with lime-water, or baking soda and water or even soap-suds may be employed For burns from carbolic acid, alcohol should be applied freely Burns from alkalies should be washed, in the same way as acid burns, and neutralized by vinegar, lemon juice or hard cider. In all burns use care in removing clothing, cutting away around the burn, but never pulling. Clothing that sticks should be soaked off later with oil Never place cotton over a burn.

Sunstroke.—If sunstroke has occurred, the face will be hot, flushed and dry The patient should be cooled as quickly as possible Cracked ice or cloths wrung out in cold water should be applied, especially to the head, which should be slightly raised—the patient, of course, lying down When conscious, he may drink

cold water freely. If he is rubbed constantly to bring blood to the surface and to avoid shock, he may be wrapped in sheets wrung out in cold water or put in a very cold bath No stimulants should be used.

Heat Exhaustion.—Heat exhaustion, which must be distinguished from sunstroke, causes the skin to be pale, cold and moist, and should be treated in the same manner as shock (*see* "Treatment for Shock").

Frost-bite or Freezing.—Frost-bite or freezing should be treated by gradually bringing the frozen part to its natural temperature Rub with snow or cold water, gradually increasing the temperature of the water, and of the room in case of freezing In the latter case, the patient should always be taken first to a cool room, and no heat should be used until his circulation becomes active

Artificial Respiration.—The essential treatment in all forms of suffocation, whether from water, gas, smoke or shock from electrical contact, is artificial respiration (For explanation and description of this process *see* ARTIFICIAL RESPIRATION)

Gas Poisoning.—Gas poisoning, commonly resulting from leaking fixtures, or from the fumes of an automobile exhaust (the deadly carbon monoxide gas) causes suffocation, headache, dizziness, nausea, vomiting and extreme sleepiness The pulse is fast and breathing weak and rapid This poisoning is rapidly fatal. The victim should be quickly carried to fresh but not cold air, as cold will kill a gassed person from shock If needed, artificial respiration should be given at once If the patient is conscious, strong coffee should be given liberally, or some other stimulant may be substituted The patient should be kept warm and not allowed to exercise A doctor's services must be procured to avoid the danger of pneumonia

Electric Shock.—In cases of electric shock, the victim must be quickly released from the current by using a dry non-conductor (rubber gloves, several thicknesses of newspaper, dry clothing, a wool cap or felt hat wrapped around the hand, a rope or a dry board may be used) Thus the wire, if on top of the victim, can be quickly flipped off with any board or stick, or an instrument with a wooden handle may be used to cut it Alternatively, it may be short circuited by dropping a metal bar on it between the victim and source of the current, or the former may be removed by lifting, care being taken that the rescuer stands on a dry non-conducting surface and uses no metal or anything damp or moist in doing so After the victim is released, artificial respiration and treatment for shock should follow

Drowning.—To administer efficient first aid in drowning requires special knowledge and skill (For discussion of methods of actual rescuing from the water *see* LIFE SAVING SERVICE, DROWNING AND LIFE SAVING) It may suffice to say here that after the body has been secured, artificial respiration, in charge of someone who understands it, should be immediately tried, any water or mud having first been removed from the mouth and a doctor, of course, being sent for (*See* ARTIFICIAL RESPIRATION and DROWNING AND LIFE SAVING)

Unconsciousness.—Unconsciousness may be the result of a large number of causes. Unless special treatment be required for poison, bleeding, sunstroke or suffocation, the procedure is to place the patient prone with head low, and, if the face be pale and the pulse weak, to warm and stimulate him in every way possible If, however, as sometimes happens, he is red-faced, with a strong pulse, he should be placed prone, head raised, cold water should be sprinkled on the face and chest and no stimulants applied In any case of fainting, windows should be opened, clothing loosened and smelling salts or ammonia used Taking the person who feels faint into cold fresh air, or making him double over with his head between his knees for a moment, sometimes will avert a faint.

Convulsions.—If a person is seized with convulsions, do not attempt to hold him, but put him on the ground or floor where he cannot injure himself by thrashing about and place a piece of wood covered with a handkerchief in the mouth to prevent him from biting his tongue.

Apoplexy and Brain Injuries.—In the case of apoplexy and brain injuries send for the doctor at once, giving the patient in the meantime complete rest and quiet, if possible in a darkened room, with the head and shoulders raised on a pillow Cold cloths may be applied at the same time to the head and hot water bottles to the limbs but no stimulants should be given

Alcoholic Poisoning or Drunkenness.—Alcoholic poisoning or drunkenness must never be confused with apoplexy. If in doubt as to which condition is present treat for apoplexy and be careful not to cause vomiting For drunkenness give an emetic, such as mustard and water or quantities of lukewarm water, followed by strong coffee or aromatic spirits of ammonia. Apply hot water bottles and rub the limbs towards the body to increase circulation

Opium Poisoning.—Poisoning from preparations of opium, of which laudanum and morphine are the most common, should be treated, while awaiting a physician, with an emetic (mustard and water or quantities of lukewarm water) to provoke profuse vomiting Plenty of strong coffee should be given, and an adult may be slapped with a wet towel, or threatened, to rouse him. Unless weak, he may be walked up and down, but at any signs of weakness he should be made to lie down

Carbolic Acid Poisoning.—In carbolic acid poisoning, Glauber's or Epsom salts are fair antidotes, or lime water, though less efficient, may be used as a mouth wash and swallowed. Raw eggs, castor oil or sweet oil may be given, and stimulants and warmth should always be included in the treatment. In general, in cases of poisoning, the first step is to send for the doctor, telling him if possible what poison has been taken Then give an emetic, and antidote, with the doctor's advice. (*See* table of antidotes, etc , under ANTIDOTES)

Home and Camp Emergencies.—For the numberless small emergencies of home, camp and sports which arise, a few simple bits of first aid knowledge often save discomfort and sometimes avert serious consequences

Common Cramps Common cramps of the abdomen, usually due to indigestion or chill, should be treated by gentle rubbing and application of the hot water bottle. For internal relief a soda mint tablet may be given Cathartics immediately or forced vomiting are not recommended because of the possibility of appendicitis. For nausea and vomiting, drinking lukewarm water freely causes vomiting and washes out the stomach Following this the patient should lie down in a cool place, hot fomentations should be applied to the abdomen, and a little soda mint may be taken. Cramps in the legs should be treated by rubbing and kneading

Hiccupping. Hiccup can usually be stopped by holding the breath long enough so that the air in the chest forces the diaphragm down and prevents it from contracting This may be done by drinking a large glass of water in small sips, without taking a breath If necessary, vomiting will always cure hiccup by removing the cause of irritation from the stomach

Convulsions in Children Convulsions in children always require treatment by a doctor Until his arrival absolute quiet for the patient is necessary, and cold cloths or an ice cap should be applied to the head, with a mustard pack surrounding the body to bring the blood to the skin Disturb the child as little as possible

Toothache If toothache begins at a time when it is impossible to reach a dentist immediately, clean out the cavity if accessible and place a small piece of cotton, dipped in oil of cloves, in the cavity, with a toothpick or needle If treatment must be through the gum, use absorbent cotton soaked in spirits of camphor as an emergency measure

Earache. For emergency and temporary treatment of earache, hot cloths or hot water bottles, or fumes from hot alcohol poured on a cloth and held outside the ear may be of help A few drops of hot sweet oil not hot enough to burn, dropped in the ear, the ear then being plugged with cotton, may give temporary relief but the earache should be treated as soon as possible by a physician.

Sties. Pain from a sty may be diminished by holding to the eye a cloth wet with water as hot as can be borne

Prickly Heat Prickly heat is often relieved by a good talcum powder, but if severe it should be bathed with a mixture of one part alcohol to three of water, and afterwards dusted with talcum.

Lime-water with two drops of carbolic acid to the ounce is an excellent application for prickly heat These applications should always be used after bathing

Hives (Urticaria or Nettle-rash) In severe cases of hives a doctor should be called Ordinarily an emetic should be taken followed by a purgative such as Rochelle or Epsom salts To relieve itching, a warm bath containing a handful of washing soda may be given, or bathing the parts with a strong solution of bicarbonate of soda and water, or rubbing with spirits of camphor, may give relief

Mosquito Bites Mosquito bites are best treated with ammonia, or lime-water containing two drops of carbolic acid The application of cool, wet dressings may help

Ivy or Oak Poisoning Severe ivy or oak poisoning should be treated by a doctor, but the application of a simple wash of 3% boracic acid solution, with carbolized vaseline as an ointment affords relief, the treatment being repeated daily Epsom salts solution is also recommended

Blisters Blisters on the hands or feet are best treated by washing the part thoroughly in hot water, pricking the blister through the skin at the side with a clean needle and gently pressing out the fluid

Snake Bites Snake bites are comparatively rare injuries but may be rapidly fatal In the United States, the rattlesnake and moccasin are most to be feared The treatment consists in immediately circling the wounded part with a tightly tied string, handkerchief, or bandage, between the bite and the body, if the bite is on a limb, thus preventing absorption of the poison by cutting off the return of blood to the body Soak the wound in hot water and squeeze or suck it as it is absolutely essential to extract as much of the poison as possible There is little danger in sucking wounds made by the poisonous snakes in the United States, unless there is a cut or infection in the mouth Then cauterize or burn the wound, using ammonia or permanganate of potassium freely, in strong solution Dose freely with strong stimulants such as aromatic spirits of ammonia Do not fail to loosen the tight bandage after one hour, loosening it a little at a time, and observing the effect of the poison thus let into the blood-stream on the patient Tighten again and repeat the loosening process If the poison should cause severe depression, care should be taken to keep the wound tightly tied up regardless of the danger of the part dying from lack of circulation

Dog and Cat Bites Treatment for dog and cat bites is the same as for snake bite, except that the bandage may be removed as soon as the wound is cauterized A doctor should be consulted and every effort made to discover whether or not the animal was rabid, if so every measure for the prevention of hydrophobia must of course be taken

Insect Bites In general, for the bites of insects and spiders, ammonia should be applied and care taken to ensure that the sting does not remain in the wound

Eye Injuries In any injury of the eyeball, cover both eyes with absorbent cotton or soft cloths, soaked in cool water, so as to keep the eyelids still, and bandage them into place with head bandages, being careful not to bind tightly enough to cause pressure on the eyeballs They should then be kept constantly cooled with water till a doctor can be procured Splinters in the eye should be pulled out if possible A little olive- or castor-oil in the eye may help If foreign bodies, such as cinders, sand or dust get in, never rub the eye, but first close it to allow tears to accumulate which may wash the object into view so that it may be removed with a bit of clean cloth or cotton Failing in this, pull the upper lid over the lower two or three times, close the nostril on the opposite side with the finger and blow the nose hard If the offending object is still in the eye, examine first the lower lid by pressing down and then the upper lid To do this last, seat the patient in a chair, head bent backward, and standing behind him place the finger or a match on the upper lid, ½in from its edge Turn the upper lid back and if the foreign body can be seen brush it off with a bit of clean cotton Particular care must be taken to avoid any rough treatment and in case of any difficulty the eye should be bandaged as above instructed, and a doctor called.

How and When to Use Iodine.—Iodine is the only disinfectant suitable for general use which is of sufficient strength to be efficacious Painting iodine on wounds is unquestionably of value in preventing infection, but only if applied within two hours after the accident It will probably not reach the tissues in a very deep wound, however, and will not prevent pus infection if the tissues are extensively crushed The best iodine solution is Lugol's, a weak solution of iodine crystals with iodide of potassium in water Tincture of iodine (a 7% solution) is, itself, too strong and must be diluted with one part alcohol to one of tincture It should never be used in a stronger solution than this The method of applying is to paint it on freely with a camel's hair brush or cotton wool on a stick Do not pour iodine into a wound or cut, and never use it on or near the eyes Use a rubber plug in the bottle

Carrying Sick or Injured Persons.—Before attempting to carry a sick or injured person, loosen any tight clothing and see that the patient is warm In case a stretcher is needed it may be improvised by the use of a pair of poles and two suit coats The sleeves are first turned inside out and the coats placed on the ground, with the lower edges touching each other, the poles are then passed through the sleeves on each side, the coats buttoned and the buttoned side turned down A stretcher may also be improvised from a large blanket or rug, in which the poles have been rolled from the outer edge inwards until firmly held, leaving about 20in between the two poles, the whole being then turned over In case narrow blankets are used the edges should be bound to the poles with twine

Household Medicine Cabinet.—For the household medicine cabinet, the Red Cross recommends the following standard supplies, which are best kept in a white enamelled box, provided with lock and key —

- Aromatic spirits of ammonia, 2oz (rubber stopper)
- Olive oil, 2 drams
- Epsom salts, 4oz (or 6 Seidlitz powders)
- Lime-water, 2oz
- Mustard, powdered, 2oz
- Syrup of ginger, 2oz
- Syrup of ipecac, 2oz.
- Witch hazel, 4oz
- Bismuth subnitrate tablets, 5 grain (100 tablets in bottle)
- Carbolized vaseline or petrolatum, 1 tube
- Oil of cloves, 1 dram bottle (labelled "poison")
- Soda mint tablets, 100 tablets in bottle
- Talcum powder, 1 tin
- Antiseptic gauze, 1 small package
- Absorbent cotton, ½lb
- Roller bandages, gauze, 6—3 large and 3 small
- Collodion, 1 small bottle with brush
- First aid outfits, Red Cross, 2
- Tooth plasters, 1 box
- Corn plasters, 1 box
- Glass and spoon, 1 each or medicine glass
- Scissors, 1 pair
- Pins, ordinary and safety
- Iodine, one-half tincture with one-half alcohol, 2oz in bottle, rubber stopper
- Iodine swabs, 6
- Bottle, 2oz, 1
- Camel's hair brush, 1

A convenient first aid kit obtained from the Red Cross or easily made at home consists of a white enamelled tin box with a tight fitting cover, containing.

- 2 triangular bandages
- 2 roller bandages
- 2 packages of dressing
- 1 small roll of absorbent cotton
- ½oz of iodine (rubber stopper in bottle)
- 1oz aromatic spirits of ammonia (rubber stopper).
- 2 or 3 safety pins
- Small scissors
- First aid text-book, with list of contents pasted on inside cover of box

See *American Red Cross Abridged Text-book on First Aid* (3rd general edition) *See* also RED CROSS (M J S)

FIRST BANK OF JAPAN. The Japanese name of which this is the convenient English equivalent is *Dai Ichi Ginko Kabushiki Kaisha* (the Number 1 Bank Joint Stock company) It was founded in July 1873, and was the first private bank in Japan

In 1872 the Japanese Government had promulgated the National Banks Regulations, which were modelled on the National Bank Act of the United States. But these regulations applied only to the national banks, meanwhile, private banks and banking companies began with the founding of the Dai Ichi Ginko, and, 11 years after this inauguration of private banking enterprise, private banks numbered 954. For some time there were

no general provisions to control such banks and companies, beyond their subjection to the control of the local authorities To bring them under more efficient control, the Ordinary Banks Regulations and the Savings Banks Regulations were promulgated in 1890 and put into force three years later

The First Bank of Japan, therefore, led the way as a financial organ of general trade It introduced several innovations and differences from the procedure followed by the national banks The year 1899 saw the conversion of all the existing national banks into private banking organizations, a process which had been steadily proceeding as the charters granted to the former fulfilled their periods At this time all banks became subject to the general banking laws, and ordinary banks are now under the control of the minister of finance In March 1927 a new act was promulgated and it came into force on Jan 1, 1928, by this act all banking organizations were brought into closer and more uniform relations

The capital of the First Bank (paid up) was, in Dec 1928, 57,500,000 yen The reserves of the bank at the same date totalled 61,550,000 yen (S YA)

FIRST-FOOT, in British folk-lore, especially that of the north and Scotland, the first person who crosses the threshold after midnight on Christmas or New Year's Eve Good or ill luck is believed to be brought the house by First-Foot, and a female First-Foot is regarded with dread In Lancashire a light-haired man is as unlucky as a woman In Worcestershire luck is ensured by stopping the first carol-singer who appears and leading him through the house In Yorkshire it must always be a male who enters the house first, but his fairness is not considered an objection In Scotland the custom of first-footing was always more elaborate than in England, involving a subsequent entertainment

FIRST INTERNATIONAL: *see* INTERNATIONAL, THE

FIRST OFFENDER'S ACT: *see* CHILDREN'S COURTS

FIRST OF JUNE. The battle of the Glorious First of June was so named because it was fought at a point over 400m from the mainland and reached a decision on June 1, 1794 It arose out of an attempt by the British to intercept, and by the French to protect, a large consignment of corn which the latter, faced by famine as a result of the bad harvest of 1793, had purchased in America This convoy, consisting of over 100 vessels, sailed from the Chesapeake at the beginning of April 1794, protected by Admiral Vanstabel with four battleships Villaret-Joyeuse, the French commander-in-chief at Brest, intended to meet him with his main fleet in the latitude of Brest, some 400m from the coast He sent out five ships as forerunners on April 10, and himself prepared to follow as soon as possible Lord Howe, commanding the British Channel fleet, sailed from Spithead on May 2, with 34 sail of the line, unfortunately he was hampered with a convoy, and was forced to detach eight ships for its protection, but six of them were to rejoin him with all speed after reaching the latitude of Cape Finisterre

Howe, with the remainder of the fleet, was off Ushant on May 5, and there ascertained that Villaret had not sailed Not wishing, however, to prevent him from doing so—for he was as willing to fight Villaret as to capture the convoy—he made no attempt to watch Brest, but advanced in a westerly direction along the 47th parallel, thus putting himself between the convoy and the main French fleet Meeting with no one, he eventually returned to Ushant, arriving there on the 19th, and finding Brest empty Villaret had sailed on the 16th with 25 ships—he was shortly joined by one of his advance guards—and had passed close by the British fleet in foggy weather Howe, without even waiting for the six ships which were to have rejoined him next day, immediately turned in pursuit

Early on May 28, the French were sighted some ten miles to windward The British were further from Brest than they, which seems to have puzzled Villaret, who, as soon as he had definitely ascertained the position, began to retreat But Howe, who had collected his fastest vessels into a flying squadron, signalled a general chase, and several English ships got into action with the rear French ship, the enormous "Révolutionaire," which was made unfit for action at the expense of a smaller English vessel On the 29th, Howe, who naturally desired the windward position—especially in view of the particular plan which he wished to put into execution—determined to break the French line from to-leeward His van ships failed to pierce the enemy, but Howe himself in the "Charlotte," stationed in the centre, broke through the French line towards the rear, and was followed by several of his ships In the process they surrounded the three rearmost of the French, and Villaret, in order to save them, was compelled to run to leeward He was too late to prevent them from being rendered unfit for further immediate fighting The British thus gained the weather-gauge and had, in two days, reduced Villaret's strength to 22, while they themselves still had 25 fit for action The 30th was foggy, and Howe was content to keep contact with Villaret, who edged to leeward, hoping to meet the remaining four ships of his advance squadron This he was fortunate enough to do On the 31st the fog cleared at mid-day, but Howe preferred to postpone his final attack until June 1

Lord Howe's plan, which he executed on the final day of the battle, was designed to overcome the French withdrawing tactics so often employed by them Operating from the leeward position, the French would fire at the masts and sails of the British as they advanced, retreating as soon as the latter approached close range, and repeating this manoeuvre till the British were rendered immobile Howe, instead of engaging the French on the same tack while still to windward, proposed to break through their line at all points, and engage from to-leeward, thus preventing their retreat This was a counsel of perfection, for not every ship could be expected to break through, but each one that did would prevent the withdrawal of the corresponding Frenchman The attack produced a mêlée during which seven or eight British ships broke through, and the result was the capture of six French ships and the sinking of another Villaret succeeded in drawing off the remainder, and the British pursuit lacked direction, Howe, who was nearly 70, being exhausted after five days and nights with no rest The convoy escaped capture, but the British, who were depressed with the lack of success attending the war on land, were disposed to forgive this oversight in their jubilation at obtaining a first-class victory at sea

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FIRTH, SIR CHARLES HARDING (1857–), British historian, was born at Sheffield on March 16, 1857, and was educated at Clifton and Balliol college, Oxford He became a fellow of All Souls, Oxford, in 1901, and regius professor of modern history at Oxford in 1904 On his retirement in 1925 he became professor emeritus Firth's historical work was almost entirely confined to English history during the time of the Great Civil War and the Commonwealth, and his books are of great value to students of this period The chief of them are *Life of the Duke of Newcastle* (1886), *Scotland and the Commonwealth* (1895); *Scotland and the Protectorate* (1899), *Narrative of General Venables* (1900); *Oliver Cromwell* (1900), *Cromwell's Army* (1902), *The Last Years of the Protectorate* (1909), *English History in English Poetry* (1911), *Modern History in Oxford, 1841–1918* (1920), and the standard edition of *Ludlow's Memoirs* (1894) He also edited the *Clarke Papers* (1891–1901), and Mrs Hutchinson's *Memoirs of Colonel Hutchinson* (1885) and wrote an introduction to the *Stuart Tracts* (1903), and contributed to the *Dictionary of National Biography* and the *Cambridge Modern History*

FIRTH, MARK (1819–1880), English steel manufacturer and philanthropist, was born at Sheffield on April 25, 1819, the son of a steel smelter At the age of 14 Mark, with his brother, left school to join their father in the foundry where he was employed, and ten years later the three together started a six-hole furnace of their own Their huge Norfolk works were erected at Sheffield in 1849, and still greater ones were afterwards acquired at Whittington in Derbyshire, and others at Clay Wheels near Wadsley Mark Firth made many benefactions to the town of

Sheffield, and on his death on Nov. 28, 1880, was accorded a public funeral.

FIRUZABAD, a town of Persia, in the province of Fars, 72 m S of Shiraz, in 28° 51′, at an altitude of 4,180 ft, in a fertile plain, 15 m long by seven, well watered by a river which flows through it from north to south Pop about 4,000, according to Lorini (1900) The town is surrounded by a mud wall and ditch. The district has 20 villages and produces much wheat, and the rice of Firuzabad is famous Three or four miles north-west of the town are the ruins of the ancient city and of a large building popularly known as the fire-temple of Ardashir; beyond them on the face of the rock in the gorge through which the stream enters the plain are two Sassanian bas-reliefs The river leaves the plain at its southern end, and according to Persian history it was there that Alexander the Great, when unable to capture the ancient city, built a dyke across the gorge, thus damming up the water of the river, turning the plain into a lake, and submerging the city and villages The lake remained until the beginning of the third century, when Ardashir, the first Sassanian monarch, drained it by destroying the dyke He built a new city, calling it Jur or Gur, and made it the capital of one of the five great divisions of Fars Firuz (or Piruz), one of Ardashir's successors, called the district after himself—Firuzabad—("the abode of Firuz"), but the name of the city remained Gur until Azud-ud-Dowleh (949–982) changed it to its present name. (P. Z C)

FIRŪZKŪH, a small province of Persia, with a population of about 5,000 Its chief place is a village of the same name situated in a valley of the Elburz, about 90 m E of Teheran, at an elevation of over 5,000 ft and in 35° 45′ N. and 52° 30′ E It has a population of 2,500 A cliff on the eastern side of the valley is surmounted by the ruins of an ancient fort popularly ascribed to Alexander the Great

FISCAL POLICY: *see* FREE TRADE, FAIR TRADE; PROTECTION; TARIFF REFORM; TARIFFS, IMPERIAL PREFERENCE, SAFEGUARDING OF INDUSTRY, CUSTOMS; CUSTOMS HOUSE, CUSTOMS COLLECTOR, CUSTOMS UNION

FISCAL YEAR, any 12-month period, which may or may not coincide with the calendar year, determined upon by a business or Government as the annual period at the end of which books are closed and the financial condition ascertained The fiscal year of the British Government closes on April 5, and of the United States Government on June 30

FISCHART, JOHANN (*c* 1545–1591), German satirist and publicist, was born, probably at Strasbourg, about 1545, and was educated at Worms in the house of Kaspar Scheid, whom in the preface to his *Eulenspiegel* he mentions as his "cousin and preceptor" After travelling extensively he returned to take the degree of *doctor iuris* at Basel From 1575 to 1581 he appears to have been associated in the business of his sister's husband, Bernhard Jobin, the Strasbourg printer In 1581 Fischart was attached, as advocate to the imperial court of appeal at Spires, and in 1583, when he married, was appointed magistrate at Forbach near Saarbrucken Here he died in the winter of 1590–91 Fischart wrote under various feigned names, such as Menzer, Reznem, Huldrich Elloposkleros, Jesuwalt Pickhart, Winhold Alkofribas Wustblutus, Ulrich Mansehr von Treubach and Im Fischen Gilt's Mischen More than 50 satirical works, both in prose and verse, are ascribed to him, of which the most famous is *Affentheuerliche und ungeheuerliche Geschichtschrift vom Leben, Rhaten und Thaten der . . Helden und Herren Grandgusier Gargantoa und Pantagruel* (1575), an imitation of Rabelais, which appeared again in 1577 under the modified title *Naupengeheurliche Geschichtklitterung*

Fischart had studied not only the ancient literatures, but also those of Italy, France, the Netherlands and England He was a lawyer, a theologian, a satirist and the most powerful Protestant publicist of the counter-reformation period, in politics he was a republican Above all, he was a master of language, and was indefatigable with his pen His satire was levelled mercilessly at all perversities in the public and private life of his time—at astrological superstition, scholastic pedantry, ancestral pride, but especially at the papal dignity and the lives of the priesthood and the Jesuits He indulged in the wildest witticisms, the most abandoned caricature, but all with a serious purpose As a poet, he is characterized by the eloquence and picturesqueness of his style and his symbolical language. Thirty years after Fischart's death his writings, once so popular, were almost entirely forgotten Recalled to the public attention by Bodmer and Lessing, his position in German literature is now fully assured.

Among Fischart's other works are —*Von St. Dominici des Predigermoncks und St. Francisci Barfussers artlichem Leben* (1571), a poem with the expressive motto "Ye have noses and smell it not," written to defend the Protestants against certain accusations, one of which was that Luther held communion with the devil, *Eulenspiegel Reimensweis* (written 1571, published 1572); *Aller Praktik Grossmutter* (1572), after Rabelais's *Prognostication Pantagrueline, Floh Haz, Weiber Traz* (1573), in which he describes a battle between fleas and women; *Das gluckhafft Schiff von Zurich* (1576, republished 1828, with an introduction by Ludwig Uhland), a delightful poem commemorating the adventure of a company of Zurich arquebusiers, who sailed from their native town to Strasbourg in one day, and brought, as a proof of this feat, a kettleful of *Hirsebrei* (millet), which had been cooked in Zurich, still warm into Strasbourg, *Podagrammisch Trostbuchlein* (1577), *Philosophisch Ehzuchtbuchlein* (1578), the celebrated *Bienenkorb des heiligen romischen Immenschwarms*, etc, a modification of the Dutch *De roomsche Byen-Korf*, by Philipp Marnix of St Aldegonde, published in 1579 and reprinted in 1847, *Der heilig Brotkorb* (1580), after Calvin's *Traité des reliques; Das vierhornige Jesuiterhutlein*, a rhymed satire against the Jesuits (1580), and a number of smaller poems.

Freiherr von Meusebach, whose valuable collection of Fischart's works has passed into the possession of the royal library in Berlin, deals in his *Fischartstudien* (Halle, 1879) with the great satirist Fischart's poetical works were published by Hermann Kurz in three volumes (Leipzig, 1866–68), and selections by K Goedeke (Leipzig, 1800) and by A Hauffen in Kurschner's *Deutsche Nationalliteratur* (Stuttgart, 1893) *Das gluckhafft Schiff* has been frequently reprinted (critical edition by J Baechtold, 1880) *See* for further biographical details, W Wackernagel, *Johann Fischart von Strassburg und Basels Anteil an ihm* (2nd ed, Basel, 1875), A Hauffen, *Johann Fischart* (vol. 1, 1921), Leitzmann, *Fischartiana* (1924).

FISCHER, EMIL (1852–1919), German chemist, was born at Euskirchen, Rhenish Prussia, on Oct 9, 1852 He studied at Bonn and at Strasbourg, where he graduated Ph D in 1874 He then acted as assistant to Adolf von Baeyer at Munich for eight years, after which he was appointed to the chair of chemistry successively at Erlangen (1882) and Wurzburg (1885) In 1892 he succeeded A W von Hofmann as professor of chemistry at Berlin Emil Fischer devoted himself entirely to organic chemistry, and his investigations are characterized by an originality of idea and readiness of resource which make him the master of this branch of experimental chemistry The extraordinary merit of his researches was recognized by all the important scientific societies in the world; in 1890 he was awarded the Davy medal of the Royal Society and elected a foreign member in 1899 He was awarded the Nobel prize for chemistry in 1902 Under his control the laboratory at Berlin became one of the most important in existence, and attracted to itself a constant stream of brilliant pupils. Emil Fischer died at Wannsee, Berlin, on July 15, 1919

In 1875, he published his discovery of the organic derivatives of hydrazine (*q v*). He investigated their relation to the diazo compounds (*q v*) His observations, published in 1886, that the hydrazones, by treatment with hydrochloric acid or zinc chloride, yielded derivatives of indol, the pyrrol of the benzene series and the parent substance of indigo, were a valuable confirmation of von Baeyer's views on indigo and its derivatives. Of greater moment was his discovery that phenyl hydrazine reacted with the sugars to form substances which he named osazones, and which served to identify such carbohydrates more definitely than had been previously possible. He next turned to the rosaniline dyestuffs, and in collaboration with his cousin Otto Fischer, he published papers in 1878 and 1879 which established that these dyestuffs were triphenyl methane derivatives The results of this work were collected after his death and published as *Untersuchungen uber Triphenylmethanfarbstoffe, Hydrazine und Indole* (1924) Fischer's next research was concerned with compounds related to uric acid Here the ground had been broken, more especially by von Baeyer, but almost all our knowledge of the purine group (*see* PURINES) is due to Fischer. In 1881–82 he established the formulae of uric acid, xanthine, caffeine, theobromine and some

other compounds of this group.

His greatest work was instituted in 1894, when he commenced his great series of papers, wherein the compounds above mentioned were all referred to a nitrogenous base, purine. The base itself was obtained after much difficulty, and an immense series of derivatives were prepared, some of which were patented in view of possible therapeutical applications These researches were published in a collected form in 1907 with the title *Untersuchungen in der Puringruppe* When the work on the purine group was progressing satisfactorily he attacked the sugar group. Here again Fischer may be regarded as the prime investigator in this field His researches may be taken as commencing in 1883, and the results are unparalleled in importance in the history of organic chemistry. The chemical complexity of these carbohydrates (*q v*), and the difficulty with which they could be got into a manageable form—they generally appeared as syrups—occasioned much experimental difficulty, but these troubles were little in comparison with the complications due to stereochemical relations However, Fischer synthesized fructose, glucose and a great number of other sugars, and showed how to distinguish the formulae of the 16 stereoisomeric glucoses (*see* STEREOCHEMISTRY and ISOMERISM). The study of the sugars made it necessary to examine the nature, properties and reactions of substances which bring about fermentation (*q v*) Fischer attacked the problem presented by ferments and enzymes, and although we as yet know little of this complex subject, to Fischer and his co-worker Abderhalden is due the credit of having laid the foundation of enzyme chemistry (*see* ENZYME) The magnitude of his researches in this field may be gauged by his collected papers, *Untersuchungen uber Kohlenhydrate und Fermente* (1909)

From the sugars and ferments it is but a short step to the chemistry of the proteins (*q v*) By the introduction of new methods, Fischer succeeded in breaking down the complex proteins into amino-acids and other nitrogenous compounds, the constitutions of most of which have been solved, and by bringing about the recombination of these units, appropriately chosen, he prepared synthetic peptides which approximate to the natural products His researches made from 1899 to 1906 have been published with the title *Untersuchungen uber Aminosauren, Polypeptides und Proteine* (Berlin, 1907)

Fischer also made a number of investigations on the Walden inversion and on gallic acid derivatives of the sugars which were related to the tannins During the World War he was very active in organizing German chemical resources He increased the supply of ammonia available from coke-ovens, encouraged the synthetic nitric acid industry, suggested camphor substitutes and new sources of glycerine He was particularly concerned with the problem of conserving the food supply

See Fischer, *Memorial Lecture, Journal of the Chemical Society* (1920).

FISCHER, ERNST KUNO BERTHOLD (1824–1907), German philosopher, was born at Sandewalde, Silesia, on July 23, 1824 Educated at Leipzig and Halle, he became a privatdocent at Heidelberg in 1850, and in 1856 a professor at Jena In 1872 he succeeded Zeller at Heidelberg as professor of philosophy and of the history of modern German literature In philosophy, where his attitude was mainly Hegelian, his part was that of an historian and commentator, his chief production being *Gesch der neuern Phil* (1852–93) Fischer also made valuable contributions to the study of Kant, Spinoza, Schopenhauer, Bacon, Shakespeare, Goethe, Lessing and Schiller

The Eng. trans of his numerous works are *Francis Bacon*, by J. Oxenford (1857), *Life of Benedict Spinoza*, by F Schmidt (1882), *A Commentary on Kant's Kritik of Pure Reason*, by J. P. Mahaffy (1866); *Descartes and his School*, by J P. Gordy (1887); *A Critique of Kant*, by W S. Hough (1888) *See* also H Falkenheim, *Kuno Fischer und die litterar-historische Methode* (1892); and bibliography in Baldwin's *Dict. of Philosophy and Psychology* (1905).

FISCHER, THEOBALD (1846–1910), German geographer, was born at Kirchsteitz, Thuringia, on Oct. 31, 1846 He was educated at the universities of Heidelberg and Halle, and visited many parts of Europe in the pursuit of geographical study, but especially the Mediterranean lands, including north Africa (Atlas lands). The "Mediterranean region" is a conception the world owes to Fischer. His thesis for the rank of *Privatdozent* in the University of Bonn (1876) was entitled *Beitrage zur physischen Geographie der Mittelmeerlander*, and his most important publications are a collection of *Mittelmeerbilder* and his work on the Mediterranean peninsulas of Europe in Kirchhoff's *Allgemeine Landerkunde* He held professorships of geography at Kiel (1879–83), and at Marburg until his death on Sept. 17, 1910.

FISCHER VON ERLACH, JOHANN BERNHARD (1656–1723), Austrian architect, was born at Graz on July 20, 1656, and died in Vienna on April 5, 1723 He probably began his artistic career as a sculptor Then, during a period of study in Rome, he turned to architecture, and after his return to Austria in 1683, rose to be one of the most distinguished representatives of the Austrian Baroque His early work is chiefly connected with Salzburg, where he designed various churches About 1700 he began his work on the palace and gardens of Schonbrunn—the imperial residence Other notable works are the royal library, the palace of Prince Eugene, and the church of San Carlo Borromeo in Vienna. He wrote a history of architecture, illustrated with his own engravings, which is one of the first works on this subject (English ed., *A Plan of Civil and Historical Architecture, 1730*) His son Josef Emanuel (1693–1742) was also an architect.

See Albert Ilg, *Die Fischer von Erlach* (1895)

FISH, HAMILTON (1808–1893), American statesman, was born in New York city on Aug 3, 1808 His father, Nicholas Fish (1758–1833), served in the American Revolution. The son graduated at Columbia college in 1827, and in 1830 was admitted to the bar, but practised only a short time. In 1843–45 he was a Whig representative in Congress. He was governor of New York from 1849 to 1851, and was U S. senator in 1851–57, acting with the Republicans during the last part of his term In 1861–62 he was associated with John A Dix, William M Evarts, William E Dodge, A T Stewart, John Jacob Astor, and other New York men, on the Union defence committee, which (from April 22, 1861, to April 30, 1862) co-operated with the municipal government in the raising and equipping of troops, and disbursed more than $1,000,000 for the relief of New York volunteers and their families Fish was secretary of State during President Grant's two Administrations (1869–77) He conducted the negotiations with Great Britain which resulted in the treaty of May 8, 1871, under which the "Alabama claims" were referred to arbitration, and the same disposition was made of the "San Juan boundary dispute," concerning the Oregon boundary line In 1871 Fish presided at the Peace Conference at Washington between Spain and the allied republics of Peru, Chile, Ecuador and Bolivia, which resulted in the formulation (April 12) of a general truce between those countries, to last indefinitely and not to be broken by any one of them without three years' notice given through the United States; and it was chiefly due to his restraint and moderation that a satisfactory settlement of the "Virginius affair" was reached by the United States and Spain (1873) Fish was vice-president-general of the Society of the Cincinnati in 1848–54, and president-general from 1854 until his death He died in Garrison, N Y, on Sept 7, 1893

His son, NICHOLAS FISH (1846–1902), was appointed second secretary of legation at Berlin in 1871, became secretary in 1874, was *chargé d'affaires* at Berne in 1877–81, and minister to Belgium in 1882–86, after which he engaged in banking in New York city

See A. Elwood Canning, *Hamilton Fish* (1918).

FISH, that class of vertebrate animals which lives exclusively in water, breathes through gills, and whose limbs take the form of fins (*see* FISHES and PISCICULTURE) The article FISHERIES deals with the subject from the economic point of view, and ANGLING with the sport of fishing The constellation and sign of the zodiac known as "the fishes" is treated under PISCES

The fish was an early symbol of Christ in primitive and mediaeval Christian art. The origin is to be found in the initial letters of the names and titles of Jesus in Greek, Jesus Christ, Son of God, Saviour, which together spell the Greek word for "fish," *ἰχθύς*.

FISH COOKERY. The term fish includes many water animals which are classed as "sea food" (*e g*, crabs, shrimps, lobsters, turtles, oysters, frogs, etc), besides fish proper. Fish is sold whole, dressed, salted, dried, tinned or alive It is generally a cheap and wholesome source of nitrogenous food though compared with meat, bulk for bulk, fish contains more water and refuse. There are three main classes of fish oily, containing fatty oil dispersed throughout the flesh, white or non-oily (lean), containing oil secreted in the liver; and shell-fish Examples of oily fish are salmon and herring, flat fish and turbot belong to the lean kinds, while the shell-fish include lobsters, crab, oysters, clams, etc Owing to the shortness and flakiness of the muscle fibres, fish, with the exception of some shell-fish, is easily digested, and should be eaten with vinegar or some form of acid Oily fish are more nourishing than lean kinds but less easily digested, and are best grilled or cooked by dry methods Lean fish are usually supplemented by sauces, etc

Preparation of Fish for Cooking.—Fresh fish should be "scaled" and cleaned In skinning round fish, proceed from head to tail, and reverse for flat fish To fillet flat fish place on a board, grasp the tail firmly with fingers dipped in salt (to prevent slipping), and cut an incision just above the tail Slip the knife under the flesh and raise it gently, at the same time loosening the skin with the thumb and forefinger of the left hand Round fish may be baked and stuffed All trimmings should be placed in a pan and covered with water to make fish stock for sauces Roes in large fish should be removed, cooked separately and served as savouries on toast.

Methods of Cooking Fish.—There are many ways of cooking fish Boiling is the simplest, though the least nourishing, as much of the flavouring juices is lost This method of cooking is suitable for large, round fish or for thick pieces The water should simmer, not boil, and only enough used to cover the fish Sea water is excellent for boiling sweet fish Add lemon juice or vinegar to the water to keep the fish white and firm and add salt unless a salt fish Boiling is the best method for cooking salt fish Tasteless fish requires additional spices and flavourings added to the water Allow 5 min to the pound for thin fish, 10 min or over for larger fish Steaming is better than boiling, but takes a little longer Small fillets of fish may be steamed on an oiled plate over a pan of boiling water Squeeze lemon juice over to keep the flesh white Steaming is useful for invalid fish cookery (*see* INVALID COOKERY).

Certain fish are best baked and stuffed or baked *au naturel* Fish may also be baked in a tin with spices and butter, or in milk Paper bags (oiled) are excellent for baking fish Truss whole fish before baking Broiling or grilling is suitable for oily fish, which should be placed on a greased gridiron If thick, split the fish down the centre and grill the flesh side first Remove head and tail for grilling Planked fish is grilled and served on a board made for the purpose Frying is one of the most popular methods of cooking lean fish and may take the form of frying in a bath of boiling fat or "pan" frying in a shallow pan Oil is better than any other fat for frying fish, as it keeps the colour a clear golden-brown All fish that is fried must be perfectly dry It can be served with a sauce but this is not necessary unless the fish is fried in batter Certain kinds of fish are tasty if stewed in the form of a *souchy* (in the United States, chowder), that is, slices of fish simmered in broth with vegetables and spices A *bouillabaisse* is a special dish much eaten on the Continent and consists of a stew or chowder of several kinds of fish. In cooking shell-fish other than crabs and lobsters, be very careful not to boil them, as they then become tough Periwinkles, snails, etc , are served *au naturel* with butter and chopped parsley Raw oysters and clams may be served in their shells with accompaniments of vinegar, lemon, red pepper and various other relishes.

Sauces for fish are (*a*) those with a water white sauce (drawn butter sauce) or a fish stock white sauce as a foundation, (*b*) those with melted butter as a foundation; (*c*) those with mayonnaise, Hollandaise or other butter-egg yolk sauces Sharp ingredients, such as capers, horseradish and pickles, are often added (*see* SAUCES).

Roe.—This is a spawn or milt of fish. In the case of large fish the roe is removed and prepared for table separately in various ways. Soft roes, as herring, etc , are served on toast as a savoury Shad roe is a delicacy in the United States Hard roes, as cod roes, are frequently dipped in batter and fried in deep fat Caviare, sturgeon roes (salted), is served plain on sippets of bread and butter as *hors d'oeuvres*

FISH CULTURE: *see* PISCICULTURE

FISH CURING, an operation, or series of operations, the object of which is the preservation of the flesh of fish by salting, drying, pickling, or smoking Though preservation by various means in periods of plenty against periods when fish could not be caught has been practised by man since earliest times, it is only recently that a scientific study of the various processes has been begun and the literature is still of meagre character. Curers, in consequence, rely for results on experience and rule of thumb practices, passed on traditionally from father to son.

The principle involved in salting is one of osmosis, in which a certain amount of salt combines with the water of which the tissues of fish flesh are largely composed Subsequently the completion of curing may be accomplished by allowing the fish to remain in the salt solution (pickle) of its own creation, as in the case of pickled herrings, sprats, mackerel and salmon, or it may be dried in the sun, or by artificial heat as in the case of salt cod; or smoked, as with red herring

As civilization has advanced, there has been a tendency in the temperate zones and in regions touched by increasingly rapid transport for the harder cures to be replaced by fresh fish or by more lightly cured preparations, and for the hard cures (cod, ling, saithe or coalfish, haddock) thus superseded to find new markets in less readily accessible parts of the world among more primitive peoples Thus in the years immediately preceding the World War Germany was taking a steadily increasing volume of fresh herrings but at the same time the quantity being cured was growing because pickled herrings were penetrating further and further into Russia Similarly, hard cures of cod (also ling, haddock, coalfish and tusk) were being marketed in tropical Africa, Central and South America, experience showing it to be a simpler matter to cure fish in Arctic Norway, at British ports or in Newfoundland for such markets than it is to catch and cure indigenous fish on the spot

Later developments of the same general tendency have been that with the improvements in refrigeration, cold stored fish begins to compete with cured fish Of this it is too early to speak, except to state that it has been demonstrated that cold-stored fish can be more widely distributed geographically than was possible with salt cured fish 50 years ago As a result of improvements in refrigeration at least one fish, the hake, has disappeared from among the kinds which were formerly cured

Heavy curing of fish was essential in the early days of civilization in northern latitudes when fish flesh had of necessity to take an important place in human fare With regular supplies of fish available lighter cures have come into use in which the process of smoking is more largely concerned than that of salting Among these are kippers and bloaters, as split and round herrings are termed respectively, smoked haddock (finnan), whiting and codling In the case of the last three the fish are headed and split after the manner of cod, except that the backbone is not removed. All these are in popular demand in Great Britain, but in the last few years remarkable developments have followed the introduction of smoked fillets For the preparation of these boneless strips are cut from such fish as cod, ling, haddock, tusk Before smoking these are steeped in a pickle to which a harmless vegetable dye (annatto) is customarily added. An economical and readily transported product is then available which has met with a keen demand not only at home but in British colonies.

In Great Britain, the United States, Norway, Holland and Russia cold-smoking is customary, but in Germany and Sweden hot-smoking, by which the fish is partially cooked whilst being smoked, is favoured.

Herrings.—In all matters of smoking the wood used is a question of prime importance Generally speaking soft resinous woods

are avoided as tending to produce a disagreeable taste For herrings no wood is equal to oak, though since the War there has been an increasing tendency to dye kippers, with which process many connect the decline of this particular product in the public favour Of all the fishes subjected to the various curing processes the two kinds taken in the greatest abundance, herring and cod, receive the greatest attention from curers Reference can be made to innumerable works in many languages dealing with the development of the herring fisheries from earliest times. exact records of the technique of curing fish are less easily come by And yet the cures of herrings are more diverse than those of any other single species The average catch yearly by the principal European countries for the period 1910–13 was (in tons) Great Britain 608,000, Norway 271,000; Holland 91,000, Sweden 81,000, Germany 51,000; of which only a very limited proportion reached the consumer in an uncured state The method of curing most favoured is "pickling," in which the fish in various grades are gutted by removal of the gills and intestines (but not the milt or roe) and packed in layers of salt in water-tight barrels wherein they make their own pickle which ensures preservation The pre-War European production in this manner was about 4,000,000 barrels annually, three-quarters of which originated in Scotland and England Conditions in the few years preceding the War were exceptionally favourable for herring production, but as the greatest upheavals resulting from that event took place in the chief herring consuming countries there has been a marked shrinkage in the fishing fleets and catch The average catch of the principal European nations engaged in the herring fishery was, for the period 1919–23, 496,718 tons, and grave difficulties have been experienced in marketing this reduced amount Russia, formerly the principal buyer of pickled herrings, is endeavouring to replace requirements by fish of home production, so that it is on Germany, Poland and the Baltic States that curers have to rely to absorb the 2–3 million barrels produced annually For the Mediterranean countries a dried herring is produced which as "golden" or "silver" cure finds its way to Italy, Greece, Egypt and the Levant, where the dried pilchard, cured only in Cornwall, is marketed

In the British Isles the curing of herrings is done ashore and a Government brand can be demanded guaranteeing the quality and preparation of the contents of the barrels branded Dutch, German and French fishermen cure their herrings aboard their ships at sea

Cod Curing.—Cod, the second most important of the world's food-fishes, are caught off Iceland and the Lofoten islands, in the North sea and on the Atlantic coast of North America There are two principal cures known as "klipfish" from the practice of spreading the split and salted fish on rocks (*klipper*) to dry and "stockfish" (*stock*, a stick) when the fish are hung up round to dry in the form from which they take their name

Cod are cured both at sea and ashore, but the final stages of preparation for export are completed ashore At sea, on the Icelandic fishing grounds in spring, trawlers belonging chiefly to England, Germany and Iceland concentrate on the cod fishery French trawlers favour more the Newfoundland Banks When the fish are to be cured at sea they are eviscerated, headed, about two-thirds of the backbone removed, and then thoroughly washed After this they are stacked in the trawler's hold with salt in plenty between the layers of fish Sale is by contract or by auction at a price per ton

It is customary for British vessels proceeding on "salting voyages" to engage Scandinavian "splitters" for the specialized work implied by the word Machines have recently been devised in Germany which do this work very effectively, and these have also been fitted in ships

After the fish has been landed at Aberdeen, Hull or Grimsby the process of curing is completed at "cod farms," where the fish are spread on racks exposed to the sun or dried under cover by air heated by coke fires or other means When the desired standard of dryness has been attained the fish are packed in cases which for some markets are tin lined and hermetically sealed Large quantities of fish, cleaned at sea and brought ashore in ice in the customary manner of all white fish, are split, salted and dried in establishments in the manner described above The curing of ling, coalfish, haddock, tusk, is of minor importance and occurs when these fish are incidental to the cod fishery Curers of salt fish have constantly to be on their guard against "pink-eye" in their stocks This is caused by organisms occurring in unsterilized salt which develop under certain conditions of temperature and moisture and, giving the fish a pink appearance, render it unsalable The chief markets for salt cod are the Roman Catholic countries of Southern Europe (Spain, Portugal, Italy), and of South America (Argentine, Brazil, Uruguay) and the West Indies The lower grades are also extensively exported to West Africa

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(G T A)

FISHER, ANDREW (1862–1928), Australian statesman, was born at Crosshouse, Kilmarnock, Aug 29, 1862, and began life as a coal miner He emigrated to Queensland at the age of 23, and was elected to the Queensland legislature in 1893 In 1901 he was elected to the Commonwealth Parliament, joined Mr Watson's Labour Cabinet of 1904 as Minister of Trade and Customs, and became leader of the Labour party in 1907 on Mr Watson's resignation In 1908 he became Prime Minister, but his administration lasted only six months At the general election in 1910, however, his party was returned with a sweeping majority, and he was Prime Minister for three years, during which period he tackled the question of imperial defence, adopted Lord Kitchener's report of 1909 and passed a measure establishing universal military training His Ministry fell in 1913, but at the election of Aug 1914 he was again returned to power and gave Australia a vigorous lead in the early days of the World War. At the end of 1915 he resigned and took up the high commissionership, retiring in 1921 and died in London on Oct 22, 1928

FISHER, HERBERT ALBERT LAURENS (1865–), British historian and statesman, was born in London on March 21, 1865 He was educated at Winchester and New college, Oxford, being elected in 1888 to a fellowship at the latter college, where he lectured for some years In 1911–12 he was appointed Chichele lecturer in modern history at Oxford He was also a member of the royal commission on the public services of India (1912–15) In 1912 he was appointed vice-chancellor of Sheffield university. In 1916, Fisher became minister of education in Lloyd George's cabinet and was elected to parliament for the Hallam division of Sheffield In 1918 he was elected Liberal member for the English universities An Education bill was introduced by him, in Aug 1917, which contained many important reforms (*See* EDUCATION. *National Systems*, England) He was a British delegate to the Assembly of the League of Nations (1920–22) In Jan. 1925 he was elected warden of New college, Oxford He resigned his seat as member for the combined universities in Feb. 1926

Among his books are *The Mediaeval Empire* (1898), *Studies in Napoleonic Statesmanship* (1903), *A Political History of England* (1906), *Bonapartism* (1908), *Life of F W Maitland* (1910), *The Republican Tradition in Europe* (1911), *Political Unions* (1911), *Napoleon Bonaparte* (1913), *The Common Weal* (1924).

FISHER, IRVING (1867–), American economist, was born at Saugerties (N Y), Feb 27, 1867 He studied at Yale, Berlin and Paris. At first he taught mathematics at Yale, but in 1895 was made assistant professor of political economy and in 1898 professor He was editor of the *Yale Review*, 1896–1910 He served as chairman of many commissions dealing with public health, prohibition and labour He was an advocate of dollar stabilization (*q v*)

His writings include *Mathematical Investigations in the Theory of Value and Prices* (1892), *A Brief Introduction to the Infinitesimal Calculus* (1897), *The Nature of Capital and Income* (1906), *The*

Purchasing Power of Money (1911); *Stabilizing the Dollar in Purchasing Power* (1919), *America's Interest in World Peace* (1924)

FISHER, JOHN (*c.* 1469–1535), English cardinal and bishop of Rochester, born at Beverly, went in 1484 to Michael House, Cambridge, where he took his degrees in arts in 1487 and 1491, and, after filling several offices in the university, became master of his college in 1499 He took orders; and his reputation for learning and piety attracted the notice of Margaret Beaufort, mother of Henry VII, who made him her confessor and chaplain. In 1501 he became vice-chancellor, and later on, when chancellor, he was able to forward, if not to initiate, the schemes of his patroness in the foundations of St John's and Christ's colleges, in addition to two lectureships, in Greek and Hebrew His love for Cambridge never waned, and his own benefactions took the form of scholarships, fellowships and lectures In 1503 he was the first Margaret professor at Cambridge; and the following year was raised to the see of Rochester, to which he remained faithful, although the richer sees of Ely and Lincoln were offered to him He was nominated as one of the English prelates for the Lateran council (1512), but did not attend A man of strict and simple life, he did not hesitate at the legatine synod of 1517 to censure the clergy, in the presence of Wolsey himself, for their greed of gain and love of display; and in the convocation of 1523 he freely opposed the cardinal's demand for a subsidy for the war in Flanders A great friend of Erasmus, whom he invited to Cambridge, whilst earnestly working for a reformation of abuses, he had no sympathy with those who attacked doctrine, and he preached at Paul's Cross (May 12, 1521) at the burning of Luther's books. Although he was not the author of Henry's book against Luther, he joined with his friend, Sir Thomas More, in writing a reply to the scurrilous rejoinder made by the reformer. He retained the esteem of the king until the divorce proceedings began in 1527, and then he set himself sternly in favour of the validity of the marriage He was Queen Catherine's confessor and her only champion and advocate. He appeared on her behalf before the legates at Blackfriars, and wrote a widely read treatise against the divorce

Recognizing that the true aim of the scheme of church reform brought forward in parliament in 1529 was to put down the only moral force that could withstand the royal will, he energetically opposed the reformation of abuses, which doubtless under other circumstances he would have been the first to accept. In convocation, when the supremacy was discussed (Feb 11, 1531), he declared that acceptance would cause the clergy "to be hissed out of the society of God's holy Catholic Church"; and it was his influence that brought in the saving clause, *quantum per legem Dei licet* Through listening to the revelations of the "Holy Maid of Kent," the nun Elizabeth Barton (*q v*), he was charged with misprision of treason, and was condemned to the loss of his goods and to imprisonment at the king's will, penalties he was allowed to compound by a fine of £300 (March 25, 1534) Fisher was summoned (April 13) to take the oath prescribed by the Act of Succession, which he was ready to do, were it not that the preamble stated that the offspring of Catherine were illegitimate, and prohibited all faith, trust and obedience to any foreign authority or potentate Refusing to take the oath, he was committed (April 15) to the Tower, where he suffered greatly from the rigours of a long confinement On the passing of the Act of Supremacy (Nov. 1534), in which the saving clause of convocation was omitted, he was attainted and deprived of his see The council, with Thomas Cromwell at their head, visited him on May 7, 1535, and his refusal to acknowledge Henry as supreme head of the church was the ground of his trial The constancy of Fisher, while driving Henry to a fury that knew no bounds, won the admiration of the whole Christian world, where he had been long known as one of the most learned and pious bishops of the time. Paul III was unaware of the grave danger in which Fisher lay; and in the hope of reconciling the king with the bishop, created him (May 20, 1535) cardinal priest of St Vitalis. When the news arrived in England it sealed his fate. Henry, in a rage, declared that if the pope sent Fisher a hat there should be no head for it. The cardinal was brought to trial at Westminster (June 17, 1535) on the charge that he did "openly declare in English that the king, our sovereign lord, is not supreme head on earth of the Church of England," and was condemned to a traitor's death at Tyburn, a sentence afterwards changed He was beheaded on Tower Hill on June 22, 1535, after saying the *Te Deum* and the psalm *In te Domine speravi* His body was buried first at All Hallows, Barking, and then removed to St. Peter's *ad vincula* in the Tower, where it lies beside that of Sir Thomas More His head was exposed on London Bridge and then thrown into the river. As a champion of the rights of conscience, and as the only one of the English bishops that dared to resist the king's will, Fisher commends himself to all. On Dec 9, 1886 he was beatified by Leo XIII.

Fisher's Latin works are to be found in the *Opera J Fisheri quae hactenus invenire potuerunt omnia* (Wurzburg, 1595), and some of his published English works in the Early English Text Society (Extra series, No 27, part 1, 1876) There are others in manuscript at the *P R O* (27, Henry VIII., No 887). Besides the State papers, the main sources for his biography are *The Life and Death of that renowned John Fisher, Bishop of Rochester* (London, 1655), by an anonymous writer, the best edition being that of Van Ortroy (Brussels, 1893); Bridgett's *Life of Blessed John Fisher, Bishop of Rochester* (London, 1880 and 1890); and Thureau, *Le bienheureux Jean Fisher* (Paris, 1907). (E Ta)

FISHER, JOHN ARBUTHNOT FISHER, 1ST BARON (1841–1920), British admiral, was born on Jan 25, 1841, and entered the navy in June 1854 He served in the Baltic during the Crimean War, and was engaged as midshipman in the "Highflyer," "Chesapeake" and "Furious," in the Chinese War, in the operations required by the occupations of Canton and of the Peiho forts in 1859 He became sub-lieutenant on Jan 25, 1860, and lieutenant on Nov 4 of the same year The cessation of naval wars, at least of wars at sea in which the British navy had to take a part, after 1860, allowed few officers to gain distinction by actual services against the enemy But they were provided with other ways of proving their ability by the sweeping revolution which transformed the construction, the armament, and the methods of propulsion of all the navies of the world, and with them the once accepted methods of combat Lieutenant Fisher began his career as a commissioned officer in the year after the launching of the French "Gloire" had set going the long duel in construction between guns and armour He early made his mark as a student of gunnery, and was promoted commander on Aug 2, 1869, and captain on Oct 30, 1874 In this rank he was chosen to serve as president of the committee appointed to revise "The Gunnery Manual of the Fleet" It was his already established reputation which pointed Captain Fisher out for the command of H.M S "Inflexible," a vessel which, as the representative of a type, had supplied matter for much discussion As captain of the "Inflexible" he took part in the bombardment of Alexandria (July 11, 1882). The engagement was not arduous in itself, having been carried out against forts of inferior construction, indifferently armed, and worse garrisoned, but it supplied an opportunity for a display of gunnery, and it was conspicuous in the midst of a long naval peace The "Inflexible" took a prominent part in the action, and her captain had the command of the naval brigade landed in Alexandria, where he adapted the ironclad train and commanded it in various skirmishes with the enemy After the Egyptian campaign, he was, in succession, director of Naval Ordnance and Torpedoes (Oct 1886–May 1891); A D C. to Queen Victoria (June 18, 1887–Aug 2, 1890, at which date he became rear-admiral); admiral superintendent of Portsmouth dockyard (1891–92); a lord commissioner of the navy and comptroller of the navy (1892–97) and vice-admiral (May 8, 1896); commander-in-chief on the North American and West Indian station (1897) In 1899 he acted as naval expert at The Hague Peace Conference, and on July 1, 1899, was appointed commander-in-chief in the Mediterranean From the Mediterranean command, Admiral Fisher went again to the Admiralty as second sea lord in 1902, and became commander-in-chief at Portsmouth on Aug. 31, 1903, from which post he passed to that of first sea lord. Besides holding the foreign Khedivial and Osmanieh orders, he was created K.C B in 1894 and G.C B. in 1902. As first sea lord, during the years 1903–09, Sir John Fisher had a predomi-

nant influence in all the far-reaching measures of naval development and internal reform, and he was also one of the committee, known as Lord Esher's committee, appointed in 1904 to report on the measures necessary to be taken to put the administration and organization of the British war offices on a sound footing The changes in naval administration made under him were hotly criticised by his critics, who charged him with autocratic methods, and in 1906–09 with undue subservience to the government's desire for economy; and whatever the efficiency of his own methods at the admiralty, the fact was undeniable that for the first time for very many years the navy suffered, as a service, from the party-spirit which was aroused It was notorious that Admiral Lord Charles Beresford in particular was acutely hostile to Sir John Fisher's administration, and on his retirement in the spring of 1909 from the position of commander-in-chief of the Channel fleet, Lord Charles put his charges and complaints before the government, and an inquiry was held by a small committee under the Prime Minister Its report, published in August, was in favour of the Admiralty, though it encouraged the belief that some important suggestions as to the organization of a naval "general staff" would take effect On Nov 9 Sir John Fisher was created a peer as Baron Fisher of Kilverstone, Norfolk He retired from the Admiralty in Jan 1910

From 1910 until Oct 1914 Lord Fisher remained in retirement, although Winston Churchill, then first lord of the Admiralty, constantly consulted him and it was on Fisher's advice that Sir John Jellicoe was designated admiral of the Grand Fleet in the event of war (It is noteworthy that at the time of the Agadir crisis, Fisher expressed to Lord Esher and others strong disapproval of the War Office plans involving Great Britain in extensive land operations in France)

Fisher was recalled as first sea lord in place of Prince Louis of Battenberg in the critical days at the end of Oct 1914 The "Audacious" had been sunk, Cradock heavily defeated off Coronel, German submarines were active and the measure to stop the flow of supplies into Germany were not effective Fisher took the responsibility of weakening the British fleet in home waters and detached the "Invincible" and "Inflexible" to engage von Spee, with the result that a complete victory was gained in the battle of the Falkland Islands To Fisher's boldness and realism again were due the new blockade policy and the laying of extensive mine fields The association between Churchill and Fisher was most happy until it was broken by the Dardanelles enterprise Fisher never liked it, his preference was for a landing on the coast of Prussia in the Baltic and the employment of Russian troops against the heart of Germany But he was over persuaded by Churchill into reluctant acquiescence to the initial efforts against the Dardanelles

When, however, the first attempt to force the straits had failed, and German submarines had made their appearance in Turkish waters, and it seemed doubtful whether the demands of the French campaign would allow the British to send the necessary reinforcements to the army in Gallipoli, Fisher felt that he could no longer continue to countenance the project of forcing the Dardanelles At the War council of May 14, 1915 he had declared that "he was against the Dardanelles and had been all along." Churchill afterwards told him that it was not fair to obstruct necessary measures at the Dardanelles and then when things went wrong to turn round and say "I told you so, I was always against it" Fisher replied "I think you are right—it isn't fair" That night Churchill in order to encourage the entry of Italy into the War on the side of the Allies gave instructions that four cruisers should go to the Mediterranean 48 hours before the time arranged, and the minute was signed "First sea lord to see after action." That was the first document seen by Fisher on beginning work as usual at four o'clock next morning. He refused to serve with Churchill any more and resigned His resignation coinciding with the crisis about high explosive shells, brought down the already shaken Liberal Government, and led to the formation of the first Coalition The manner of his leaving the Admiralty became Fisher less than anything in his life, but his motives were neither personal nor unworthy. He felt that as things were he had lost his power of service; that he could only hamper the Dardanelles and be "unfair" to Churchill without influencing events in the direction which he felt was right

Fisher did useful work later in the War as Chairman of the Inventions board, and when he died on July 10, 1920 and was buried in Westminster Abbey, the crowds felt that they were mourning the greatest British sailor since Nelson. Their reverence was the more remarkable because Fisher never commanded a fleet in action, nor, except the Falkland Islands, is any great victory at sea traceable to his direct inspiration. His enemies accused him of exaggerating the material side of naval power at the expense of the moral and intellectual He was not good in the logical presentation of an argument, he thought pictorially and the sequence of his ideas expressed themselves in a series of verbal explosions But his prescience amounted at times almost to second-sight, and he had a genius for the burning phrase that lights up the truth from within The most amazing quality of the man was that as he grew older he became more radical and revolutionary in his ideas. To the old man in 1919 his own Dreadnought of 13 years was a symbol of effete tradition, his slogan "Sack the lot" was not the prosecution of a personal vendetta against the Admiralty chiefs, but expressed his conviction that though the spirit was eternal, its forms were only made to be broken He wrote two volumes of memoirs *Memories* (1919) and *Records* (1919), somewhat scrappy and disorderly in composition but full of his glowing vitality Fisher married, in 1866, Miss Kate Broughton, by whom he had one son and three daughters (D H, H Sm)

FISHER (*Mustela pennanti*), a North American member of the weasel family (Mustelidae), black in colour, reaching a total length of about 42 inches, and producing valuable fur The fisher is also called Pennant's marten, and, by trappers, black cat (*See* Marten, Fur-bearing Animals, Fur Trade)

FISHERIES. This term as commonly employed embraces every method of pursuit and capture, whether for profit or for sport, of aquatic animals, from whales and seals, which are warm-blooded mammals, to the "tiddlers" prized by urchins However, neither whaling nor sealing comes within the scope of this article, which is limited to the pursuit of fish properly so-called and is primarily concerned with commercial fisheries for fish for food Fishing is probably the earliest form of hunting, and, as men were surely hunters before they were cultivators, is actually the oldest industry in the world.

For the most part, the attitude of man towards fisheries has been that of the spendthrift Nature gave the increase, he had but to use it if he could The abundance of fishes in their different species varied from year to year, but there was always abundance and it is only in comparatively recent years that serious apprehensions have been entertained lest the operations of man might jeopardize the stability of the stock. The contrary view still finds vigorous expression in some quarters in spite of the rapid growth both of the volume of fishing and of the efficiency and destructiveness of fishing gears

Most fishes are enormously prolific A female turbot will produce in one spawning season more than 8,000,000 eggs, a cod 4,500,000, a plaice 300,000, a herring 31,000 The eggs produced by individuals of most of the species of chief importance are numbered at least in hundreds of thousands; but at all stages of their life the fishes are beset by a host of enemies, among whom it is probable that man has been, until recently, the least destructive.

With the growth of the population of the world and the increasing demand upon available resources of food, it has begun to be recognized that man has hitherto failed to take full advantage of the enormous resources of the sea Approximately three-quarters of the earth's surface is covered by water; but the great fishing-grounds of the world are determined primarily by the depth of water upon them, and are almost entirely within the limit of a depth of 200 fathoms, and chiefly within 100 fathoms It is improbable that any great abundance of fish is to be found far beyond these limits, and in any case the difficulty and the cost of fishing operations by the methods hitherto in use increase in proportion to the depth of water on the fishing grounds It is

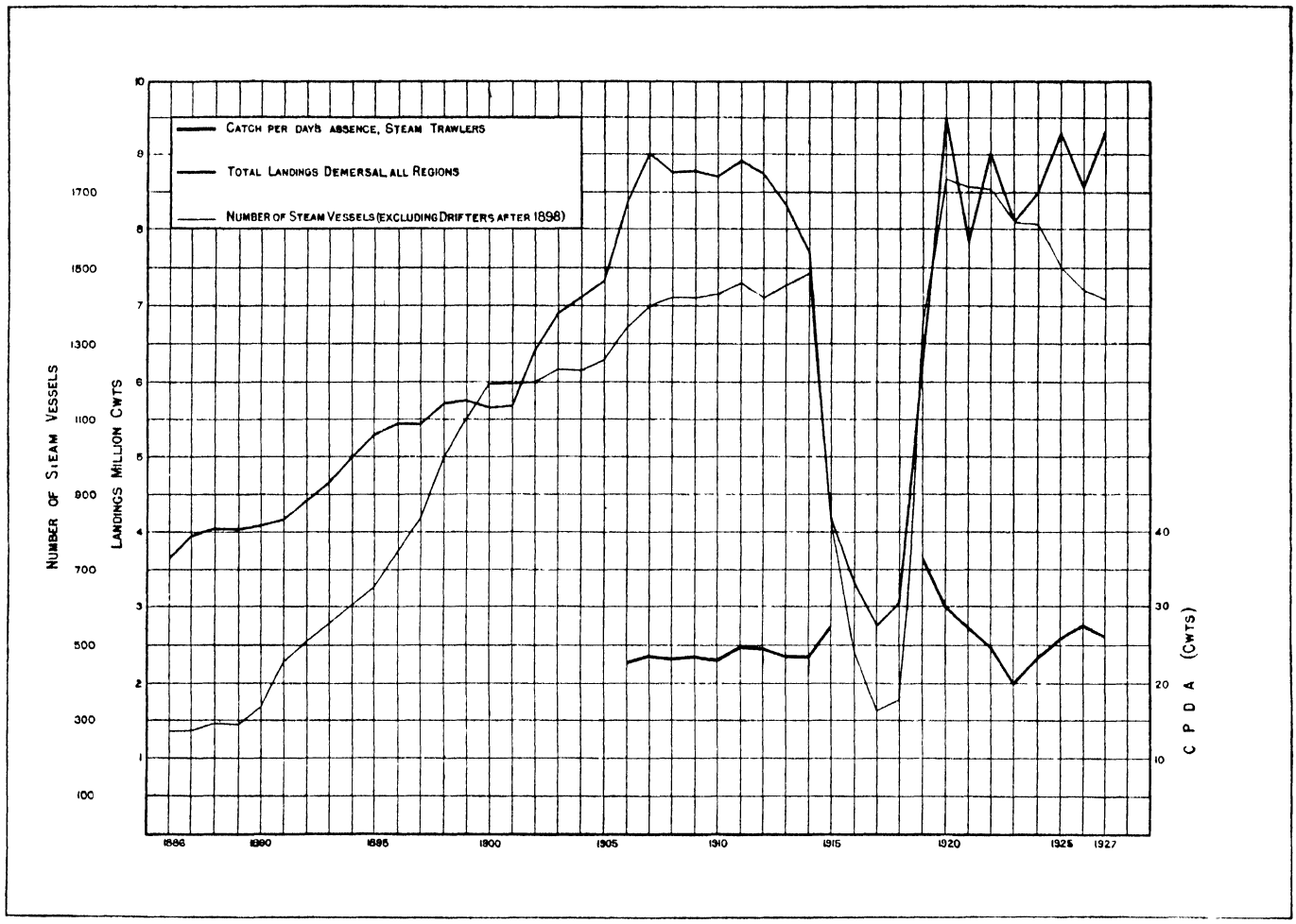


CHART SHOWING THE TOTAL LANDINGS OF DEMERSAL FISH AND THE NUMBER OF STEAM FISHING VESSELS (EXCLUDING DRIFTERS AFTER 1898) YEARLY SINCE 1886 AND THE AVERAGE CATCH PER DAY'S ABSENCE FROM PORT (C P D A) MADE BY STEAM TRAWLERS SINCE 1906 (EXCLUDING WAR YEARS)

thus on what may be described as the shelves of the continents or the banks of the oceans that the deep sea fisheries, the chief commercial fisheries of the world, are prosecuted

Historically speaking, there has been no parallel to the development of the fisheries of the North Atlantic and North Pacific, and more particularly of European waters Nor must we forget when we speak of the great industrial developments of fisheries in Europe in the past 60 years, and particularly of the ubiquitous steam trawlers of Great Britain, that in the days of the Tudors English fishermen were fishing not only in the North sea and other home waters, but at Iceland, as far east of the North Cape as Vardo, and even off Newfoundland Throughout the Middle Ages salt fish played a recognised part in the economy of European nations, it was the Lenten fare of Catholic Europe, a regular part of the rations of armies in the field, and the complement of salt meat in the winter food of northern Europe

In Great Britain today the consumption of fish per head of the population is about 40 lb annually, and the total consumption of fish is something more than one-third of the total consumption of meat Fish is also the raw material of various industries, fish-canning, fish-salting, herring-pickling, the manufacture (from the offal of fish) of fish meal, which is a useful feeding stuff for poultry, pigs and cattle, and of fish-manure, and the production of oil of various grades from medicinal cod-liver oil to cruder oils used for such purposes as tanning, soap-making and tempering steel Glue and isinglass are also among the by-products of fisheries, and attention is now being directed to the conversion of fish-skins into fine leather.

Again, fishing by modern methods provides employment on a large scale in connection with ship-yards, ice-factories, net-factories, motor works, etc The fishing industry of Great Britain uses at least 3,000,000 tons of coal a year The daily transport of fish is an important factor in the activities of some of the principal railway companies The distribution of fish from the wholesale markets to the retail shops and to the fried fish shops—which handle something like 40 per cent of the total quantity of fish consumed—provides employment for many hands If account be taken of the many trades and occupations which are in some sort ancillary to or activated, in whole or in part, by the fishing industry, it will be seen that, although the number of fishermen is comparatively small (about 60,000 in Great Britain) the failure of the industry would cause widespread repercussions in the labour market In every country with a fishing population this would be a calamity, in some, such as Norway and Newfoundland whose leading industry is fishing, it would be a disaster

But the influence of the fishing industry goes further and deeper than this It is not generally recognised how great a part fisheries have played in the destinies of nations A history of fisheries and even of the fisheries of any one country has yet to be written When the first man ventured to sea in a dug-out, it is probable that his purpose was the better to pursue fish, and not only the deep sea trawlers, liners and drifters of to-day, but the merchant and fighting navies are the lineal descendants of the pre-historic fisherman in his dug-out Thus fishing may be presumed to have prepared the way for sea trade, without which modern civilisation is inconceivable. The growth of the all-powerful Hanseatic League from the small beginnings of the herring fisheries of Scania, and the rise of the sea-power of the Dutch in the 17th century, following upon their predominance in the fisheries of the North sea, are comparatively modern instances of the influence of fishing on shipping. "It is the fish taken upon his majesty's coasts," wrote Sir William Monson,

admiral of the Narrow Seas, in the reign of James I, "that is the only cause of the increase of shipping in Europe, and he that hath the trade of fishing becomes mightier than all the world besides in the number of ships"

The Tudors in England feared a loss of sea power from the decline of the fisheries which followed the Reformation, and by various measures, including the so-called "political Lent," sought to give a new impetus to the fisheries The Stuarts with the same object in view sought to assert a British dominion over the North Sea, and it was with the temporary decline of her fishing fleet that in the subsequent struggle with the Dutch, Great Britain encountered perhaps her greatest humiliation at sea Moreover, throughout the history of Great Britain, the fisheries have not merely been a "nursery" for the mercantile marine and the royal navy but have directly contributed their quota to the fighting forces at sea, and when in the recent World War the fishermen with their ships played a prominent part in combating the menace of mine and submarine, history was repeating itself, as it had from age to age with variations, from the days when the fishermen of the Cinque Ports acquired their privileges in return for naval service

Fishing Methods and Gears.—The methods of catching swimming fish in use in Great Britain alone are very numerous, and, if one extends one's survey to the whole world, almost innumerable, but all of them are variations of a few radical methods One, perhaps the earliest, is that of direct attack by means of a spear and is still in use in some parts of the world The next is a trap devised to intercept and capture roving fish The various forms of fish-weirs still found here and there on the coasts of Great Britain, which work on the principle of admitting fish on the flood tide and trapping them on the ebb, are probably of primitive origin From the fish-weir or dam of stone or clay to a similar trap of wattle hedging and thence to fixed nets is a natural logical evolution. Another form of trap is that into which fish are attracted by food, examples of which, probably of primitive origin, are the wickerwork traps used for catching lobsters, prawns and crabs The baited line was probably first used without a hook, as it is even now in the method of catching eels known as "clotting" or "bobbing," that is tying a bunch of worms at the end of a line, and, when it has been taken by the eel, drawing it swiftly to hand before the eel has had time to disengage its teeth This method was improved upon by the introduction of a hook, the earliest form of which may have been the thorn hooks still used in parts of Wales and the Thames estuary From these methods the more elaborate devices employed in commercial fishing to-day have been evolved, the most important development being the device of bringing the trap, in the form of a net, to the fish, instead of trusting to the natural movements of the fish or the lure of bait to bring the fish to a stationary trap

In the fisheries of the North Atlantic, which are the most highly developed and commercially organised in the world, the methods of fishing of chief importance are trawling, seining, drifting and lining The first two methods involve the use of a net which is brought to the fish, in the case of the trawl, by dragging on, or near, the bottom of the sea, a bag-shaped net the mouth of which is kept open either by a beam across the head or by the pressure of the water upon wooden kites known as trawl boards attached to the net and, in the case of the seine, by gradually encircling the fish with a net in the centre of which is a bag not unlike that at the end—known as the "cod-end"—of the trawl The beam trawl is used only on sailing smacks and other small fishing craft, the trawl which depends for its spread on kites is known as the otter trawl and is universally employed on steam trawlers. It is, having regard to all possible circumstances, by far the most efficient instrument for taking "demersal" (*i e* bottom-feeding) fish yet devised One of the most efficient forms of seine net is the instrument chiefly used by the Danish fishermen and adopted to some extent in recent years by the British fishing industry

The principle of the drift net differs from that of the trawl and of the seine in that it is not actively approached to the fish On the other hand, it differs from the stationary trap and the many forms of stationary net in that it is attached either to a floating buoy or to a drifting ship (hence the name) and moves with the buoy or ship under the influence of wind and tide It is lightly and strongly made of cotton and is the instrument principally used in the great herring fisheries Each herring net measures from 50–60 yards long and about 14 yards deep, but the nets are used in "fleets," as many as 85 or more of them being employed at one time from one vessel so as to form an extended wall of netting hanging perpendicularly in the water The net is generally fished about 3 yards below the surface of the water, being kept at the right level by a series of buoys or "pellets" connected with the head-line by strops This net is devised to intercept sizeable fish which in the attempt to pass it are caught by the gills Drift nets of various dimensions are used for catching "pelagic" fish, that is to say, fish that swim in the upper layers of the water, chiefly herring, mackerel, pilchards and sprats Drift nets of larger mesh are also used for catching salmon

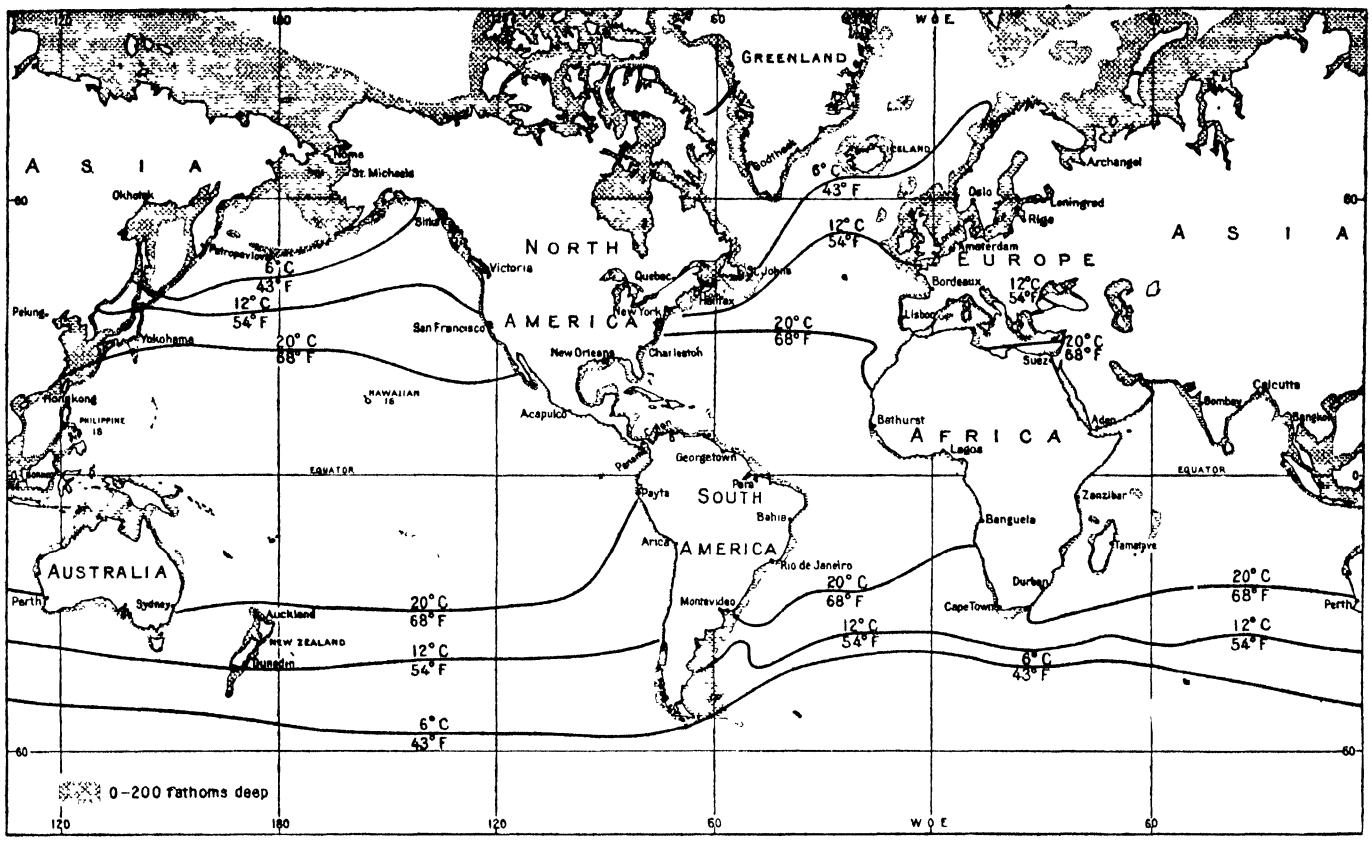
Fishing by means of lines with baited hooks was formerly of much greater commercial importance than it is to-day There are two methods of lining, hand-lining and long-lining In the former method the line is drawn by hand as soon as the fish is felt; in the latter, the line is shot and left unattended till it is time to haul Hand-lines are not, generally speaking, of great commercial importance A long line is fitted with a great number of hooks attached to the main line by thin strong lines of materials which vary according to the character of the fish and to local custom Long-lines may be set at low water on the sands, but more often they are worked from fishing vessels in deep water All the deep water lines are anchored and buoyed at each end, the longer ones also anchored and buoyed at intervals along the whole length On a large steam liner the number of hooks on one line may be anything from 1,000 to 5,500 Deep-sea long lines are chiefly used for cod and halibut The baits vary according to local conditions, and include mussels, whelks, squid and herrings

TRADE ASPECTS

World Fisheries.—The pursuit of fish is, in greater or less degree, world-wide No estimate of the output of the fisheries of the world can be wholly reliable, or indeed, more than an approximation, because in many parts of the world where fishing is actively carried on no statistics are compiled Again, the countries which do publish statistics do not compile them on a uniform plan, and it is generally difficult to derive from them comparable figures Most of the countries of Europe, however, the United States of America, the British dominions and Japan publish annual statistics of some sort or another, and a comprehensive statistical account of the greater part of the Fisheries of Europe will be found in the *Bulletin Statistique des Pêches Maritimes* of the International Council for the Exploration of the Sea

A further difficulty arises from the fact that, although, in many parts of the world, the inland fisheries are of great economic importance, statistics of their yield are usually lacking Here, however, attention will be concentrated chiefly on the sea fisheries which are the most highly developed and organized, particularly in the northern hemisphere The available statistics, excluding as far as possible the products of inland fisheries and those products of the sea outside the category of food-fishes, *e g*, seals, whales, corals, sponges, etc, show an output of food-fish to the value of more than £109,000,000 sterling per annum This figure does not include the fisheries of—in Europe—Italy, Russia, Greece and Turkey; with the exception of Japan it omits practically the whole of the Orient; nor does it include South and Central America, the West Indies, the greater part of Africa and the islands of the south Pacific and south Atlantic

In Europe, Great Britain easily leads the way in sea fisheries, with an output (1925) valued at over £20,250,000 France comes next with, in round figures, £7,000,000 worth, Norway next with £4,850,000 worth; then Spain with £4,000,000 worth On the American continent the value of the catch of the U S A is over £19,000,000, that of Canada over £5,000,000, that of Newfoundland, with Labrador, over £2,000,000 The only other British dominion with landings worth more than one million pounds is the



FROM THE REPORT OF THE IMPERIAL ECONOMIC COMMITTEE, PART V—FISH

MAP OF THE WORLD WITH THE AREA WITHIN 200 FATHOM LINE STIPPLED SHOWING THE LOCATIONS OF THE PRINCIPAL FISHING GROUNDS, AND THE MEAN ANNUAL ISOTHERMS INDICATING THE DISTRIBUTION OF THE KINDS OF FISH

commonwealth of Australia, with £1,200,000 worth The most startling outcome of a study of all the statistics available is that in respect of the value of its landings of sea fish Japan is the foremost fishing country of the world, with landings valued at more than £30,600,000

Fish is a very important, indeed a necessary item in the diet of rice-eating populations If one considers of how great a part of the population of the Far East rice is the staple food, one can appreciate the importance of the part played by fisheries in the economy of the eastern nations In Japan sea fisheries predominate, but in British India, although in certain provinces, notably on the west coast of Madras, serious and not unsuccessful attempts have been made to develop the sea fisheries, the economic importance of the inland fisheries is probably greater In Malaya and in Ceylon the sea fisheries are actively exploited In many parts of Africa fish is greatly sought after by the native population Indeed, if one could procure an account of the total catch of fish—both sea fish and freshwater fish—throughout the world, the value would certainly reach a startling figure In Tressler's *Marine Products of Commerce* the annual value of fish and fishery products is placed approximately at $800,000,000, say £160,000,000 This is probably too conservative an estimate.

Shellfish.—The term "shellfish" embraces the edible species of both crustaceans (crabs, lobsters, crawfish, prawns and shrimps) and molluscs (oysters, mussels, cockles, escallops, clams, whelks, etc) Their economic importance varies from country to country, but is nowhere comparable with that of the fisheries for what are commonly known as "wet fish" For instance, in Great Britain the total value of all shellfish (1926) was £599,817, but in the United States of America the annual first value of the crop of oysters is about £2,500,000, the value of the output in 1922 of canned oysters was about £480,000, and that of shell-grit, a by-product of the oyster fisheries, of which great quantities are exported to Great Britain and elsewhere for feeding to laying hens, about £400,000 (*see* OYSTER) Lobsters are an important article of commerce in Canada, whence Great Britain alone imports canned lobsters to the value of about £400,000 per annum Japan has a considerable and developing trade in canned crab meat and South Africa in canned crawfish

The yearly value of the lobster fisheries of Great Britain is £115,000 and of the crab fisheries £96,000, and it is interesting to observe that the shrimp fisheries reach an annual value of between £80,000 and £90,000 The most prolific of the fisheries for molluscs are the cockle and mussel fisheries, in that order The potential output of the mussel fisheries of Great Britain is practically unlimited; but many of the most prolific beds have been closed owing to sewage pollution Mussels, though themselves immune, are capable of transmitting typhoid and other intestinal diseases, whence arises the necessity for closing mussel fisheries in heavily polluted areas Methods have recently been elaborated in Great Britain by the Ministry of Agriculture and Fisheries by which polluted mussels can be effectively and economically cleansed The chief importance of the shellfish fisheries of Great Britain lies in the fact that they contribute to the livelihood of the declining population of inshore fishermen

BRITISH FISHERIES

It is worth while in a study of fisheries to consider the British fisheries in some detail because they are, so far as sea-fishing is concerned, the most highly organised in the world, with the possible exception of those of Japan The inland fisheries of Great Britain are of little commercial significance The salmon fisheries are exploited commercially, and have thus a certain importance, but reliable statistics of the catch of salmon in the British Isles are not available The salmon fisheries of many of the rivers of Great Britain have suffered from reckless pollution. At their best they could not bear comparison in the commercial sense with those of the western rivers of North America which provide, in the various breeds of Pacific salmon, the raw material of a great canning industry and trade The value of the trout and freshwater fisheries of Great Britain is almost wholly recreative

It is as a deep-sea fishing nation that Great Britain is supreme, for no country has so great a fleet of powerful steam vessels

equipped for distant voyages Although some progress has lately been made in the use of the internal combustion engine for fishing vessels of the larger deep-sea types, steam is still the chief index of power and the following comparative table is, therefore, of interest.

The Number of Steam Fishing Vessels Employed by Certain Countries of Europe, 1925

Great Britain	Germany	France	Norway	Holland
3,020	465	456	366	228

The steam-fishing vessels of Great Britain are chiefly trawlers and drifters, of which those with the widest range of fishing are steam trawlers The following table affords an index of comparative steam trawling power.

The Number of Steam Trawlers Employed by Certain Countries of Europe, 1925

Great Britain	France	Germany	Holland	Sweden
1,563	430* (year 1927)	393	167	45

*This number includes 37 trawlers of more than 500 tons employed in the Newfoundland fisheries, six of which are actually over 1,000 tons

Of the British steam trawlers, 1,222 fish from ports of England and Wales, visiting the fishing grounds of the whole of the Continental Shelf, from Iceland to Morocco and from the Barentz sea to the west of Scotland, Rockall and the south west of Ireland

The steam trawlers built in Great Britain during and since the World War conform fairly closely to three types which are distinguished as the "Mersey," "Castle" and "Strath" types They are all steel built The following table gives their usual dimensions.

Type	Length	Beam	Depth	Gross tonnage
Trawler				
"Mersey"	138′	23 7′	13·5′	324
"Castle"	125′	23 6′	12·7′	275
"Strath"	115′	22′	13′	215

The "Mersey" type is that generally used for fishing in Icelandic and Murman coast waters, the "Castle" for the hake fishery along the Atlantic Slope, the "Strath" for the North sea The tendency is for the size and power of the steam trawlers used for the more distant voyages to increase

Of the drifters some are still built of wood, but the majority of steel The usual dimensions of drifters are as follows

Type	Length	Beam	Depth	Gross tonnage
Drifter	85·8′	18·6′	9 2′	95

A certain number of vessels are used alternatively for either drifting or trawling

The relative importance of the different methods of fishing in Great Britain may be gauged by reference to the following figures.

Quantity of Wet Fish of British Taking Landed in Great Britain in 1926 by Each Method of Capture

Trawl	Drift	Lines	Danish Seine
Cwt.	Cwt	Cwt.	Cwt
9,481,000	7,853,000	903,000	353,000

In addition 286,000 cwt were taken by other or unstated methods. Of the total, 18,965,000 cwt., 16,089,000 cwt were taken by vessels fishing under steam power, although the coal supply was curtailed by the strike of that year. Trawlers, liners and seiners take chiefly demersal fish (known to the trade as "white" fish), *i e*, fish normally found feeding at the bottom of the sea, but some mackerel are taken by the trawl and seine, and there has been an important development in recent years of trawling for herring For a few years before the war this method of fishing for herring was actively practised at certain times and places by British vessels and is still used at the Smalls, but since the war it has been most highly developed by Germany The relative values of the demersal and pelagic fisheries may be gauged by reference to the following figures

Quantity and Value of Demersal and Pelagic Fish of British Taking Landed in Great Britain in 1926

Demersal		Pelagic (Chiefly Herring)	
Quantity	Value	Quantity	Value
Cwt	£	Cwt	£
10,961,000	13,541,000	8,000,000	3,503,000

In considering these figures, regard must be had to the fact that since the war the herring fisheries, which depend for the most part upon the export trade in cured herrings, have suffered seriously from the disorganisation of the markets of Europe, and particularly the markets of pre-war Russia, which country formerly absorbed more than 50% of the export The white fish fisheries, on the other hand, which depend mainly upon the home market for fresh fish have not been affected by post-war conditions to the same extent The effects of the change may in part be gauged by reference to corresponding figures for the year 1913.—

Quantity and Value of Demersal and Pelagic Fish of British Taking Landed in Great Britain in 1913

Demersal		Pelagic (Chiefly Herring)	
Quantity	Value	Quantity	Value
Cwt	£	Cwt	£
11,096,000	9,096,000	12,317,000	4,633,000

Although steam trawling is the predominant method of fishing for demersal fish in England and Wales, new methods are always being tried The use of the Danish seine is a comparative novelty This instrument is worked by the Danes from motor boats of comparatively small size, but, by their British imitators, mainly from steam vessels of the drifter type There have been developments also of trawling in the direction of the improved efficiency of the trawl itself A more recent enterprise which may be the precursor of more important developments is the commissioning by a well-known firm of trawler owners of two vessels of over 3,500 and 10,000 gross tons, respectively, to exploit the waters west of Greenland These vessels carry a large number of Norwegian dories, which fish by line, bringing back their catches to the parent ships The fish caught is in part sent by steam trawlers, acting as carriers, to England for immediate sale, and part of it is frozen and stored on board for future use There is also machinery on board for the extraction of oil from the livers of fish, and for the turning of offal into fish meal, so that, in effect, the parent ships are also floating factories If this method stands the test of experience, the enterprise may be the forerunner of developments of a revolutionary character Trawlers did excellent work in the World War when they were employed principally on minesweeping service, usually armed with a light gun and a rifle or two

There has been, especially since the introduction of steam power in the fishing industry, a growing tendency in Great Britain towards the centralization and industrialization of fisheries The following table indicates the relative importance of the major fishing ports in which the commercial fisheries are chiefly concentrated (of the Scottish ports, Aberdeen and Granton alone are largely devoted to steam trawling; of the rest the herring fisheries supply the bulk of the catch, as is also the case of Yarmouth and Lowestoft among the English ports)

Average Daily Landings of Wet Fish at Ports at Which the Quantity Landed Daily Was 20 Tons or Over in Either of the Years 1913 and 1926

Port	1913	1926	
	British	British	Foreign
	Tons	Tons	Tons
Grimsby	584	493	69
Hull	262	383	29
Aberdeen	203	243	153
Yarmouth	512	240	
Lowestoft	397	224	3
Fleetwood	121	147	9
Lerwick	101	121	
Milford Haven	80	103	3
Shields, North	150	83	
Wick	68	82	
Stornoway	88	73	
Peterhead	131	72	
Fraserburgh	109	69	
London	157	56	
Granton	50	56	
Stronsay	45	47	
Newlyn	18	38	
Swansea	25	33	
Hartlepool	41	32	
Plymouth	14	32	
Cardiff	22	27	
Scarborough	27	14	
Blyth	36		
All ports	3,301*	2,674	266

*In 1913 the total daily landings by foreign vessels direct from the fishing grounds was 120 tons

From a general economic point of view this centralization has advantages, but it has had a regrettable sequel in the depression of the smaller fishing ports, which have been unable to withstand the competition of their more powerful and better organized rivals Their contribution to the fish supply of the country is, in these days, no more than 5% of the total—but they have played a great part as a "nursery" of natural seamen for the mercantile marine and the royal navy and have been the chief source of strength of the life-boat service With the centralization of the fisheries and the development of the steam trawler, by means of which a smaller number of men can catch a greater quantity of fish, the number of fishermen regularly employed has declined This fact must be reckoned a misfortune to an island nation, the heart of a great empire dependent for its existence on the freedom of the seas and, therefore, on an adequate supply of seamen to sail and to defend the sea routes

FISHERIES OF THE BRITISH EMPIRE

Reference has been made to some fisheries of the British empire If a chart of the world be studied with special reference to the sea areas within the depth of 200 fathoms—that being roughly the limit of depth of the fishing grounds—it will be seen that most of the principal fishing grounds are fairly easily accessible from different parts of the British empire In Canada and Newfoundland there are already well-established fishing industries exploiting the fisheries of the north-western Atlantic, and an experimental station has recently been erected at Halifax under the control of the Marine Biological board for the study of the preservation of fish by brine freezing, with a view to the development of an export trade to Europe Canada also, and particularly British Columbia, exploits the fisheries of the north Pacific, the most important fisheries being those for salmon (which accounts for something more than three-quarters of the annual value of the fisheries of British Columbia), halibut and herring

Comparatively little attention has until recently been bestowed upon the fisheries of Australia, and the fishing grounds have only been partially explored The lack of interest in fisheries may be accounted for partly by difficulties of transport and partly by the relative cheapness of meat. There are, beyond doubt, large areas of trawlable water round the coasts, and there is every reason to believe that they are prolific of fish In recent years a trawling industry has grown up in New South Wales, and the Australian Development Commission is now seriously studying the question of the development of Australian fisheries

The fisheries of New Zealand are already well developed and steadily increase in importance Between 40 and 50 steam trawlers are employed and about 1,300 vessels of smaller types Oysters of high quality are produced, particularly in Foveaux strait, and the endeavour is being made to acclimatize turbot and other food fishes from the north Atlantic

It is probable that the most important development in the near future in British empire fisheries will take place in South Africa, where surveys already carried out and at present in progress have revealed rich and extensive fishing grounds, some within a few hours steaming of Cape Town, others at no great distance from Durban A fishing harbours committee was appointed in Oct 1925, by the Union Government to investigate and report on the improvement of the harbours along the coast and of the assistance which could be given to encourage fishing industries A small trawling industry has already been developed, with Cape Town, and though South Africa imports considerable quantities of cured, dried and preserved fish, its export trade in fish amounts already to some £300,000 worth a year and is growing steadily The chief item of export is preserved crawfish, valued at over £200,000 a year, the principal market for which is in France. Fresh and frozen fish are exported chiefly to Australia There is also a considerable market for fresh fish in South Africa, particularly in the towns of Rand

The fisheries of the tropical regions of the empire stand on a different footing to those hitherto mentioned It is probable that in the warmer seas there is a greater number of species of fish, but that there are no such great concentrations of any one species as are found in the colder regions, moreover, the areas within the 200 fathom line are on the whole less extensive in the tropics than in the northern seas, but fishing is carried on on practically all the shores of the tropical colonies and of India On the west coast of Madras, where the fisheries are more systematically organised than in other parts of the province and statistics are collected, some 54,000 tons of fish are landed annually, valued at between £400,000 and £500,000 Statistics are not available for the fisheries of the east coast of the province On the coast of Bombay fishing by old-fashioned methods is carried on and attempts have recently been made to develop trawling, hitherto with little success The fisheries of Bengal supply to Calcutta alone about 16,000 tons of fish yearly In Ceylon and in Malaya experimental work is being conducted by the Governments with a view to the development on more modern lines of age-old fishing industries

Generally speaking, it may be said that throughout the empire there has developed in the present century a disposition to pay greater attention than heretofore to the food resources of the sea, and that this disposition has been translated into active energy

UNITED STATES FISHERIES

The United States fisheries supporting a large manufacturing trade are prosecuted on the seaboard of the Atlantic and Pacific oceans, in the Great Lakes and in many prolific rivers Their range extends from Alaska south-eastwards to Florida and over something more than 100° of longitude Although in respect neither of latitude nor of longitude is their range much greater than that covered by the ubiquitous steam trawlers of Great Britain, their variety is so great that no summary account can do justice to it For details, reference must be made to the reports of the individual States and of the bureau of fisheries, which is attached to the Department of Commerce

The value and importance of the industry increases steadily with growing recognition and increasing demand, but there is as yet a lack of such detailed and comprehensive statistics as are essential to an accurate economic survey of the industry The importance of such statistics is, however, now fully recognized: it was emphasised again and again at a conference of the division of scientific inquiry organised in Jan, 1927, by the bureau of fisheries, and great progress has been made in recent years through the efforts of the bureau to make good the deficiency

It is calculated that the fisheries and fishery industries of the

United States (including whale, sponge and other fisheries, which it is difficult to extract) employ about 190,000 persons, and that the property and equipment involved in them is worth more than $210,000,000 The quantity of fishery products sold by fishermen is over 1,300,000 tons, valued at nearly $109,000,000 Of the manufactured fish products the most important are

(1) Canned products, over $86,000,000 worth, the chief of which are salmon, over $56,000,000 worth, and sardines, about $14,500,000

(2) Fish oils, 10,900,000 gallons, valued at something more than $5,000,000 Of these, the most important are menhaden, about 4,000,000 gallons, herring, over 3,000,000 gallons, and sardine, over 2,000,000 gallons

(3) Fish meal, about 93,000 tons, valued at about $3,650,000

(4) Fish glue, 520,600 gallons, valued at about $732,000

(5) Poultry grit, about 251,000 tons, valued at $2,400,000

The most important sea fisheries are those centred on the three ports of Boston and Gloucester, Mass., and Portland, Me These fisheries employ 350 sail, steam and oil-driven vessels, including 30 steam trawlers The aggregate landings of the three ports are about 106,500 tons and their value over $9,000,000 The three most important fishes are haddock, about 42,000 tons, cod, about 35,000 tons, and mackerel, about 16,000 tons In 1926, the year to which the above figures belong, about 26% of the catch was taken by steam trawlers, again, 83% was taken off the coast of the United States, 16% off that of Canada, and 1% on the banks of Newfoundland

It is said that over 90% of the sea fish landed in American ports is consumed within 200 miles of the coast It is, however, generally anticipated that, as the result of the improvement of methods of transport, by means of which it is hoped to bring sea fish within reach of consumers far inland, there will, in the near future, be a great development of sea fishing, and especially of trawling The tendency at present is to rely mainly on vessels of comparatively small tonnage—not more than 100 tons—using oil engines of diesel or semi-diesel type If the development of the markets is as great as is expected in some quarters, it seems probable that steam trawling may also develop

The lobster fisheries, which have long suffered from the results of indiscreet exploitation, are still one of the important branches of the fishing industry of the New England States and particularly of the State of Maine

The first value of the fisheries of the States of the Pacific Coast is (figures based on statistics for 1925) about $24,500,000 The landings of fish, other than shell-fish, are about 266,000 tons, and of shellfish about 5,600 tons By far the most valuable fishery is that for salmon, yielding over 62,000 tons, with a value of over $10,000,000 Next in importance is the tuna fishery of some 24,000 tons, with a value of about $4,500,000 The halibut fishery, centred at Seattle but prosecuted from California northward, is next in importance The landings amount to between 8,000 and 9,000 tons, and the value to about $2,177,000 These figures do not include something over 1,000 tons landed in Alaska The sardine fisheries, valued at about $2,000,000 are fourth in importance, though the yield of these fisheries, about 140,000 tons, is greatly in excess of all the rest

The oyster fisheries of the United States exceed by a considerable margin those of the rest of the world The chief producing States are Maryland and Virginia Maryland, in 1880, the highest recorded year, produced over 10,000,000 bushels, valued at 5 million dollars, and, in 1915, the lowest recorded year, over 4,000,000 bushels, valued at 3¼ million dollars The output of Virginia in 1925 was 4,300,000 bushels, valued at over 2¾ million dollars The highest previous record of this State (1904) was 7,600,000 bushels, valued at more than 3½ million dollars Other States producing over 1,000,000 bushels annually are New York, New Jersey, Mississippi and Louisiana

The fisheries of the Great Lakes are shared between the United States and Canada, the catch of the former being about double that of the latter The United States landings from the lakes in 1925 amounted to nearly 31,000 tons; in the highest recorded year, 1915, the landings exceeded 48,000 tons Over 4,500 tons of lake trout were landed in 1925, of which more than 3,000 tons came from Lake Michigan The landings of white fish (*Coregonus clupeiformis*) were 1,500 tons, chiefly from lakes Michigan and Huron The heaviest landings were those of lake herring, 6,500 tons, of which about 60% was taken in Lake Superior and nearly 30% from Lake Michigan Blue pike, 4,700 tons, are taken almost exclusively in Lake Erie Sturgeon have varied between 48 tons in 1915 and 11 tons in 1925

The most important anadromous fishes, other than salmon, are shad, alewives and striped bass The shad fisheries of the Potomac yielded in 1926 over 460 tons, valued at $217,000, and, in 1922, the highest previously recorded year, nearly 1,400 tons The landings from the Hudson river are, roughly, a quarter of those of the Potomac The landings of alewives from the Potomac (1926) were 2,500 tons, valued at $55,000 In the highest previously recorded year (1909) these landings were more than doubled

The striped bass is fished all along the Atlantic coast of the States, and, like the shad, has been successfully naturalized on the Pacific coast

The administration of the fisheries is in the hands of the various States, but the bureau of fisheries at Washington, which is attached to the Department of Commerce, not only conducts scientific investigations, either independently or in co-operation with provincial investigators, but has acted as a clearing-house for statistical information collected within the States, largely at its instigation Only the State Governments have authority to enforce the collection of statistical records, and the function of the bureau is, in this respect, chiefly one of advice, co-ordination and compilation It is through the bureau also that the United States is represented in the North American Committee of Fishery Investigations The bureau publishes annual reports on the fishing industries of the United States, including steadily improving statistical material, and *Reports on the Progress of Biological Studies*, which give a general picture of investigations conducted and of their results Nor are the investigations of the bureau confined to purely biological studies They embrace important investigations of the technique of handling fish after capture, and the bureau has played an important part in the recent development of the "package fish" trade

The attention of the bureau has also been directed to improving the method of production of such fishery products as oil, meal and manure, with a view to eliminating waste, more especially in connection with the menhaden industry and with the disposal of the waste from filleting and canning The investigations of the bureau embrace also such subjects as the preservation of nets, the canning of sardines and inquiries as to the nutritive value of fish

PISCICULTURE

The prospect of very considerably increasing by artificial means the stocks of those multitudinous fishes which are the foundation of the great commercial fisheries of to-day is at present remote There is no reason to discourage researches directed to the artificial propagation of fish of every kind, but for the present the more practical line of inquiry will be that which aims rather at the prevention of wasteful exploitation than at artificial contributions to the stock

Certain fishes lend themselves to the art of pisciculture, more or less according to circumstances Among freshwater fishes those of the carp family can be successfully bred and reared in captivity, and trout can be profitably hatched in special receptacles and reared in suitable ponds to the yearling or two-year-old stage, or even further, to be disposed of either for stocking or restocking sporting waters or for consumption in hotels and restaurants The process is comparatively simple Usually the ripe female fish are "stripped," the eggs being allowed to fall into a vessel of water into which a little milt from the male is introduced, the eggs thus fertilized being then transferred to the hatching receptacles The same process can be applied to sea fishes, and experiments have been carried out in the distribution of newly hatched larvae of plaice and cod in waters where it is desired to increase the stock; but there is no convincing evidence in the case of these

fishes that the result sought has in any case been achieved The great fecundity of sea fishes is nature's provision against an enormously high rate of mortality, and the number of larvae which it is practicable to hatch in a hatchery of reasonable size is so small by comparison with the natural distribution that it is inherently improbable that the output of a hatchery could make an appreciable difference in the abundance of the stock The investigations undertaken by Captain Dannevig in selected Norwegian fjords in 1904 and 1905 tend to confirm this conclusion (See *Report for 1906 of the Lancashire Sea-fisheries Laboratory,* Liverpool, 1907) A possible exception may be found in the results of the work of the Commission on Inland Fisheries in the artificial rearing of young lobsters from the egg to the lobsterling stage in the quiet waters of Rhode Island, U S A There appears to be some evidence of improvement of the lobster fisheries resulting from this work, but whether the improvement is to be attributed to this cause or to such methods of conservation as, *e g*, protection of the berried female, and whether in the former case the improvement has been proportionate to the cost involved, is open to some doubt (See *Annual Reports of the Commissioners of Inland Fisheries, Rhode Island,* especially those for 1908 [Special paper by A O Mead] and 1910 [Appendix])

Artificial methods of cultivation have chiefly proved useful where it has been desired to populate streams or parts of streams which are understocked, or to introduce into a river a new species of fish The distribution of eyed ova or of yearling fry of trout or salmon in waters inaccessible to native fish may lead to the establishment of a stock or to the increase of the total run of salmon in a river The shad has been successfully acclimatized in the rivers of California and in the Mississippi by the distribution of artificially propagated eggs from the eastern rivers of the United States The quinnat and Atlantic salmon and the brown and rainbow trout have by similar means been successfully naturalized in the rivers of New Zealand Experiments which have been carried out in certain British rivers for the purpose of improving the native stock of salmon by the introduction of fresh blood by crossing with the stock of other rivers by means of artificial fertilization of the eggs have hitherto been inconclusive

There is another branch of pisciculture which may be broadly summed up as transplantation This method is familiar to every oyster planter and is usefully employed in the cultivation of other molluscs, such as cockles, mussels, etc The main purposes of transplantation of molluscs are to relieve over-crowding of young fish and to place the mature fish on beds where the conditions are suitable for fattening Transplantation is an essential feature of successful oyster farming (*see* OYSTER)

Successful results have attended the transplantation of eels Millions of elvers are annually captured in the river Severn and exported to Germany for distribution in suitable waters in that country Similarly elvers are trapped in the Danish fjords and transplanted to suitable lagoons to become the source of a profitable industry.

Reference is made below to the rapid growth of plaice transplanted from the eastern waters of the North Sea to the Dogger Bank, and similar experiments in the transplantation of plaice from the outer lagoons of the Limfjord in Denmark to the inner, which are rich in food but are blocked against the immigration of flat fish by dense growths of sea grass (*Zostera*), have laid the foundations of a profitable fishery in these waters

So far as experience goes, then, it is clear that attempts to increase the supply of sea fish by artificial hatching have been unsuccessful, that the increase of the stock by transplantation succeeds in the case of molluscs and in the case of flat fish in special circumstances, such as those appertaining in the Danish fjords, and may prove successful with certain fishes in more open waters Artificial propagation from the egg is useful for the introduction of a new stock of fish in suitable river waters either by the distribution of eyed ova or, where that is impracticable, by the distribution of young fish which have reached an age at which they can take care of themselves It is extremely doubtful whether it is ever worth while to distribute the newly hatched larvae, which are very delicate and are exposed on distribution in the open waters of a stream or of the sea to a thousand hazards

Scientific Research.—Speaking of the inaugural meeting of the International Fisheries Exhibition of 1883, T H. Huxley said, "I believe that the cod fishery, the herring fishery, the pilchard fishery, the mackerel fishery, and probably all the great sea-fisheries are inexhaustible, that is to say that nothing we do seriously affects the number of fish." In an earlier passage of his argument, which was, in effect, that the fish were so prodigiously numerous and the quantity caught by man so insignificant by comparison with the other destructive agencies at work that regulation of man's operations would be futile, he qualified his conclusion with the words, "in relation to our present method of fishing" In 1883 the use of steam power for fishing was hardly regarded seriously (the first experiment was made in 1877 with an old paddle tug out of North Shields), the otter trawl had not been invented, and the carefully designed steam trawler of to-day had not been dreamed of Every innovation is an object of suspicion, especially among such conservative folk as fishermen are and Huxley was familiar with the complaints laid against the beam trawl before the royal commission of 1864 of which he was a member The circumstances of to-day are very different and, whatever view may be taken of the controversial topic of overfishing no one is now likely, with full knowledge of the evidence, to say that the operations of man are insignificant in their effects upon the composition of the stock of fish

The Exhibition of 1883 gave impetus to a demand for scientific investigation of the sea and its resources which had already made itself felt Ten years had passed since the "Challenger" sailed on her famous voyage The Fishery board for Scotland had just begun systematic inquiries, abroad, notably in Germany, marine science was establishing itself and in Great Britain the next year was to witness the establishment of the Marine Biological Association of the United Kingdom With the rapid development of fishing which followed the introduction of steam and, later (about 1895) of the otter trawl the old apprehensions were intensified and compelled the serious attention of the Governments, so that, when in 1899 the king of Sweden invited representatives of the countries interested in the fisheries of the North sea and the Baltic to a conference at Stockholm to discuss the subject of co-operation in the study of marine problems the response was general and, after a second conference in Christiania in 1901, the International Council for the Exploration of the Sea was constituted to co-ordinate the national researches of the participating countries To-day all the countries of Northern Europe with important fishing interests are members of the Council, except Soviet Russia Portugal, Spain and Italy are also members, having joined respectively in 1922, 1924 and 1927, and the Council's investigations cover the whole of the continental shelf of Europe and Northern Africa outside the Mediterranean

In 1919 there was established the Commission Internationale pour l'Exploration de la Mer Méditerrannée, fashioned in many respects on the model of the International Council, and in 1921 an analogous body was formed under the name of the North American Committee on Fishery Investigations to secure co-ordination of marine fishery investigations between the United States of America, Canada, Newfoundland and France

The aim of economic marine biology is well summed up in the object set before it by the International Council for the Exploration of the Sea, which is "the rational exploitation of the sea" To exploit the sea rationally means, presumably, to get as much out of it as is possible at the least possible cost and without waste

The first necessity is to know or at least to have a rational conception of what the stock of fish is and what are the factors governing these fluctuations of it which have puzzled and alarmed generations of fishermen The first step in any such inquiry must take the form of statistics. The most complete and comprehensive statistics of sea fisheries are those of Great Britain The International Council, which publishes an annual *Statistical Bulletin,* realises the importance of uniformity of method in the collection and presentation of statistics and is disposed to accept the British method as its model; but few of the constituent countries are, as

yet, as well equipped as Great Britain for their collection The British statistics record annually the total landings of fish and of each of the most important food fishes separately. Such statistics are mainly of use for commercial purposes The details required to supplement and guide biological investigations are many The endeavour is made, in the case of each important food fish, to show from year to year the weight of fish taken, the range of size of the most important species the region in which they are taken, and the fishing power expended in their capture Note is taken of the proportions of the different trade categories in the landings—"large," "medium" and "small", but as these are variable dimensions, a check is kept upon these variations by measurers at the principal ports Increased landings from any region may be the result merely of increased fishing therefore note is taken of the number of voyages made and the length of time spent in fishing, from which is calculated the quantity of fish landed per day's absence from port, or, more lately, per 100 hours' fishing Allowance has to be made, as well as may be, for increased size and power of the ships fishing, and for increasingly efficient gear Having thus ascertained, as nearly as possible, the quantities of fish, in their different species, landed in a given period in different regions, the relation of this quantity to the power expended in its capture and the quality of the landings as regard the proportion of the totals falling into certain size categories, the calculations are further checked by special statistics collected on board a certain number of trawlers by fish measurers The fish measurer takes mixed samples of the contents of the trawl after each haul and measures every fish in the sample A considerable quantity of the fish taken are too small to be marketable, and are thrown overboard but, since they are usually killed in the process of capture, they are lost to the stock It is the business of the fish measurer to complete the picture furnished by the port statistics by revealing the quantity of undersized fish not landed, but, nevertheless, taken out of the total available stock The actual stock on which we are working can never be accurately known: but the data collected by the methods just enumerated enable a reasoned opinion to be formed as to whether, making due allowance for all other factors, the stock is being overfished

The chart on page 294 illustrates generally the method of comparison of landings with fishing power

The chart presents two interesting features. The first is the similarity between the ascending curves of landings and of steam power employed until two new factors, the general adoption of the otter trawl and the development of fishing on the more distant grounds appear to be reflected in a steep rise of the curve of landings. The second is the high point at which the interrupted curve of catch per day's absence from port starts immediately after the war, during which little fishing had taken place, and its rapid decline apparently reflecting the influence of renewed fishing

The following table of the landings of North Sea plaice is an interesting illustration of what appears to be the effect of fishing operations on the composition of the stock of a single species of fish

The graph and the table are to be regarded merely as samples of the statistical data by means of which the endeavour is made to record changes of the stock (which, in the nature of things can, at best, only be estimated) and to form a reasoned opinion as to the relation between these fluctuations and the operations of men

Such statistical data are the starting point of biological investigations and may furnish the test of provisional biological conclusions In order that all factors affecting the stock of fish may be taken into account, it is necessary to study the life histories of the food fishes severally and collectively Since the life histories of fishes, as of other animals, must be governed mainly by the factors of their environment, that environment must also be studied The most important factors of the environment are, to express it very generally, climate and food, the former naturally reacting to a great degree upon the latter What corresponds to climate in the sea is—again speaking in general terms—the physico-chemical composition and the movements of the water It is an established fact that all animal organisms depend ultimately for their food supply in the sea, as on land, upon plant life

Quantities (in 1,000 Tons) of Large, Medium and Small Plaice, Landed at English Ports from the North Sea by All Classes of British Vessels in Each Year from 1906 to 1927

	Large	Medium	Small	Total (excluding unsorted)
Pre-war 1906	10	7	9	26
1907	8	8	14	30
1908	8	8	13	29
1909	6	9	14	29
1910	5	8	11	24
1911	5	8	13	26
1912	5	9	11	25
1913	5	8	10	23
War 1914	4	6	10	20
1915	2	2	2	6
1916*	1	2	1	4
1917*	1	2	1	4
1918*	2	9	2	13
Post-war 1919	9	13	2	24
1920	13	12	5	30
1921	6	11	6	23
1922	5	10	11	26
1923	3	6	12	21
1924	2	5	14	21
1925	2	4	16	22
1926	1	3	14	18
1927	1	4	16	21

*Estimated figures

The fixed sea-weeds are found only in a narrow fringe in shallow water round the coasts, but in the upper water layers of the whole ocean to such depths as sunlight can penetrate are multitudes of microscopic plants, upon which above all depends the great productivity of the sea. These plants are eaten by various animals, which in their turn are eaten by larger ones, till at the other end of the food chain we find the fishes exploited by man, which thus ultimately depend upon vegetable growth The plant harvest of the sea depends on many physical and chemical factors, the most important being suitable temperatures, an adequate supply of sunlight, of carbonic acid and of certain chemical salts

FOUR BRANCHES OF RESEARCH

Thus, fishery research is divided broadly into four branches,—statistics, to which we have already referred, investigations of fishes, investigations of their food, including both the organisms, many of them microscopic, inhabiting the surface layers of the water and the invertebrates found at the bottom of the sea; and hydrographical investigations In practically every instance conclusions have to be deduced from samples collected by ingeniously contrived, but as yet imperfect instruments The factors to be taken into account are, moreover, so numerous and so complex and the area of inquiry so wide that the only hope of arriving at well-founded conclusions within a measurable space of time lies in organized team work This fact has been recognized by the Governments of States represented in the International Council for the Exploration of the Sea in making themselves individually responsible for definite shares of a programme of work internationally organised through the Council Neither must it be forgotten that the deep sea fisheries are for the most part prosecuted in waters in which all countries have equal rights of fishing If, therefore, any practical results are to ensue from the knowledge acquired, in the form of regulation of fishing operations, or, as is not wholly inconceivable, actual cultivation of the stock, these measures must be applied with the goodwill and co-operation of all the interested countries

A detail of the study of the life history of fishes of peculiar economic importance is the investigation of the rate of their growth and the variations of the rate of growth responding to different circumstances For this purpose it is essential to have an index of age so that the growth rate of fishes of the same ages in different localities and circumstances and the variation of the growth rate generally at different stages of life or in favourable or unfavourable years may be compared. The ages of some fishes —notably of flat fishes—are fixed by counting the annual rings

in the ear bones or otoliths, of others—notably the herring—by counting similar rings in the scales The technique of scale reading is by no means simple, and in the case of cod considerable difficulty has been experienced in accurate deductions of age from the scales

Again, it is necessary to study the food of fishes by examination of the contents of the stomachs, and to correlate the information thus gained with information as to the distribution and abundance, from time to time of various organisms, pelagic or demersal, which furnish the food of different fishes or of the same fishes at different stages of life That an adequate supply of suitable food is essential to healthy growth is axiomatic, and it has been suggested that the present rate of destruction of small fish might advisedly be accelerated in order to promote the more rapid growth of the survivors This raises the question of the amount of food which fishes can, at different stages of life, usefully consume It may, however, be remarked that, if it were true, as appears to be established by evidence laid before the royal commission of 1864, that it was then by no means uncommon for a sailing smack, working on the most frequented (admittedly also the richest) grounds of the North sea to take from two to three tons weight of fish in a three hours haul with a beam trawl, whereas to-day the average daily take of a North Sea trawler using the otter trawl is something less than a ton, there seems, *prima facie* to be little cause to apprehend that the food supplies are, under present conditions, overtaxed

It is also necessary to follow the migrations of the fishes, which can be most directly done, where such a course is practicable, by marking large numbers of them and offering rewards for well authenticated information as to the time and locality of their recovery The technique of fish marking still requires elaboration, and is being carefully studied

Some or all of these various methods of investigation have been applied and are being applied to the most important of the food fishes in accordance with programmes laid down by the International Council for the Exploration of the Sea Those which have been most intensively investigated to date are the plaice and the herring, but investigation has also made considerable progress in regard to cod, haddock and hake, while other fish have received or are receiving attention as opportunity serves

A classical example of the study of growth rate is that carried out in connection with the investigations of the plaice fisheries, where, by marking large numbers of young plaice, 7 to 8 in long, taken in the shallow waters on the east side of the North sea, transplanting a proportion of them to the Dogger bank, where there is an abundance of suitable food, and leaving others where they were caught, it was proved that the transplanted fish developed at a remarkably greater rate than those left behind The former, in 12 months grew about 5 in in length and to nearly four times their original weight, while the latter grew little more than 2 in in length and no more than doubled their weight

An interesting illustration of deductions from scale reading is furnished by the investigations of Johan Hjort of the Norwegian herring fisheries, by means of which he showed that frequently and, indeed, usually, fish of a certain year group predominated over all other year groups over a series of years, whence it appeared reasonable to deduce that the stock of herrings from year to year depended mainly not upon regular annual accretions, but rather upon occasional floods from particularly prolific years Hjort's examination of samples of Norwegian spring herrings in the seven years 1907–1913 revealed the presence of the following percentage of herrings of the 1904 year class.—1 6, 34 8, 43·7, 77 3, 70 0, 64 3, 64 7

The most important examples of the study of the migrations of fish by marking are the experiments with marked fish conducted in connection with the plaice investigations, mentioned above and those with marked cod carried out by Hjort and reported in his *Fluctuations in the Great Fisheries of Northern Europe;* while a notable example of the study of migration by other means than marking is furnished by Schmidt's investigations of the eel, in the course of which, by following the larval eels, he traced the European eels to their spawning place in the Sargasso sea.

The hydrographical investigations take the form not only of the study of the physico-chemical composition (and temperature) of the sea, upon which depends the harvest of the plant growth which, as already observed, is the beginning of the chain of marine life, but also of the movements of the water at the surface, near the bottom and in the intermediate layers, which govern to a great degree the actual distribution of the stock of fish particularly in the larval stages For these purposes various ingenious instruments have been contrived and are constantly being improved upon; water bottles for the collection of samples at known depths, self-recording current meters, drift bottles adjusted to float at or near the surface, or to trail along the sea bottom By means of such instruments and by many and various lines of investigation a few of which only it has been feasible to indicate above, the endeavour is being made to probe the mysteries of life in the sea.

PROVISION FOR RESEARCHES

The Government of Great Britain while taking direct responsibility, through the Fishery Board for Scotland and the Fisheries Department of the Ministry of Agriculture and Fisheries, for economic investigations, most of which are carried out in co-operation with the International Council, supports by liberal grants unofficial institutions devoted to marine research, on no other condition than that their work shall be of such a standard of excellence as to make it worthy of support The chief of such institutions are the Marine Biological Association of the United Kingdom, with its headquarters and laboratory at Plymouth, the Dove Marine laboratory at Cullercoats, the oceanographical department of the University of Liverpool and the Scottish Marine Biological laboratory at Millport (*see* MARINE BIOLOGY)

The organization of fishery research varies from the country to country, but it can be stated in general terms that in practically every country of Europe provision is made for such researches in a greater or less degree, and with a greater or less measure of Government support, that in the United States of America the provision for fishery investigations partly under the direction of the States, partly under that of the central Government, is elaborate and costly, that in varying degree of development corresponding inquiries are in progress in most of the British dominions and colonies, and, indeed, in every country in which the economic importance of fisheries has gained recognition

To pass under review the investigations of the last quarter of a century and their results up to date would be a gigantic task No more has been possible here than to indicate briefly some of the lines of investigation and their aim

The uses of science do not end with those studies which bear upon the capture of fish The art and science of catching fish has developed far more rapidly than that of the disposal of fish when caught The problem of keeping fish taken on distant voyages in a fresh state is not wholly solved by the use of ice The fish which, in the course of a distant voyage goes first into the hold, and, on return to port, comes last out of it are seldom fit for the fresh fish market, the present day methods of pickling herrings are practically the same as those invented by the Dutchman Beukels in the 17th century; the methods of production of fish oils are, as yet, imperfect In almost every phase of the handling and use of fish there is work for the biochemist and in recent years the problem of how to make the best use of the fish when caught has been the subject of serious scientific study. Considerable progress has been made in devising methods of refrigeration suitable for application to fish, but there are many technical obstacles to be overcome It is enough for the present to point out that the future development of the industry will depend not less, perhaps more, upon the improvements that science may devise in the methods of handling fish and fish wastes than upon the discovery of new resources or of improved and more intelligent practice in the capture of the living fish

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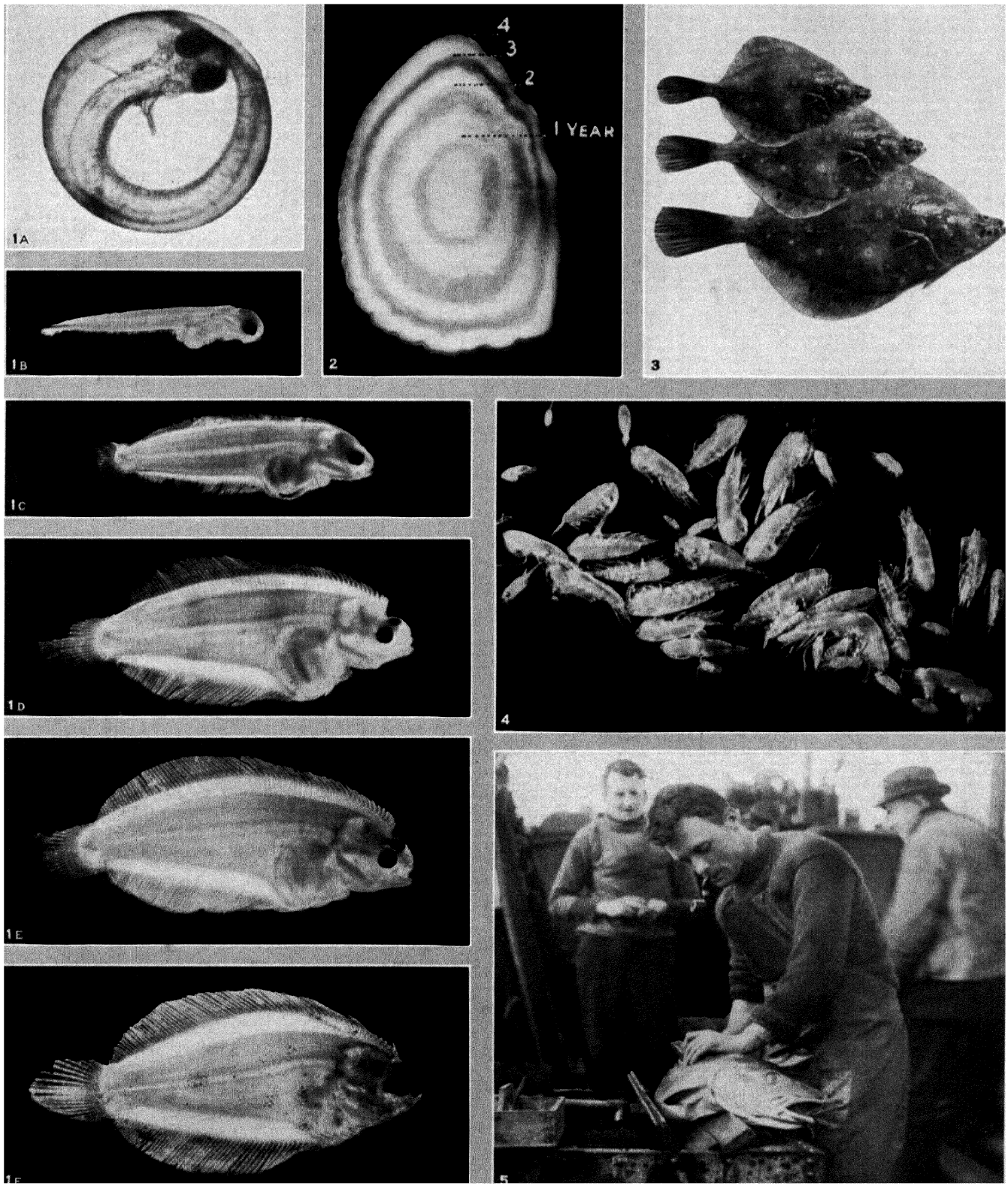

ASPECTS OF FISH CULTURE

1 (A–F) Development of plaice from (1A) the egg, 1/8" long, showing the change in shape from a round to a flat fish, and the migration of left eye to right side close to right eye The fish in fig. 1B is 1/2" long

2 Otolith or "ear-stone" of a four-year-old plaice The age of the fish is determined by the number of rings in the otolith

3 The effect of changing the feeding-ground of plaice The upper picture shows the original size; the centre, the size after a year on the Dutch coast, the bottom, the size after a year on the rich ground of the Dogger Bank

4. Copepods (magnified), the minute crustaceans which form the staple diet not only of the herring but of the very young of most fish

5 Marking live cod with numbered disc before liberating Both the movements and the age of the fish are checked by this means

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(H G M)

FISHERIES, LAW OF. As fishing is carried on both within and beyond regions over which national laws are in operation, any consideration of the law of fisheries naturally falls into two main divisions Accordingly the national and the international aspects of the subject will be dealt with separately, the English law applicable within territorial waters (as to the extent of which *see* WATERS, TERRITORIAL) being explained in the first place

English Law.—There is some confusion in the nomenclature used by early writers on the English law of fisheries, but the classification may be reduced to fisheries which are exclusive, and those which are not In exclusive fisheries the right of fishing belongs to the owner of the soil, or is derived from him These fisheries are sometimes referred to as "several" or "free" They may be corporeal, where they comprise both the soil and the fishing, or incorporeal, where they have been granted without the soil Fisheries which are not exclusive comprise (1) common fishery, which is the right of the public to fish in tidal waters not appropriated as exclusive fisheries, and (2) common of fishery, where one or more persons have a right to fish in common with the person who owned the exclusive right A fishery does not necessarily include all fish Thus one person may own the soil and oyster fishery, and another the fishery for floating fish Royal fish, *i e*, whales and sturgeons, are under the statute *De Praerogativa Regis* (1324) the property of the Crown and not of the finder

"Ancient records from Domesday downwards show us that the most ancient and usual mode of enjoying the profit of fisheries, both in tidal and non-tidal waters, was by wiers, kiddels, fishgarths, stake nets, bucks, and other engines fixed into and permanently erected in the soil of the fishery" (Stuart Moore) Thus fisheries originally were profits of the soil over which the water flowed This is still the general principle. The title to a fishery arises from the right to the soil The rule is so well established that upon it has been based the converse proposition, namely, that ownership of a several fishery is evidence of the ownership of the soil (*Attorney-General* v *Emerson*, 1891, A C 649). A fishery may be severed from the soil, or *solum*, and become a *profit à prendre in alieno solo* and an incorporeal hereditament, *i e*, a right exercisable over the property of another person This broad principle is not restricted to inland or non-tidal waters It gives to the owners of lands on the foreshore or within an estuary or elsewhere where the tide flows and reflows a title to fish in the water over such lands, and this is equally the case whether the owner be the Crown or a private individual But in the case of tidal waters (whether on the foreshore or in estuaries or tidal rivers) the exclusive character of the title is qualified by another and paramount title which is *prima facie* in the public. "The common people of England" (wrote Lord Hale) "have regularly a liberty of fishing in the sea or creeks or arms thereof, as a public common of piscary, and may not without injury to their right be restrained of it, unless in such places, creeks or navigable rivers where either the king or some particular subject hath gained a propriety exclusive of that common liberty" The subjects of the Crown are entitled as of right not only to navigate but to fish in the high seas and tidal waters alike. This is probably a right enjoyed, so far as the high seas are concerned, by common practice from time immemorial, and it was probably in very early times extended by the subject without challenge to the foreshore (*i e*, to between high- and low-water mark) and to tidal waters which were continuous with the ocean, if indeed it did not in fact first take rise in them The right into which this practice has crystallized resembles in some respects the right to navigate the seas or the right to use a navigable river as a highway. To the practice and the right there were and are exceptions The king had the prerogative of excluding the right of public fishing in tidal waters He could keep the fishery in hand, or grant it to a subject, but, since Magna Carta, no new exclusive fishery could be created by royal grant in tidal waters, and no public right of fishing in such waters, then existing, can be taken away without competent legislation (This statement is summarized from the judgment of the privy council in *Attorney-General for British Columbia* v. *Attorney-General for Canada*, 1914, A C 153 Though the question at issue arose in relation to British Columbia, it was governed by the law of England, which, accordingly, was stated in the judgment)

The public right above referred to depends upon the water being tidal and not comprised within the limits of any several fishery There is no public right to fish in non-tidal waters, although navigable The public right (which is subject to statutory regulations referred to later) includes the right of fishing over the foreshore (*i e*, between high- and low-water mark) when not within the limits of a several fishery, and of laying lines and drawing nets. It does not include the right of fixing stakes or fixed engines on the foreshore, or the right of drawing up boats above high-water mark and leaving them there for future use, though such rights may be gained by custom by fishermen in a particular locality The public right does not include a right to appropriate part of the foreshore for the storage of oysters to the exclusion of the rest of the public (*Truro Corporation* v *Rowe*, 1902, 2 K B 709). Oyster ponds or layings, it appears, may be the property of a private person, and may exist quite apart from the existence of a several oyster fishery (*Foster* v *Warblington U D C*, 1906, 1 K B. 648)

The public rights of navigation must be exercised with due regard for the rights of owners of fisheries If, by negligent navigation, injury is caused, *e g*, to an oyster bed, damages may be recovered On the other hand, navigation must not be obstructed by, *e g*, the deposit of unreasonably large masses of oysters in the bed of a navigable river (*Mayor of Colchester* v *Brooke*, 1845, 7 Q B 339).

Statutory Provisions.—The following are some of the principal statutory provisions as to British fisheries By the White Herring Fisheries Act 1771 persons employed in these fisheries have the free use of all ports, harbours, shores and forelands in Great Britain, but subject to payment of dues for artificial harbours and piers The Cran Measures Act 1908 legalizes the use of cran and quarter cran measures (regulated by the Herring Fishery [Scotland] Act 1815) in connection with trading in fresh herrings in England and Wales The Herring Fishery (Branding) Act 1913 provides for the branding of barrels filled with cured herrings in England and Wales

Under the Sea Fisheries Act 1868 the Ministry of Agriculture and Fisheries (formerly the Board of Trade) may make orders (operative when confirmed by act of parliament) for the establishment or improvement of oyster or mussel (and, by the Sea Fisheries Act 1884, cockle) fisheries on the shore and bed of the sea, or of an estuary or tidal river A number of these orders have been made The Fisheries (Oyster Crab and Lobster) Act 1877 prohibits the sale of oysters between certain dates, and the sale of edible crabs and of lobsters under a certain size

The Sea Fisheries Regulation Act 1888, as amended by the Fisheries Act 1891, enacts that the Ministry of Agriculture and Fisheries may, by order, create sea fisheries districts, comprising any part of the sea within which British subjects have by international law the exclusive right of fishing, either with or without any part of the adjoining coast of England and Wales An order must be laid before parliament, and may establish in each district a local fisheries committee, with power to make by-laws

regulating fishing The by-laws become valid on being confirmed by the Ministry of Agriculture and Fisheries, and are enforced by fishery officers appointed by the committee Under acts of 1891 and 1894 a local fisheries committee has powers to enforce statutory provisions with respect to shell-fish, which expression includes all kinds of molluscs and crustaceans

The Fishery Board (Scotland) Act 1882 established a Fishery Board for Scotland, which was to take cognizance of everything relating to the coast and deep sea fisheries of Scotland and to administer the Herring Fishery Acts, a long series of statutes extending from the time of George III onwards By the Herring Fishery (Scotland) Act 1889 power was given to the Fishery Board to prohibit by by-law the methods of fishing known as beam and otter trawling in certain localities. By the Sea Fisheries Regulation (Scotland) Act 1895 the Fishery Board for Scotland, established by act of 1882, was reconstituted, and provision was made for the establishment of sea fisheries districts, including parts of the sea adjoining Scotland, and for the establishment of fishery district committees for the regulation of sea fisheries The Trawling in Prohibited Areas Prevention Act 1909 prohibits the landing and selling in Great Britain of fish caught by beam and otter trawling in prohibited areas adjoining Scotland (As to the Moray Firth *see* WATERS, TERRITORIAL)

The Salmon and Freshwater Fisheries Act 1923 repeals nearly a score of former acts from 1861 onwards, and consolidates and amends their provisions The act of 1923 prohibits certain modes of taking and destroying fish, and prohibits the taking of "unclean" or "immature" fish as defined by the act Obstructions to the passage of fish, and times of fishing and selling and exporting fish are regulated Provision is made for orders, to be made and confirmed by the Ministry of Agriculture and Fisheries, defining fishery districts, and establishing fishery boards to exercise certain powers given by the act, including the making of by-laws and the granting of licences to fish Provisions are contained in the act as to inspectors, water bailiffs and other officers, and as to the recovery of penalties for offences This consolidating statute extends only to England and Wales The corresponding legislation applicable to Scotland must still be sought in a series of acts dating back for a century

The Merchant Shipping Acts contain certain provisions applicable to fisheries Part IV of the principal act of 1894 as amended by later Merchant Shipping Acts deals with fishing boats Its provisions, besides those applying to all fishing boats and to the whole fishing service, include others applying to (1) fishing boats of 25 tons tonnage and upwards and (2) trawlers The provisions relate to the fishing boat register, discipline, casualties on board, disputes, apprenticeship, etc , and (with reference to trawlers) to the engagement, payment and discharge of seamen, and the certificates of skippers and second hands The Regulations for the Prevention of Collisions at Sea (which are international in their application, but, so far as Great Britain is concerned, are operative under the provisions of the Merchant Shipping Acts) contain some provisions referring particularly to fishing vessels and fishing boats

International Law.—Outside territorial waters fisheries are not subject to legal regulation, except where conventions have been entered into between States and have been made by legislation applicable to the subjects of the States which are parties to the conventions Territorial waters may be regarded as survivals from mediaeval assumptions of sovereignty by maritime States over extensive areas of the high seas Instances were the early Italian republics, the Scandinavian nations, Spain and Portugal The English Queen Elizabeth contested the Danish, Spanish and Portuguese claims, but in the Stuart period a different policy, aimed at the Dutch, was pursued, and an extensive maritime jurisdiction was claimed by England These extended claims to jurisdiction and to regulate fisheries have now mostly been expressly or tacitly abandoned or are maintained only in a modified form as (for instance) by Russia and Norway. (*See* HIGH SEAS; WATERS, TERRITORIAL)

Instances of international fishery conventions are those entered into between Great Britain and the United States in 1818 and 1872 as to Atlantic fisheries (*see* the North American Fisheries Act 1819 and the Treaty of Washington Act 1872) and in 1892 as to the Behring sea fisheries (*see* Behring Sea Award Act 1894), those between Great Britain and France in 1839 and 1867 as to adjacent seas (*see* Sea Fisheries Acts 1843 and 1868) and in 1904 as to Newfoundland (*see* Anglo-French Convention Act 1904). The parties to the North Sea Fisheries Convention of 1882 were Great Britain, Germany, Belgium, Denmark, France and the Netherlands This convention was confirmed by the Sea Fisheries Act 1883, and a further convention dated 1887 between the same parties respecting liquor traffic in the North sea was confirmed by the North Sea Fisheries Act 1893 A declaration respecting the North sea fisheries between Great Britain and Belgium was confirmed by the Fisheries Act 1891 As to seal fishery (1) on the eastern coast of Greenland *see* the Seal Fishery (Greenland) Act 1875, and (2) in the North Pacific *see* the Seal Fisheries (North Pacific) Acts 1895 and 1912, the latter having been passed to carry out a convention between Great Britain, the United States of America, Japan and Russia

See S A Moore and H S Moore, *The History and Law of Fisheries* (1903), T W Fulton, *The Sovereignty of the Sea* (1911), H J W. Coulson and U A Forbes, *The Law relating to Waters* (4th ed, by H Stuart Moore, 1924) (S D C)

United States.—After the American Revolution the people of each State became themselves sovereign, and in that character held the absolute right to all navigable waters within their territorial limits, including the soil under them and the fisheries therein, for their own common use, subject only to the right of control and regulation of navigation which the Constitution of the United States reposes in the Federal Government As in the absence of treaty stipulations Congress has no authority to pass laws to regulate or protect fisheries within the territorial jurisdiction of the States, this function rests with the individual States In exercising the right of control and regulation of navigation, the secretary of war of the United States may grant permission for the use of fishing gear in areas in navigable waters under such conditions as he may prescribe where, in his opinion, it will not constitute a menace to navigation The right of the States to regulate the fisheries extends to the three-mile limit of adjacent waters, with certain exceptions, *e g* , in the Great Lakes, where such jurisdiction extends to the international boundary line As laid down by the award of The Hague Tribunal (1910) the general principle with respect to bays is that the three marine miles are to be measured in a straight line drawn across the body of water at the place where it ceases to have the configuration and characteristics of a bay, and at all other places the three marine miles are to be measured following the sinuosities of the coast In the case of large indentations the limits of exclusion are to be drawn three miles seaward from a straight line across the bay in the part nearest the entrance, at the first point where the width does not exceed ten miles While the tendency of international law is to restrict jurisdiction over large coastal indentations, the rule is not absolute Such large bays as the Chesapeake and Delaware are recognized as parts of the United States As regards their local government the States are sovereign within their own limits and foreign to each other. An agreement between States, for example, affecting fisheries in boundary waters between them, to be binding, must be ratified by Congress Such a treaty exists between the States of Washington and Oregon with respect to regulating the fisheries of the Columbia river The Constitution provides that no State shall enter into any treaty, alliance or confederation The exclusive right of regulating by treaty with foreign nations all matters which are the proper subject of international agreement has been taken away from the States and committed to the Federal Government In treaties pertaining to the fisheries as in other matters this authority is supreme

Under the provisions of the Constitution, Congress is empowered to make rules and regulations respecting the territory of the United States, and under this authority Congress makes the laws which are the basis for regulating the fisheries of Alaska and the District of Columbia On the other hand the laws of the territory of Hawaii not inconsistent with the Constitution or the

aws of the United States or the provisions of the organic act continue in force, subject to repeal or amendment by the legislature of Hawaii or the Congress of the United States Regulatory powers over the fisheries have been exercised by the territorial Government Under the law of 1793, the right to engage in the coasting trade and the fisheries is restricted to U S vessels

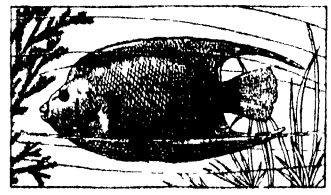
While it has been held that the high seas are the territory of no nation and no nation can extend its laws over them, means or exercising control over the operations of its own nationals and inhabitants on the high seas have been evolved For example, a aw of Congress, approved Aug 15, 1914, makes it illegal to have on any vessel or boat of the United States engaged in sponging in he waters of the Gulf of Mexico or the Straits of Florida outside of State territorial limits sponges of less than a fixed diameter, or o possess any sponges of less than the said diameter sold or delivered by such vessels By treaty two nations may control he operations of their nationals and inhabitants on the high seas Thus under the terms of a convention between the United States and Great Britain for the preservation of the halibut fishery of he northern Pacific ocean, including Bering sea, ratified Oct 21, 924, the actions of the nationals and inhabitants and the fishing essels and boats of the United States and of the Dominion of Canada are subject to certain regulations and restrictions including closure to fishing for halibut for a fixed period of three months

Under the convention between the United States, Great Britain, apan and Russia, signed July 7, 1911, the citizens and subjects of he several nations named are prohibited from engaging in pelagic ealing in the waters of the north Pacific ocean, north of the 30th parallel of north latitude, including the seas of Bering, Kamhatka, Okhotsk and Japan Importations of sealskins taken in estricted waters are prohibited, provision is made for a patrol nd for the assignment of fixed percentages of the kill by the Governments having jurisdiction over the breeding grounds to ertain of the other Governments The story of the international omplications that have arisen between the United States and Great Britain over the interpretations placed upon the intent and meaning of the several treaties regulating the fishing interests of he United States, Canada and Newfoundland, is a lengthy one uffice it to say that the first grant of fishing privileges was secured n 1783 with the conclusion of the treaty of peace between the Jnited States and Great Britain and held until the opening of the war of 1812 Subsequently the convention of 1818 was entered nto Its provisions have been the basis of United States fishing ights in Canadian and Newfoundland waters much of the time ince 1818, and with slight modifications, such as those under the ward of The Hague Tribunal of Sept 7, 1910, are still in force t provides that American fishermen shall be admitted to enter the ays or harbours of Canada and Newfoundland "for the purpose f shelter and of repairing damages therein, of purchasing wood, nd of obtaining water, and for no other purpose whatever" Under he provisions of the existing tariff law, the products of American isheries are admitted duty free (L RA)

FISHES, a name that has generally been applied to all those ertebrate animals that live in water, swimming by fins and reathing by gills Most modern authorities agree in separating s a distinct class the lampreys and hagfishes, which have no ill-arches and no jaws These are opposed as Cyclostomata (*q v*) r Agnatha to the remaining vertebrates, grouped together as Gnathostomata The selachians (*q.v*) are here also regarded as a lass distinct from the true fishes, or Pisces, which are distinguished by having a more or less ossified internal skeleton, by lermal ossifications in the form of scales, bony plates and segmented fin-rays, and by the presence of an air-bladder, or lung

The vertebral column differs from that of the selachians in having ribs that bound the abdominal cavity, which primitively meet in the tail region to form haemal spines, and in having a eries of paired elements above the neural arches that meet above o bear an unpaired series of spines. This characteristic structure is well seen in the living Chondrostei and Dipneusti, but is nodified by fusion and reduction in other fishes.

The dermal ossification on the body, where flexibility is a requirement, takes the form of juxtaposed rhombic bony plates or "ganoid scales" in the more generalized forms, in most recent fishes the scales are rounded and overlapping by bony plates, including paired parietals and frontals on top of the skull, a parasphenoid below it, operculum, suboperculum and branchiostegals covering the gill-chamber and a series of four bones on each side overlying the pectoral arch and connecting it with the skull Toothed bones, the premaxillaries and maxillaries, form the upper border of the mouth, and the primary upper jaw lies within the mouth, is typically connected on each side with the ethmoid region of the skull, and is generally supported behind by the hyomandibular, which articulates with the skull The septa between the gills are reduced, so that the gill lamellae project as filaments, the gill-clefts lead into the gill-chamber, which has a single external opening The air-bladder, originally a ventral diverticulum of the oesophagus, was perhaps first developed as an air-breathing organ. Several of the features that distinguish the Pisces from the Selachii, especially the premaxillaries and maxillaries, the bony skeleton, the air-bladder or lung, acquire additional importance because they are characteristic of all terrestrial vertebrates The Batrachia or Amphibia differ from the Pisces especially in the structure of the limbs, in having true internal nostrils, and in the modification of the hyomandibular into the stapes, but the crossopterygian fishes of the order Rhipidistia are very close to the Stegocephalia, which are the most primitive four-footed vertebrates



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ANGEL FISH (ANGELICHTHYS CILIARIS) A CHAETODONT FROM THE WEST INDIES

The class Pisces, even as here restricted, is the largest of all the vertebrate classes, including some 20,000 living species Moreover, within it is found a greater diversity of structure than in any other class of vertebrates It has been distinct from the Selachii from Silurian times, and there is no connecting link between them These considerations, and the important structural characters outlined above, should leave no doubt that the Pisces are entitled to be regarded as a class from which the selachians are excluded Fishes live under a great variety of conditions, at the surface of the sea, in mid-water, at the bottom, or buried in the sand or mud, some rarely approaching the coasts, some never far from them, and some never leaving the zones between tide-marks In fresh-water they may frequent either slow rivers, mountain torrents, lakes, underground waters or swamps Some are carnivorous, others herbivorous, others mud-eaters They exhibit great diversity in form, coloration, size and shape of the fins, structure of the mouth and teeth, according to their mode of life

Sub-classes and Orders.—For convenience of reference a list of the sub-classes and orders is given here, but a more detailed account of the classification follows the sections on anatomy, distribution, natural history, etc

Sub-class 1 PALAEOPTERYGII. (*q v*)
- Order 1. Archistia
- 2 Belonorhynchi
- 3 Chondrostei
- 4 Cladistia

Sub-class 2 NEOPTERYGII (*q v*)
- Order 1 Protospondyli
- 2 Ginglymodi
- 3 Halecostomi
- 4 Isospondyli
- 5 Haplomi
- 6 Iniomi
- 7 Giganturoidea
- 8 Lyomeri
- 9 Ostariophysi
- 10 Apodes
- 11 Heteromi
- 12 Synentognathi
- 13 Microcyprini
- 14. Salmopercae
- 15 Solenichthyes
- 16 Anacanthini
- 17 Allotriognathi
- 18. Berycomorphi
- 19 Zeomorphi
- 20 Percomorphi
- 21 Scleroparei
- 22 Hypostomides
- 23 Heterosomata
- 24 Discocephali
- 25 Plectognathi
- 26 [illegible]
- 27
- 28 Haplodoci
- 29 Pediculati
- 30 Opisthomi
- 31 Symbranchii

Sub-class 3 CROSSOPTERYGII (*q v*)
- Order 1 Rhipidistia
- 2 Actinistia
- 3 Dipneusti

ANATOMY

Two general works on fishes contain good accounts of the anatomy, namely S Bridge, *Cambridge Natural History, Fishes* (1904) and E S Goodrich, Lankester's in *Treatise on Zoology, Fishes* (1909) and to them the reader is referred for more details than are given below A typical fish is spindle-shaped, laterally compressed, tapering towards the tail The head is bounded behind by the gill-opening, in front of which are the gill-covers the mouth is generally terminal, the eyes lateral, in front of the eye are the nostrils, two on each side The body is covered with scales, and the lateral line series of scales, each bearing a tubule, extends backwards from above the gill-opening The fins, each consisting of a membrane supported by fin-rays, include one or more dorsals on the back, a caudal at the end of the tail, and an anal on the lower side of the tail, generally beginning not far behind the anus, or posterior opening of the alimentary canal The paired fins, which are homologous with the limbs of four-footed vertebrates, comprise an anterior pair, the pectorals, placed just behind the head, and a posterior pair, the pelvics

Muscles.—The main longitudinal muscles of the fish which run backwards on each side are divided into an upper and lower portion by a horizontal septum and are divided into successive interlocking segments, the connective tissue, septa between which are attached internally to the vertebrae and ribs, appearing externally, if the scales be removed, as a double series of V shaped lines The fins have their own series of muscles, the muscles of the eyes, jaws, etc need not be described here

Electric Organs.—The large electric organs of the electric eel are formed of modified muscular tissue, but those of the electric catfish are subcutaneous

Alimentary Canal.—The alimentary canal in fishes shows a great diversity of structure, which has perhaps not been sufficiently studied for purposes of classification The gut is generally differentiated into pharynx, oesophagus, stomach and intestine, a liver and a pancreas are present, in the Crossopterygii and Palaeopterygii and in a few primitive Neopterygii the intestine has a spiral valve, as in the Selachii

Gills.—The gill-clefts, generally five in number on each side, are openings leading from the pharynx to the gill-chamber, which opens to the exterior The septa between the clefts are reduced, so that the gill-lamellae, which in the selachians are attached to the septa for the whole or greater part of their length, project outwards and backwards as a double series of red filaments, supported by the skeletal arches in the walls of the pharynx The gill-rakers, projections from the gill-arches in the opposite direction to the gill-filaments, may be absent or represented by a few knobs in piscivorous fishes, but in those that feed on minute organisms may be very numerous, long, slender and close-set, intercepting the food and keeping it from the gills

Air-bladder.—The air-bladder in *Polypterus* and the Dipneusti agrees in its origin and its blood supply with the lungs of higher vertebrates, is sacculated in structure, and opens into the oesophagus by a mid-ventral glottis In other fishes the air-bladder arises dorsally from the alimentary canal, and its duct, when present, opens into the upper part of the oesophagus, or sometimes into the stomach The air-bladder may have been originally an air-breathing organ, and it retains this function in *Polypterus*, the Dipneusti and some primitive Neopterygii, in most fishes it has a hydrostatic function, secreting or absorbing gas so as to counteract the changes of pressure at different depths, in many it becomes connected with the internal ear, either by a chain of ossicles (Ostariophysi) or by means of anterior diverticula (Clupeidae, Mormyridae, etc) and is an accessory organ of hearing, in others it is a sound-producing organ (some Siluroidea, Sciaenidae, etc)

The Kidneys are generally elongate, lying under the vertebral column for the greater part of the length of the abdominal cavity The *testes* and *ovaries* are generally paired, elongate in form

Vascular System.—The heart consists of a sinus venosus receiving the blood from the great veins, an auricle, and a thick-walled, muscular ventricle In the Dipneusti the auricle and ventricle are incompletely divided into two In front of the ventricle is the ventral aorta, the enlarged and contractile, proximal end of which, known as the conus arteriosus, is long and has a longitudinal series of numerous valves in more primitive fishes, vestigial and with a single circle of valves in the higher Neopterygii The blood is driven forward by the heart through the ventral aorta, which gives off paired arteries to the gills, dorsal vessels carry the oxygenated blood from these to the dorsal aorta, which sends forward carotid arteries to the head, and runs backwards below the backbone, sending off arteries to the muscles, viscera, etc.

Brain and Sense Organs.—In most living fishes the brain has a large cerebellum and no distinct cerebral hemispheres, but in the Dipneusti the cerebellum is small and the cerebral hemispheres are well-developed The olfactory organs are a pair of pits with the lining epithelium produced into ridges, covered by the skin, and each with two nostrils, an anterior inhalent and a posterior exhalent The eyes have a spherical lens, which can effect accommodation not by altering its convexity, but by changing its position with regard to the retina In the internal ear a small projection of the sacculus—the lagena—represents the cochlea of higher vertebrates, solid calcareous concretions, the otoliths, are generally present in utriculus, sacculus and lagena The lateral line system on the head and body consists of continuous canals containing sense-organs and communicating with the exterior of either by pores, or by tubes that perforate the scales Whereas the internal ear is concerned with hearing and equilibrium, the lateral line is for the perception of movements of water

Photophores.—The luminous organs found in many oceanic fishes *e g*, stomiatoids, Iniomi, ceratioids, are glands with a luminous secretion They may have a complex structure, with lens and reflector, they have been studied in detail by Brauer

Teeth may be present in the jaws, on the inner surface of the mouth and pharynx, and in the Stromateidae even in the oesophagus The teeth in the jaws are frequently conical, fixed, in several series, in piscivorous fishes they may be strong and acute, sometimes sharp-edged (*e g*, Sphyraenidae), sometimes hinged and depressible inwards, in other fishes, according to the nature of the food, they may be incisor-like, blunt crushing teeth, slender and brush-like, small and cuspidate, or absent

Scales.—The body of a fish is generally covered with scales, which in the most primitive types are juxtaposed, rhombic, bony plates or ganoid scales, arranged in parallel, oblique and longitudinal series, and in more advanced forms may be thin, rounded and overlapping The work of Goodrich (1908) on the microscopic structure of the ganoid scales is of great value in classification In the Palaeopterygii each scale consists of parallel layers of ganoine, a glassy substance, near the surface, and of bone within, separated by cosmine, a vascular layer with bunches of minute tubules arising from the channels nearest the ganoine The scales of the Neopterygii differ in the absence of the cosmine layers, and in those of the Crossopterygii the cosmine has a very specialized and regular structure and is covered by only a single thin layer of ganoine In most living Neopterygii the scales are thin, rounded and overlapping, with edges entire (cycloid scales), or denticulated (ctenoid scales) Some are entirely naked, others have a bony armour, which may be formed by the fusion of large secondarily ossified scales (e g, *Ostracion*) or may be a new formation, in others the scales may be represented by spines

Head-skeleton.—The cartilaginous cranium may be nearly or quite unossified, as in the sturgeons and lung-fishes, but this is probably secondary Some Palaeoniscidae appear to have had lateral ethmoids, a large unpaired sphenoid in the orbital region, opisthotics on each side of the posterior part of the skull, and a basioccipital These elements can be recognized in the skull of the living *Polypterus* The early Crossopterygii appear to have had a somewhat similar structure, except that the sphenoid was postorbital in position In the Neopterygii the cartilage bones are much more numerous, a basioccipital below and exoccipitals at the sides of the foramen magnum; five otic bones on each side, posteriorly an epiotic above and an opisthotic below, in front of the opisthotic a prootic, and above the prootic, a pterotic behind and a sphenotic in front; in the orbital region alisphenoids and orbitosphenoids, the latter often united to form a single bone;

n the ethmoid region lateral ethmoids. To these, found in *Amia* ınd *Lepidosteus,* is added in the Isospondyli an endochondral ıupraoccipital and a Y-shaped "basisphenoid," the vertical limb ›f which divides the entrance to the myodome or eye-muscle anal, which is bounded mainly by the parasphenoid and is roofed ›y inner shelves developed from the prootics In several orders ›f Neopterygii some of these bones may be lost, the orbitosphe-ıoid, basisphenoid and opisthotic being the least constant; in ›thers modifications of the usual arrangement may be of value n classification, *e.g* , the enlargement of the opisthotic in the \nacanthini, and of the pterotic in the Solenichthyes and the neeting of the epiotics behind the supraoccipital in the Pedi-ulati

The dermal bones that cover the upper surface of the skull nclude paired parietals and frontals and at the sides of the ›arietals in most Palaeopterygii and Crossopterygii supra-emporals, which in the Neopterygii become cartilage-bones and ıre termed pterotics Behind the parietals are the dermo-occipi-als, generally one median and one on each side in the Crossop-erygii, one or more pairs in other fishes On the snout there are ıs a rule paired nasals, covering the olfactory sacs, and a mes-'thmoid, which in many Neopterygii ossifies downwards into the 'thmoid cartilage Below the skull is a large parasphenoid, which, 'xcept in the Crossopterygii, generally has ascending wings in ront of the prootics, in front of the parasphenoid are the vomers, vhich in recent Neopterygii, except *Lepidosteus* and *Amia,* are ınited to form a single bone that often ossifies upwards in the thmoid cartilage

The upper border of the mouth is formed in the most primi-ive fishes by two pairs of bony plates with toothed edges, the ›remaxillaries in front and the maxillaries at the sides In the 'alaeopterygii the maxillaries are attached within to the ecto-›terygoids, but in the Neopterygii they are free, their front ends ırticulating with the ethmoid region of the skull The premaxil-aries are firmly fixed in most Palaeopterygii, and in the Cladistia, 'rotospondyli and Ginglymodi ossify through the ethmoid car-ılage, in other Neopterygii they are generally loosely attached, nd they may extend backwards, excluding the maxillaries from he oral border, and become protractile, developing a pair of ›osterior processes that slide on a median keel on the ethmoid

The eye is surrounded by a series of circumorbitals, often ncomplete above, behind, the cheek may be covered by the ›reoperculum (Archistia, Cladistia) or there may be other bones n front of the preoperculum, a large one in the Crossopterygii be-ng regarded as the homologue of the squamosal of the Tetrapoda n the Neopterygii the preoperculum is narrow, crescentic and ırmly attached to the hyomandibular and quadrate

The membrane covering the gill-chamber contains a series of ›ones attached to the hyoid arch, operculum, suboperculum and ›ranchiostegal rays, in the Neopterygii there is an additional ›one—the interoperculum—in front of the sub-operculum, be-ow the lower limb of the preoperculum, and attached to the lower aw In front of the branchiostegals and between the rami of he lower jaw there are in some Palaeoniscidae a median and ›aired gular plates, the median gular persists in *Amia* and the Elopidae, and in the Crossopterygii and *Polypterus* the paired ;ulars are enlarged backwards, replacing the branchiostegal rays

Visceral Arches.—The gill-arches, which surround the pharynx ›etween the gill-clefts, consist of four pieces on each side, ›haryngo-, epi-, cerato- and hypo-branchials, the last join a mid-'entral series of basi-branchials. There is a backwardly directed ingle between the epi- and cerato-branchials, which are the prin-ipal gill-bearing pieces Generally there are four complete gill-ırches; behind the fourth the cerato-branchials of a fifth arch, ermed lower pharyngeals, generally bear teeth that bite against eeth borne by the pharyngo-branchials of the preceding arches The mandibular and hyoid arches are modified gill-arches, the ›alato-quadrate and lower jaw representing the epi- and cerato-›ranchials of one arch, the hyomandibular the epibranchial of he next. The mandibular arch consists of the palato-quadrate ınd the lower jaw; the palato-quadrate has a palatine ossifica-ion in front, attached to the ethmoid region of the skull, and be-hind two ossifications, a quadrate, to which the lower jaw is artic-ulated, and a metapterygoid above, the membrane bones are a dermo-palatine, an ectopterygoid along the lower edge and con-necting palatine with quadrate, and an entopterygoid above it In the Chondrostei the palato-quadrates meet in front and are free from the skull

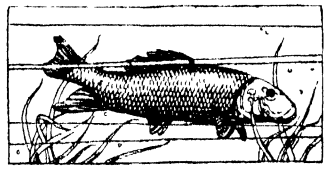
The lower jaw has one or more articular bones and is sheathed by a number of bones, on the outside dentary in front, angular and supra-angular behind, on the inside a large prae-articular and in front of it, inside the dentary, a series of bones that may extend back above the prae-articular and by some authorities are termed coronoids Such is the structure of the lower jaw in the Archistia, Protospondyli and Ginglymodi, but in the Rhipidistia there may in addition be a series of three or four bones below the dentary, the first of which is the homologue of the splenial of the Tetrapoda In other fishes the number of bones is re-duced by loss and by fusion, in some Neopterygii there are two only, dentary and articulo-angular

The hyoid arch has no pharyngo- element, and the hyoman-dibular or epi-hyal, generally articulates with the otic region of the skull, and at its lower end is attached to the quadrate; but when the metapterygoid has an extensive articulation with the skull (Actinistia) the hyomandibular is small and free, and when the palato-quadrate fuses with the skull (Dipneusti) the hyoman-dibular is vestigial In the Chondrostei the attachment to the quad-rate is indirect, a separate cartilaginous element intervening In the Neopterygii the lower part of the hyomandibular ossifies as the symplectic, a bone wedged in between preoperculum and quadrate, in the Protospondyli forming an additional articulation for the lower jaw The hyomandibular supports the operculum and suboperculum and the principal lower elements of the hyoid arch, the cerato-hyals, bear the branchiostegal rays; a median basi-hyal, the front element of the basibranchial series, may form a "tongue" in the floor of the mouth cavity

Backbone.—In the most primitive condition as in the stur-geons and lung-fishes, the vertebral column consists of the noto-chord, of paired cartilages above and below (neural and haemal elements) and of supraneural and infra-haemal arches Of the neural cartilages, which protect the spinal cord, there are two to each muscle segment, a principal—basi-dorsal—and a smaller —inter-dorsal The basi-dorsals bear a pair of rod-like pieces that meet above, forming supra-neural arches, and have articulated to their distal ends a median series of supra-neural spines Below the notochord are basi-ventral and inter-ventral cartilages, the former in the trunk region bearing pleural ribs, which bound the abdominal cavity, running along the edges of the intermuscular septa; these are the ventral counterparts of the supra-neural arches The presence of supra-neural arches and pleural ribs distinguishes the backbone of the Pisces from that of the Selachii

In *Polypterus* and in most Neopterygii with a well ossified back-bone the supra-neural arches are not distinct elements, but ap-pear as slender processes, which may unite above; the supra-neural spines persist in most fishes, at least on the anterior verte-brae, but elsewhere are liable to suppression by the dorsal fin-skeleton In some Protospondyli centra of a kind may be formed by the growth downwards round the notochord of the bony inter-dorsals, which may fuse with a similar upgrowth of the basi-ventrals behind them, in the tail these elements may remain sepa-rate, so that there are two centra to each muscle segment, an archless (inter-dorsal) and an arch-bearing (basi-ventral meet-ing basi-dorsal) In the Amiidae nearly solid centra are formed by the ossification of the tissue surrounding the notochord and the bases of the arches, in the tail, arch-bearing and archless centra alternate as in the Eugnathidae, Pachycormidae, etc , although their structure is quite different In other Neopterygii the centra are formed in the same way as in *Amia,* but the tail vertebrae are undivided, in the more primitive Isospondyli the bases of the arches remain distinct from the centra, the basi-ventrals, or parapophyses, especially retaining their individuality as separate bones wedged into pits in the centra; in the more ad-vanced types all the elements of the vertebra are co-ossified, and the parapophyses appear as processes bearing the ribs.

Fins.—Each fin consists of a membrane supported on each side by a series of ossified and segmented fin-rays In the sturgeons the dorsal and anal fins are more primitive than in any other living fishes; each has a lobe at the base, containing a series of fin-muscles, there is an internal skeleton of a series of rod-like pterygiophores, each segmented into two principal pieces, basals in the body and radials in the muscular lobe of the fin; the fin-rays are much more numerous than the radials, which their inner ends overlap Such a structure is characteristic of the Palaeopterygii In the Neopterygii and *Polypterus* the lobe at the base of the fins is reduced and the radials are quite short; or are fused with the basals, the fin-rays are united in pairs and each is articulated to its own radial Most Crossopterygii have two dorsal fins and one anal, differing in structure from those of the Palaeopterygii in the fusion of the anterior or all the basal segments of the pterygiophores to form a single bone. The caudal fin-rays articulate with the vertebral column



BY COURTESY OF THE N Y ZOOLOGICAL SOCIETY

COMMON SUCKER (CATOSTOMUS COMMERSONII), ABUNDANT IN THE GREAT LAKES AND NORTHWARD A FISH WITH PROTRUSIBLE MOUTH AND FLESHY LIPS ADAPTED FOR SUCKING UP MUD AND ORGANIC DEBRIS FROM THE BOTTOM

There can be little doubt that originally the tail was straight, but it is unlikely that any known fishes with a straight tail and the caudal fin equally developed above and below are primitive in that respect In most primitive fishes the tail bends upwards and the lower lobe is more developed than the upper (heterocercal condition) in the lower Neopterygii and *Polypterus* the upturned part of the tail is so much shortened that the lower lobe becomes terminal and externally nearly symmetrical In most Neopterygii the tail is homocercal, symmetrical, with not more than two or three upturned vertebrae, and with the upper hypurals, expanded haemal spines that bear the fin-rays, supported by the enlarged neural spines of posterior vertebrae, the centra of which have disappeared In most Palaeopterygii the pelvic fins are similar to the anal This is well shown in the living Chondrostei, especially *Psephurus,* in which the pelvic fin has a series of pterygiophores and differs from the anal in structure only in the more extensive fusion of the anterior basal segments to form a pelvis The pectoral, from its position of greater importance, is more advanced in structure; the coraco-scapular cartilage, formed by the fusion of the anterior basalia, is firmly anchored by dorsal and ventral outgrowths; the posterior basalia unite to form a metapterygium In the Neopterygii the pelvic fins are shortened, there are no basalia behind the pelvis, and the radials are reduced or absent, the fin-rays being inserted on the pelvic bones; the pectorals are as in the sturgeons in the more primitive orders, but in most there are no radials articulating with the metapterygium, which may persist as a bone that appears to be the lowest of a series of radials The pectoral fins of the Crossopterygii differ from those of the sturgeons in that none of the radials articulates directly with the pectoral arch, and that the metapterygium projects outwards from the body, is segmented, and in the more advanced forms is long and bears radials on its posterior as well as its anterior side, the pelvic fins are similar, but are generally less specialized than the pectorals These fishes have the fins more or less paddle-shaped, with long muscular lobes fringed with rays The Actinistia are an exception, as in them the lobes are short and rounded, with a few divergent radials, perhaps articulating with the pectoral arch

Pectoral Arch.—The primary pectoral arch, or coraco-scapular cartilage, may contain one or more ossifications. In most Neopterygii there are two, hypercoracoid above and hypocoracoid below, and in most Isospondyli and Ostariophysi a bony mesocoracoid arch

The secondary pectoral arch consists of a series of four bones overlying the primary pectoral arch, strengthening it and connecting it with the skull; from above downwards post-temporal, supra-cleithrum, cleithrum and clavicle, the last meeting its fellow in a ventral symphysis; in the Belonorhynchii and Neopterygii clavicles are absent In most Neopterygii the post-temporal has an upper fork attached to the epiotic and a lower to the opisthotic, but in some the lower fork is absent; in others the post-temporal is small, simple and united to the skull; in the Apodes, Opisthomi, etc., it is absent and the pectoral arch is unconnected with the skull.

COLORATION

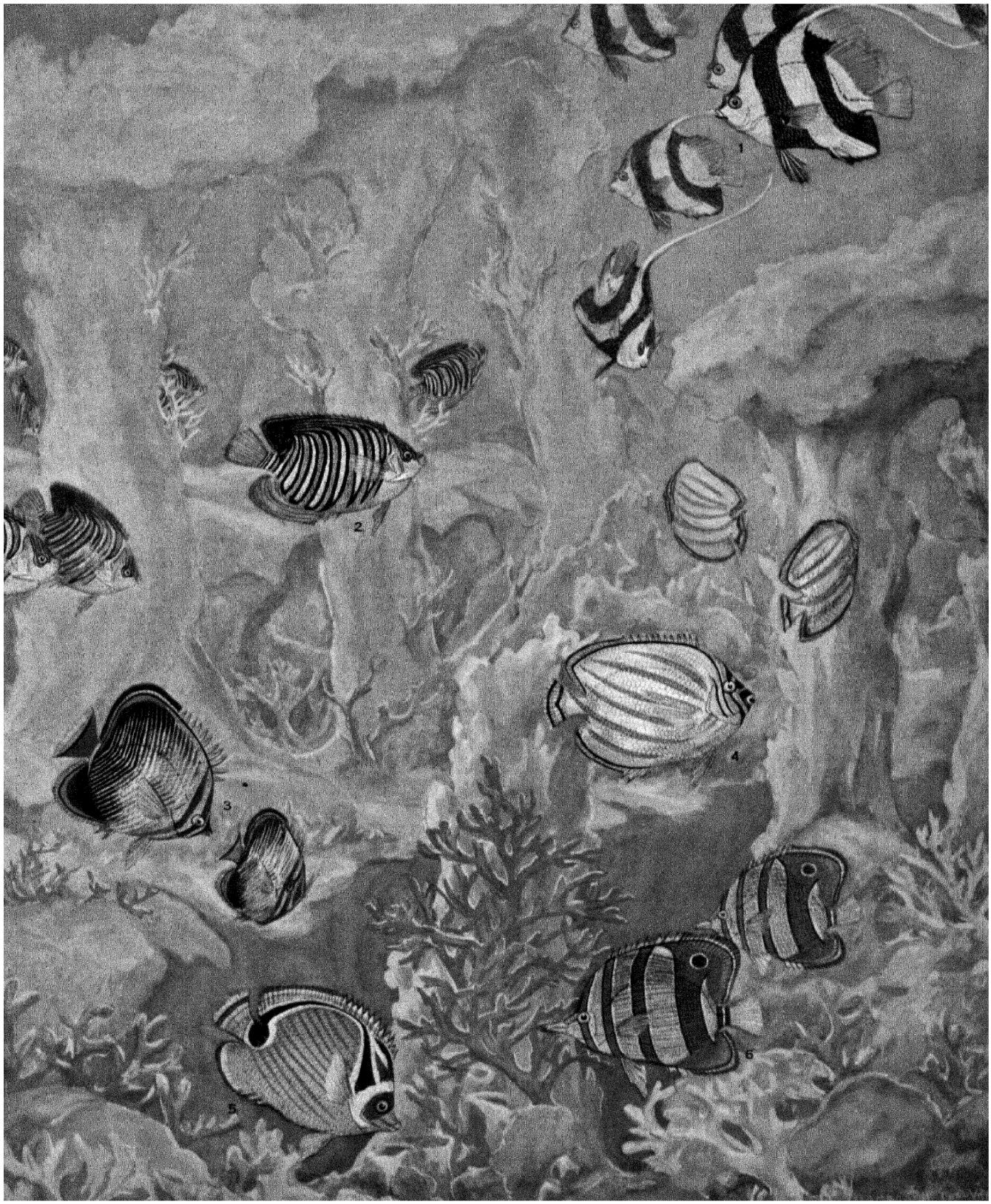
The majority of fishes exhibit obliterative countershading, that is the colour grades from dark on the back to pale below, counteracting the effect of light falling from above and producing a uniform effect. In the sucker-fishes (*Echeneis*), which adhere to sharks, etc , and have their backs against and in the shadow of the object to which they cling, this type of coloration is said to be reversed, as it is in the black-bellied Batensoda, a catfish of the Nile that habitually floats upside down Oceanic fishes that swim near the surface are generally blue above and white below, *e g.,* tunny, flying fish, from 100 to 500 metres below the surface occur large-eyed, silvery fishes with luminous organs, such as the Myctophidae, and at greater depths 500 to 2,000 metres, where there is little or no light, the majority of the fishes are uniformly blackish, have smaller eyes and often have luminous organs, the Macruridae, which are believed to live at the bottom in great depths, are uniformly coloured fishes with larger eyes than those that inhabit the middle depths, a curious feature as yet unexplained Many coastal fishes are spotted, mottled or barred in such a way that they resemble the ground, or the rocks and weeds among which they live Without observation of a fish in its natural surroundings it may be difficult to understand its coloration A number of unrelated species of sea-perches are covered with hexagonal reddish spots separated by a pale network, a fish so coloured, when wounded, was observed by Alcock to take refuge in a clump of corals, where it lay concealed, the red spots exactly resembling the coral polyps

Many tropical fishes have a brilliant coloration. The chaetodonts, characteristic coral-reef fishes, exhibit an extraordinary variety of markings, all of which, however, conform to Mottram's definition of concealing patterns, in that they break out at the margin and tend to conceal the shape

Colour Changes.—The tropical sea-perches from Bermuda in the New York aquarium are of interest for their sudden changes of colour and markings, one species changing from yellow to red or brown, another turning on or off dark cross-bars and spots; under natural conditions the different colour-phases probably harmonize with different environments The flat-fishes have long been known to simulate closely the ground on which they lie Sumner, experimenting with a Mediterranean flat-fish (*Platophrys podas*) obtained some remarkable results by placing them on patterns such as black and white squares, on such backgrounds the fish responded more slowly than on sand, gravel or mud, but with practice changed more rapidly than at first The capacity of this species to adapt itself is limited to the black, grey, brown and white of its usual habitat, and it has definite spots or markings that vary in relative intensity or may disappear, but always occupy the same position when present. Mast has found that flat-fishes of the genus *Paralichthys* can assume various colours that correspond closely to the background, although yellows and browns take much less time to copy than reds, greens or blues These effects are produced by the concentration or distribution of granules of pigment in the pigment cells of the skin, under the control of stimuli received through the eyes The flat-fish has to see the ground before it can resemble it, although there is no visual comparison of skin with ground

LOCOMOTION

The locomotion of fishes has been studied by Breder (1926), in most fishes muscle segments of one side contract successively from head to tail, and then those of the other side, progression being accomplished by alternate strokes to right and left: this is the method adopted for rapid swimming by fishes of the normal spindle-shaped form In swift oceanic fishes the dorsal and anal fins are generally small and serve as keels, the caudal fin is strong and forked, with pointed lobes, able to cleave the water; the



BUTTERFLY FISHES AND THEIR ALLIES

Heniochus varius Occurs in Samoa, where it is common among the reefs
Holacanthus diacanthus Ranges from the Red Sea and Zanzibar to Polynesia
Chaetodon triangulum Abundant from Sumatra to New Guinea
4 Chaetodon ornatissimus Known from the Moluccas to Samoa, and to Hawaii
5 Chaetodon fasciatus Ranges from the Red Sea to China and Hawaii
6 Chelmon rostratus Occurs from east Africa to China

paired fins are pointed and are folded into the body in forward swimming, but are used in turning movements, in slowing down, etc. Such fishes have long narrow gill-openings, and the ejection of water through these—jet propulsion—is considered to be of considerable importance in forward movement.

The less active fishes may show great departures from the normal, in form, structure of the fins and methods of locomotion Elongate fishes, such as eels or ribbon-fishes, move in a serpentine manner, curves alternately to one side or the other passing backwards along the body; undulating movements of the long dorsal or anal fins may assist Deep-bodied fishes such as the plectognaths may keep the body nearly rigid, swimming by lateral strokes of the caudal and undulations of the dorsal and anal Gobies, some wrasses, etc , swim by strokes of the pectorals

BREEDING AND DEVELOPMENT

The majority of fishes come together in large shoals at the breeding season, when the eggs and sperm are extruded in the water There is generally a migration to the breeding places, fresh-water fishes often making their way up-stream into the smaller rivers, or congregating on shallows, marine fishes seeking areas from which the eggs and larvae, if pelagic, will be carried by the currents in the right direction, or places where the ground is suitable for the eggs if these lie or are attached at the bottom Some marine fishes, such as the shads, are anadromous, entering rivers to breed; other fishes that may feed and grow in fresh water breed in the sea, these are termed katadramous, the eels (*Anguilla*) and *Galaxias attenuatus* are examples J Schmidt has shown that many fishes are peculiarly sensitive to external conditions at the breeding season, for example the species of *Anguilla* require at this time water of a high temperature and a high salinity at about 500 metres below the surface, the migration of the European eel across the Atlantic is related to this need.

In most fishes there is no definite pairing and no care for the eggs and young All the important northern food-fishes except the salmon, herring and shad produce great numbers of eggs that float in the sea, in some species of Gadidae a single fish sheds millions of eggs annually The Salmonidae breed on gravelly shallows in rivers, and bury the eggs, so that these and the larvae are protected Many Cyprinidae breed among weeds, to which the eggs adhere

In other fishes there may be a definite courtship and pairing, it is among these that marked sexual differences may occur, the males being brightly coloured, with enlarged and beautifully marked fins, the eggs are generally few in number and are cared for by one or both parents, usually the male. A nest may be made, either by excavating and clearing a hollow at the bottom, as in some Centrarchidae and Cichlidae, by clearing a space among the weeds in a swamp (*Heterotis, Ophiocephalus*), or by cementing together bits of weeds (sticklebacks). In some Anabantidae the male blows bubbles that form a mass of foam floating on the water; as the eggs shed by the female fall through the water he collects them in his mouth and sticks them on to the under side of the nest, which he guards In many Cichlidae the mother keeps the eggs in her mouth until they hatch, afterwards she swims with the brood, and opens her mouth for the little fish to swim into it at any sign of danger Many gobies, cling-fishes, etc., lay their eggs in the shells of oysters or mussels, or on the under side of a stone. In the pipe-fishes and sea-horses the male receives the eggs into a groove or pouch on the under side of the tail or belly, and keeps them until they hatch.

Some fishes are viviparous, such as the Embiotocidae or surf fishes of the north Pacific, and many cyprinodonts.

Larvae.—The time of hatching and the size of the newly-hatched larvae vary greatly according to the size of the egg, some species starting life at a length of about 3 mm The larva is generally transparent, with pectoral fins, a continuous median fin without rays, a notochord and a straight gut; the mouth may not be formed until the yolk-sac disappears, when the little fish begins to feed As it grows the dorsal, anal and caudal fins appear in the continuous fin-fold, and the pelvics are developed. The tail is at first straight and symmetrical, and the first indication of a caudal is the development of a mass of pro-cartilage, which later becomes the hypurals, below the notochord at some distance from the end of the tail, in connection with this the caudal fin-rays are developed; next the end of the tail turns upwards, so that the caudal fin becomes terminal, and the projecting end of the notochord, with its membranous fin, disappears. The ossification of the skeleton and other changes that give the young fish nearly the organization of the adult occur when it is quite small, usually less than an inch long Some pelagic larval and post-larval fish have curious structures that disappear later, such as the long spines on the body of the larval *Mola,* or the long filamentous fin-rays of the larval *Trachypterus.*

The fins vary in their development, the dorsal appearing before the anal in the Clupeidae, the anal before the dorsal in the Iniomi. In some Notothenuformes the larvae have large pelvic fins In the Clupeidae the dorsal is fully developed far back, and then moves forward to its position in the middle of the length In the young swordfishes both jaws are produced, and the lower becomes the shorter later on, but in the Belonidae the lower jaw is first prolonged and the upper grows out to equal it afterwards In the Elopidae, Albulidae and Apodes the larval life is prolonged, the transparent compressed larva attains a considerable size, in some Apodes as much as a foot in length, and the change into the young fish is accompanied by a shrinkage in depth and length

Among fresh-water fishes many larval adaptations may occur, such as adhesive organs (sturgeons, Lepidosirenidae, etc) external gills (Lepidosirenidae, *Polypterus*), and the prolongation of the gill-filaments to the exterior (*Heterotis, Gymnarchus*)

DISTRIBUTION IN TIME

In Middle Devonian strata the Palaeopterygii are represented by Palaeoniscidae (*Cheirolepis, Rhadinichthys*) and the Crossopterygii by both Rhipidistia and Dipneusti, so that already the Pisces had had a long history and undergone considerable differentiation The Palaeoniscidae flourished until the Jurassic, and with them from the Carboniferous the Platysomidae, and later, in Triassic times, another off-shoot, the Catopteridae The Archistia became extinct in the Cretaceous period, the Belonorhynchii flourished in the Triassic and became extinct in the Jurassic The Chondrostei began in the Jurassic with *Chondrosteus,* but little is known of other forms leading to the modern sturgeons, and of the Cladistia (*Polypterus*) no fossils are known. Throughout Palaeozoic times the Rhipidistia and Dipneusti flourished, but in the Triassic dwindled The Ceratodontidae, represented to-day by *Neoceratodus* in Queensland, date from this period. The Actinistia ranged from the Upper Devonian to the Cretaceous. Thus the subclasses Palaeopterygii and Crossopterygii, which were dominant in Palaeozoic times, held on through the Mesozoic, during which most of the orders became extinct, and are represented to-day by a few remnants, the sturgeons, polypterids and lung-fishes

The Neopterygii began in the Upper Permian with the Semionotidae, a family which flourished in Triassic and Jurassic times and gave rise to a number of other families of Protospondyli, which became extinct in or before the Cretaceous, except the Amiidae and Lepidosteidae, still living in North America. One Jurassic off-shoot of the Semionotidae, the herring-like Pholidophoridae, gave rise towards the end of the Jurassic to the Leptolepidae (Isospondyli), the first fishes with a true homocercal caudal fin, very near the Elopidae, which were abundant in the Cretaceous and are still in existence. During the Cretaceous the Isospondyli evolved and several off-shoots of this order appeared, notably the Iniomi (*Sardinioides*), the Heteromi (Halosauridae), the Apodes (Urenchelidae) and the Berycomorphi, these being the first spiny-rayed fishes The earliest true perch (*Prolates*) appeared at the very end of the Cretaceous. The Tertiary history is very imperfect, but it is probable that most of the modern families date back to the early Eocene In the Lower Eocene (London Clay) are a scorpaenid, and several sword-fishes and Scombridae. In the Upper Eocene of Monte Bolca occur several modern genera, and representatives of the Plectognathi, Pediculati, Discocephali, etc.

GEOGRAPHICAL DISTRIBUTION

Marine Fishes.—Fishes that live in the sea may be divided into oceanic and coastal fishes The oceanic fishes include those that live at or near the surface, such as the tunny, bonito, flying-fish, many Myctophidae, etc , those that swim generally from about 150 to 500 metres below the surface, mostly silvery, large-eyed fishes such as *Stylophorus, Chauliodus*, etc , the bathypelagic fishes, usually blackish, occurring generally at depths greater than 500 metres below the surface, and finally the abyssal fishes, that live at or near the bottom of the ocean The coastal fishes may live near the surface, as most Clupeidae, and Carangidae, may dwell on the bottom, either in shallow inshore waters, or on the continental shelf, the edge of which generally corresponds to a depth of about 200 metres, or on the slopes leading down to the abyss

The microscopic plants, diatoms, etc , at the surface of the ocean are the basis of oceanic life, these are eaten by small pelagic Crustacea, etc , these again by the fishes, and the smaller fishes by larger ones Some authorities have asserted that the small organisms that constitute the plankton are much more abundant in the colder seas than in the tropics, and consider that the importance of the northern fisheries is due to this The truth is that plankton is more abundant in coastal waters than in the open ocean, and that although in northern waters there may in the right season be an abundance of plankton exceeding anything found in the tropics, this is no true index of annual production, growth and reproduction being quicker, and seasonal fluctuations less in the warmer seas Moreover, the importance of plankton for bottom-living coastal fishes may have been overestimated Petersen has found that detritus from the land and from sea-weeds is the food of the bottom-living invertebrates on which these fishes feed Descriptions given of the enormous shoals of gray-mullet, scombroids, etc , seen in tropical seas do not support the view that fishes are more abundant in colder waters In the warmer seas there is a much larger number of species, and the number of individuals of any one species is consequently less, the herring must outnumber any of the numerous tropical species of Clupeidae But the importance of the great fisheries of the north Atlantic, including the North sea, is not due to abundance of plankton, but to the presence of large areas less than 500 metres in depth, the grounds inhabited by the cod, plaice, etc , it is these bottom-living fishes of the continental shelf on which the great trawling industries depend

Little can be said of bathypelagic and abyssal fishes, except that some are known to have a world-wide distribution, others may be more restricted, but our knowledge is as yet incomplete It is of considerable interest that the ridge, less than 1,000 metres in depth, extending from Scotland to Iceland and Greenland, is a barrier to *Macrurus*, which does not occur north of it There is some evidence that species of *Macrurus* may be localized in parts of the Pacific from a similar cause

Zones of Distribution.—For fishes that live not far from the surface, and for bottom fishes that live in inshore waters or on the continental shelf, temperature is a most important factor in distribution For these fishes we may recognize a tropical zone, bounded by the mean annual surface isotherms of 20° C; north and south temperate zones, extending to the isotherms of 6° C and divided by that of 12° C into subtropical and subarctic or subantarctic zones, and arctic and antarctic zones beyond the 6° C isotherms The tropical zone contains by far the greatest number and diversity of fishes The oceanic scombroids, tunnies, bonitoes, swordfishes, etc , the flying-fishes, the sun-fishes (*Mola*) are tropical and sub-tropical The zone includes the coral-reefs and all the fishes that live in or near them, numerous Gobiidae and Blenniidae, pomacentrids, chaetodonts, plectognaths, Scaridae, the wrasses of the sub-families Julidinae, Novaculinae and Cheilininae, etc The great majority of the perch-like fishes are tropical, including the Serranidae, Lutianidae, Pomadasidae, Sciaenidae, etc The Clupeidae and Carangidae have many tropical genera The flat-fishes are *Psettodes*, numerous Bothidae, Soleidae and Cynoglossidae

There are two main divisions of the tropical zone, American and Indo-Pacific Jordan and Evermann, generally with good reason, separate generically most of the American species from their Old World allies There are other American genera that have always been recognized as distinct, *e g , Centropomus*, the nearest relative of which is the Indo-pacific *Ambassis* The fishes of the Pacific coast present a great similarity to those of the other side, most of the genera being the same, but the species different, this is due to the continuity of the two oceans in Eocene times across the isthmus of Panama The Indo-pacific region extends from East Africa to Polynesia, it includes many more genera and species than the American region West Africa has a comparatively poor fauna, but shows more affinity to the Indo-Pacific than to America Thus of the flat-fishes *Psettodes, Solea Synaptura* and *Cynoglossus* are genera common to West Africa and the Indian ocean It seems probable that in Eocene times, when the Mediterranean communicated with the Indian ocean, a tropical Indo-pacific fauna extended through the Mediterranean to West Africa, and that the present West African fauna is mainly a remnant of this The fishes found fossil in the Upper Eocene of Monte Bolca, Italy, include some genera now living only in the Indian ocean

Southern Fishes.—South of the tropics the currents are not deflected by the land-masses to the extent that they are in the north, the isotherms are nearly parallel, and the seasonal fluctuations are relatively small, so that the zones of distribution are better defined The sub-tropical areas include species of certain tropical genera and have other genera peculiar to them An interesting feature is the presence of the same genus north and south of the tropics, for example *Box* (Sparidae) in the Mediterranean and at the Cape *Sardina*, the pilchards or sardines, includes *Sardina pilchardus* of Europe, *S sagax* with races from Japan, California, Chile and South Africa, and *S neopilchardus* of South Australia and New Zealand The hakes, *Merluccius*, have a somewhat similar distribution, they are mainly sub-tropical, but extend into the subarctic and subantarctic zones Southern Australia and New Zealand are characterized by wrasses of the family Odacidae and flat-fishes of the sub-family Rhombosoleinae In the southern subtropical zone Tristan da Cunhay and St Paul, some 4,000 miles apart, but on the same isotherm, have species in common, a *Labrichthys* and a *Chilodactylus*, found nowhere else in the world A similar wide distribution of subantarctic fishes is found, southern New Zealand and the Magellan-Falklands area having three species of *Notothenia* in common

Antarctic Fishes.—An important result of the recent Antarctic expeditions is to establish that the Falklands and South Georgia have entirely different fish-faunas, that of South Georgia being the same as that of Graham Land The Notothenniformes, with four families, constitute the bulk of the Antarctic fish-fauna, but the most primitive family, the Bovichthyidae, is more northerly, *Bovichthys* itself having species from Chile, Argentina, Tristan d'Acunha, St Paul, Tasmania and New Zealand, and *Cottoperca* being confined to the Falklands-Magellan area Of the Nototheniidae *Notothenia* has a number of subantarctic species distinct from the Antarctic ones, most of the other Nototheniidae, all the Bathydraconidae, and all the Chaenichthyidae except one species from the Falklands, are Antarctic The Zoarcidae are represented in the Falklands-Magellan area by several peculiar genera, and in the Antarctic by two more

Northern Fishes.—In northern seas the spreading of the currents produces the effect that the isotherms are close together in the west, but far apart to the east, so that the temperate zones are narrow in the west, but broaden out westwards; indeed, on the American side of the Atlantic the cold Labrador current comes into direct contact with the warm tropical water The zones are less well-marked than in the south, but the same isotherms may be used; that of 12° C runs to the mouth of the English channel, which is near the northern limit of many Mediterranean species, near the southern limit of *Salmo* as a marine genus, and the region where the pilchard replaces the herring Hjort enumerates cod, haddock, ling, tusk, plaice and halibut as important species found mainly in the North sea and northwards, and hake, pollack, sole, sea-bream, gurnards, etc , as occurring mainly south of the British Isles P Schmidt has shown that the Bering sea, the

Okhotsk sea and the north Japanese sea have each their own fishes. A most interesting example of discontinuous distribution is furnished by the Pacific herring (*Clupea pallassii*) which has an isolated colony in the White sea, with the Atlantic herring (*C harengus*) along the coast outside

The Arctic Zone.—The Arctic fish-fauna is a poor one, some Cottidae, with a few species of *Gadus* and *Pleuronectes*, appear to be confined to this region, and some of these may have a circumpolar distribution Whether the isotherm of 6° C is the proper boundary for the arctic zone is open to question, it corresponds to the southern limit of certain arctic fishes, for example *Salvelinus* (char) as a marine genus, on the other hand several subarctic fishes, cod, halibut, herring, etc, occur round Iceland and along the northern coast of Europe about to the isotherm of 3° C

Fresh-water Fishes.—Many marine fishes may enter fresh-water at times either to breed, or in search of food, and these may form fresh-water colonies that in time may become species Thus there are fresh-water species of marine genera, and even fresh-water genera of marine families, such as the burbot (*Lota*), the only fresh-water member of the cod family These are unimportant in distribution, but on the other hand there are families (*e g*, Percidae) or even orders (Haplomi, Ostariophysi) that are true fresh-water fishes, and for them the sea constitutes an impassable barrier, their distribution is accomplished by hydrographical changes, such as the capture by one river of the tributaries of another, or the confluence of rivers brought about by an elevation of the land Fishes of this kind are of great value in relation to problems such as the past history of continents indicating former unions or ancient lines of severances

Australia and Madagascar—Each of the great regions proposed by A R Wallace and P L Sclater for the mammals has a well-defined fish fauna, and the proposal made by some authorities to consider Madagascar distinct cannot be opposed from a consideration of the fishes, although its chief characteristics are negative The Australian region and Madagascar, indeed, may be considered together, being characterized by the complete absence of Ostariophysi, except species of the secondarily marine Siluroid families Arridae and Plotosidae For the Australian region the only true fresh-water fishes are the archaic *Ceratodus* and a species of *Seleropages*, the other species of this genus inhabiting Borneo *Seleropages* belongs to the Osteoglossidae, a primitive and widely distributed family, probably dating back to early Cretaceous times The rivers of Australia and New Guinea contain many species of the marine families Arridae, Plotosidae, Clupeidae, Serranidae, Atherinidae, Gobiidae, etc Wallace's line may be regarded as the boundary between the Indian and Australian regions, the contrast between Borneo with its rich fauna of carps, loaches, cat-fishes, labyrinthic fishes, etc, and Celebes without a single indigenous true fresh-water fish, is a striking one Madagascar has none of the characteristic African families except a few peculiar Cichlidae, and as these are mainly brackish water species they do not negative other evidence that the severance of Madagascar from Africa is ancient, perhaps as ancient as that of Australia from Asia

The Ostariophysi.—This order, comprising nearly 5,000 species, and including the characins, carps and cat-fishes, is dominant in the fresh-waters of all regions except Australia and Madagascar The cyprinoids, the more generalized suborder, includes three divisions, Characiniformes, Gymnotiformes and Cypriniformes The Characiniformes, with toothed jaws, are found in Africa and tropical America, attaining a much greater diversity in the latter; no genera are common to the two continents, but there appears to be a rather close relationship between the South American *Brycon* and the African *Alestes*. The Gymnotiformes, which may be regarded as highly specialized eel-shaped characins, are restricted to Central and South America The Cypriniformes, distinguished by the toothless mouth and the falciform lower pharyngeals, include four families, the most generalized being the Cyprinidae The headquarters of this family is in southern Asia, where there is a great variety of genera; the African species are numerous, but mostly belong to Indian genera, *Labeo, Barbus,* etc, and are probably the result of a comparatively recent invasion Many of the Cyprinidae of Europe and temperate Asia, and all in North America, are leuciscines, a group intermediate between the more primitive danionines and the cyprinines, the two last are more characteristic of India and Africa The Catostomidae, or suckers, are restricted to North America, except for a genus with two species in China The Cobitidae, or loaches, abound in mountain streams in central and southern Asia, and the Homalopteridae are loach-like fishes of India and South-east Asia

Of the siluroids, or cat-fishes, South America has a large and varied assemblage, belonging to nine families, all endemic, including the primitive *Diplomystes* of Chile and such highly specialized forms as the Loricariidae, armoured, and with the lips forming a sucker Africa and southern Asia have three families in common, one the Bagridae, rather closely related to the Pimelodidae of South America, each continent also has peculiar families The Palaearctic region has few siluroids, *Silurus*, some Bagridae, etc The North American cat-fishes are Amiuridae, a family closely related to the Bagridae

Zoogeographical Regions.—From the distribution of the Ostariophysi the following regions may be recognized

1 Australia, with the islands east of Wallace's line No Ostariophysi except Arridae and Plotosidae

2 Madagascar No Ostariophysi except *Ancharius* (Arridae)

3 Neotropical Region South and Central America Characiniformes, Characinidae in common with Africa, four endemic families Gymnotiformes Siluroidea, nine endemic families

4 Ethiopian Region Africa Characiniformes, Characinidae in common with South America, Citharinidae endemic Cyprinidae Indian genera Siluroidea, three families in common with India, three endemic

5 Indian Region India and South-East Asia, with Java, Sumatra and Borneo Cyprinidae numerous, mostly Danioninae and Cyprininae Cobitidae Homalopteridae Siluroids numerous with endemic families

6 Palaearctic Region Europe, and Asia to the Himalayas and Yang-tse-Kiang Cyprinidae, Cyprinines and many Leuciscines. Cobitidae Siluroids few, of Indian families

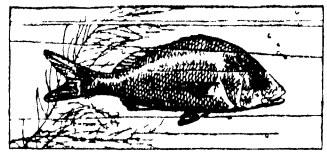
7 Nearctic Region North America Leuciscine Cyprinidae Catostomidae Amiuridae

The distinctness of the different regions is emphasized when other fresh-water fishes are considered, for although the Palaearctic and Nearctic regions have in common the Haplomi (Esocidae, Umbridae) and the Percidae, North America is characterized by *Lepidosteus* and *Amia*, Hiodontidae, Amblyopsidae, Percopsidae, Aphredoderidae, Centrarchidae, and the numerous dwarfed Percidae known as darters Africa also has several endemic families, Polypteridae, Mormyridae, Knerridae, Phractolaemidae, etc As in Central and South America, there are in Africa numerous species of cichlid perches, but the fondness of some of these for brackish lagoons makes them, like the cyprinodonts, unreliable as evidence of former land connections. Much more important are the characins, and the Lepidosirenidae, with *Protopterus* in Africa and *Lepidosiren* in South America, the latter family specialized for fresh-water life in the tropics

From the available palaeontological evidence it seems clear that the present distribution of fresh-water fishes was in the main accomplished at the beginning of the tertiary In Eocene beds of North America occur Catostomidae, Amiuridae, Percidae and Centrarchidae In Europe modern genera of Cyprinidae occur in Oligocene and Miocene deposits It is generally accepted that in the Eocene the continents were isolated and developed peculiar faunas, and that at the end of the Eocene the present connections became established, joining North to South America, Africa and India to Eurasia, and in addition joining Asia to North America across the Bering sea These connections allowed migrations and interchanges which produced considerable effects on the terrestrial faunas; but so far as can be judged they accomplished little for fresh-water fishes, beyond the introduction of leuciscines into North America from Asia, and of Cyprinidae and perhaps Clariidae from India to Africa In Central America some neotropical types have penetrated to southern Mexico, but none has got on to the Mexican plateau In the other direction the ancient *Lepidosteus* has reached Panama, and two or three nearctic genera are found in Guatemala But it is a fair statement to say that the very distinct nearctic and neotropical fish faunas barely meet,

much less overlap, in striking contrast to the invasion of South America by northern mammals and reptiles

To summarize, it appears that for fresh-water fishes, as compared with mammals, migration is much more difficult but survival more easy, the post-Eocene connections that enabled mammals to roam the world had little effect on the distribution of fresh-water fishes These are, however, very important as a clue to the distribution of land and water in Cretaceous times, for it is almost impossible that the relationship between the fishes of Africa and South America is due to migration from the north It seems probable that in early Cretaceous times South America and Africa were one continent, which extended to India, but not through Madagascar In this continent the Ostariophysi originated and evolved, so that when it was broken up towards the end of the Cretaceous, these were at least Characinidae and Pimelodidae in South America, Characinidae and Bagridae in Africa, and Cyprinidae and Bagridae in India Since then South Africa has been isolated and has developed its rich and remarkable fauna, colonizing Central America when the connection was established India must have been connected with eastern Asia and thus with North America during some part of the Cretaceous, for the ancestors of the Catostomidae and Amiuridae reached North America from Asia before the Eocene



BY COURTESY OF THE N Y ZOOLOGICAL SOCIETY

MARGARET GRUNT (HAEMULON ALBUM), A MARINE PERCH OF THE FAMILY POMADARIDAE, PEARLY WHITE IN COLOUR IT RANGES FROM FLORIDA TO BRAZIL

CLASSIFICATION

Sub-class 1 PALAEOPTERYGII.—Scales, when ganoid, formed of parallel layers of ganoine near the surface, and of bone within, separated by a layer of cosmine Dorsal and anal fins with the dermal rays more numerous than their skeletal supports (except the dorsal of *Polypterus*), which typically form a regular series, with the radial segments well developed Pectoral fin with one or more anterior radials articulating with the pectoral arch the rest with a metapterygium, pelvic with a well-developed series of radials, and often with the posterior basals free, not incorporated in the pelvis Skull with few cartilage bones, lateral ethmoids, an unpaired sphenoid in the orbital region, a basioccipital and paired opisthotics being the usual ossifications Maxillary firmly attached to ectopterygoid Lower jaw without splenial or other bones below the dentary No interoperculum and no symplectic. Clavicles present (except in the Belonorhynchii)

Order 1 **Archistia.**—Body usually covered with ganoid scales Caudal fin heterocercal Head covered with bones; preoperculum large, extending forward over cheek Snout short, mouth normally formed, with fixed premaxillaries, and with palatines attached to ethmoid region of skull Clavicles present Vertebral column acentrous This order includes the Palaeoniscidae, Platysomatidae and Catopteridae.

The Palaeoniscidae, which range from the lower Devonian to the end of the Jurassic, show a combination of primitive characters that entitles them to be regarded as the ancestors of all other fishes, except the Crossopterygii They are elongate fusiform in shape, with a short and blunt snout projecting a little in front of the rather large mouth, which has acute conical teeth in the jaws The dorsal fin is short, placed above or behind the pelvics. The Palaeoniscidae were evidently active, predacious fishes. Numerous genera are known, of which the Devonian *Cheirolepis* is remarkable for the long-based pelvic fins.

The Platysomidae, known from Carboniferous and Permian strata, are deep-bodied, with longer dorsal fin, smaller mouth and blunter teeth than the Palaeoniscidae. The Triassic Catopteridae differ from the Palaeoniscidae especially in the shortness of the upturned end of the tail.

Order 2 **Belonorhynchii.**—Body with four series of bony scutes Caudal fin symmetrical Snout and lower jaw very long; premaxillaries present, and palato-quadrates as in the Archistia. No clavicles. Veterbral column acentrous The Triassic Saurichthyidae are pike-like fishes, whose structure has recently been elucidated by Stensio (1925)

Order 3 **Chondrostei.**—Body naked, or with vestigial scales, sometimes with series of bony scutes Caudal fin heterocercal. Snout prominent jaws toothless, premaxillaries absent; pterygoquadrates meeting below skull, protractile. No preoperculum Clavicles present. Vertebral column acentrous.

The Liassic Chondrosteidae differ from the modern Acipenseridae and Polyodontidae in having a series of branchiostegal rays The Polyodontidae include *Polyodon folium*, the spoon-bill of the Mississippi, and *Psephurus gladius* of Chinese rivers The Acipenseridae, or sturgeons (*q v*), differ in having the mouth smaller and more protractile, with a transverse row of barbels in front of it, and in having five series of bony scutes along the body There are about 20 species of *Acipenser* from north temperate seas, entering rivers to spawn, several inhabit the Black and Caspian seas. *Scaphirhynchus* has four species, one from the Mississippi, three from the rivers of Tartary All the Chondrostei are believed to feed mainly on small invertebrates found in mud, which they stir up with their snouts when feeding

Order 4 **Cladistia.**—Scales, head skeleton, pectoral arch, etc nearly as in the Palaeoniscidae, anal fin with rays more numerous than radials, and pelvics with well-developed radials, but other fins more specialized, the pectorals with one large radial articulating with the pectoral arch and numerous small ones articulating with a plate developed between them and the metaperygium, caudal abbreviate heterocercal (as in *Amia*), dorsal long, with each ray supported by its own basal, and all but the posterior ones spaced forming strong spines No branchiostegals, but a pair of large gular plates Vertebral column with bony centra The single family Polypteridae inhabits the fresh-waters of Africa, it includes *Polypterus*, of which ten species are known, and the eel-shaped *Calamichthys* As in the Dipneusti, the air-bladder is lung-like, and is used as an accessory organ of respiration The larvae have a pair of large pinnate external gills

Sub-class 2 NEOPTERYGII.—This sub-class includes the groups formerly known as Holostei and Teleostei, to it belong the great majority of living fishes Its characters can best be understood by comparing the organization of its earliest and most primitive family, the Semionotidae, which ranged from the Upper Permian to the Jurassic, with that of the Palaeoniscidae, the only known fishes from which they can have been derived The typical palaeoniscids appear to have been swift-swimming predacious fishes, with a large mouth and sharp teeth, whereas the Semionotidae were slow-swimming fishes, feeding at the bottom on shell-fish, etc , and had a small mouth with styliform or tritorial teeth Most of the differences between the Palaeoniscidae and the Semionotidae can be interpreted as related to this difference in habits The dorsal and anal fins of the Palaeoniscidae, with numerous rays forming a close-set series, are fitted for cleaving the water and withstanding strains. In the Semionotidae the fin-rays are much reduced in number, are set well apart and are united in pairs; the muscular lobe at the base of the fin is reduced, the radial segments of the pterygiophores are shortened, and each fin-ray articulates with its own radial and has its own muscles Such fins can perform the delicate movements needed by a fish at rest or swimming slowly. Correlated with this modification of the dorsal and anal fins is the shortening of the upturned end of the tail, so that the caudal fin becomes terminal, and the narrowing of the bases of the paired fins The preoperculum, which in the Palaeoniscidae was a plate covering the cheek, became in the Semionotidae a strong crescentic bone firmly attached to the hyomandibular and quadrate, and the lower end of the elongated hyomandibular ossified as the symplectic, wedged in between quadrate and preoperculum, and at its anterior end forming an additional articulation for the broad lower jaw This consolidation of elements is necessary for the articulation of a lower jaw that is massive and used for crushing In the Semionotidae, as in the Palaeoniscidae, the operculum and suboperculum are the upper elements of a series of branchiostegal rays, but in the Semionotidae there is an additional bone of some interest, the interoperculum, which lies between the suboperculum and lower

jaw; it seems that the suboperculum, retaining its attachment to the posterior end of the lower jaw, has been elongated and fractured so that the posterior part may retain its freedom of movement, the anterior, overlapped by the lower limb of the preoperculum, being the interoperculum

The Semionotidae also possess other important differences from the Palaeoniscidae that are not evidently related to different habits, *e.g.*, the absence of a cosmine layer in the scales, the disappearance of the clavicles, more ossifications in the chondrocranium, etc It is of interest that most of the adaptive features first acquired by the Semionotidae in relation to their habits have persisted in all the members of the sub-class, whatever their manner of life Thus there are many swift and predacious Neopterygii, in which the dorsal and anal rays have increased in number and form a close-set series, but the skeletal supports have increased in number with them and thus the essential feature, that each ray articulates with its own radial is retained. such fishes have a widely forked caudal fin, but the upper fork is formed by the outgrowth of fin-rays, not by the upturned end of the tail, they may also have a large mouth, so that the preoperculum has no lower limb; but they retain the interoperculum, which was first developed in relation to a small mouth and a preoperculum with a long lower limb. The Neopterygii may be diagnosed as follows —

Scales, when ganoid, of parallel layers of ganoine outside and of bone within, without a cosmine layer Dorsal and anal rays equal in number to their skeletal supports, each articulating with its own radial, which is small, or fused with the basal Caudal fin abbreviate heterocercal or homocercal Pectoral fins with all or some of the radials articulating with the pectoral arch, pelvic fins with radials reduced or absent, the rays articulating with the pelvic bones Typically a symplectic and an interoperculum Skull typically with orbitosphenoids and alisphenoids and with five otic bones on each side No clavicles

Order 1 **Protospondyli.**—Caudal fin abbreviate heterocercal with all the hypurals supported by the upturned end of the vertebral column Centra absent, or variously developed Premaxillaries fixed, firmly attached to frontals, pierced for passage of olfactory nerves Maxillaries movable, anteriorly articulating with ethmoid region of skull Lower jaw with dentary, angular and supraangular on the outside, with large dentigerous prearticular on the inside, and with two articular bones for the quadrate and one for the symplectic, which articulates with it above and outside the quadrate Hyomandibular firmly attached to quadrate, and preoperculum to both One coracoid bone, or none, mesocoracoid bridge cartilaginous, one or more pectoral radials on metapterygium Scales often ganoid

This order includes a number of families found fossil in Mesozoic strata The Semionotidae, with small mouth and short dorsal fin, the Macrosemiidae with a longer dorsal, the Eugnathidae, predacious fishes with large mouth, sharp teeth and forked caudal fin, the Pachycormidae, mackerel-like fishes, the Pycnodontidae, deep-bodied fishes with crushing teeth, resembling the modern Plectognathi, and the Aspidorhynchidae, in which the premaxillaries are prolonged into a beak, as in the swordfishes The only living member of the group is the bowfin (*Amia calva*), a fresh-water fish of North America, belonging to a family that dates back to Cretaceous times and is distinguished from the Eugnathidae by the longer dorsal fin, rounded caudal, thin overlapping scales, and by the solid centra of the vertebral column

Order 2. **Ginglymodi.**—Distinguished from the preceding by the structure of the jaws, suspensorium and opercles Snout and lower jaw long; maxillary segmented, the first one or two segments attached to premaxillary, the rest to the ectopterygoid, metapterygoids articulating with transverse facets on wings of parasphenoid: hyoid arch free from pterygo-quadrate; preoperculum small, its anterior end articulating with a condyle on quadrate; interoperculum large, fixed, connecting hyomandibular with preoperculum. Vertebrae solid, opisthocoelous.

Lepidosteus, with a few species from the fresh-waters of North America, is related to the Semionotidae, and differs from them especially in structural readjustments related to the prolongation of the jaws, the quadrate retains its anterior position, and the strain imposed on the suspensorium by the long and powerful lower jaw is relieved by the support afforded by the metapterygoid articulation with the parasphenoid The gar-pikes (*q.v.*) or alligator-gars, are sluggish piscivorous fishes with strong conical teeth, they are the only living Neopterygii with ganoid scales

Order 3 **Halecostomi.**—Differ from the Protospondyli in that the premaxillaries are small and loosely attached, the maxillary has a convex oval border and bears two supplemental bones, and the lower jaw has no supraangular Vertebral centra annular or biconcave. The Mesozoic Pholidophoridae had minute teeth, and were evidently plankton-feeders like the herrings, which they resemble in form and shape of the fins The Oligopleuridae are distinguished by thin cycloid scales

Order 4 **Isospondyli.**—Caudal fin homocercal, *i.e.*, the upturned end of the vertebral column is short, with not more than two or three centra, and the upper hypurals are supported by paired bones—uroneurals—that appear to be the enlarged neural arches of posterior vertebrae that have aborted Fins without spinous rays pelvics generally abdominal in position Air-bladder with an open duct Maxillaries generally forming part of upper border of mouth Lower jaw without supraangular and without or with small praearticular An endochondral supraoccipital. Coraco-scapular cartilage typically with three ossifications, including a mesocoracoid; pectoral radials articulating direct with pectoral arch, the lowest perhaps representing the metapterygium. Vertebrae biconcave Scales not ganoid

The principal families may be arranged as follows:—

I Parapophyses generally small distinct elements wedged into pits in the centra
- A Oviducts generally complete
  - 1 No photophores; mouth toothed, the maxillary, when well-developed, with two supplemental bones, branchiostegals five or more, no adipose fin. *Leptolepidae, Elopidae, Albulidae, Saurodontidae, Alepocephalidae, Clupeidae, Ctenothrissidae*
  - 2 No photophores; mouth small, toothless; three or four branchiostegals, no adipose fin *Chanidae, Knerudae, Phractolaemidae, Cromeriidae.*
  - 3 Photophores present *Gonostomatidae, Sternoptychidae, Enchodontidae, Astronesthidae, Chauliodontidae, Stomiatidae*
- B Oviducts absent or incomplete; mouth toothed; not more than one supplemental maxillary, adipose fin usually present. *Salmonidae, Microstomidae, Argentinidae, Opisthoproctidae, Osmeridae, Salangidae, Retropinnatidae, Haplochitonidae, Galaxidae*

II Parapophyses ankylosed with centra, appearing as strong processes
- A. Parietals meeting, entopterygoid articulating with a lateral peg on parasphenoid. *Osteoglossidae, Pantodontidae*
- B Parietals meeting, air-bladder with an anterior vesicle on each side connected with otic region of skull *Hyodontidae, Notopteridae*
- C Parietals meeting; a large cavity on each side of skull, above the pterotic, containing a vesicle detached from the air-bladder *Mormyridae, Gymnarchidae*
- D Parietals small, separated by supraoccipital; mouth small, toothless *Gonorhynchidae.*

The Jurassic and Cretaceous Leptolepidae scarcely differ from the Elopidae, also found in Cretaceous strata and represented to-day by two genera from tropical seas They have a large terminal mouth with bands of small conical teeth, two supplemental maxillaries, numerous branchiostegal rays, a median gular plate behind the symphysis of the lower jaw, as in *Amia*, dorsal fin above or a little behind the many-rayed pelvics, and widely-forked caudal *Megalops atlanticus*, the tarpon (*q.v.*) found on both sides of the Atlantic, is a much larger fish than its Indian congener *Elops*, with seven species, is a widely distributed genus; these are silvery fishes, slender in form, and very active The Albulidae differ from the Elopidae in having no gular plate and the mouth small, subterminal *Albula vulpes* is a silvery fish found on sandy coasts throughout the tropics. *Pterothrissus gisu*, with long dorsal fin, is an albulid from deep water off Japan The Cretaceous Saurodontidae are very near the Elopidae, but have stronger teeth. The Alepocephalidae are bathypelagic or abyssal, deep-blue, purple or blackish fishes, with the dorsal fin above the anal; some 50 species are known The Clupeidae, with over 200 species, differ from the Elopidae in having no gular plate and in certain skeletal characters, paired anterior diverticula

of the air-bladder expand into vesicles inside the otic region of the skull Most Clupeidae are marine, and swim in shoals near the surface, generally feeding on plankton. The herring, *Clupea harengus,* of the north Atlantic, is one of the most important food-fishes *Sardina* includes the pilchards (*q.v.*) or sardines, found north and south of the tropics, *Sardinella* and *Harengula* are allied tropical genera *Chirocentrus dorab* of the Indo-Pacific, a predacious fish with strong acute teeth, retains the spiral valve of the intestine *Alosa* of the north Atlantic and Mediterranean comprises the shads, which enter rivers to breed, allied genera with similar habits are *Caspialosa* of the Black and Caspian seas, *Brevoortia* (menhaden) of the Atlantic coast of America and *Hilsa* of the Indian ocean The anchovies (*Engraulis,* etc.) are small fishes of warm seas, distinguished by the projecting snout *Chanos chanos* of the Indo-Pacific, the only species of the Chanidae, reaches a length of five feet; it feeds on algae and sometimes enters fresh-water The Kneriidae, Phractolaemidae and Cromeriidae are small African fresh-water fishes The Isospondyli with photophores, generally arranged in two rows along each side of the body, fall into two groups, the Gonostomatidae and Argyropelicidae, with two supplemental maxillaries and related to the Elopidae, and the more specialized Astronesthidae, Stomiatidae, etc., with slender maxillary without supplemental bones These are all oceanic, some living at considerable depths below the surface

The Salmonidae are distinguished from related families with an adipose fin and without oviducts in that the last two or three vertebrae turn upwards at the base of the caudal fin They are primarily marine fishes of arctic and northern seas that enter rivers to breed, but include a number of fresh-water species in Europe, northern Asia and North America The principal genera are *Salmo,* salmon and trout (*qq.v.*), *Salvelinus,* char (*q.v.*), *Coregonus,* whitefish (*q.v.*) and *Thymallus,* grayling (*q.v.*) The Argentinidae and Microstomidae are marine, deep-water or oceanic fishes, and the Osmeridae, or smelts, differ from the preceding families in having no orbitosphenoid, and in the presence of a series of teeth along the inner edge of the entopterygoid, characters that persist in the remaining salmonoid families, which, however, are distinguished by the loss of the mesocoracoid The Osmeridae, like the Salmonidae, are northern marine fishes, they breed in inlets, estuaries or rivers, generally in brackish water *Mallotus,* capelin, *Thaleichthys,* eulachon, and *Osmerus,* smelt (*q.v.*) are important genera, *Plecoglossus altivelis* is the ayu of Japan The Salangidae of China and Japan are small, slender, translucent fishes *Retropinna* of Australia and New Zealand differs from the Osmeridae mainly in the loss of the mesocoracoid and leads to the other southern families, the Haplochitonidae, in which the premaxillaries extend nearly the whole length of the maxillaries, and the Galaxiidae, which have no adipose fin, the dorsal being above the anal. *Galaxias attenuatus,* from Patagonia, southern Australia and New Zealand, is remarkable in that it reverses the habits of its northern allies, descending to the sea to breed, the other species of *Galaxias* are mostly confined to fresh-water The Osteoglossidae have large bony scales they are unique among fresh-water fishes in their distribution *Scleropages* has one species in Sumatra and Borneo, the other in Queensland and New Guinea *Osteoglossum* has a single species from South America. *Arapaima gigas* of South America reaches 15 ft in length *Heterotis niloticus* is African. The little African *Pantodon* has large pectoral fins and is said to be a fresh water flying-fish The Hiodontidae include only *Hiodon,* with three species from rivers and lakes of North America, large-eyed, silvery fishes. The Notopteridae, with a few species from lakes and marshes of Africa and southern Asia, differ in having the long anal fin confluent with the reduced caudal

The Mormyridae (*see* MORMYR), with over 100 species from the fresh waters of Africa, are queer-looking fishes with restricted gill-openings, small eyes and generally a small mouth, which in some species is situated at the end of a long tubiform snout A thin, loosely attached bony plate overlies the cavity in the side of the skull that lodges the vesicle which is in contact with the internal ear *Gymnarchus niloticus* is allied to the Mormyridae but is eel-shaped The Gonorhynchidae include only *Gonorhynchus* with few species from Japan, South Africa, Australia and New Zealand, slender fishes with spiny scales, a small toothless inferior mouth, and a prominent pointed snout with a barbel at the end.

Order 5 **Haplomi.**—Soft-rayed fishes with abdominal pelvic fins, with the maxillary entering the gape, and with an open duct to the air-bladder Vertebral column with separate parapophyses inserted in pits in the centra, orbitosphenoid, and no mesocoracoid; mesethmoid represented by a pair of large dermal bones. Freshwater fishes of Europe, northern Asia and North America. Three families, each with a single genus The Umbridae are small fishes One species of *Umbra* inhabits central Europe, the other North America The Esocidae are distinguished by the produced, flattish snout, the large mouth, the strong erect teeth of the lower jaw, and by having the premaxillaries widely separated from each other The pikes are voracious, feeding mainly on other fishes The Dallidae differ from the Umbridae in having the pectoral radials represented by a cartilaginous plate *Dallia pectoralis* is the blackfish of Alaska and eastern Siberia

Order 6 **Iniomi.**—Soft-rayed fishes with pelvic fins abdominal or thoracic and pelvic bones free from the cleithra, air-bladder usually absent, when present with an open duct, mouth bordered above by the premaxillaries, pectoral arch attached to the skull by a forked post-temporal, no mesocoracoid, vertebral centra co-ossified with the arches, adipose fin generally present A large and varied group of marine fishes

Sub-order 1 *Myctophoidea*—Pectoral fins lateral, pelvics below or behind them Palatine normal, articulating with vomer. Cleithrum attached to lower end of supracleithrum Four families

The Aulopidae include the Cretaceous *Sardinoides* and the living *Aulopus* from the coasts of Australia and the Mediterranean, with a rather wide mouth with bands of conical teeth, a somewhat elongate dorsal fin followed by an adipose fin, and pelvic fins wide apart and placed below or a little behind the pectorals, inserted at the sides of the plate formed by the pelvic bones, which bears a pair of long posterior processes The Synodontidae have a larger mouth with bands of depressible curved pointed teeth, the maxillary slender and adherent to or united with the premaxillary *Synodus* and *Saurida* include a score of species from the coastal waters of warm seas *Bathysaurus* has two species from deep water in the Pacific *Harpodon* of the Indian ocean has the skeleton very feebly ossified and barbed teeth The Sudidae differ from the Aulopidae in having a short dorsal fin, the pelvic fins close together, the pelvic bones simple triangular plates, no orbitosphenoid, etc These are oceanic fishes, some living at considerable depths *Chlorophthalmus* has a short snout The other genera fall into two groups (*A*) with spatulate snout and with large mouth extending back beyond the eye, *Bathypterois, Ipnops,* etc (*B*) More or less elongate and compressed, with produced snout, and mouth not reaching the eye, *Sudis, Paralepis,* etc The Myctophidae are small silvery fishes with large eyes, and with rows of luminous organs on the body, inhabiting the ocean from the surface down to about 500 metres The principal genera are *Neoscopelus, Myctophum* and *Lampanyctus* The Rondeletiidae and Cetomimidae, deep-bodied fishes with large mouth and dorsal fin above the anal, may belong here

Sub-order 2 *Alepidosauroidea*—Pectoral fins low, pelvics far behind them Palatine large, firmly fixed to frontals and to ethmoid region of skull Cleithrum attached near upper end of supracleithrum, which runs downwards and backwards and bears the post-cleithrum at its lower end Fishes with a large mouth, with strong canines on the palatines and in the lower jaw, and with the premaxillaries and maxillaries slender and united posteriorly.

The Scopelarchidae are moderately elongate in form, with a short dorsal fin, and with slender barbed canines. The Omosudidae differ in having a produced pointed snout and compressed pointed canines. The Alepidosauridae are elongate, naked fishes with a long pointed snout, compressed teeth, and a very long dorsal fin; they are large oceanic fishes probably living at considerable depths. *Alepidosaurus* has four or five species from the Atlantic and Pacific *Eugnathosaurus* is an Antarctic genus The Creta-

ceous *Apateodus* may belong to this family, and the Dercetidae of the Cretaceous may be related

Sub-order 3 *Ateleopoidea*.—Pectorals lateral, pelvics in advance of them, wide apart, each of a single ray, inserted at the sides of a cartilaginous pelvis which bears a pair of long posterior processes as in *Aulopus* Skull in great part cartilaginous Elongate, naked fishes, with short dorsal fin just behind the head, long anal joined to the small caudal, and small subterminal mouth The genus *Ateleopus* includes about six species from the Indo-Pacific, living at the bottom in rather deep water

Order 7 **Giganturoidea.**—Soft-rayed fishes without air-bladder, without pelvic fins and with long many-rayed pectorals high up, above and behind the small gill-openings Mouth wide, bordered above by the long premaxillaries, which are united on the inside to the ectopterygoids, no maxillaries and no palatines Gills small, widely separated from those of the other side, the lower parts of the gill-arches being undeveloped Pectoral arch free from skull, no post-temporal and no supra-cleithrum, pectoral radials and coracoid ossifications thin plates This order contains the single genus *Gigantura*, with four species from the Atlantic and Indian oceans These are naked silvery fishes, with short snout, large telescopic eyes placed close together and directed forwards, slender acute depressible teeth in the jaws, and the lower lobe of the caudal fin elongate

Order 8 **Lyomeri.**—Naked soft-rayed fishes with long slender tail, long dorsal and anal fins, no caudal, small pectorals and no pelvics Gill-openings small Mouth very large, bordered above by a pair of slender bones that meet in front and behind are attached within the quadrates, connected with head by loose skin, no palatine or pterygoid bones, hyomandibular-quadrate long, oblique, gills and pectoral arch far behind head, with reduced skeleton, skull with much cartilage and thin membrane bones, parietals meeting in front of supraoccipital No ribs No air-bladder Oceanic fishes living at considerable depths, belonging to two families, each with a single genus and species *Saccopharynx*, with curved pointed teeth and very distensible stomach, is piscivorous *Eurypharynx*, with enormous mouth and minute teeth, may feed mainly on small invertebrates

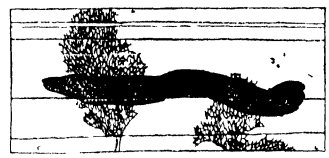
Order 9 **Ostariophysi.**—Closely related to the Isospondyli, but distinguished by a communication between the air-bladder and the internal ear through a chain of ossicles, which are modified elements of the four anterior vertebrae An orbitosphenoid, generally a mesocoracoid

This order contains some 5,000 species, nearly all fresh-water fishes The most primitive members of the group are essentially similar in structure to generalized Isospondyli such as the Elopidae, but others, especially among the catfishes, depart widely in structure from that type In spite of this diversity, all are held together by the essential similarity of the mechanism that transmits vibrations from the air-bladder to the internal ear and increases the sense of hearing The air-bladder is divided into two parts, the anterior held by a strong pair of bones that represent the parapophyses, and ribs of the fourth vertebra, in its wall is embedded on each side a process of the *tripus*, a triradiate bone that represents the rib of the third vertebra, which is connected by a ligament with the *scaphium*, an ossicle which is the neural arch of the first vertebra, and is embedded in the wall of a membranous diverticulum of a cavity in the basioccipital bone that communicates with the perilymph spaces of the ear

Sub-order *Cyprinoidea*.—The fishes of this sub-order are generally normally scaled It comprises three well marked groups, the first including the characins, the second the electric eels, and the third the carps

Characiformes.—In the characins the jaws are toothed, the maxillary enters the gape, and the upper and lower pharyngeals are toothed and opposed to each other in the usual way The family Characinidae includes several hundred species from Central and South America and about 50 from Africa The African *Alestes* and the American *Brycon* appear to be closely related *Hydrocyon* of Africa includes the tiger-fishes, distinguished by the strong pointed sharp-edged teeth *Sarcodaces* is a pike-like fish from West Africa. Many of the South American forms are small deep-bodied silvery fishes (*Tetragonopterus, Astyanax,* etc) often seen in aquaria *Serrasalmo* has a keeled and serrated abdomen, short but powerful jaws, and sharp-edged triangular teeth Other South American families are the Gastropelecidae, Xiphostomatidae, Anostomidae and Hemiodontidae *Gastropelecus* is remarkable for its deep, strongly compressed body with the thorax and abdomen expanded into a sharp-edged semicircular disc Within this disc is a bony lamina formed by the union of the hypocoracoid bones, on which are inserted the very large muscles of the long pectoral fins Eigenmann has seen these fishes skim along the surface of the water, with rapid beats of the pectoral fins, and finally emerge in a true flight The Xiphostomatidae are carnivorous pike-like fishes The Anostomidae have incisor-like teeth, or none, and probably feed on weeds, or some on mud The Citharinidae include about 40 species from Africa, they have ciliated scales, the majority have a small mouth and small teeth, and are herbivorous

The Gymnotiformes are South American fishes that differ externally from the characins in the anterior vent, long tapering tail with a very long anal fin and caudal small or absent, no dorsal or pelvic fins, and restricted gill-openings The palatine and ectopterygoid are absent and the entopterygoid has an extensive attachment to the vomer and parasphenoid The vertebrae are numerous, 70–250 There are four families The Rhamphichthyidae and Sternarchidae are probably herbivorous, the different genera parallel the Mormyridae in the diversity of the form of the snout, which in some is long and tube-like The other families each contain a single species, *Gymnotus carapo* and *Electrophorus electricus*, the latter the electric eel (*q v*), which grows to a length of 8 ft and discharges powerful electric shocks, the paired electric organs, formed of modified muscular tissue, occupy the lower half of the greater part of the fish



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SPOTTED MORAY (MURAENA MORINGA), AN EEL, ABUNDANT IN THE WEST INDIES IT IS YELLOWISH IN COLOUR AND IS THICKLY MARKED WITH DARK SPOTS

The Cypriniformes differ from the characins in that there is no adipose fin, the mouth is toothless and protractile, and the lower pharyngeals are falciform, with teeth opposed to paired processes of the basioccipital that may unite below the aorta In the Catostomidae the premaxillaries are small, the lips fleshy, the pharyngeal teeth in a single series, often numerous, and the pharyngeal processes of the basioccipital united to form an expanded perforated lamella, rolled up at the edges, and not covered by a horny sheath These are the suckers, of which some 60 species are known from North America, belonging to *Carpiodes, Catostomus,* etc *Myxocyprinus*, with two species from China, has a long dorsal fin like *Carpiodes*, as has *Amyzon* from the Eocene of North America These fishes feed on small aquatic animals, weeds and mud; in the spring they swarm and run up the smaller streams to spawn In the Cyprinidae, or carp family, the premaxillaries exclude the maxillaries from the gape, one or two pairs of barbels are often present, the pharyngeal teeth are in one, two or three series, are not numerous, and bite against a horny pad supported by the flat or concave lower surface of the basioccipital plate This is a very large and widely distributed family, including at least 1,000 species. The form of the pharyngeal teeth, conical, molariform, compressed, etc , their number and arrangement, are of great importance in classification The most primitive group is the Danioninae, mainly from southern and eastern Asia, but represented in Europe and Africa, the cleithra are rounded or pointed anteriorly *Opsariichthys, Chela, Barilius, Danio, Xenocypris, Aspius, Pelecus,* etc , belong to this group The leuciscines differ in that the cleithra are more expanded and truncated anteriorly; this group is well represented in Europe and northern Asia and all the American Cyprinidae seem to belong to it. *Leuciscus* (dace, chub, *qq v*), *Rutilus* (roach, *q v*), *Xenocypris, Phoxinus* (minnow, *q v*), *Alburnus* (bleak, *q v*), *Abramis* (bream, *q v*), *Semiplotus, Rhodeus* (bitterling, *q v*), etc , are Old World genera In the cyprinines of Eurasia and

Africa the cleithra are emarginate anteriorly; this group includes *Cyprinus* (carp *q v*), *Barbus* (barbel, *q v*), *Labeo, Discognathus, Tinca* (tench, *q v*), *Orenus, Gobio* (gudgeon, *q v.*), etc. The majority of the Cyprinidae eat insects, worms, etc, or are herbivorous, but some have powerful jaws and are piscivorous The Cobitidae, or loaches are small fishes with small scales, they differ from the Cyprinidae in having at least three pairs of barbels The pharyngeal teeth are uniserial; the pharyngeal processes of the basioccipital do not unite and do not bear a horny pad, the anterior part of the air-bladder is in a bony capsule Numerous species of this family inhabit mountain streams in tropical and temperate Asia, three are found in Europe and one in Abyssinia. The Homalopteridae are loach-like fishes with at least three pairs of barbels, with uniserial pharyngeal teeth, with pharyngeal processes of basioccipital reduced, and without horny pad In skeletal characters they differ widely from the Cobitidae; the air-bladder is divided into two lateral sacs, each enclosed in a bony capsule The mouth is sub-terminal or inferior, the lower surface of head and abdomen flat, the paired fins horizontal There are ten genera from southern Asia In *Gastromyzon* of Borneo the broad flat lower surface is margined by the long many-rayed pectoral and pelvic fins and by a lateral flap of skin between them, the whole forming an enormous suctorial disc

Sub-order 2 *Siluroidea*—The siluroids or catfishes (*q v*) have the body naked or covered with bony plates, with the mouth toothed and non-protractile, without parietals, opisthotic, symplectic or suboperculum, with first vertebra a disc rigidly united to basioccipital and to the second, third and fourth vertebrae which are ankylosed to form a complex, to which the fifth is rigidly attached, and with the parapophyses ankylosed to the centra The mouth is generally furnished with barbels, a maxillary pair being the most constant, but one or two mandibulary pairs being present in most families, and a nasal pair in some The second ray of the dorsal and the outermost ray of each pectoral are typically strong spines, often serrated The pectoral arch is highly characteristic, the post-temporal, when present, is a small plate rigidly attached to the skull; the supra-cleithrum is typically forked, the upper limb usually rigidly attached to the epiotic and pterotic, the lower to the basioccipital, the distal part, beyond the fork, forms a socket for the head of the cleithrum A mesocoracoid is present except in the Ariidae, Doradidae and Bunocephalidae The nuchal shield, found in many siluroids, is formed by a process of the supraoccipital and by expansions of the three first radials of the dorsal fin

The air-bladder is divided by a partition into anterior and posterior divisions, the anterior is connected with the tripus, and usually extends laterally to beneath the skin above the pectoral fin The complex vertebra bears a single transverse process, which is usually divided into an anterior branch, decurved and firmly attached distally to the stem of the supra-cleithrum, and a posterior horizontal branch; these branches support the anterior and dorsal walls of the anterior chamber of the air-bladder, which is also supported by the transverse process of the fifth vertebra In the Doradidae, Pangasiidae, Mochochidae and Malopteuridae the anterior branch of the parapophysis of the complex vertebra loses its connection with the supra-cleithrum, its proximal part is a thin stem, its distal part an expanded plate inserted in the wall of the air-bladder and furnished with a muscle attached to the skull This "elastic spring" mechanism is for the production of sound In several families the posterior part of the air-bladder is absent, and the anterior is represented by two lateral portions, sometimes disconnected, and more or less encapsuled by the transverse processes of the fifth and complex vertebrae, which in the Trichomycteridae and Clariidae are complete bony cylinders, open only at their outer ends just beneath the skin, and with a fenestra for the insertion of the tripus In some families (Callichthyidae, Loricariidae) the supra-cleithra and exoccipitals may share in the formation of the bony capsules, which open laterally by clefts or perforations in the supra-cleithral plates

Most Siluroids have bands of pointed teeth and are omnivorous, but some with small mouth and incisor-like or bicuspid teeth are herbivorous, or feed on organic debris The Diplomystidae include only *Diplomystes papillosus* of Chile and Argentina, the most primitive catfish, with a well-developed maxillary, expanded distally, and toothed. In all other siluroids the maxillary is small, slender and toothless. In most of them, as in *Diplomystes*, the dorsal fin has a spine and is anterior in position, an adipose fin is present, the anal is short or moderately long and the caudal is well-developed; in the following account the fins will be mentioned only when they have a different arrangement In the Bagridae of Africa and southern and eastern Asia the anterior and posterior nostrils are wide apart, the latter usually with a barbel, the gill-openings are wide, and the air-bladder is large, not encapsuled *Bagrus* and *Chrysichthys* in Africa, *Macrones, Liocassis* and *Rita* in Asia, are the principal genera The Amiuridae of North America are closely related to the Bagridae The Amblycepidae, small Asiatic cat-fishes, have the air-bladder divided into two lateral sacs, partly enclosed in bone. The Sisoridae are also Asiatic, they are found especially in mountain streams and have a flat lower surface and horizontal paired fins, the very strong parapophysis of the fifth vertebra extends outwards to the skin In the more specialized forms the head is depressed, and the thorax may have longitudinal plaits (*Glyptosternum*) or the lips be expanded and reflected to form a sucker (*Exostoma*) The Amphiliidae of Africa also have a depressed head and expanded horizontal paired fins, the air-bladder is divided into two lateral parts enclosed in incomplete bony cylinders The Chacidae include only the Indian *Chaca lophioides*, a fish with very large flat head and very wide terminal mouth, the caudal fin extends forward above and below, simulating a second dorsal and anal

The Schilbeidae of Africa and India are very near the Bagridae, but have a long, many-rayed anal fin, in some specialized genera the dorsal fin is small and spineless, or is absent The Indian *Entropiichthys* is remarkable for having a long, toothed bone, extending from the premaxillary to the corner of the mouth, simulating a maxillary, but the true maxillary, reduced, toothless and bearing barbels, is also present The Indian *Pangasius* also has a long anal fin, but the air-bladder has an elastic spring mechanism The Mochochidae of Africa have an elastic spring apparatus, they have the external characters of the Bagridae, except that there is no nasal barbel and the gill-openings are restricted, the nuchal shield is strongly developed *Synodontis*, with branched barbels, is the largest genus The Malopteruridae include only the African *Malopterurus electricus*, without dorsal fin and with a subcutaneous electric organ extending over the whole body; the air-bladder has an elastic spring mechanism In the Siluridae of Europe and Asia the body is elongate, the dorsal, when present, is small and spineless, the adipose fin is absent, and the very long anal is contiguous to and continuous with the caudal *Silurus glanis* is the "Wels" of Europe The Clariidae of Africa and India are elongate, with depressed head, transverse terminal mouth, four pairs of barbels, spineless dorsal and long, many-rayed anal, the cranial roof-bones are expanded, forming a shield Above the gills is an air-breathing sac The air-bladder is divided into two lateral portions enclosed in transverse bony cylinders

The Ariidae, found on coasts and in estuaries throughout the tropics, are primitive in form, in the structure and position of the fins, but in skeletal characters they are more specialized than the Bagridae. The Plotosidae of the Indo-Pacific are elongate, without adipose fin and with a very long anal confluent with the caudal In some species the caudal fin extends forward along the back, simulating a second dorsal fin, but having no skeletal supports for the rays *Plotosus* is a widely distributed marine genus, *Copidoglanis, Cnidoglanis*, etc, are restricted to the rivers of northern Australia and New Guinea

Of the Siluroids of South America the Pimelodidae scarcely differ from the Bagridae, but have no nasal barbel There are numerous species of *Rhamdia, Pimelodella*, etc. *Platystoma* has a long spatulate snout The Doradidae resemble the African Mochocidae in their restricted gill-openings and large nuchal shield; but in skeletal structure they are quite different, and even the elastic spring apparatus is formed on another plan *Helogenes* is the type of a distinct family; the spineless dorsal is placed

above the long anal. *Hypopthalmus*, also forming a separate family, has a toothless mouth, eyes behind and below the angle of the mouth, a very long anal, united lower pharyngeals, and air-bladder reduced to two small sacs, each enclosed in a bony capsule with a lateral opening beneath the skin The Trichomycteridae have a spineless dorsal and no adipose fin, the air-bladder is divided into two lateral sacs in bony capsules, which, except in *Cetopsis*, are united to the skull In most of the genera the operculum and interoperculum are armed with spines *Stegophilus* and *Vandellia* are small, slender fishes parasitic in the gill-cavities of other fishes The Bunocephalidae have a broad flat head, the gill-openings reduced to small holes, and no adipose fin In the Callichthyidae and Loricariidae the air-bladder is reduced to a pair of sacs enclosed in bony capsules that are united with the skull In the Callichthyidae the body is covered on each side with two series of thin overlapping bony plates In the Loricariidae the body is generally covered with bony scutes, anteriorly in five longitudinal series on each side, the small mouth is inferior, with expanded lips forming a sucker, the upper part of the gill-opening is inhalent These are herbivorous or mud-eating fishes, with a very long intestine coiled like the spring of a watch, their oral sucker enables them to fasten on to rocks. *Cyclopium*, with about 15 species from mountain streams of the Andes, is naked, the absence of carnivorous fishes rendering the bony armour unnecessary

Order 10 **Apodes.**—Soft-rayed fishes with an open duct to the air-bladder and with the pelvic fins, when present, abdominal Body elongate, gill-openings small, dorsal and anal contiguous to or continuous with the caudal, pelvic fins usually absent Skull long, premaxillaries, mesethmoid and lateral ethmoids represented by a single toothed bone, which separates the maxillaries, parietals meeting, pterotic extending forward to alisphenoid above sphenotic, no opisthotic, paired orbitosphenoids No symplectic, a single palato-pterygoid bone, or none Opercular bones small, the long branchiostegals supporting the skin covering the large gill-chambers No post-temporal, supra-cleithrum attached to vertebral column by ligament, no mesocoracoid Vertebrae numerous, arches ankylosed to centra No oviducts A *Leptocephalus* larva The peculiarities of the skull, jaws, suspensorium and pectoral arch separate the Apodes, or eels (*q v*), very sharply from the Isospondyli They are carnivorous and marine, except that the species of *Anguilla* enter fresh water All the Apodes have a remarkable developmental history, the larvae being strongly compressed and transparent, with a single series of slender, pointed teeth in the jaws These larvae are known as *Leptocephalus*, they live near the surface of the ocean and feed on minute organisms, when they have attained a certain length, which in some species may be as much as a foot, they cease feeding, shrink in depth and in length, become compact and opaque, lose their larval teeth and undergo other changes that convert them into small eels

The Cretaceous Urenchelidae are primitive eels with the caudal fin free from the dorsal and in one genus, *Anguillavus*, with small, eight-rayed pelvic fins In all other Apodes the caudal fin, when present, is continuous with the dorsal and anal, and pelvic fins are absent. There are 17 families, that may be divided into two groups, one with paired frontals, the other with the frontals united to form a single bone Of the families with paired frontals the Anguillidae contain the single genus *Anguilla*, with species from the north Atlantic, Japan and the tropical Indo-Pacific Related to the Anguillidae are the Simenchelidae, which include *Simenchelys parasiticus*, an eel with transverse mouth and incisor-like teeth from deep water in the north Atlantic, that is often found burrowing in the flesh of the halibut The Myrocongridae, with a single species known from St Helena, resemble the Anguillidae in having pectoral fins, but approach the Muraenidae in having the pharyngeal openings of the gill-clefts narrow and the palato-pterygoid very slender The Muraenidae, or morays (*see* MURAENA), include more than 100 species, voracious eels from tropical and sub-tropical seas, abounding in the crevices of coral reefs, many have strongly marked colour patterns. They are naked, with small round gill-openings and without pectoral fins, distinguished by having "pharyngeal jaws," the upper and lower pharyngeals being long bones, each bearing a double series of strong teeth, supported by the much enlarged epi- and ceratobranchials of the fourth gill-arch

The Heterenchelidae of West Africa and the Moringuidae of the Indo-Pacific have the vertical fins well developed only near the end of the tail, they have small eyes, and a prominent otic bulla formed by the prootic and exoccipital The Nemichthyidae are oceanic eels, very elongate, with the snout and lower jaw very long and slender, and with numerous small teeth regularly arranged in quincunx The Cyemidae include a single species, *Cyema atrum*, an oceanic fish with the jaws and teeth of a *Nemichthys*, but with short body, and with the dorsal and anal fins highest posteriorly and separated by a notch at the end of the tail, simulating a forked caudal

The families with the frontals united to form a single bone fall into two groups, the congers and their allies having strong jaws and a well-developed palato-pterygoid, the Synaphobranchidae, etc, having slender jaws and the palato-pterygoid very slender, or absent The Muraenesocidae comprise the single genus *Muraenesox*, found in tropical seas, large voracious eels with strong canine teeth In the Congridae the maxillaries articulate near the end of the snout, the caudal vertebrae have transverse processes, and the nostrils are lateral This is a large and varied family, some of the species live in shallow water, others at considerable depths The Echelidae, differing in having the nostrils in the upper lips, are small worm-like eels inhabiting sandy coasts in tropical seas The Ophichthyidae also have labial nostrils, but have no caudal fin, the tip of the tail projecting beyond the dorsal and anal There are more than 100 species from tropical seas, especially abundant about coral reefs, many are banded or spotted with bright colours The Synaphobranchidae are deep-sea eels with the gill-openings confluent into a single ventral slit

Order 11 **Heteromi.**—Air-bladder without duct, but vertebral column primitive, with the parapophyses separate elements. Skull elongate, with parietals meeting above supraoccipital and parasphenoid joining sphenotic, basisphenoid, alisphenoid, orbitosphenoid and opisthotic absent; post-temporal simple or ligamentous A long tail, with a long anal fin below it, tapering to a point, without caudal fin, pelvic fins abdominal, many-rayed No oviducts These are oceanic fishes, living at considerable depths, about 25 species are known In the Halosauridae, the mouth is bordered above by the premaxillaries and maxillaries, both toothed, the dorsal fin is short and there are no spinous fin-rays In the Lipogenyidae (*Lipogenys gilli* from the north Atlantic) the mouth is small, toothless and thick-lipped, and the anterior rays of the dorsal and anal and the outer rays of the pelvic fins are spinous In the Notacanthidae the mouth is bordered above by the toothed premaxillaries; the pelvic and anal fins are as in the Lipogenyidae, but the dorsal is represented by a series of isolated spines

Order 12 **Synentognathi.**—Soft-rayed physoclists with abdominal, six-rayed, pelvic fins, and with the lower pharyngeals united to form a single bone Premaxillaries non-protractile and maxillaries entering gape to a greater or less extent, lower jaw with laminar prearticular Parietals, if present, very small, separated by supra-occipital, no orbitosphenoid and no opisthotic, epiotic and pterotic produced back into a lamina, to which the post-temporal is attached, supra-cleithrum reduced, pectoral radials short, rigidly attached Fishes with cycloid scales, low lateral line, dorsal fin above the anal, and pectoral fins placed high The large number of branchiostegals (9–15), the structure of the mouth, the absence of spinous rays, the truly abdominal pelvic fins, etc, indicate their derivation from the Isospondyli

Sub-order 1. *Scombresocoidea*.—Scales small; jaws produced Third upper pharyngeals moderately enlarged, separate; lower pharyngeal triangular or long and narrow Cleithrum connected with basioccipital by a strong ligament The Belonidae, or garfishes, are coastal fishes of warm seas, generally swimming near the surface and feeding on small fishes. The principal genera are *Belone* and *Tylosurus*, the latter with stouter jaws and stronger teeth. *Potamorhaphis* comprises some small fresh-water species

from the Malay archipelago The Scombresocidae include *Scombresox saurus*, a widely distributed oceanic species, with minute teeth and with a series of detached finlets behind the dorsal and anal fins *Cololabis* lacks the anterior extensions of the jaws

Sub-order 2 *Exocoetoidea*.—Scales rather large, mouth small Third upper pharyngeals much enlarged, together forming a somewhat convex ovoid plate that opposes the concave upper surface of the broad lower pharyngeal Cleithrum articulating directly with basioccipital In the Hemirhamphidae, the premaxillaries form a flat triangular expansion in front, and the teeth in the jaws are small and compressed, generally tricuspid These are coastal fishes of warm seas, said to feed mainly on green algae Few exceed a foot in length In *Hemirhamphus* the lower jaw is produced into a long pointed beak In the Exocoetidae the premaxillaries are not expanded forwards, the teeth are minute, and the pectoral fins are much enlarged The flying-fishes (*q v*), are found in the warmer parts of the oceans

Order 13 **Microcyprini.**—Soft-rayed physoclists with abdominal pelvic fins, without lateral line, and with terminal mouth bordered above by the premaxillaries Lower pharyngeals separate, or, if united, with persistent median sutura Parietals separated by supraoccipital, mesethmoid flat, nasals well separated, no orbitosphenoid

The Amblyopsidae have a rather wide, non-protractile mouth, and vent jugular in position The parietals are large, the opisthotic is well-developed, and the palatine and pterygoid bones are normal These are fresh-water fishes of North America, *Chologaster* is normally pigmented and has small eyes *Amblyopsis* and *Typhlichthys* are translucent, eyeless fishes with numerous tactile papillae on the skin, found in the subterranean streams of limestone regions

In the Cyprinodontidae, or Poecilidae the mouth is generally small and somewhat protractile, the parietals are small or absent, the opisthotic, if present, is small and adherent to the exoccipital, the palatine and ectopterygoid are ankylosed, and the metapterygoid is absent The Fundulinae, oviparous and with conical teeth, are the most generalized and the most widely distributed group There are numerous North American species, many marine and some confined to fresh-water, mostly belonging to *Fundulus* *Rivulus* and *Cynolebias* are South American fresh-water genera, the latter remarkable for the difference between the sexes, the males having the dorsal and anal fins larger and formed of many more rays than the females In Africa there are about 100 species, mostly confined to fresh water, belonging to *Nothobranchius, Haplochilichthys, Panchax*, etc, the last also occurring in southern Asia *Haplochilus* ranges from India to Japan and Celebes The Cyprinodontidae (*Cyprinodon* of North America, *Lebias* of the Mediterranean countries) have tricuspid teeth, and the Orestiinae, from elevated lakes in the Andes, differ from the Fundulinae in having no pelvic fins The remaining Cyprinodonts are viviparous, and in relation to the development of viviparity it is interesting to note that courtship and pairing are general among the oviparous forms, in which the male is usually more ornamental than the female and may have enlarged and brightly coloured dorsal and caudal fins Moreover in *Fundulus* it has been observed that the male closely embraces the female when she sheds the eggs

In the Characodontinae the anal fin of the male has the first five or six rays short and stiff, separated by a notch from the rest of the fin The subfamily is almost confined to the system of the Rio Lerma in Mexico The seventeen species belong to four genera The Jenynsiinae comprise the genus *Jenynsia*, with a few species from the La Plata and Argentina; in the male the urogenital duct is produced as a tube to the end of the anterior rays of the anal fin In the Anablepinae, comprising *Anableps* with three species from Central and South America, the anal fin of the male and the produced tube are covered with scales and appear as a large, conical, scaly intromittent organ *Anableps* is remarkable for having the eye divided by a transverse black band into an upper and a lower portion, the former raised above the surface of the head and used for vision in the air The Poeciliinae have the anal fin of the male advanced and modified, the third, fourth and fifth rays are enlarged and prolonged, and border a groove or tube into which the seminal duct opens; the prolonged rays may end in curved hooks or in antler-like processes, etc, the different modifications being of value in classification Bony stays, projecting downwards and forwards from the posterior precaudal vertebrae, support the anal fin of the male There are numerous species, all American, ranging on the coasts and in the rivers from the southern United States to the La Plata

The Phallostethidae, little fresh and brackish-water fishes ranging from Singapore to the Philippines, differ from the Cyprinodontidae in having no pelvic fins and the vent placed just behind the head The males have a large fleshy appendage, the priapium—below the head and chest—which contains the terminal parts and openings of the intestine, genital duct and ureters, and has a skeleton of its own, including a longitudinal bone, to which are articulated movable external bony appendages, an anterior, curved and pointed, the toxactinium, present only in *Phallostethus*, and one or two on one side near the posterior end, sometimes with serrated edge, and termed ctenactinia The enlarged first pair of ribs extends downwards into the priapium and support it, it also contains longitudinal muscles that move the bony appendages, which are probably used to hold the female The six species are referred to four genera

Order 14 **Salmopercae.**—Physoclists with the dorsal and anal fins preceded by one to four spines and with sub-abdominal pelvic fins, each of a rudimentary spine and seven or eight soft rays, pelvic bones connected with post-cleithra Premaxillaries forming upper border of mouth No orbitosphenoid Small fresh-water fishes of North America, including three genera, each with a single species, grouped into two families, Percopsidae (*Percopsis, Columbia*) with an adipose fin, and Aphredoderidae (*Aphredoderus*) without adipose fin, and with the vent at the throat in the adult The head has large mucilerous channels, those of the frontals are continued forwards in the large, thin, concave nasal bones, which nearly or quite meet in the middle line This is an isolated order, without evident relationships except to the Isospondyli or primitive Iniomi

Order 15 **Solenichthyes.**—Physoclists with abdominal pelvic fins without spine, and with the mouth at the end of a long tube-like snout Parietals absent pterotic extending downward to basioccipital, no opisthotic A spinous dorsal fin sometimes present This order includes six families, that may be classified as follows —

I Gills pectinate
  A First four vertebrae very long, rigidly united, with transverse processes forming a continuous shelf, pectoral radials enlarged, mouth toothed, body very elongate (Aulostomatoidea)
    Body scaly, a series of isolated dorsal spines . 1 *Aulostomatidae*
    Body naked, no dorsal spines . 2 *Fistularidae*
  B. Anterior vertebrae long, but with separate transverse processes, pectoral radials small, mouth toothless, a spinous dorsal, body deep or moderately elongate (Centriscoidea)
    Body with bony scutes and rough scales, caudal terminal . 3 *Macrorhamphosidae*
    Body encased in thin bony shields, spinous dorsal terminal, soft dorsal and caudal inferior . 4 *Centriscidae*
II Gills lobate, mouth toothless (Lophobranchii)
  A Spinous dorsal, of flexible spines, pelvics large, seven-rayed, stellate ossifications on body, cleithrum attached to supracleithrum . . 5 *Solenostomidae*
  B No spinous dorsal, no pelvic fins, body enclosed in bony rings, cleithrum attached to transverse processes of two first vertebrae . . 6 *Syngnathidae*

Aulostoma coloratum, is the trumpet-fish of the Caribbean sea *Fistularia* has three or four species from tropical seas The Macrorhamphosidae, or snipe-fishes, include about 12 species from tropical and temperate seas The Centriscidae (Amphisilidae) are very strongly compressed, with sharp-edged lower surface; four species are known from the Indo-Pacific *Solenostomus* has a few species from the Indo-Pacific; in the female the pelvic fins form a pouch in which the eggs are carried The Syngnathidae (pipe-fishes) are found in all warm seas, generally among sea-weeds; some enter fresh-water The males carry the eggs in a groove or pouch, which in some genera is on the abdomen, in others under the tail The dorsal and pectoral fins are small, but many rayed,

and locomotion is accomplished by their rapid undulating or vibrating movements; the caudal is small, or absent The most interesting genus is *Hippocampus,* the sea-horses (*q v*), in which the horse-like head is set at an angle to the curved neck and can be moved up and down, the tail is prehensile, and by it these fishes attach themselves to sea-weeds, they swim and generally anchor themselves in a vertical position

Order 16 **Anacanthini.**—Soft-rayed fishes with the pelvic fins often many-rayed, thoracic or jugular in position, but with the pelvic bones not directly attached to the cleithra Caudal fin, when present, formed mainly of dorsal and anal rays, the homocercal fin being reduced Air-bladder without duct Mouth bordered above by the protractile premaxillaries No orbitosphenoid, opisthotic large, extending downwards to basioccipital A large and important group of marine fishes, carnivorous and with few exceptions living at the bottom, often at considerable depths

Family Macruridae The first vertebra articulates with the skull in the normal manner The tail is long and tapering, without a caudal fin, and with the long dorsal and anal continued to its end Large-eyed fishes, generally with a mental barbel, living at the bottom in deep water The species are numerous

Family Merluccidae First vertebra firmly attached to skull Frontals separate, with ridges diverging from the occipital crest and bordering a large triangular depression A short first dorsal and a long soft dorsal and anal, mouth wide, terminal, with strong teeth *Merluccius* (hake, *q v*) with separate caudal fin, has three northern species, and three southern ones *Macruronus* of New Zealand differs in having a tapering tail without caudal fin

Family Gadidae First vertebra attached to skull Frontals united, without divergent ridges A separate caudal fin This large family includes a number of valuable food-fishes from northern seas *Gadus,* with three dorsal and two anal fins, has the cod, haddock, whiting, pollack and coal fish (*qq v*) as its principal species *Molva,* with two dorsal fins and one anal, and with strong teeth includes the ling (*q v*) *Lota,* the burbot (*q v*) of Europe, and North America, is the only fresh-water fish of the order *Brosmius* (torsk), *Onos* (rocklings) are other important genera

Family Muraenolepidae *Muraenolepis* is an Antarctic genus apparently related to *Onos,* but differing in the restricted gill-openings, in having no separate caudal fin, etc

Order 17 **Allotriognathi.**—Soft-rayed fishes (the first one or two rays of the dorsal sometimes spinous) with protractile maxillaries, each of an outer blade and an inner posterior process that is connected with its fellow and underlies the similar process of the premaxillary Pectoral with horizontal base, pelvic fins, when present, below or a little behind the pectorals, often many-rayed, pelvic bones erect, triangular, inserted between hypocoracoids and sometimes articulated to them An orbitosphenoid, no opisthotic This order includes marine, mostly oceanic, fishes, with large eyes, and with a rather small mouth, without or with feeble teeth The families differ greatly, and their principal characters are shown in the following synopsis

I Body deep, dorsal and anal fins long Skeleton well ossified, ribs strong Epiotics separated by supraoccipital, post-temporal forked
No anterior cranial chamber, pelvics of 15 to 17 rays 1 *Lampridae*
A large anterior cranial chamber, the walls formed by the frontals, the floor by cartilage containing the mesethmoid and orbitosphenoid bones, pelvics of 8 or 9 rays 2 *Veliferidae*

II Body elongate, dorsal fin long, anal short or absent Skeleton weakly ossified, ribs feeble or absent Epiotics meeting behind supraoccipital, post-temporal a simple plate, overlying and firmly attached to parietal

A A cranial chamber as in Veliferidae Eyes normal Mouth moderately protractile, lower jaw short
Pelvics close together, of one to nine rays . . . 3 *Trachypteridae* Pelvics, if present, widely separated, of five or six rays. . . . 4 *Lophotidae*

B No cranial chamber, frontals narrowed between orbits Eyes telescopic, close together, directed forwards Mouth extremely protractile, lower jaw very long . . 5 *Stylophoridae*

The opah (*Lampris luna*) is the only species of its family. It is a large fish, reaching a length of five or six feet, plump, oval in form, blueish with silvery spots and scarlet fins *Velifer,* with two species from the seas of Japan and Australia, is more strongly compressed and has very high dorsal and anal fins The Trachypteridae, or ribbon-fishes (*q v*), have a long and strongly compressed body, they are silvery, oceanic fishes In the adult *Trachypterus* the lower lobe of the caudal fin is absent and the upper is turned upwards nearly at right angles to the body *Regalecus* (oar-fish, *q v*) has the pelvic fins represented by a pair of long rays expanded at the ends The Lophotidae resemble the Trachypteridae, but have a high crest on the head on to which the dorsal fin extends, beginning with a strong spine *Stylophorus chordatus* of the tropical Atlantic is an extremely aberrant type, with large forwardly directed telescopic eyes, and with the lower lobe of the caudal produced into a whip that is twice as long as the fish itself By a downward movement of the lower jaw the upper is pulled right away from the skull, and the mouth appears at the end of a membranous pouch; the downward projection would not catch the prey sighted by the forwardly directed eyes, and this is remedied by the head being thrown up as the mouth is protruded

Order 18 **Berycomorphi.**—Physoclists with the anterior rays of the vertical fins spinous, with pelvic fins thoracic or subabdominal, often many-rayed and with caudal that has generally 19 principal rays, 17 branched Mouth bordered above by the protractile premaxillaries, one or two supplemental maxillaries. Skull with orbitosphenoid, alisphenoids and Y-shaped "basisphenoid", opisthotic well-developed, parietals separated by supraoccipital; a thin-walled otic bulla Hyo-palatine and opercular bones normally developed Vertebral centra solid and co-ossified with arches Post-temporal forked, attached to epiotic and opisthotic, no mesocoracoid, pectoral radials hour-glass shaped, four in number This order is distinguished from other physoclistic groups with many-rayed pelvic fins by the retention of many primitive characters The presence of an orbitosphenoid and the normally developed opisthotic characterize the skull, the two supplemental maxillaries of the Berycidae and Holocentridae resemble those of the clupeoids and *Aulopus;* the caudal fin, except in the Polymixiidae, has the number of rays characteristic of the Isospondyli, and *Myripristis* has a toothed maxillary The order appears to be directly intermediate between the clupeoid Isospondyli and the Percomorphi Fossil berycoids are abundant in Cretaceous strata Synopsis of the families —

I Pelvics subabdominal, 7 or 8 rayed, without spine Caudal with 18 principal rays A pair of hyoid barbels Dorsal and anal long, with a few spines 1 *Polymixiidae*

II Pelvics thoracic, of a spine and 3 to 13 soft rays, pelvic bones attached to cleithra No barbels

A Dorsal with few spines, abdomen not ridged
Vertebrae 26–30 Maxillary exposed, behind the deep praeorbital 2 *Berycopsidae*
Pelvics 17–13 Vertebrae 24 Maxillary sheathed 3. *Berycidae*
Pelvics 15, with laminar spine 4 *Diretmidae*
Pelvics 15, with normal spine 5 *Caristiidae*

B Dorsal spines few abdomen with a median series of ridged scales
No subocular organ, scales normal, pelvics 16 . 6 *Trachichthyidae*
No subocular organ, scales large, bony, rigidly united, pelvics 13 7 *Monocentridae*
An evertible subocular luminous organ . 8. *Anomalopidae*

C. A long spinous dorsal . . 9 *Holocentridae*

All the Berycomorphi are marine, and except the Holocentridae, live in rather deep water They are carnivorous, with bands of villiform teeth in the jaws The Polymixiidae include the recent *Polymixia,* with species from the tropical Atlantic and Pacific, the Cretaceous *Platycormus,* and perhaps some less well known Cretaceous genera *Berycopsis* is a Cretaceous genus *Beryx* includes species from the north Atlantic and Japan, deep-bodied, large-eyed, reddish fishes with the anal fin much longer than the dorsal; it or both are preceded by three or four graduated spines *Hoplopteryx* has the dorsal fin longer than the anal, it is preceded by six to eight spines, stouter and more spaced than in *Beryx.* There are several Cretaceous species, and four living in southern seas *Diretmus argenteus* is a small and rare fish known

from near Madeira The little-known Caristiidae include two genera each with a single species, *Caristius* from Japan and *Platyberyx* from the Atlantic. The Trachichthyidae include about 15 deep-water species belonging to *Hoplostethus, Trachichthys, Gephyroberyx,* etc *Aipichthys* and *Acrogaster* are Cretaceous genera of this family *Monocentris* is an Indo-Pacific genus with few species *Anomalops* and *Protoblepharon* have a large luminous organ which can be everted or withdrawn into a cavity below the eye; each genus has a single species from the Malay archipelago The Holocentridae, of which *Holocentrus* and *Myripristis* are the most important genera, include some 70 species from tropical seas, particularly abundant about coral reefs.

The Melamphaidae are oceanic fishes, found at considerable depths, which resemble the Berycomorphi in the structure of the protractile mouth, in the dorsal and anal fins with a few spinous rays, the caudal with 19 principal rays, 17 branched, and spinous procurrent rays, and the pelvics thoracic, of a spine and six to nine soft rays The Stephanoberycidae, are also deep-water fishes with a similar caudal fin; but they have no spines in the dorsal and anal fins, and have the pelvics abdominal, five or six rayed, without spine These families have been associated in an order, Xenoberyces, but until their osteology is better known their position is uncertain

Order 19 **Zeomorphi.**—Distinguished from the Berycomorphi by certain features of specialization A spinous dorsal; anal fin preceded by one to four spines which form a more or less distinct fin; caudal with 12 or 13 principal rays, pelvics each of a spine and five to nine branched rays, thoracic. No orbitosphenoid Post-temporal simple, rigidly united to skull; cleithrum ending above in a pointed projection just behind post-temporal Pelvic bones directly attached to cleithra. First vertebra very firmly united to skull.

Two families, Zeidae with 31 to 46 vertebrae, and Caproidae with 22 The Zeidae include about 40 species from tropical and temperate seas, referred to 11 genera, *Zeus, Cyttus, Oreosoma, Grammicolepis,* etc Most live in moderately deep water and have large eyes; they are deep strongly compressed fishes, with a very protractile mouth, which is suddenly projected to seize prey. *Zeus faber* is the John Dory (*q v*), which ranges from the Mediterranean to England The Caproidae comprise two genera. *Capros aper* is the boar-fish, a small red fish with a very protractile mouth In *Antigonia* the body is deeper and the mouth less protractile.

Order 20 **Percomorphi.**—Allied to the Berycomorphi, but without an orbitosphenoid, with not more than one supplemental maxillary, pelvic fins with not more than six rays, caudal typically with 17 principal rays, 15 branched, never with more Pectoral arch attached to skull by a more or less distinctly forked post-temporal, and pelvic bones typically attached to cleithra, although in some groups this attachment is lost Even after the exclusion of certain specialized offshoots as separate orders, this is a very large and diverse group, containing not only the typical perches (*q.v.*), but the mackerels, gobies, blennies (*qq v*), gray mullets (*see* MULLET), etc

In the Berycidae the vertebrae number 24, 10 precaudal and 14 caudal *Prolates* of the Upper Cretaceous, the earliest known perch, seems to have had the same number, as have several living Serranid genera In several families of Percomorphi this number is constant, *e.g*, Lutianidae, Sparidae, Chaetodontidae, etc, and it is probable that this is a primitive percoid character derived from a berycoid ancestor

SYNOPSIS OF THE SUB-ORDERS

Pelvic fins thoracic or jugular, typically of a spine and five soft rays; pelvic bones directly attached to cleithra; without special features characterizing remaining suborders. . . 1. Percoidea.

Hyomandibular attached to suborbitals, with inner shelf articulating with prootic 2 Teuthidoidea

Maxillary firmly attached to premaxillary, articulating with a prepalatine bone; pelvics of two spines and three soft rays between them. 3. Siganoidea.

Ribs expanded juxtaposed rings enclosing the air-bladder . 4 Kurtoidea.

Premaxillaries fixed, beak-like, hypurals not covered by bases of fin rays. . . . 5 Trichiuroidea.

Premaxillaries fixed, caudal widely forked, the bases of the rays of the upper and lower lobes meeting, concealing the hypurals. . . . 6 Scombroidea

Opisthotic enlarged, reaching basioccipital; no parietals . . 7 Gobioidea

No entopterygoid or metapterygoid, supra-cleithrum slender, directed outwards, pectoral radials large, laminar. . . . 8. Callionymoidea.

Pelvics jugular, with rays reduced in number, parasphenoid with ascending wings meeting alisphenoids or frontals, dorsal and anal rays corresponding to vertebrae, each basal attached to a neural or haema spine. . . . 9 Blennioidea.

Pelvics jugular or mental, of one or two filamentous rays; fins without spines, parasphenoid meeting frontals, dorsal and anal rays more numerous than vertebrae . . . 10 Ophidioidea

Oesophagus expanded to form a muscular sac with internal papillae and often with teeth 11 Stromateoidea

An air-breathing chamber above the gills, containing a labyrinthic organ. . . 12 Anabantoidea

An air-breathing chamber above the gills, no labyrinthic organ; no spinous fin rays, pelvics subabdominal, six-rayed . 13 Ophiocephaloidea

Pelvics subabdominal, of a spine and five branched rays, pelvic bones not attached to cleithra; pectorals normal . . 14 Mugiloidea

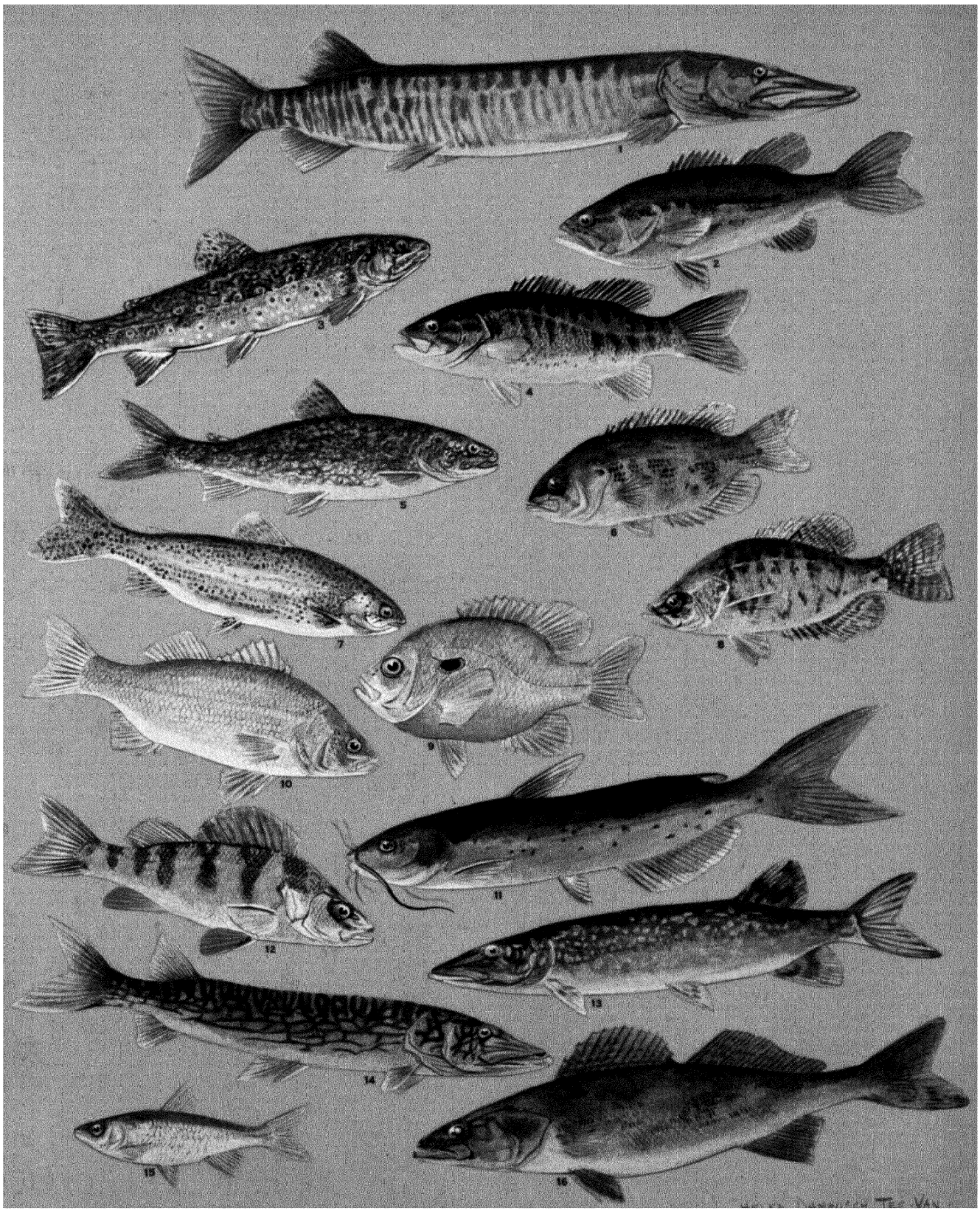
Pelvics subabdominal, of a spine and five branched rays, pelvic bones not attached to cleithra, pectoral with a detached lower part of free filamentous rays . 15 Polynemoidea

Within the limits of this article it is impossible even to mention by name, much less to define, all the families of the Percoidea, about 80 in number.

In the typical perches the spinous dorsal is well developed, and the pelvic fins are thoracic, each of a spine and five soft rays The most generalized family is that of the Serranidae or sea-perches, which have pointed teeth, the maxillary exposed, the pelvic fins without a scaly axillary process, and the anal fin preceded by three spines This large family includes carnivorous fishes that live at the bottom near the coasts in tropical and sub-tropical seas. *Epiniphelus, Serranus, Polyprion, Stereolepis* and *Morone* are important genera To *Epiniphelus* and related genera belong the tropical sea-perches known as rock-fish, groupers (*q v*), etc *Polyprion cernuum* is the wreck-fish of the Mediterranean and eastern Atlantic; *Stereolepis gigas,* the jew-fish (*q v*) of California, attains a length of seven feet and a weight of 500 lb *Morone labrax,* the bass (*q v*), reaches the south coast of Great Britain, other species are American, two being fresh-water fishes The Chilodipteridae differ from the Serranidae in having only two anal spines; these are small prettily coloured fishes; *Apogon* is the principal genus The Latilidae include the tile-fish (*q v*), *Lopholatilus,* and the Sillaginidae are the sand-whitings of the Indo-Pacific, in both families the dorsal spines are slender. The Cirrhitidae and allied families are marine fishes with the lower pectoral rays simple and free at the tips

The Centrarchidae are fresh-water fishes of North America. There are about 30 species, including the sun-fishes (*Lepomis*) and the black bass (*Micropterus*) The Percidae are fresh-water fishes of northern Eurasia and North America, with only one or two anal spines, British species are the perch (*Perca fluviatilis*) and the pope or ruffe (*Acerina cernua*) The pike-perches (*Lucioperca*) of North America and Europe are large predacious fishes, valued as food (*See* PIKE-PERCH) The rivers of eastern North America are inhabited by a tribe of dwarfed Percidae known as "darters" (*Etheostoma,* etc) of which more than 50 species are known, graceful little fishes that rest on the bottom and move with swift darts, propelled by their large pectoral fins. The Centropomidae have the maxillary exposed, and a scaly process in the axil of the pelvic fins This family includes the large Nile perch, *Lates niloticus,* the robalos (*Centropomus*), silvery fishes found on both coasts of tropical America, and the Indo-pacific *Ambassis.*

Several families of marine perches have a scaly axillary pelvic process, and the maxillary sheathed by the preorbital, namely the Lutianidae, or snappers, the Pomadasidae, or grunts, the Lognathidae, the Sciaenidae, or drums, the Mullidae, or red mullets, the Sparidae, or sea-breams, etc Most are carnivorous fishes with conical teeth, but many of the Sparidae have blunt molars at the sides of the jaws, used for crushing shell-fish, and others with incisor-like teeth are herbivorous. The Mullidae have a pair of barbels at the chin, used to probe for the small shell-fish, worms, etc., on which they feed. The Sciaenidae, with a short



PAINTED FOR THE ENCYCLOPÆDIA BRITANNICA BY HELEN DAMROSCH TEE VAN

COMMON NORTH AMERICAN GAME FISHES

1 Lake Chautauqua muskellunge (*Esox ohiensis*) 2 Large-mouth black bass (*Micropterus salmoides*) 3 Brook trout (*Salvelinus fontinalis*) 4 Small-mouth black bass (*Micropterus dolomieu*) 5 Lake trout (*Cristivomer namaycush*) 6 Rock bass (*Ambloplites rupestris*) 7 Rainbow trout (*Salmo irideus shasta*) 8 Crappie (*Pomoxis annularis*) 9 Long-eared sunfish (*Lepomis auritus*). 10 White perch (*Morone americana*). 11. Spotted catfish (*Ictalurus punctatus*) 12 Yellow perch (*Perca flavescens*) 13 Common pike (*Esox lucius*) 14 Eastern pickerel (*Esox reticulatus*) 15 Common silverside or shiner (*Notropis cornutus*) 16 Wall-eye pike-perch (*Stizostedion vitreum*)

spinous and long soft dorsal, make a drumming noise by the vibration of the air-bladder, which often bears a series of hollow branched appendages on each side. The Pristolepidae are fresh-water fishes of India; *Pristolepis* is remarkable for having a very large patch of rounded molars in the roof of the mouth, borne by the expanded parasphenoid and opposed to a similar patch on the tongue. The Hoplegnathidae of the Pacific are allied to the Lutianidae, but have the teeth united to form sharp edged plates, as in the parrot fishes. The Chaetodontidae and related families are deep and compressed fishes with a small mouth furnished with bristle-like teeth; they are characteristic coral-reef fishes, often fantastically coloured

The Pomatomidae are allied to the Serranidae, but have the spinous dorsal of a few short and slender spines, depressible in a groove, the soft dorsal, and anal long, pointed in front, and the caudal wide forked; the teeth are strong, compressed and acute The blue-fish (*Pomatomus saltator*) is a large voracious fish found in all warm seas, swimming in shoals and attacking other fishes with great ferocity. The Carangidae resemble the Pomatomidae in fin structure, but have small teeth This is a very large and varied family, found in all warm seas *Naucrates ductor* is the pilot-fish (*q v*), *Seriola* includes the yellow-tails; in *Caranx*, etc, the scales of the lateral line form bony shields. Other percoids with widely forked caudal are the Corylhaenidae (dolphins) and Bramidae. The Cichlidae, with nearly 600 species from the fresh and brackish waters of tropical America and Africa, are typical perches allied to the Serranidae, but have a single nostril on each side, and the lower pharyngeals coalescent or united by suture, generally forming a triangular plate

The percoids with the lower pharyngeals ankylosed to form a single bone form three distinct and apparently unrelated groups, two with a single family, the other with three

The Embiotocidae are the surf-fishes of California and Japan, so-named because they mostly inhabit the surf along sandy beaches, they are viviparous The Pomacentridae, with a single nostril on each side and with two anal spines, are small tropical marine fishes, often brilliantly coloured, and characteristic inhabitants of coral reefs The Labridae, or wrasses (*q v*), are a large family of carnivorous marine fishes, in which the lower pharyngeals form a broad triangular or T-shaped plate, bearing conical or rounded teeth that bite against similar teeth on the enlarged upper pharyngeals Most live in shallow water among rocks and weeds, and feed on shell-fish The premaxillaries are protractile and the teeth in the jaws are separate There are nearly 500 species The tropical genera of *Julis*, *Platyglossus*, *Cheilinus*, etc, include a number of small and brightly coloured species *Labrus* and related genera inhabit the north Atlantic. *Epibulus* of the Indo-Pacific has a very protractile mouth and is unique among fishes in that the quadrate is a long rod, articulated to the hyomandibular, its movement thrusting the lower jaw forwards

The Odacidae of southern Australia and New Zealand resemble the Labridae in structure, but the premaxillaries are fixed, the teeth in the jaws are united to form low sharp-edged plates, and the pharyngeal teeth are pavement-like. *Siphonognathus*, with long tube-like snout, recalls *Fistularia* of the Solenichthyes In the Scaridae, or parrot fishes (*q v*), the teeth in the jaws coalesce to form sharp-edged plates; the jaws are short and powerful, with the maxillaries firmly attached to the premaxillaries, and the dentaries movably articulated with the articulo-angulars The pharyngeal teeth are flat, forming a pavement; the upper pharyngeals bear ridges above that move backwards and forwards in a pair of grooves on the parasphenoid, their teeth grinding against those of the lower pharyngeal, which occupy a quadrangular area. These are large-scaled herbivorous fishes of warm seas, especially abundant about coral reefs More than 100 species are known, mostly beautifully coloured; some grow to a large size.

In the sub-order Percoidea are included a number of families that differ from the typical perches in having the pelvic fins jugular in position. The Gadopsidae include only *Gadopsis marmoratus* from the rivers of Australia, a perch-like fish with the pelvic fins reduced, each of a small spine and a bifid ray. The Ammodytidae, or sand-launces (*see* SAND-EEL), are elongate fishes with a pointed head and long soft-rayed dorsal and anal fins, they burrow in the sand with great rapidity; *Ammodytes*, without pelvic fins, is a northern genus. In the remaining families with jugular pelvic fins these are formed of a spine and five soft rays; the spinous dorsal is short, the soft dorsal and anal are long. The Trachinidae, or weevers (*q v.*), of the Atlantic coast of Europe and Africa, have grooved poison spines The Uranoscopidae, fishes of warm seas, have a vertical mouth and the eyes placed on top of the head; they burrow in the sand, with only the eyes projecting, and attract small fishes by the play of a membranous flap or filament protruded from the mouth. The Notothenidae and allied families are the characteristic fishes of Antarctic seas; they exhibit great diversity, some recalling the Cottidae, others the Gadidae of northern seas. The Siganoidea include the single genus *Siganus*, with about 30 species, herbivorous fishes of the Indo-Pacific, ovate and compressed in form, with small mouth and incisor-like teeth, with long dorsal and anal fins, each with several spines, and with the pelvics of two spines with three soft rays between them.

The Teuthidoidea include two families, the Zanclidae, with protractile premaxillaries and brush-like teeth, and the Teuthididae, with the small mouth formed as in the Siganidae, the maxillary being firmly united to the premaxillary, and the teeth incisor-like The Teuthididae are herbivorous fishes of tropical seas. *Teuthis* (*Acanthurus*) has numerous species, known as surgeon-fishes, from the movable sharp-edged spine on each side of the tail.

The Kurtoidea include only *Kurtus indicus* of the Indo-Pacific, in which the expanded ribs enclose the air-bladder; it is a strongly compressed fish, with short dorsal fin and long anal; the males bear on top of the head a bony projection of the supraoccipital, curved forwards to form a hook, used for the attachment of the egg-masses, which these fishes carry about with them

The Trichiuroids are distinguished from the percoids by the non-protractile beak-like premaxillaries, to which the maxillaries are firmly attached, the pectoral fins are placed low These are carnivorous marine fishes with large mouth, sharp teeth, and strong anterior canines In the Gempylidae the body is elongate, the maxillary is exposed, and the pelvic bones are directly attached to the cleithra In the Trichiuridae the body is very long and strongly compressed, the maxillary is sheathed by the preorbital, the caudal fin is small or absent, the pelvic fins, if present, are reduced to a pair of scale-like structures attached to a slender bone connected with the cleithra by a long ligament The Chiasmodontidae comprise *Chiasmodus niger*, a small, blackish, bathypelagic fish of the Atlantic, which may be related to the Gempylidae Specimens of *Chiasmodus* have been captured distended with fishes they have swallowed, sometimes many times their own size.

The scombroids have the maxillaries attached to the non-protractile premaxillaries, which are typically produced and pointed The caudal peduncle is slender, the caudal fin forked, with widely divergent lobes, and with the hypural covered by the bases of the rays In these features the scombroids are more advanced than the percoids, and it is remarkable that such highly specialized types as the sword-fishes (*q v*) should be known from Lower Eocene deposits The Scombridae have beak-like premaxillaries and the pectoral fins placed high. This important family includes the mackerel, tunny, bonito, albacore (*qq v*), etc They are carnivorous pelagic fishes, silvery and blue-backed, especially abundant in warm seas The pointed head and fusiform shape mark them as swift swimmers; the spinous dorsal fin is formed of slender spines and is depressible in a groove; the soft dorsal and anal are composed of short anterior pointed portions, with the rays crowded together, followed by a series of detached and much branched rays, or finlets; in the oceanic species, such as the tunny, the pectoral and pelvic fins fold into depressions on the body, so as not to interrupt the contour

The Luvaridae include a single species, *Luvarus imperialis*, a large pelagic fish with blunt head and small nearly toothless mouth, restricted gill-openings, and pectoral fins placed rather

low The very large epiotics meet behind the supraoccipital and carry it forward to above the ethmoid. The Eocene *Semiophorus* has a scombroid tail and may belong to this group, but if the large pelvic fins have more than five rays its affinities may be elsewhere.

In the Histiophoridae (spear-fishes and sail-fishes) there is a long pointed rostrum, rounded in transverse section, formed by the united premaxillaries and by the nasals The Xiphiidae (sword-fish) differ in that the rostrum is flat, sword-like These families include large fishes of the warmer parts of the ocean, *Xiphias gladius* attaining a length of 20 feet In the young both jaws are produced and the dorsal fin is high and continuous, this high fin persists in the adult *Histiophorus* (sail-fish) but in *Tetrapturus* and *Xiphias* it becomes low and divided The Eocene Xiphiorhynchidae and Blochiidae are closely related to the Xiphiidae, the Blochiidae having long slender jaws like a young *Xiphias* In all these the vertebrae number 24 to 26, but the Palaeorhynchidae, known from Eocene and Miocene deposits, had 50 to 60

The gobioids are well distinguished from the percoids by the depressed skull, the absence of parietals, the enlarged opisthotic, and the large laminar pectoral radials The spinous dorsal is formed of a few flexible spines, the anal is similar to the soft dorsal, the caudal is generally rounded The group includes at least 600 species, mostly small, carnivorous, bottom-living, coastal fishes of tropical and temperate seas, several enter rivers, there are a number of species restricted to fresh water, especially in the Australian region In the Eleotridae the pelvic fins are separate, and the pectoral radials are inserted on the hypercoracoid and hypocoracoid and on the fibrous or cartilaginous tissue between these bones The largest of the group, reaching a length of two to three feet, belong to the genus *Philypnus*, these fishes, from the rivers of tropical America, somewhat resemble the pike-perches Some eleotrids have a great likeness to *Ophiocephalus* The Gobiidae differ from the Eleotridae in having the pelvic fins united to form an adhesive disc or cup, and in having the pectoral radials inserted on a ridge of the cleithrum, the hypercoracoid being absent There are several British species of *Gobius* and numerous related forms in tropical and temperate seas, some on a sandy or muddy bottom, many in tidal pools, little fishes moderately elongate in form, with small terminal mouths furnished with conical teeth, and with large broad-based pectoral fins *Aphya* and *Crystallogobius* are translucent pelagic gobies that live one year only *Typhlogobius* of California is a naked pinkish fish with vestigial eyes hidden under the skin; it lives like a slug, fastened on to rocks or crawling about in the crevices *Periophthalmus* and *Boleophthalmus*, mainly Indo-Pacific, but with one west African species, are distinguished by the large muscular lobes of the pectoral fins and by the prominent eyes, placed close together on top of the head, at low tide these fishes walk or jump about on the mud, hunting for food

The Callionymoidea include the Callionymidae and Draconettidae, distinguished from the percoids by peculiarities of the skeleton of the head and pectoral arch, the vertebrae are compressed, and number 21 (7+14), the precaudals without ribs but with long epipleurals These are small naked fishes with depressed head and small terminal mouth, living at the bottom in shallow or moderately deep water in tropical and temperate seas The spinous dorsal is short, the pectorals are large, the pelvics are jugular in position The Callionymidae or dragonets (*q v*), have a strong preopercular spine, in the Draconettidae the preopercle is unarmed, but the operculum and sub-operculum are reduced to a pair of strong spines In *Callionymus* the males have large fins and bright colours, courtship and pairing has been observed

The blennioids have the pelvic fins jugular or mental, each of a spine and four soft rays, or still further reduced. The parasphenoid has strong ascending wings that meet the alisphenoids or frontals, the dorsal and anal rays correspond to the vertebrae, each basal bone being attached to its own neural or haemal spine The most generalized family is that of the Clinidae, which are moderately elongate, generally scaly fishes, with a protractile mouth and conical teeth, and with a long spinous dorsal, one or two anal spines, a separate caudal, broad-based pectorals and jugular pelvics, each of a spine and three or four unbranched rays, two or three of which are usually thickened and free distally These are numerous species from tropical and temperate seas, especially California and South Africa, living near the coasts, often in rock pools or among weeds

The Dactyloscopidae of the coasts of tropical America are related to the Clinidae The Stichaeidae, Pholidae, Lumpenidae, etc, of arctic and northern seas, are elongate, with a long dorsal fin wholly or mainly formed of spines, and with the pelvic rays branched The Zoarcidae are near the Clinidae, they are elongate fishes, with the long soft-rayed dorsal and anal fins joined to the caudal and with gill-openings restricted Many, if not all, are viviparous, and most live in rather deep water Most of the genera are arctic or northern, but the family extends down the Pacific coast of America to the Antarctic *Zoarces viviparus* is the viviparous blenny *Lycodes* is an important genus

The Blenniidae, with the related Anarrhichadidae, Congrogadidae and Notograptidae, differ from the preceding families in having a stout, rigid suborbital ring firmly attached to the lateral ethmoid in front and to the frontal behind In the Blenniidae the body is naked, the spinous and soft parts of the dorsal fin are generally equal, the pelvics are jugular, of a spine and two to four simple rays, and the mouth is non-protractile, the jaws have a single series of slender close-set teeth, within which is often a pair of strong curved canines, placed posteriorly The main genera are *Blennius*, *Salarias* and *Petroscirtes*, there are numerous species from tropical and temperate seas, mostly small shore-fishes that shelter among rocks and weeds *Xiphasia* of the Indo-Pacific has the characters of *Petroscirtes*, except that the tail is very long and tapering, with the vertebrae and dorsal and anal rays much increased in number The Anarrhichadidae have no pelvic fins, and the mouth is provided with strong conical canines in front and large molars at the side, these are large fishes of northern seas, belonging to two genera, *Anarrhichas* (wolf-fish, *q v*) and *Anarrhichthys* (wolf-eel)

The Ophidioidea differ from the blennioids in that the dorsal and anal rays are closer together, their basals outnumbering the corresponding neural and haemal spines There are no spinous fin-rays, the long dorsal and anal fins are generally confluent with the reduced caudal, the pelvics are close together each of one or two filamentous rays The mouth is terminal, with bands of villiform or cardiform teeth. The first one or two ribs are expanded to support the air-bladder There are three families, Brotulidae, Ophidiidae, and Fierasferidae In the Brotulidae the pelvic fins are jugular, the parietals are separated by the supraoccipital and the opisthotic is not enlarged This large family includes a great diversity of forms, some of the deep-sea genera being extremely aberrant *Typhlonus* is eyeless, *Acanthonus* has a strong spine at the end of the snout, and *Lamprogrammus* has the lateral line enlarged and luminous The blind cave-fishes, *Lucifuga* and *Stygicola*, of the subterranean rivers of Cuba are the only fresh-water fishes of the family, they are viviparous, and the new-born young have well-formed eyes, but these soon degenerate and become covered by the skin The Ophidiidae differ from the Brotulidae in having the pelvic fins placed under the lower jaw, where they appear as a pair of forked barbels. *Ophidium* (cusk eel) and related genera are found in the Mediterranean and on the coasts of tropical America, *Genypterus* is a southern genus The Fierasferidae have no pelvic fins and the vent is jugular, although the skeleton is in most respects similar to that of the Brotulidae, it differs in that the parietals meet in the middle line and the large opisthotic reaches the basioccipital. These are little eel-like fishes of warm seas that often live inside holothurians, or in the shells of living oysters

The stromateoids differ from the percoids in that the oesophagus is expanded to form a sac with muscular walls, internally covered with papillae that bear setiform teeth in the Nomeidae and Stromateidae, but not in the Tetragonuridae. These fishes have a single series of small teeth in the jaws and are mostly oceanic, feeding on pelagic crustaceans, medusae, etc. The Nomeidae include the black-fish, *Centrolophus niger*. *Nomens gronovii*, a little

fish found in all warm seas, with very large pelvic fins that fold into a groove on the abdomen, swims in small companies under a *Physalia* (Portuguese man-of-war), unharmed by its stinging tentacles The Stromateidae are deep and strongly compressed in form *Persilus triacanthus,* the butter-fish of the Atlantic coast of North America, is valued as food

The anabantoids have an air-breathing chamber above the gills containing a labyrinthic organ, the folding of which increases the respiratory surface They are fresh-water fishes of Africa and southern Asia, perhaps related to the Nandidae The Anabantidae include *Anabas scandens,* the so-called "climbing perch," famous for its journeys on land, *Osphromenus* (gourami), *Polyacanthus* (paradise-fish), *Betta* (fighting-fish), etc The Ophiocephaloids are generally considered to be related to the Anabantidae, as they have an air-breathing chamber above the gills, but this is a diverticulum of the pharynx, not of the gill-chamber, and contains no labyrinthic organ *Ophiocephalus* of Africa and tropical Asia includes species that are elongate in form, with broad flattish head covered with large scales, rather large mouth with pointed teeth, long soft-rayed dorsal and anal and subabdominal six-rayed pelvic fins ' These fishes are piscivorous, some reach a length of two feet, when the ponds dry up they either burrow in the mud or migrate overland, they are unique among fresh-water fishes in having floating eggs, laid in a round space cleared among the reeds by the male who guards them

The Mugiloidea have a separate spinous dorsal and subabdominal pelvic fins, each of a spine and five branched rays There are three families, Sphyraenidae, Mugilidae and Atherinidae The Sphyraenidae or barracudas, are pike-like fishes of tropical seas, with strong acute sharp-edged teeth, some reach a length of eight feet The Mugilidae, or gray mullets, have a small mouth, with the teeth in bands, or in *Mugil* reduced to a series of minute bristles, they are found on the coasts of all tropical and temperate countries, some species enter fresh-water. *Mugil* includes about 100 species, these fishes swim in large shoals and feed mainly on mud The Atherinidae, or sand-smelts, differ from the Mugilidae in having 32 to 60 vertebrae, instead of 24 to 26, they are small silvery carnivorous fishes that frequent inlets and often enter fresh water, nearly 100 species are known *Chirostoma* has about 20 species from the lakes of the Valley of Mexico *Melanotaenia* and related genera inhabit the rivers of Australia and New Guinea. The Polynemidae resemble the mugiloids in external characters, except that the lower rays of the pectoral are detached and produced into filaments, used as feelers The shoals frequent sandy bays and estuaries in the tropics

Order 21 **Scleroparei.**—Allied to the Percomorphi, but with the second suborbital produced across the cheek, typically articulating with the preoperculum The recognition of this large and varied group as an order is convenient The most generalized family, the Scorpaenidae, is not very remote from the Serranidae The families may be arranged thus —

I Mesethmoid ossified, nasals paired, an opisthotic Second suborbital rigidly attached to first Post-temporal not enlarged Anterior vertebrae free, normal
- *A* Pelvic bones directly attached to cleithra (Scorpaenoidae)
  - 1 Opisthotic large, post-temporal forked, palatine and pterygoids normal
    - *a* Vertebrae 24–40, anterior ribs sessile
      - 3 pairs of toothed upper pharyngeals . *Scorpaenidae, Triglidae, Caracanthidae*
      - 1 pair of toothed upper pharyngeals *Aploactidae, Synancidae, Pataecidae.*
    - *b* Vertebrae 42–64, ribs on strong parapophyses *Hexagrammidae, Anoplopomatidae*
    - *c* Vertebrae 27, ribs attached to sessile epipleurals *Platycephalidae*
  - 2 Opisthotic large, palatine and ectopterygoid united to form a slender rod; no entopterygoid *Hoplichthyidae*
  - 3 Opisthotic large, post-temporal simple, an integral part of skull. *Congiopodidae*
  - 4. Opisthotic small, entopterygoid reduced
    - *a* Pelvic fins normal, body naked or scaly. *Cottidae, Cottunculidae, Psychrolutidae, Comephoridae*
    - *b.* Pelvics normal; body enclosed in bony rings *Agonidae.*
    - *c.* Pelvics forming a sucker. *Cyclopteridae.*
- *B.* Pelvic bones not attached to cleithra (Gastrosteoidea) *Gastrosteidae, Aulorhynchidae*

II Mesethmoid unossified, nasals united to form a median plate; no opisthotic Second suborbital small, movably articulated with first and with preoperculum Post-temporal a very large plate First three vertebrae long, rigidly united Pelvic bones attached to cleithra Pectoral fin very large (Dactylopteroidae) *Dactylopteridae*

The Scorpaenidae include some 300 species from tropical and temperate seas, but are especially abundant in the north Pacific They are carnivorous, bottom living fishes, some with a mottled coloration that matches the rocks and weeds among which they live, others from deeper water reddish in colour The spinous dorsal is well-developed, and the lower pectoral rays are simple, often free at the tips In *Sebastes* and related northern genera the vertebrae number more than 24 *Sebastes marinus* is the "Norway haddock," a reddish fish found on both sides of the north Atlantic, it reaches three feet in length and is viviparous *Scorpaena,* with numerous tropical species, has 24 vertebrae, the head is spiny and there are little skinny flaps on the body *Pterois* is an Indo-Pacific genus, the pectorals are much enlarged and the dorsal spines are very long and inflict poisonous wounds

In the Triglidae or gurnards (*q v*), the three lowest rays of the pectoral fins are detached to form long finger-like appendages, used for crawling about on the bottom, or for turning over the sand or gravel in search of worms, crustaceans, etc , on which these fishes feed There are several European species of *Trigla,* which is also found with *Lepidotrigla* in the Indo-Pacific *Prionotus* has about 20 American species *Peristedion,* covered with bony plates and with only two detached pectoral rays, is a deep-water genus The Caracanthidae are little fishes of the Indo-Pacific, oval and compressed in form The Synancidae of the Indo-Pacific include *Synanceia* and related genera, naked, with vertical mouth and with poisonous dorsal spines, they lie in crevices in the reefs *Pataecus* from temperate Australia has a grotesque appearance, the dorsal fin extends forward on the head, which has a vertical profile

The Hexagrammidae and Anoplopomatidae of the north Pacific form a group apart, distinguished by the numerous vertebrae, the many rayed dorsal and anal fins, the small scales, etc

In the Platycephalidae the head is broad and flattened, there are about 50 species from the Indo-Pacific The Hoplichthyidae resemble them in the form of the head, but structurally are quite different The Congiopidae include *Congiopus,* with a few species from Chile, South Africa and Australia and *Zanclorhynchus,* with one species from Kerguelen, the snout is produced, and the mouth is small In *Congiopus* it has been observed that the naked skin grows very thick and becomes dirty-brown in colour and is then cast off in patches, revealing the bright new skin underneath

The Cottidae comprise some 300 species from northern seas and a few fresh-water forms from Europe, northern Asia and North America They are known as sculpins and bullheads (*q v.*). The majority are small fishes, rather sluggish in habit *Cottus gobio* is the bullhead or miller's thumb of the rivers of Europe. *Myoxocephalus scorpius,* the sea-scorpion of the north Atlantic, reaches a length of two feet The Psychrolutidae and Cottunculidae are degenerate deep-water cottids The Agonidae are armoured cottids There are about 50 species, small fishes, all from northern seas except one from Patagonia

The systematic position of the Gastrosteidae, or stickle-backs (*q v*), is uncertain, but the second suborbital extends across the cheek to the preoperculum in the typical scorpaenoid manner, and they have no characters that negative this idea of their relationship They differ from the scorpaenoids especially in that the pelvic fins are sub-abdominal and the pelvic bones are not attached to the cleithra, and in the presence of a pair of large dermal plates that fuse with the hypocoraroids The body is naked, with or without a series of bony plates, the dorsal spines are isolated and the pelvic spines are strong *Gastrosteus aculeatus,* the three-spined stickleback, ranges from the Arctic seas southward to California and southern Europe, in the greater part of its range it is both marine and fresh-water, but southwards is not found in the sea. The marine forms generally have a complete series of bony plates, which are best developed in the colder seas; in fresh water the plates are absent except just behind the head and near the end of the tail *Pygosteus pungitius,* the ten-spined stickleback, has many local forms in the rivers of Europe, northern Asia and North

America; northwards it enters the sea *Apeltes* and *Eucalia* are American genera, and *Spinachia* is the fifteen-spined stickleback of the seas of Europe The sticklebacks are remarkable for their voracity and pugnacity and for the nest-building habits of the males, who protect the eggs and young.

The Aulorhynchidae, with tubiform snout and ribs supporting the lateral bony plates, comprise two species from the north Pacific The Dactylopteridae differ very markedly from the scorpaenoids The arrangement of the suborbitals gives free play to the long spine with which the preoperculum is armed There are four species from tropical seas, belonging to two genera, *Dactylopterus* and *Dactyloptena* The pectoral fins are used for flight, which is less sustained than in the flying-fishes (Exocoetidae)

Order 22 **Hypostomides.**—Body enclosed in a broad bony box, tail in bony rings, a rostrum formed by the coalesced nasals; behind it a bony cavity bounded by the nasals and preorbitals, open below and containing the mouth, which is small, toothless, and protractile downwards, maxillaries protractile, produced forwards above premaxillaries, meeting in front and connected by ligament to roof of bony cavity, premaxillaries retractile within maxillaries No alisphenoids or opisthotics No entopterygoid or metapterygoid, palatine and ectopterygoid unconnected with quadrate Post-temporal an integral part of skull, no supra-cleithrum, pectoral fins large, horizontal, pelvics abdominal, of a spine and one or two long unbranched rays, pelvic bones large, connected with cleithra by ligaments; no spinous dorsali, 19–34 vertebrae (7+12–15) the first six immovably joined No air-bladder The Pegasidae are curious little fishes from tropical seas, the systematic position of which is quite uncertain

Order 23 **Heterosomata.**—Allied to the Percomorphi, but asymmetrical, with both eyes on one side Strongly compressed fishes, with long many-rayed dorsal and anal fins

The flat-fishes differ from all other fishes in their asymmetry, they live at the bottom, with the eyed side, which is coloured, uppermost, and with the blind side, which is generally white, underneath When they are first hatched the larvae have the eyes on opposite sides and swim near the surface in the normal manner, but at an early age one eye migrates round the top of the head to the other side and thenceforth the fish lives at the bottom, eyed side up Williams (*Bull Mus Comp Zool* 1902), has studied the migration of the eye; in the cartilaginous skull of the larva two bars above the eyes connect the lateral ethmoid cartilages with the otic capsules; preparatory to the migration of one eye the bar above it is resorbed and becomes reduced to projections of the lateral ethmoid and otic capsule with a gap between them Through this gap the eye migrates until it reaches the other supra-orbital bar, when both eyes move to their final position, causing a torsion of the bar between them which also affects the ethmoid region; when the shifting is complete ossification takes place, and the main part of the frontal bone of the blind side forms on the wrong side of its eye Thus the essential feature of the skull of the flat-fishes is that the interorbital bar is formed mainly by the frontal of the eyed side and that the frontal of the blind side extends forward to the ethmoid region outside the upper eye

A peculiarity of the flat-fishes is that they are able to raise their eyes and move them independently, so that they can survey the ground round them Another peculiarity, which has already been referred to, is their power of changing their coloration to resemble the ground on which they lie In certain species albinos, partial albinos, etc, are fairly common, but the most interesting variation is known as ambicoloration, the blind side being coloured as well as the eyed side Ambicoloration may be incomplete, the fish having irregular spots on the blind side, or having part coloured like the eyed side and the rest white; frequently it is complete except for a white patch on the head in the orbital region, which is the first and most asymmetrical part of the fish When ambicoloration is complete or nearly so it is always associated with other variations towards symmetry, the scales of the blind side assuming the structure of those of the eyed side and the migration of the eye being delayed so that it reaches only the top of the head and interferes with the growth forward of the dorsal fin, which forms a hook above it.

Reversal, the occurrence of individuals with the eyes and colour on the side which is generally eyeless and white in the species is not uncommon, indeed, in some species of *Paralichthys* from the Pacific coast of America reversed specimens (with eyes on the right side) are as numerous as the normal ones The researches of Parker on the optic nerves (*Bull Mus Comp Zool* 1903) are of great interest in this connection In fishes generally the optic nerves cross each other, and the left crosses above the right as frequently as the right above the left This has been found to be true of the soles, whether dextral or sinistral, and of *Psettodes*, the most primitive living flat-fish, and it follows that in these the nerves are partly uncrossed when that of the migrating eye is above the other and are nearly doubly crossed when it is below it But in other flat-fishes, whether dextral (*Pleuronectes*, etc) or sinistral (*Paralichthys*, etc), Parker has found that the nerve of the migrating eye is always above the other, except in reversed examples, in which that nerve is dorsal which is normally dorsal in the species

The flat-fishes are a large and varied group, and may be divided into five families The Psettodidae include the single genus *Psettodes*, with two species, one west African, the other ranging from east Africa to China Except for its asymmetry and the long dorsal and anal fins *Psettodes* is a typical perch and might almost be placed in the Serranidae The combination of 24 vertebrae (10 precaudal and 14 caudal), 17 principal caudal rays, 15 branched, and pelvic fins of a spine and five soft-rays, with the pelvic bones directly attached to the cleithra, is common among the percoid fishes but is not found in any other group In *Psettodes* alone among the flat-fishes the dorsal fin has anterior rays with slender spines and does not extend forward on the head *Psettodes* has a larger mouth than any other flat-fish and the teeth are strong and pointed, it probably lies concealed at the bottom and makes short dashes after fishes that come near It may have retained so many percoid features because it has not adopted progression along the bottom by undulating movements of the body and marginal fins to the same extent as other flat-fishes In the remaining members of the order the dorsal fin extends forward on the head at least to above the eye, all the fin-rays are articulated, and the vertebrae are never fewer than 28

The Bothidae are sinistral, with the nerve of the right eye dorsal The mouth is terminal, with the lower jaw prominent, and the jaws and teeth are usually equally developed on both sides There are three sub-families, the Paralichthinae, in which both pelvic fins are short-based, the Bothinae, in which the pelvic fin of the eyed side extends forward and is supported by a plate of cartilage, the third is the Psettinae, in which both pelvic fins are elongate and supported by cartilaginous plates The first two sub-families include about 30 genera from tropical and temperate seas, none of which, except *Paralichthys*, includes fishes of great value as food The Psettinae of the north Atlantic and Mediterranean include the turbot (q v, *Psetta maxima*) and the brill (*P laevis*)

The Pleuronectidae are dextral, with the nerve of the left eye dorsal, the mouth is terminal, with the lower jaw prominent There are four sub-families, Pleuronectinae, Paralichthodinae, Samarinae and Rhombosoleinae, of which the first and last are important In the Pleuronectinae the pelvic fins are short-based This sub-family includes a number of genera from Arctic and northern seas Of those with the mouth large and the jaws and teeth equally developed on both sides the most important is the halibut (q v, *Hippoglossus*) which reaches a length of over eight feet, a voracious fish and an active swimmer, with the body thicker and more elongate than in most flat-fishes The genera with a small asymmetrical mouth, with the jaws and teeth more developed on the blind side, include *Limanda* (dab) *Pleuronectes* (plaice, *q v*) *Microstomus* (lemon-sole) and *Glyptocephalus* (witch). These feed at the bottom of the sea on shell-fish and other invertebrates.

In the Rhombosoleinae the pelvic fin of the eyed-side is median, elongate, often continuous with the anal and with the rays increased in number. The jaws of the blind side are strongly curved and toothed, those of the eyed side toothless. The principal genera are *Rhombosolea, Peltorhamphus* and *Ammotretes* from south-

ern Australia and New Zealand, with *Oncopterus* from Patagonia

The remaining members of the order are grouped together as soles (*q v.*), distinguished by having the mouth small, with the lower jaw not prominent, and with the jaws of the blind side strongly curved and toothed, by having no free preopercular margin, by the absence of ribs, etc In spite of these characters in common it is doubtful whether the two families, the dextral Soleidae and the sinistral Cynoglossidae, are very closely related

The Soleidae, or true soles, include over 100 species from the sandy shores of tropical and temperate seas, many enter rivers and there are a few permanently fluviatile forms The eyes are small, the lower surface of the head generally bears tactile filaments and the under nostril is frequently greatly developed Probably the majority are not unlike the common sole of Europe (*Solea vulgaris*) in their habits, this species generally lies hidden in the sand by day and at night feeds on invertebrates, small fishes, etc, that it finds by smell and touch The American soles (*Achirus*) are distinguished by the elongation of the pelvic fin of the eyed side, which is joined to the anal *Synaptura* is a large genus, which like *Solea* ranges from the eastern Atlantic throughout the Indo-Pacific.

The Cynoglossidae or tongue-soles are sole-like fishes with eyes on the left side, vertical fins confluent, no pectorals, and the pelvic fin of the blind side median, that of the eyed side being displaced and reduced These are slender fishes, with rounded head and tapering tail, from warm seas Principal genera, *Symphurus, Paraplagusia, Cynoglossus*

Order 24. **Discocephali.**—Allied to the Percomorphi, but with the spinous dorsal fin transformed into a flat, oval, transversely laminated, adhesive disc, which extends forward on the upper surface of the head The spinous fin-rays are shortened, depressed backwards, divided into their two components, and expanded transversely to form pairs of broad flat laminae that are denticulated near their free posterior edges, in the middle line, pointed posterior projections of each pair of laminae are connected by ligament, and are joined to those of the next pair by a low fin-membrane The small lateral expansions of the radials found in the spinous dorsal of most percoids have developed into large overlapping laminae; the basals are nearly normal, except that they are directed very obliquely backwards

The Echeneidae include about 10 species belonging to genera, *Echeneis* and *Remora* The largest species, *Echeneis naucrates*, attains a length of about three feet They are carnivorous fishes of warm seas, attaching themselves to sharks or other marine animals, or to floating objects By slightly raising the laminae of the suctorial disc a series of vacuum chambers is created, to dislodge a sucker-fish from an object to which it adheres it is pulled forwards, depressing the laminae, if it be pulled backwards the laminae are raised, and the harder the pull the more firm becomes the attachment This is well known to the fishermen who in different parts of the world use these fishes to catch turtles In pelagic percoids and scombroids the spinous dorsal fin is generally formed of short or slender spines and is depressible in a groove Some of these, such as the pilot-fish (*Naucrates*) associate with sharks, and it seems not unlikely that some such fish should have found that the spinous dorsal fin, if depressed in its groove and then slightly raised, could be used more or less effectively as an adhesive organ, and should have acquired the habit of fastening on to its protector; the development of the adhesive disc would have followed In the Echeneidae the disc is nearly as broad as the head, extends forwards to the snout, and is formed of 10 to 30 segments In the Upper Eocene *Opisthomyzon* the disc was narrow, about a third as broad as the head, short, being restricted to the postorbital part of the head, and formed of about six segments, in which the median projections of the laminae were relatively strong and seem to have been undivided. The broad opercles and the widely forked caudal indicate that this was a more active swimmer than its modern relatives.

Order 25 **Plectognathi.**—Allied to the Percomorphi Parietals absent, or co-ossified with epiotics, which are separated by supra-occipital; hyomandibular and palatine rigidly united to skull; post-temporal short, simple, completely united by suture to pterotic; pelvic bones, when present, long, united by suture or co-ossified Gill-openings small

Fishes of warm seas, generally with bony or spiny scales, a small mouth with short but powerful jaws, and the teeth usually strong incisors or forming a sharp-edged beak. Except in the Triacanthidae, the premaxillaries are not protractile and the maxillaries are firmly attached to them There are seven well defined families, which may be grouped into two sub-orders The plectognaths are worthless as food, and many are poisonous

Sub-order 1 *Balistoidea*—Supra-cleithrum vertical Pectoral radials small, movable Neural spines single The Triacanthidae have a deep compressed body covered with small rough scales, a small mouth with a few strong teeth and with the upper jaw protractile, a spinous dorsal fin with the first spine strong, and the pelvic bones firmly attached to the cleithra and supporting the strong pelvic fin-spines, each of which has an inner basal knob that locks it when everted *Triacanthus* comprises about eight species from the Indo-Pacific; silvery blue-backed fishes with two series of teeth, the outer incisors, the inner blunt, they live on a sandy bottom and feed mainly on shell-fish In the other genera the teeth are conical *Halimochirurgus* of the Indian ocean, a deep-water fish, is remarkable for the long tubiform snout

In the Balistidae the maxillaries are firmly attached to the non-protractile premaxillaries, the mouth is small, with incisor-like teeth in a double series in the upper jaw and a single series in the lower, the first dorsal spine is strong and when erected is locked by a knob on the second, the pelvic bones are co-ossified to form a long bone, movably attached to the cleithra, helping to expand an abdominal air-sac, and the pelvic fins are represented by a short spine at the end of the pelvis There are about 100 species from tropical and sub-tropical seas The most important genera are *Balistes* (the trigger-fish), covered with juxtaposed bony plates, and *Monacanthus* (the file-fish) covered with close-set spinules Species of *Balistes* are said to eat pearl-oysters, first making a hole in the shell with their teeth

Triodon bursarius of the Indian ocean is the single species of the family Triodontidae, which resembles the Balistidae in having the pelvis a long movable bone that dilates the air-sac, but differs in having no spinous dorsal fin and in having the teeth represented by a beak The Ostraciontidae, or trunk-fishes, differ from the Balistidae in that the scales are hexagonal bony plates, united to form a firm box that encloses the head and body, except for the small mouth and the short, naked tail There is no spinous dorsal fin and no pelvis. There are about 25 species from shallow coastal waters of warm seas Genera, *Aracana, Ostracion, Lactophrys*

Sub-order 2 *Tetrodontoidea*—Supra-cleithrum oblique or horizontal Pectoral radials enlarged, fixed Neural spines of anterior vertebrae double Teeth in jaws enlarged or united to form a beak No spinous dorsal No pelvis or pelvic fins In the Tetrodontidae the tooth-plates of the jaws are divided in the middle, and the palatines are united by suture to the mesethmoid They are naked fishes, generally with movable spines in the skin, and have a large sac connected with the oesophagus which they can distend with either water or air until the fish is blown out like a balloon and the spines on the skin are erect There are over 100 species, mostly marine and tropical but a few confined to fresh water In *Lagocephalus* the nostrils are normal, in *Spheroides* they are borne on a tubular papilla, the interior of the tube representing the nasal sac; in other genera the nostrils are confluent so that the tube has a single terminal opening with two lips, finally in *Tetrodon* the tube is very short and its lips appear as a pair of tentacles united at the base

The Diodontidae differ from the Tetrodontidae in having undivided tooth-plates, with crushing surfaces developed within, and in having the palatines united by suture to the frontals, this feature being related to the fact that the head is broad and the snout very short, with the mesethmoid reduced The spines are stronger than in the Tetrodontidae, in some species two-rooted and movable, in others three-rooted and fixed

The Molidae are more primitive than the two preceding

families in having gills on all four branchial arches instead of on three only In their osteology they are very similar to the Tetrodontidae, but the teeth form an undivided beak, as in the Diodontidae The body is truncated immediately behind the dorsal and anal fins, with a deep caudal fin extending along its posterior end These are oceanic fishes, found in the warmer seas, often seen at the surface *Ranzania* includes a single species, oblong in form, with the skin tesselated with hexagonal plates, *Mola* has two species, deep and broad fish with a rough skin, which reach a length of over eight feet The larvae of *Mola* acquire an armature of spines, and when only 5 mm long, five of these have grown out into long horns one on the snout, one on the back, one on the chest, and one on each side of the body The fish loses the end of its tail and becomes very deep in form, the spines get shorter and a new caudal fin develops connecting the dorsal and anal, thus at a length of 15 mm, it has the general characters of the adult fish, except for the presence of a number of small conical spines

Order 26 **Malacichthyes.**—Physoclists with the mouth bordered above by the non-protractile premaxillaries, without spinous fin-rays, and with pelvic fins, when present, sub-abdominal, five-rayed Skeleton weakly ossified, soft, largely cartilaginous, a complete cartilaginous cranium, with the cartilage bones mostly well-separated, no orbitosphenoid and no opisthotic, membrane bones thin, parietals separated by supraoccipital Post-temporal simple, the lower fork represented by ligament, pectoral radials on the cartilage separating the coracoid ossifications, pelvic bones small, remote from the cleithra Vertebrae numerous (70), ribs feeble, hypurals radiating

The position of these fishes is uncertain, but they may be specialized and degenerate percoids The single family, Icosteidae, comprises the monotypic genera *Icosteus* and *Acrotus*, from deep water off the Pacific coast of North America They are ovate and strongly compressed, with long many-rayed dorsal and anal fins, slender caudal pedunde and fan-shaped caudal fin; the mouth is terminal, the teeth are small, pointed, uniserial

Order 27 **Xenopterygii.**—Allied to the Percomorphi Naked fishes, with broad head, pointed snout, and small mouth with conical or incisor-like teeth in the jaws, body depressed, tail short No spinous dorsal A large subcircular adhesive disc on lower surface of abdomen, surrounded by a fold of skin, which anteriorly is supported by the rays of the widely separated pelvic fins and posteriorly by the lower edges of the post-cleithra, the upper of which is a broad free plate, from which the lower runs across to meet its fellow in the middle line Entopterygoid and metapterygoid absent, ectopterygoid vestigial, attached to quadrate Ribs attached to the ends of sessile epiplemurals Post-temporal simple, rod-like, directed outwards, at right angles to the backwardly directed supracleithrum The cling-fishes, Gobiesocidae, are small carnivorous fishes of tropical and temperate seas, living near the coasts, adhering to stones or shells, and feeding on small invertebrates Most of the species are red in colour

Order 28 **Haplodoci.**—Distinguished from the Percomorphi by peculiarities of the skull and of the pectoral arch First vertebra rigidly attached to skull, which is broad and flat, epiotics and opisthotics absent, post-temporal short, simple, united to skull by suture, hypercoracoid and hypocoracoid small, pectoral radials elongate, four or five in number, the lowest much expanded distally No ribs, but epipleurals present Gill-openings restricted

This order includes the single family Batrachoididae, fishes with elongate body, depressed head and wide terminal mouth, with conical or cardiform teeth in the jaws and on the palate There is a spinous dorsal fin of two to four sharp spines, and a long soft dorsal and anal, the pectorals are broad-based, the pelvics jugular, of a spine and two or three soft rays The toad-fishes, of which about 20 species are known, inhabit tropical and subtropical seas, living on the bottom in shallow or moderately deep water They feed on crustaceans, molluscs and small fishes *Porichthys*, with rows of silvery spots on the body, produces a humming sound by the vibration of the air-bladder This is an American genus, as is *Thallassophryne*, in which the spines of the dorsal fin and operculum are hollowed to transmit the venom contained in little sacs at their bases

Order 29 **Pediculati.**—Distinguished by having the spinous dorsal fin formed of a few flexible rays, the first of which (the *illicium*) is placed on the head, generally ends in a flap, tassel or bulb, and is used as a line and bait Pectoral arch as in the Haplodoci, but only 2 or 3 radials, skull differing especially in having particularly well-developed epiotics, which meet behind the supraoccipital No ribs and no epipleurals Gill-openings small

Sub-order 1 *Lophioidea*.—This includes the single family Lophiidae, with about 20 species, naked fishes with a large depressed head and a wide mouth, with depressible cardiform teeth in the jaws Pelvic fins are present, jugular, each of a spine and five soft-rays The lower pharyngeals are well developed and toothed *Lophius piscatorius* is the angler-fish (*q v*) or fishing-frog of the north Atlantic, it lives on the bottom down to depths of 200 fathoms, and lies in wait for its prey, attracting them by movements of the flap at the end of the illicium A second species of *Lophius* is known from Japan The tropical genera have fewer vertebrae and a shorter tail, some species, *e g*, *Chirolophius naresii*, are remarkable for the branched tags that project from the body, giving the fish the appearance of a stone with weeds on it

Sub-order 2 *Antennarioidea*.—This sub-order includes anglers in which the mouth is small, or of moderate size They resemble the lophioids in having pelvic fins and toothed lower pharyngeals, but differ in the structure of the vertebral column and skull, particularly in having the frontal bones separated for the greater part of their length The Antennariidae are small fishes, compressed in form, with three fin-rays on the head, they are known as sea-toads or frog-fishes Numerous species of *Antennarius* inhabit the tropical seas, they have a prickly skin and are often coloured with bright markings, they frequent coral reefs, crawling about or hanging on by the pectoral fins, which resemble arms with many-fingered hands *Pterophryne histrio* inhabits floating masses of *Sargassum*, with which its coloration harmonizes

The Chaunacidae comprise the two or three species of *Chaunax*, curious oceanic fishes somewhat broader than deep, red in colour, with the spinous dorsal represented only by the illicium, which is short, fleshy, transversely expanded, and placed on the upper surface of the snout The Oncocephalidae or bat-fishes, of which some 40 species are known, have the illicium formed as in *Chaunax*, but it is contained in a cavity on the anterior surface of the snout, just above the mouth The head and body are covered with bony tubercles or spines, and in most of the genera the tail is well marked off from a depressed circular or triangular disc These are fishes of warm seas, living on the bottom, some in shallow water, but many at considerable depths Principal genera *Onchocephalus, Halieutea, Dibranchus, Malthopsis*

Sub-order 3 *Ceratioidea*.—Distinguished by the absence of pelvic fins, by the reduced toothless lower pharyngeals, and by having the males dwarfed and parasitic on the females These are oceanic fishes, inhabiting the middle depths, from about 500 to 2,000 metres below the surface; as there is little or no light in this region the majority are uniformly blackish in colour, and their bait, or terminal expansion of the illicium, is a luminous bulb About 60 species are known, which have been grouped into ten well-defined families From a consideration of the habits and conditions of life of these fishes, few in numbers as compared with the more active forms on which they prey, living a solitary life, floating about in the dark, it can be seen that a mature fish might have some difficulty in finding a mate This difficulty appears to have been overcome by the males, as soon as they are hatched, when they are relatively numerous, seeking the females and if they find one holding on to her and remaining attached for life. Even so the males are rare, and have so far been discovered only on four females, belonging to three different families The males must first attach themselves by the mouth, nipping a piece of the skin of the female and forming a papilla with which the lips fuse In these fishes the lower elements of the hyoid and branchial arches support a freely movable "tongue,"

and this may either unite with the skin of the female inside the mouth (*Edriolychnus*) or may be pushed forwards between the branches of the lower jaw to form an attachment below and in front of the mouth (*Ceratias, Photocorynus*) By the former method the mouth is choked up, except for a tiny opening at the corner for the intake of water for respiration, by the latter the mouth is closed only in front, and by subsequent growth may be carried away from the female, to which the male is attached by upper and lower outgrowths from the head, which unite in front of the mouth and fuse with a projection from the skin of the female Dissection shows that the union of male and female is complete, there is no boundary between them, they are connected by very vascular fibrous tissue, and the male appears to be nourished by the continuity of his blood system with that of the female, a unique type of parasitism The male has a heart and gills, but is otherwise degenerate and quite incapable of feeding, he has no illicium, the mouth is closed and toothless, the gut is vestigial, and the testis nearly fills the abdominal cavity Most of the ceratioids are piscivorous and have a large mouth, with slender acute depressible teeth in the jaws In some, *e g*, *Melanocetus, Linophryne,* the stomach is extraordinarily distensible, and they have been known to swallow fishes several times their own size *Linophryne* is remarkable for its formidable teeth and for the possession of a barbel, which in some species is large and much branched The illicium is articulated to the anterior end of a basal bone that lies in a trough on the upper surface of the skull, this bone may project, and in some species may be completely and permanently exserted as a long rod, which in *Ceratias* is nearly as long as the fish itself *Lasiognathus* has such a rod, but in addition the line is produced beyond the bait to end in a triangle of hooks, this genus is also remarkable for the structure of the mouth, the slender premaxillaries project forwards and are connected with the head by a broad membrane, which forms the walls of a pouch when the upper jaw moves downwards, these fishes must enclose their prey whole, the bristle-like teeth cannot be used for piercing, but meet across and close the opening of the pouch in front of the lower jaw In *Gigantactis* the illicium is inserted at the end of the snout, and in one species forms a fine line four times as long as the fish itself *Himantolophus* is noteworthy for the complicated structure of the illicium, which bears several long tentacles Two families of ceratioids, Neoceratiidae and Ceratiidae, contain little fishes that have lost the illicium and hunt their prey by smell and sight, in all of them the nasal sacs and nostrils are large *Neoceratias* has the teeth represented by slender spines, hooked at the ends, movable and inserted in muscular pads, in two series in the lower jaw and in three above the mouth, two of which are placed on the upper surface of the snout *Ceratias* is remarkable for its forwardly directed telescopic eyes

Order 30 **Opisthomi.**—Elongate fishes allied to the Percomorphi Body covered with small scales; dorsal and anal fins long, many-rayed, contiguous to or confluent with the small caudal, dorsal preceded by a series of isolated spines, except in *Chaudhuria;* pectorals well developed, pelvics absent Mouth terminal, with villiform teeth Posterior nostril in front of eye, anterior tubular, at the end of a fleshy tentacle at the end of snout Gill-openings restricted from above, the operculum without free edge Nasal bones very large, meeting in the middle line, and attached to the upper edge of the mesethmoid, which forms a vertical septum between the nasal sacs Palatine a narrow lamina firmly attached to vomer, parasphenoid and lateral ethmoid; ectopterygoid articulating with lateral ethmoid external to palatine No post-temporal, supra-cleithrum attached by ligament to third or fourth vertebra Carnivorous fresh-water fishes of Africa and southern Asia, probably they burrow in the mud during the day and search for food at night, the peculiarities of the nostrils and olfactory organs indicate the importance of the sense of smell.

Order 31. **Symbranchii.**—Eel-shaped fishes, with the caudal fin very small, 8–10 rayed, and continuous with the dorsal and anal, which are rayless folds of the skin, no pectoral fins, pelvics, if present, jugular. No air-bladder. Gill-openings confluent below but restricted from above, typically appearing as a transverse ventral slit Skeleton much as in the Percomorphi, but entopterygoid absent, skull without basisphenoid, alisphenoid or opisthotic, sphenotic with a projection directed outwards and forwards No ribs, epipleurals present

Sub-order 1 *Alabetoidea*—This group includes the single genus *Alabes*, little fishes of the coasts of Australia, known as "shore eels" Minute two-rayed pelvic fins are present, just behind the gill-opening, and the dorsal and anal fins are well-developed The mouth is small, with a series of blunt compressed teeth in the jaws The skull is broad and depressed, with the parasphenoid and frontals separated by an interspace and the parietals not meeting above the supraoccipital The premaxillaries have strong posterior prodicals

Sub-order 2 *Symbranchoidea*—In the symbranchoid eels, pelvic fins are absent and the dorsal and anal are vestigial The mouth is moderately large with acute teeth The skull is elongate, with the parasphenoid united to each of the frontals by a long suture, and with the parietals meeting above the supraoccipital The premaxillaries have no pedicels

In the family Symbranchidae there are no respiratory sacs and the pectoral arch is attached to the skull by a forked post-temporal *Macrotrema caligans* is a marine fish known from Penang and Singapore The species of *Symbranchus* are found in fresh and brackish waters, rarely in the sea, one is known from Central and South America, one from west Africa, and one from India to New Guinea *Monopterus* comprises a single species from the rivers of southern and eastern Asia The Amphipnoidae include only *Amphipnous cuchia* from the fresh and brackish waters of tropical Asia, which differs from the Symbranchidae especially in the development of a pair of air-breathing sacs, diverticula of the pharynx which lie on each side of the back-bone above the gills These sacs push away the pectoral arch from the skull, and the post-temporal is absent; on the outside the sacs are covered by the opercular bones, which are enlarged and form thin, almost membranous laminae The cuchia spends the greater part of its life out of the water, wriggling along the banks, in which it burrows during the dry season It visits the water in search of food, worms, crustaceans and small molluscs

Sub-class 3 CROSSOPTERYGII—Scales, when ganoid, with a single superficial layer of ganoine above the cosmine layer, which has a very regular structure Pectoral fins lobate, typically with all the radials articulating with the segmented metapterygium, and none directly with the pectoral arch, pelvic fins similar Skull with few cartilage bones, generally differing from that of the Palaeopterygii in having the unpaired sphenoid postorbital No branchiostegals, but often a pair of large gular plates Clavicles present

In the structure of the paired fins the fishes of this sub-class are more advanced than the Palaeopterygii The scales may be regarded as derived from the palaeoniscoid scales by reduction of the ganoine and specialization of the cosmine The ancestors of the Crossopterygii must have belonged to the Palaeopterygii, but some Rhipidistia retain primitive features unknown in any member of that group, notably the pineal foramen, and the complex structure of the lower jaw The replacement of the branchiostegals by the extension backwards of the paired gulars found in many Palaeoniscidae has occurred in *Polypterus* also, and is doubtless related to the fact that these are sluggish fishes, breathing quietly, the paddle-like paired fins also indicate slow swimming

Order 1. **Rhipidistia.**—Premaxillaries and maxillaries present; palato-quadrate not fused with skull, hyomandibular well-developed; pectoral fins obtusely or acutely lobate, articulating with pectoral arch by the proximal segment of the metapterygium Devonian and Carboniferous fishes that have been arranged in three families, Osteolepidae, with simple teeth, ganoid scales, and obtusely lobate paired fins, Rhizodontidae, differing in the teeth with radially arranged folds of dentine and the cycloid scales; and Holoptychiidae, further differing in having acutely lobate pectoral fins. The Osteolepidae (*Osteolepis, Megalichthys,*

etc) appear to be the ancestors of the four-footed vertebrates; the skull is very similar to that of the Stegocephalia (*see* AMPHIBIA) and the pectoral fin approaches closely the pentadactyle limb, the proximal segment of the metapterygium being the humerus, the next and the first radial the radius and ulna.

Order 2 **Actinistia.**—Highly specialized fishes apparently derived from the Rhipidistia (Stensio, 1921) Hyomandibular very small, palato-quadrate articulating with otic region of skull Paired fins with short rounded lobes, the pectorals with a few radiating radials that may articulate direct with the pectoral arch The Coelacanthidae range from the Carboniferous to the Cretaceous Principal genera *Coelacanthus, Undina, Macropoma.*

Order 3 **Dipneusti.**—Premaxillaries and maxillaries absent, palato-quadrate fused with skull, teeth forming a pair of plates on the palate, and one on the inside (prearticular) of each lower jaw Paired fins acutely lobate, hyomandibular vestigial

Of the Palaeozoic fishes of this order, the Devonian *Dipterus* resembles the Osteolepidae in having ganoid scales, two dorsal fins and a heterocercal caudal, but differs in having the top of the head covered with numerous small bones Other genera more specialized in the structure of the scales and fins have the head roofed mainly by the large frontals and parietals

In the living genera the bones of the cranial roof are few, with a large median bone, fronto-parietal—behind, and a smaller one—ethmoid—in front, and a pair of bones flanking the fronto-parietal in the otic regions, the scales are cycloid, and the vertical fins are continuous The living Dipneusti belong to two families, Ceratodontidae and Lepidosirenidae *Neoceratodus* of the rivers of Queensland is closely related to *Ceratodus*, which was widely distributed in Triassic and Jurassic times The paired fins resemble paddles, and have an internal skeleton of a segmented axis with a series of radials on each side The air-bladder is lung-like in structure *Neoceratodus* is a large, sluggish fish, inhabiting stagnant pools The eggs are laid singly, and the larva has neither external gills nor sucker The Lepidosirenidae are much more specialized than the Ceratodontidae, and are more or less eel-like, with filamentous paired fins The dental plates have three strong ridges, instead of the numerous radiating ridges found in other fishes of this order There are two genera, *Protopterus* in Africa and *Lepidosiren* in South America, they breathe air like *Neoceratodus,* and in the dry season hibernate in deep burrows in the mud Both make nests, that of *Protopterus* being a hole in the mud near the edge of a swamp, whereas that of *Lepidosiren* is a burrow at the bottom of the water When the eggs are laid the male guards the nest When hatched the larvae adhere to the mud by means of a glandular sucker behind the mouth, they are provided with four pairs of external gills. Later the sucker is lost, the gills degenerate, and the young fish leave the nest In view of the fact that *Neoceratodus* has neither external gills nor sucker it seems probable that these structures in the Lepidosirenidae are not homologous with those of amphibian larvae, but are independently developed

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Coloration of Fish.—The colours of the fishes of tropical reefs are as brilliant, and their colour patterns as bizarre, as those of any other group Whatever proves, therefore, to be the chief function of their coloration is likely to be chief also in other vertebrate classes, insects and cephalopods, with whose system of pigmentation their own has much in common (*see* COLOURS OF ANIMALS) And since cryptic coloration is better known and more surely demonstrated than any other, it will be instructive to inquire how, generally, colour seems to serve for concealment among fishes To obtain a satisfactory answer it is necessary to go down with them, and to view them as the diver sees them

First, it must be noted that the surroundings in which the gaily coloured tropical reef-fishes live show colours as bright and varied as those of the fishes themselves It was to demonstrate this fact objectively that the autochromes here reproduced were taken A larger series would be necessary to show the range of the colour scale Brown, olive and green, with many shades of grey, are the dominant bottom colours There is much bright yellow, with buff and cream Purple and red are not uncommon The water itself provides another series, not to be forgotten; green, where it is shallow, clear and looked at from above; ultramarine, where it is

both deep and clear; blue or blue-grey, as the sky is blue, when one stands on the bottom and looks away through it toward the horizon, which is very near; blue-black or violet, as one looks down into it from some vantage-point on a vertical reef-front overhanging an unseen bottom far below And finally there is the gleaming silver of the surface film, not a water colour, but an effect of reflection

Colour that conceals for the most part repeats the background colour against which it is seen Hence the question is asked are the habits of the different species of fishes such that they are seen chiefly in surroundings and against backgrounds whose dominant colours are their own? This is not a problem which may be settled after superficial observation only It calls for precise information concerning the horizontal range of the fishes, the natural colour, shade and texture of the bottom over which they swim, and the colour and cover lent to it by vegetation or sessile animals It calls, too, for data regarding the illumination to which the fishes are exposed, bringing in the relation of their activity to the time of day The vertical range of each in the normal round of its activities must also be narrowly investigated This is not an unnecessarily refined analysis that is proposed In 10ft of water at Tortugas, Florida, there are four species of *Gnathypops* which live in burrows in a rocky or sandy bottom Three spend most of their time, by day at least, in these shelters with only their heads protruding The fourth species, when undisturbed, spends little time in its burrow, but floats and feeds at an angle of 45° at an average height of about 8in above it This difference in habits brings it into very different relations with other animals from those in which the first three stand Its food is not the same as theirs and, possibly as a direct result, its degree of infection by parasites is different also Of a series of the three bottom-haunting forms examined, not one lacked a certain species of trematode encysted in its air-bladder Some contained more than 50. Of the fourth species half were uninfected, and none contained more than five of the parasites If, with such slight difference in the plane upon which some single major activity occurs, contact with other animal species may vary so greatly, it is evident that the key to the meaning of colour may be wholly overlooked, if the study of such differences is neglected In this instance the difference in colour is instructive The three species whose habits are most alike are all coloured with the mottled brown and grey of the bottom The fourth is almost wholly bluish-grey The case is not unique, blue-grey is a colour which is found on fishes that swim well off the bottom in the open water

What holds good for blue holds good for other colours. Green is chiefly the colour of surface fishes of shallow water, or of fishes of green, weedy bottoms. Silver, in fishes of shallow water, seems to be confined to those which often or always swim just beneath the surface, and so with the others Fishes whose habits confine them chiefly to one sort of habitat show in colour, and often in pattern, recognizable fitness for life in the places they occupy They are commonly accepted examples of cryptic coloration, such as some of the flounders, and the sargassum fish, *Pterophryne gibba* Others, whose habits lead them to range through a variety of surroundings or to feed at every level from the surface to the bottom, are marked, as *Abudefduf marginatus* is, with contrasting patterns of bands or blotches of colour dominant in different parts of their range If they too may not be said to be cryptically coloured, it is only because the phrase has by use become limited in application. At surprisingly short distance some of their colours appear continuous with the whole or patches of background colour Silhouettes are no longer visible Obliteration is the function of colour and pattern in these fishes as surely as in the other examples mentioned. The conditions under which reduction of conspicuousness is to be achieved are different and call for the application of another formula. This may be a difficult conclusion to accept, but there is overwhelming evidence to support it.

It is readily demonstrable that countershading—the countergradation of pigment from darkest, on surfaces most exposed, to lightest on surfaces most hidden from light—is the basis of concealing colouration. Solid objects when uniformly coloured and lighted from one side are shaded with tell-tale shadows on their faces turned away from the source of illumination But countershaded solids fitly lighted show no such shadows revealing their rotundity On the contrary, they seem flat silhouettes which background-matching patterns efface But countershading is not a direct effect of exposure to light. It is part of an inherited mechanism whose function is concealment (W. H Longley, *Jour Exp Zool.*, 1917) Its mere presence (and it is clearly present in most fishes), is presumptive evidence that their colours and patterns are cryptic in effect

The patterns themselves, upon analysis, often permit of no other interpretation. Scores of species, for example, have longitudinal, vertical or oblique dark lines crossing the eye Sometimes these lines are broad enough to include the whole orbit; usually, however, they are of the width of the pupil. Upon inspection those of the second sort can usually be resolved into seven parts, two without the orbit, two upon the sclerotic or the conjunctiva covering it, two upon the iris on opposite sides of the pupil, while the last is virtual—the retinal black seen through the pupil It may be added that the sclerotic sectors extend peripherally under the orbital margins, so that the apparent continuity of the line persists even when the eye rolls These patterns and very many others, some more, some less complex, mask the moving eye Their function may be deduced from their relation.

Finally, there is the fact that the fishes are changeable in coloration, not rarely, but usually, in the case of bottom fishes or those which approach the bottom at all often, to feed or rest In the great majority of species, these changes in colour and pattern, effected through a complex mechanism including the eye, nervous system and a series of chromatophores in the skin, are adaptive. By watching the fishes, or by leading them from place to place by offering them food, it may be shown clearly that in general the changes consist in putting off the colours dominant in those places from which the fishes have just come and in putting on the prevailing colours of those they have newly attained When all is considered, there is little ground left for assuming that among fishes colour has any other really important function besides concealment If there is another, it may be in connection with the act of breeding, for there are a good many fishes in which there is more or less display of changeable colour correlated with the exercise of the reproductive function As a second exception may be mentioned sexually dimorphic coloration, which is fairly common For functionless bright coloration, or for conspicuous coloration whose use lies in its conspicuousness, there is little place indeed This is perhaps not to be wondered at The hypothesis of immunity coloration, which would have it that bright colours in general are flaunted by creatures which are protected, by stings for example, or have a ready way of escape from their enemies, is founded in the case of fishes on superficial observation in the field and on misinterpretation of the results of uncontrolled experiments The hypothesis of signal and recognition marks seems not to apply here, nor is there evidence to suggest the common occurrence of mimicry. (*See* also COLOURS OF ANIMALS)

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FISH-FLY, the name given, especially in North America, to small insects of the genus *Chauliodes* and allied genera, related to the alder-flies (*q v*) Fish-flies belong to the order Neuroptera (*q v*), sub-order Megaloptera The larvae are aquatic

FISHGUARD (*Abergwaun*), market town, urban district and packet station, north coast of Pembrokeshire, Wales, near the mouth of the river Gwaun Pop. (1921) 3,003 The present town is perched high above a smaller harbour-village on an inlet on the south side of the bay The importance of Fishguard is due to the local fisheries and the excellence of its harbour Local interest centres around the attempted landing by General Tate, an Irish-American adventurer, with French soldiers in 1797 His force soon capitulated to the local militias. The G W R company built at great expense a breakwater across the outer end of the

bay in the hope of using the harbour for ocean liners A passenger and goods service with Rosslare on the opposite Irish coast has been maintained since 1906 Trans-atlantic liners called in 1908 to embark and disembark mails and passengers, but this soon ceased owing to difficulties of approach in rough or misty weather Goodwick, in the parish of Llanwnda, situated near the breakwater, grew while the harbour was being built.

FISH-HAWK, a common name in America for the osprey (*q v*)

FISHING: *see* ANGLING

FISHING-FROG: *see* ANGLER

FISH-LOUSE, the name applied to small crustaceans of the order Copepoda (*q v*), external parasites of fishes, whales and other marine animals

FISH MANURE: *see* FERTILIZERS

FISK, JAMES (1834–1872), American financier, was born at Bennington (Vt), on April 1, 1834 He was successively circus hand, hotel waiter, pedlar, and dry goods salesman By his dealing in army contracts during the Civil War, he accumulated a considerable capital In 1864 he became a stock-broker in New York and was employed by Daniel Drew as a buyer He aided Drew in his war against Vanderbilt for the control of the Erie railway, and as a result of the compromise that was reached he and Jay Gould became members of the Erie directorate Subsequently Fisk and Gould obtained control of the road They carried financial "buccaneering" to extremes, their programme including open alliance with the Tweed "ring," the wholesale bribery of legislatures and the buying of judges Their attempt to corner the gold market culminated in the fateful "Black Friday" of Sept 24, 1869 Fisk was shot and killed in New York city by E. S Stokes, a former business associate, on Jan 6, 1872

FISKE, JOHN (1842–1901), American historical, philosophical, and scientific writer, was born in Hartford (Conn), March 30, 1842, and died at Gloucester (Mass), July 4, 1901 Before entering college he had read widely in English literature, history, and ancient and modern languages He graduated at Harvard in 1863, continuing to study languages and philosophy with zeal, he spent two years in the Harvard Law School and opened an office in Boston, but soon devoted the greater portion of his time to writing for periodicals With the exception of one year, he resided at Cambridge (Mass), from graduation until death In 1869 he gave a course of lectures at Harvard on the Positive philosophy, next year he was history tutor In 1871 he delivered 35 lectures on the doctrine of evolution, afterwards revised and expanded as *Outlines of Cosmic Philosophy* (1874), and between 1872 and 1879 he was assistant librarian After that time he devoted himself to literary work and lecturing on history. Nearly all of his books were first given to the public in the form of lectures or magazine articles, revised and collected under a general title, such as *Myths and Myth-Makers* (1872), *Darwinism* (1879), *Excursions of an Evolutionist* (1883), *The Destiny of Man, Viewed in the Light of His Origin* (1884), *The Idea of God as affected by Modern Knowledge* (1885), and *A Century of Science* (1899)

He did much by the lucidity of his style to spread a knowledge of Darwin and Spencer in America, and through his strong faith vanquished prejudice and demonstrated that religion and evolution were not incompatible His *Outlines of Cosmic Philosophy*, while setting forth the Spencerian system, made psychological and sociological additions of original matter, in some respects anticipating Spencer's later conclusions Fiske's reputation was due to his historical writings, which were chiefly devoted to studies, in a unified general manner, of separate yet related episodes in American history.

They form a nearly complete colonial history, as follows: *The Discovery of America, with some Account of Ancient America, and the Spanish Conquest* (1892); *Old Virginia and her Neighbours* (1897); *The Beginnings of New England; or, The Puritan Theocracy in its Relations to Civil and Religious Liberty* (1889); *Dutch and Quaker Colonies in America* (1899); *The American Revolution* (1891); and *The Critical Period of American History, 1783–89* (1888) The minute investigations of more recent historians are, however, somewhat supplanting these; the multiplicity of Fiske's interests prevented thorough mastery of any one field

See J S Clark, *The Life and Letters of John Fiske* (1917) and "John Fiske, Evolutionist" in Lyman Abbott's *Silhouettes of My Contemporaries* (1921)

FISKE, MINNIE MADDERN (1865–), American actress, was born in New Orleans, the daughter of Thomas Davey. As a child she played, under her mother's name of Maddern, with several well-known actors In 1882 she first appeared as a "star." In 1890 she married Harrison Grey Fiske and was absent from the stage for several years In 1893 she reappeared in *Hester Crewe,* a play written by her husband, and afterwards acted a number of Ibsen's heroines, in Shakespearean rôles, and *Becky Sharp* in a dramatization of Thackeray's *Vanity Fair* In 1901 she opened, in opposition to the American theatrical "trust," an independent theatre in New York, the Manhattan She has won a considerable reputation in the United States as an emotional actress and as a comedienne, her "Mistress Page" in the 1927–28 revival of *The Merry Wives of Windsor* was particularly commended

FISTULA, a term in surgery used to designate an abnormal communication leading either from the surface of the body to a normal cavity or canal, or from one normal cavity or canal to another These communications are the result of disease or injury They receive different names according to their situation *lachrymal fistula* is the small opening left after the bursting of an abscess in the upper part of the tear-duct, near the root of the nose, *salivary fistula* is an opening into the salivary duct on the cheek, *anal fistula,* or *fistula in ano,* is a suppurating track near the outlet of the bowel, *urethral fistula* is the result of a giving way of the tissues behind a stricture These are examples of the variety of the first kind of fistula, while *recto-vesical fistula,* a communication between the rectum and bladder, and *vesico-vaginal fistula,* a communication between the bladder and vagina, are examples of the second The abnormal passage may be straight or tortuous, of considerable diameter or of narrow calibre Fistulae may be caused by an obstruction of the normal channel, the result of disease or injury, which prevents, for example, the tears, saliva or urine, as the case may be, from escaping, their retention gives rise to inflammation and ulceration in order that an exit may be obtained by the formation of an abscess, which bursts, for example, into the gut or through the skin; the cavity does not close, and a fistula is the result The fistulous channel remains open as long as the contents of the cavity or canal with which it is connected can pass through it To obliterate the fistula one must remove the obstruction and encourage the flow along the natural channel; for example, one must open up the nasal duct so as to allow the tears to reach the nasal cavity, and the *lachrymal fistula* will close, and so also in the *salivary* and *urethral fistulae* Sometimes it may be necessary to lay the channel freely open, to scrape out the unhealthy material which lines the track, and to encourage it to fill up from its deepest part, as in *anal fistula,* in other cases it may be necessary to pare the edges of the abnormal opening and stitch them together Where a fistulous opening results from disintegration of cancerous growth, *e g* between vagina and rectum or bladder in cancer of the neck of the womb no surgical or other treatment is likely to be of use (E. O.)

FIT. (1) A division of a poem, a canto, in this sense often spelled "fytte" (2) A sudden seizure or attack of illness, particularly one with convulsive paroxysms accompanied by unconsciousness, especially an attack of apoplexy or epilepsy, but also applied to a transitory attack of gout, of coughing, fainting, etc, also to an outburst of tears, merriment, etc, hence to any temporary or irregular periods of action or inaction (3) An adjective meaning suitable, proper; the verb "to fit" denotes suitability or correct measurement.

FITCH, JOHN (1743–1798), American pioneer of steam navigation, was born at Windsor (Conn), on Jan 21, 1743 After a common school education, he became successively a clockmaker, a brassfounder and a silversmith. During the War of Independence he was a sutler to the American troops. In 1780

he was appointed deputy-surveyor for Kentucky. He began an exploration of the north-western regions, with the view of preparing a map of the district, and, while sailing on the great western rivers, the idea occurred to him that they might be navigated by steam. He applied for assistance to the legislatures of different States, but though each reported in favourable terms of his invention, none would grant him pecuniary assistance He was successful, however, in 1786, in forming a company, and shortly afterwards a steam-packet of his invention was launched on the Delaware His claim to be the inventor of steam-navigation was disputed by James Rumsey of Virginia, but Fitch obtained exclusive rights in steam-navigation in New Jersey, Pennsylvania and Delaware, while a similar privilege was granted to Rumsey in Virginia, Maryland and New York A steamboat built by Fitch conveyed passengers for hire on the Delaware in the summer of 1790 In 1793 he endeavoured unsuccessfully to introduce his invention into France On his return to America he found his property overrun by squatters, and reaping from his invention nothing but disappointment and poverty, he committed suicide at Bardstown (Ky.), on July 2, 1798

He left behind him a record of his adventures and misfortunes, "inscribed to his children and future posterity", and from this a biography was compiled by Thompson Westcott (Philadelphia, 1857)

FITCH, SIR JOSHUA GIRLING (1824–1903), English educationist, second son of Thomas Fitch, of a Colchester family, was born in Southwark, London, in 1824 He entered the education inspectorate in 1863, and from 1885 to 1894 was chief inspector of training colleges Fitch was a strong advocate and supporter of the movement for the higher education of women, and he was constantly looked to for counsel and direction on every sort of educational subject, after he retired from official life his services were in active request in inquiries and on boards and committees In 1896 he was knighted He published *Lectures on Teaching* (1881), *Educational Aims and Methods, Notes on American Schools and Colleges* (1887), and an authoritative criticism of *Thomas and Matthew Arnold, and Their Influence on English Education* (1901) He died on July 14, 1903, in London

See A. L. Lilley, *Sir Joshua Fitch* (1906).

FITCH, RALPH (fl. 1583–1606), London merchant, one of the earliest English travellers and traders in Mesopotamia, the Persian Gulf and Indian Ocean, India proper, and Indo-China In Jan. 1583 he embarked in the "Tiger" for Tripoli and Aleppo in Syria (*see* Shakespeare, *Macbeth,* Act i. sc. 3), together with J. Newberie, J. Eldred and two other merchants or employees of the Levant Company From Aleppo he reached the Euphrates, descended the river from Bir to Fallujah, crossed southern Mesopotamia to Baghdad, and dropped down the Tigris to Basra (May to July 1583) Here Eldred stayed behind to trade, while Fitch and the rest sailed down the Persian gulf to Ormuz, where they were arrested as spies (at Venetian instigation, as they believed) and sent prisoners to the Portuguese viceroy at Goa (September to October) Through the sureties procured by two Jesuits (one being Thomas Stevens, formerly of New college, Oxford, the first Englishman known to have reached India by the Cape route, in 1579) Fitch and his friends regained their liberty, and escaping from Goa (April 1584) travelled through the heart of India to the court of the great Mogul Akbar, then probably at Agra In Sept. 1595 Newberie left on his return journey overland *viâ* Lahore (he disappeared in the Punjab), while Fitch descended the Jumna and the Ganges, visiting Benares, Patna, Kuch, Behar, Hugli, Chittagong, etc. (1585–86), and pushed on by sea to Pegu and Burma Here he visited the Rangoon region, ascended the Irawadi some distance, acquired a remarkable acquaintance with inland Pegu, and even penetrated to the Siamese Shan States (1586–87). Early in 1588 he visited Malacca, in the autumn of this year he began his homeward travels, first to Bengal; then round the Indian coast, touching at Cochin and Goa, to Ormuz; next up the Persian gulf to Basra and up the Tigris to Mosul (Nineveh); finally *viâ* Urfa, Bir on the Euphrates, Aleppo and Tripoli, to the Mediterranean. He reappeared in London on April 29, 1591 His experience was greatly valued by the founders of the East India Company, who specially consulted him on Indian affairs He died *c.* Oct. 5, 1611

See Hakluyt, *Principal Navigations* vol. ii., part i., pp. 245–271, esp. 250–268 (1599), Linschoten, *Voyages (Itineraris)*, part i. ch. xcii. vol. ii. pp. 158–169, etc. (Hakluyt Soc. ed.), Stevens and Birdwood, *Court Records of the East India Company 1599–1603*, esp. pp. 26, 123 (1886), *State Papers, East Indies, etc., 1513–1616*, No. 36 (1862), Pinkerton, *Voyages and Travels*, ix. 406–425 (1808–1814) J. Horton Ryley, *Ralph Fitch, England's Pioneer to the Indies* (1899).

FITCH, WILLIAM CLYDE (1865–1909), American playwright, was born on May 2, 1865, in Elmira, N.Y., and graduated from Amherst college in 1886 An interest in literature, already formed, led him to establish himself in New York city, where he began writing short stories for various magazines His best known play, *Beau Brummel*, produced by Richard Mansfield in 1890, was almost his first, and it at once brought him recognition He was a prolific writer and between 1890 and his death produced 36 original plays and 24 adaptations Among his most important, besides *Beau Brummel*, were *The Climbers* (1901), *The Girl with the Green Eyes* (1902), *The Truth* (1907) and *The City* (1909) *Captain Jinks of the Horse Marines* (1902) was a charming light comedy which gave Ethel Barrymore one of her first opportunities Fitch's plays show humour and facility in dialogue and expert knowledge of theatre technique, but lack strength and universality He died in France on Sept. 4, 1909

See M. J. Moses and V. Gerson, editors, *Plays by Clyde Fitch* (1915) and *Clyde Fitch and His Letters* (1924), also A. H. Quinn, *History of the American Drama* (1927)

FITCHBURG, a city of Massachusetts, U.S.A., 48m. W.N.W. of Boston, on the north branch of the Nashua river, one of the county seats of Worcester county It is served by the Boston and Maine and the New York, New Haven and Hartford railways The population was 41,029 in 1920 (32% foreign-born white) and was estimated locally at 45,000 in 1928 The city has an area of 28.4 sq.m., varying from 430 to 550ft. in altitude, and including much picturesque scenery It is the seat of a State normal school (established 1895) Fitchburg has been an important industrial centre for more than a century, and has over 100 manufacturing establishments, many of them large and of national reputation The factory output in 1925 was valued at $51,091,748 Paper is the leading product (400 tons daily), and is followed by foundry and machine products, woollen and worsted goods and a great variety of articles produced in smaller quantities The assessed valuation of property in 1926 was $62,572,050 Fitchburg was incorporated as a town in 1764, and was named after John Fitch, a citizen who did much to secure incorporation It was chartered as a city in 1872

FITCHEW, a name applied to the ferret and also to the polecat (*qq.v.*) Earlier forms of the word are ficheux, fecheu and fitcholl

FITTER. A toolfitter makes or fits up press tools, dies, cutting tools for automatic machines, and parts of such machines closely related to the operation of the tools. A pipe-fitter attends to the cutting, bending, screwing, fitting in place and joint-making of iron, steel, copper or brass pipes in various engines and machines, and installations as in factories, power stations and on board ship. An assembler is in effect a fitter of no manual skill save that of quickness, for all the parts are machined accurately to gauges (*see* ASSEMBLE) and few tools are employed.

FITTIG, RUDOLF (1835–1910), German chemist, was born at Hamburg on Dec. 6, 1835 He studied chemistry at Gottingen, graduating as Ph.D. with a thesis on acetone in 1858 He subsequently held several appointments at Gottingen, being *Privatdocent* (1860), and extraordinary professor (1870); in 1870 he obtained the chair at Tubingen, and in 1876 that at Strasbourg Fittig's researches were entirely in organic chemistry, and covered a wide field He observed that aldehydes and ketones may be reduced to secondary and tertiary glycols, which he named pinacones, and also that certain pinacones when distilled with dilute sulphuric acid gave pinacolines The unsaturated acids also received much attention, and he discovered the internal anhydrides of oxyacids, termed lactones In 1863 he introduced the reaction known by his name In 1855 A. Wurtz had shown that

when sodium acted upon alkyl iodides, the alkyl residues combined to form more complex hydrocarbons, Fittig showed that a mixture of an aromatic and an alkyl halide, under similar treatment, yielded homologues of benzene He investigated Perkin's reaction and shed some light on its mechanism These researches incidentally solved the constitution of coumarin, the odoriferous principle of woodruff Fittig and Erdmann's observation that phenyl isocrotonic acid readily yielded α-naphthol by loss of water was of much importance, since it afforded valuable evidence as to the constitution of naphthalene They also investigated certain hydrocarbons found in coal tar distillates and solved the constitution of phenanthrene. We also owe much of our knowledge of the alkaloid piperine to Fittig, who in collaboration with Ira Remsen established its constitution in 1871 Fittig edited several editions of Wohler's *Grundriss der organischen Chemie* (11th ed, 1887) and wrote an *Unorganische Chemie* (3rd, 1882) His researches have been recognized by many scientific societies and institutions, the Royal Society awarding him the Davy medal in 1906 He died at Strasbourg on Nov 19, 1910

FITTING, HANS (1877–), German botanist, was born on April 23, 1877, at Halle In 1907 he became professor at Strasbourg, in 1910 at Halle, in 1911 director of the botanical institute at Hamburg, and in 1912 at Bonn Since his journeys in 1907 through lower India, Ceylon and Egypt, and in 1910 through the Sahara, Fitting has devoted himself to work on orchids, the rubber plant, the sensitiveness of mimosa, osmotic pressure in desert plants and the metabolism of salts in the cell He has published numerous papers in *Jahrbucher fur wissensch Botanik*, which he has edited since 1920

FITTON, MARY (*c* 1578–1647), identified by some writers with the "dark lady" of Shakespeare's sonnets, was the daughter of Sir Edward Fitton of Gawsworth, Cheshire, and was baptized on June 24, 1578 About 1595 Mary Fitton became maid of honour to Queen Elizabeth Her father recommended her to the care of Sir William Knollys, comptroller of the queen's household, who was 50 and already married, but he soon became suitor to Mary Fitton, in hope of the speedy death of the actual Lady Knollys There is no hint in her authenticated biography that she was acquainted with Shakespeare William Kemp, who was a clown in Shakespeare's company, dedicated his *Nine Daies Wonder* to Mistress Anne (perhaps an error for Mary) Fitton, "Maid of Honour to Elizabeth", and there is a sonnet addressed to her in an anonymous volume, *A Woman's Woorth defended against all the Men in the World* (1599) In 1600 Mary Fitton led a dance in court festivities at which William Herbert, later earl of Pembroke, is known to have been present, and shortly afterwards she became his mistress In Feb 1601 Pembroke was sent to the Fleet in connection with this affair, but Mary Fitton, whose child died soon after its birth, appears simply to have been dismissed from court. Mary Fitton seems to have gone to her sister, Lady Newdigate, at Arbury A further scandal has been fixed on Mary Fitton by George Ormerod, author of *History of Cheshire,* in a ms. quoted by T. Tyler (*Academy*, Sept 27, 1884) She married Captain Polwhele, by whom she had a son and daughter Polwhele died in 1609 or 1610, about three years after his marriage Her second husband, Logher, died in 1636 Her own will, which was proved in 1647, gives her name as "Mary Lougher" In Gawsworth church there is a painted monument of the Fittons, in which Anne and Mary are represented kneeling behind their mother It is stated that from what remains of the colouring Mary was a dark woman, which is of course essential to her identification with the lady of the sonnets, but in the portraits of Arbury (the identity of which has been challenged), described by Lady Newdigate-Newdegate in her *Gossip from a Muniment Room* (1897) she has brown hair and grey eyes (*See* also SHAKESPEARE, WILLIAM)

FITTON, WILLIAM HENRY (1780–1861), British geologist, was born in Dublin in Jan. 1780. Educated at Trinity college, in that city, and at Edinburgh university, he took a medical practice at Northampton in 1812, and for some years the duties of his profession engrossed his time. In 1820 he settled in London and devoted himself to the science of geology. His "Observations on some of the Strata between the Chalk and the Oxford Oolite, in the South-east of England" (*Trans. Geol. Soc.* ser. 2, vol. iv) embodied a series of researches extending from 1824 to 1836, and form the classic memoir familiarly known as Fitton's "Strata below the Chalk" In this great work he established the true succession and relations of the Upper and Lower Greensand, and of the Wealden and Purbeck formations, and elaborated their detailed structure He had been elected F R S in 1815, was president of the Geological Society of London 1827–29, and was awarded the Wollaston medal by the Geological Society in 1852 He died in London on May 13, 1861

See the obituary notice by R I Murchison in *Quart Journ. Geol. Soc.* vol xviii, 1862, p xxx.

FITZBALL, EDWARD (1792–1873), English dramatist, was born at Burwell, Cambridgeshire, the son of a farmer He produced some dramatic pieces at Norwich theatre, and the marked success of his *Innkeeper of Abbeville* (1820), together with the acceptance of one of his pieces at the Surrey theatre by Thomas Dibdin, induced him to settle in London During the next 25 years he produced a great number of plays, most of which were highly successful He had a special talent for nautical drama. His *Floating Beacon* (Surrey theatre, April 19, 1824) ran for 140 nights, and his *Pilot* (Adelphi, 1825) for 200 nights His greatest triumph in melodrama was perhaps *Jonathan Bradford, or the Murder at the Roadside Inn* (Surrey theatre, June 12, 1833) He died at Chatham on Oct 27, 1873

His autobiography, *Thirty-Five Years of a Dramatic Author's Life* (2 vols, 1859), is a naive record of his career Numbers of his plays are printed in *Cumberland's Minor British Theatre*

FITZGERALD, the name of an historic Irish house, which descends from Walter, son of Other, who at the time of the Domesday Survey (1086) was castellan of Windsor and a tenant-in-chief in five counties From his eldest son William, known as "de Windsor," descended the Windsors of Stanwell, of whom Andrew Windsor was created Lord Windsor of Stanwell (a Domesday possession of the house) by Henry VIII, which barony is now vested in the earl of Plymouth, his descendant in the female line Of Walter's younger sons, Robert was given by Henry I. the barony of Little Easton, Essex, Maurice obtained the stewardship (*dapiferatus*) of the great Suffolk abbey of Bury St Edmunds, Reinald the stewardship to Henry I's queen, Adeliza, and Gerald (also a *dapifer*) became the ancestor of the Fitz Geralds As constable and captain of the castle that Arnulf de Montgomery raised at Pembroke, Gerald strengthened his position in Wales by marrying Nesta, sister of Griffith, prince of South Wales, who bore to him famous children, "by whom the southern coast of Wales was saved for the English and the bulwarks of Ireland stormed" Of these sons William, the eldest, was succeeded by his son Odo, who was known as "de Carew," from the fortress of that name at the neck of the Pembroke peninsula, the eldest son Gerald having been slain by the Welsh. The descendants of Odo held Carew and the manor of Moulsford, Berks, and some of them acquired lands in Ireland. But the wild claims of Sir Peter Carew, under Queen Elizabeth, to vast Irish estates, including half of "the kingdom of Cork," were based on a fictitious pedigree Odo de Carew's brothers, Reimund "Fitz William" (known as "Le Gros") and Griffin "Fitz William," took an active part in the conquest of Ireland

Returning to Gerald and Nesta, their son David "Fitz Gerald" became bishop of St David's (1147–1176), and their daughter Angharat mother of Gerald de Barri (Giraldus Cambrensis, *q v*) A third son, Maurice, obtained from his brother the stewardship (*dapiferatus*) of St David's, *c.* 1174, and having landed in Ireland in 1169, on the invitation of King Dermod, founded the fortunes of his house there, receiving lands at Wexford, where he died and was buried in 1176. His eventual territory, however, was the great barony of the Naas in Ophaley (now in Kildare), which Strongbow granted him with Wicklow Castle, but his sons were forced to give up the latter. His eldest son William succeeded him as baron of the Naas and steward of St. David's, but William's granddaughter carried the Naas to the Butlers and so to the Loundreses Gerald, a younger son of Maurice, who obtained lands in Ophaley, was father of Maurice "Fitz Gerald," who was

justiciar of Ireland from 1232 to 1245 In 1234 he fought and defeated his overlord, the earl marshal, Richard, earl of Pembroke, and he also fought for his king against the Irish, the Welsh and in Gascony, dying in 1257. He held Maynooth Castle, the seat of his descendants

Earls of Kildare.—The justiciar left a grandson Maurice (son of his eldest son Gerald) and a younger son Maurice, of whom the latter was justiciar for a year in 1272, while the former, as heir male and head of the race, inherited the Ophaley lands, which he is said to have bequeathed at his death (1287) to John "Fitz Thomas," whose fighting life was crowned by a grant of the castle and town of Kildare, and of the earldom of Kildare to him and the heirs male of his body (May 14, 1316) Dying shortly after, he was succeeded by his son Thomas, son-in-law of Richard (de Burgh) the "red earl" of Ulster, who received the hereditary shrievalty of Kildare in 1317, and was twice (1320, 1327) justiciar of Ireland for a year His younger son Maurice "Fitz Thomas," 4th earl (1331–1390), was frequently appointed justiciar, and was great-grandfather of Thomas, the 7th earl (1427–1477), who between 1455 and 1475 was repeatedly in charge of the government of Ireland as "deputy," and who founded the "brotherhood of St George" for the defence of the English Pale He was also made lord chancellor of Ireland in 1463 His son, Gerald, the 8th earl (1477–1513), called "More" (the Great), was deputy governor of Ireland from 1481 for most of the rest of his life, though imprisoned in the Tower two years (1494–96) on suspicion as a Yorkist He was mortally wounded while fighting the Irish as "deputy." Gerald, the 9th earl (1513–1534), followed in his father's steps as deputy, fighting the Irish, till the enmity of the earl of Ormonde, the hereditary rival of his house, brought about his deposition in 1520 In spite of temporary restorations he finally died a prisoner in the Tower

In his anger at his rival's successes the 9th earl had been led, it was suspected, into treason, and while he was a prisoner in England his son Lord Thomas Fitzgerald (*q v*), "Silken Thomas," broke out into open revolt (1534), and declared war on the Government, his followers slew the archbishop of Dublin and laid siege to Dublin Castle He and his five uncles were hanged as traitors in Feb 1537, and acts of attainder completed the ruin of the family

But the earl's half-brother, Gerald (whose sister Elizabeth was the earl of Surrey's "fair Geraldine"), a mere boy, had been carried off, and, after many adventures at home and abroad, returned to England after Henry VIII 's death, and to propitiate the Irish was restored to his estates by Edward VI. (1552) Having served Mary in Wyat's rebellion, he was created by her earl of Kildare and Lord Offaley, on May 13, 1554, but the old earldom (though the contrary is alleged) remained under attainder Although he conformed to the Protestant religion under Elizabeth and served against the Munster rebels and their Spanish allies, he was imprisoned in the Tower on suspicion of treason in 1583 But the acts attainting his family had been repealed in 1569, and the old earldom was thus regained In 1585 he was succeeded by his son Henry ("of the Battleaxes"), who was mortally wounded when fighting the Tyrone rebels in 1597 On the death of his brother in 1599 the earldom passed to their cousin Gerald, whose claim to the estates was opposed by Lettice, Lady Digby, the heir-general She obtained the ancestral castle of Geashill with its territory and was recognized in 1620 as Lady Offaley for life George, the 16th earl (1620–1660), had his castle of Maynooth pillaged by the Roman Catholics in 1642, and after its subsequent occupation by them in 1646 it was finally abandoned by the family

The history of the earls of Kildare after the Restoration was uneventful save for the re-acquisition in 1739 of Carton, which thenceforth became the seat of the family, until James, the 20th earl (1722–1773), who obtained a viscounty of Great Britain in 1747, built Leinster House in Dublin, and formed a powerful party in the Irish parliament. In 1756 he was made lord deputy; in 1760 he raised the Royal Irish Regiment of Artillery; and in 1766 he received the dukedom of Leinster, which remained the only Irish dukedom till that of Abercorn was created in 1868. His wealth and connections secured him a commanding position Of his younger children, one son was created Lord Lecale, another was the well known rebel, Lord Edward Fitzgerald, another was the ancestor of Lord De Ros, and a daughter was created Baroness Rayleigh. William Robert, the 2nd duke (1749–1804), was a cordial supporter of the Union, and received nearly £30,000 for the loss of his borough influence In 1883 the family was still holding over 70,000 acres in Co. Kildare, but, after a tenure of nearly 750 years, arrangements were made to sell them to the tenants under the recent Land Purchase Acts In 1893 Maurice Fitzgerald (b 1887) succeeded his father Gerald, the 5th duke (1851–1893), as 6th duke of Leinster

Earls of Desmond.—The other great Fitzgerald line was that of the earls of Desmond, who were undoubtedly of the same stock and claimed descent from Maurice, the founder of the family in Ireland, through a younger son Thomas Thomas "Fitz Maurice" *Nappagh* ("of the ape"), justice of Ireland in 1295, obtained a grant of the territory of 'Decies and Desmond" in 1292 His son Maurice Fitz Thomas or Fitzgerald (d. 1356), inheriting vast estates in Munster, and strengthening his position by marrying a daughter of Richard de Burgh, earl of Ulster, was created earl of Desmond (*i e*, south Munster) on Aug. 22, 1329, and Kerry was made a palatine liberty for him The greatest Irish noble of his day, he led the Anglo-Irish party against the English. He surrendered in England to the king and was imprisoned, but eventually regained favour, and was even made viceroy himself in 1355 Two of his sons succeeded in turn, Gerald, the 3rd earl (1359–98), being appointed justiciar (*i e*, viceroy) in 1367, despite his adopting his father's policy which the Crown still wished to thwart But he was superseded two years later, and defeated and captured by the native king of Thomond shortly after Yet his sympathies were distinctly Irish The remote position of Desmond in the south-west of Ireland tended to make the succession irregular on native lines, and a younger son succeeded as 6th or 7th earl about 1422 His son Thomas, the next earl (1462–67), governed Ireland as deputy from 1463 to 1467, and upheld the endangered English rule by stubborn conflict with the Irish Yet Tiptoft, who superseded him, procured his attainder with that of the earl of Kildare, on the charge of alliance with the Irish, and he was beheaded on Feb 14, 1468, his followers in Munster avenging his death by invading the Pale His younger son Maurice, earl from 1487 to 1520, was one of Perkin Warbeck's Irish supporters, and besieged Waterford on his behalf His son James (1520–29) was proclaimed a rebel and traitor for conspiring with the French king and with the emperor At his death the succession reverted to his uncle Thomas (1529–34), then an old man, at whose death there was a contest between his younger brother Sir John "of Desmond" and his grandson James, a court page of Henry VIII. Old Sir John secured possession till his death (1536), when his son James succeeded *de facto*, and *de jure* on the rightful earl being murdered by the usurper's younger brother in 1540 Intermarriage with Irish chieftains had by this time classed the earls among them, but although this James looked to their support before 1540, he thenceforth played so prudent a part that in spite of the efforts of the Butlers, the hereditary foes of his race, he escaped the fate of the Kildare branch and kept Munster quiet and in order for the English till his death in 1558 His four marriages produced a disputed succession and a break-up of the family. His eldest son Thomas "Roe" (the Red) was disinherited, and failed to obtain the earldom, which was confirmed by Elizabeth to his half-brother Gerald "the rebel earl" (1558–1583) (*see* DESMOND, GERALD FITZGERALD, 15TH EARL OF).

But the influence of the Fitzgeralds remained powerful even after the forfeiture of their estates after the execution of the 15th earl. The disinherited Thomas "Roe" left a son, James "Fitz Thomas," who, succeeding him in 1595 and finding that the territory of the earls would never be restored, assumed the earldom and joined O'Neill's rebellion in 1598, at the head of 8,000 of his men. He was eventually seized (1601) by his kinsman the White Knight, Edmund Fitz Gibbon, whose sister-in-law he had married, and sent to the Tower The "sugan" (sham) earl lingered there obscurely as "James M'Thomas" till his death. In consequence of

his rebellion and the devotion of the Irish to his race, James, son of Gerald, "the rebel earl," who had remained in the Tower since his father's death (1583), was restored as earl of Desmond and sent over to Munster in 1600, but he, known as "the queen's earl," could, as a Protestant, do nothing, and he died unmarried in 1601 The "sugan" earl's brother John, who had joined in his rebellion, escaped into Spain, and left a son Gerald, who appears to have assumed the title and was known as the Conde de Desmond He was killed in the service of the emperor Ferdinand in 1632

The Fitzmaurices.—There can be no doubt that the house of Fitzmaurice was also of this stock, although their actual origin, in the 12th century, is doubtful From a very early date they were feudal lords of Kerry, and their dignity was recognized as a peerage by Henry VII in 1489 The isolated position of their territory ("Clanmaurice") threw them even more among the Irish than the earls of Desmond, and they often adopted the native form of their name, "MacMorrish" Under Elizabeth the lords of Kerry narrowly escaped sharing the ruin of the earls The conduct of Thomas in the rebellion of James "Fitz Maurice" was suspicious, and his sons joined in that of the earl of Desmond, while he himself was a rebel in 1582 Patrick, his successor (1590–1600), was captured in rebellion (1587), and when free, joined the revolt of 1598, as did his son and heir Thomas, who continued in the field till he obtained pardon and restoration in 1603, though suspect till his death in 1630 His grandson withdrew to France with James II, but the next peer became a supporter of the Whig cause, married the eventual heiress of Sir William Petty, and was created earl of Kerry in 1723 From him descended the family of Petty-Fitzmaurice, who obtained the marquessate of Lansdowne (*q v*) in 1818, and still hold among their titles the feudal barony of Kerry together with vast estates in that county

From the three sons by a second wife of one of the earls of Desmond's ancestors, descended the hereditary White Knights, Knights of Glin and Knights of Kerry, these feudal dignities having, it is said, been bestowed upon them by their father, as Lord of Decies and Desmond Glin Castle, Co Limerick, is still the seat of the (Fitzgerald) Knight of Glin. Valencia Island is now the seat of the Knights of Kerry, who received a baronetcy in 1880

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FITZGERALD, LORD EDWARD (1763–1798), Irish patriot, fifth son of James, 1st duke of Leinster, by his wife Emilia Mary, daughter of Charles Lennox, 2nd duke of Richmond, was born at Carton House, near Dublin, on Oct 15, 1763 Joining the army in 1779, Fitzgerald served in America on the staff of Lord Rawdon (afterwards marquess of Hastings); at the battle of Eutaw Springs (Sept 8, 1781) he was severely wounded In 1783 Fitzgerald returned to Ireland and became member for Athy in the Irish parliament He acted with the small Opposition group led by Grattan (*q v*), but took no prominent part in debate After completing his military education at Woolwich he made a tour through Spain in 1787; and then, dejected by unrequited love for his cousin Georgina Lennox (afterwards Lady Bathurst), he sailed for New Brunswick to join the 54th Regiment with the rank of major In Feb 1789, guided by compass, he traversed the country, practically unknown to white men, from Frederickstown to Quebec, falling in with Indians by the way, with whom he fraternized, and in a subsequent expedition he was formally adopted at Detroit by the Bear tribe of Hurons as one of their chiefs, and made his way down the Mississippi to New Orleans, whence he returned to England

Fitzgerald, who had meanwhile been elected to the Irish parliament for Kildare, refused the command of an expedition against Cadiz offered him by Pitt, and devoted himself for the next few years to society and his parliamentary duties He was intimate with his relative C J Fox, with R B Sheridan and other leading Whigs According to Thomas Moore, Fitzgerald was the only one of the numerous suitors of Sheridan's first wife whose attentions were received with favour He visited Paris in Oct. 1792 He lodged with Thomas Paine, and listened to the debates in the Convention On Nov 18 he supported a toast at a banquet to "the speedy abolition of all hereditary titles and feudal distinctions," and repudiated his own title—an act for which he was dismissed from the army Fitzgerald now became enamoured of a young girl named Pamela, a *protégée* of Mme de Genlis (*q v*). It was commonly believed that she was the daughter of Madame de Genlis herself by Philippe (Égalité), duke of Orleans On Dec. 27, 1792 Fitzgerald and Pamela were married at Tournay, one of the witnesses being Louis Philippe, afterwards king of the French, and in Jan 1793 the couple reached Dublin

Discontent in Ireland was now finding a focus in the Society of the United Irishmen, and in the Catholic Committee, an organization formed a few years previously, chiefly under the direction of Lord Kenmare Fitzgerald, fresh from the gallery of the Convention in Paris, returned to his seat in the Irish parliament, and threw himself actively into the work of opposition Within a week of his arrival he was ordered into custody and required to apologize at the bar of the House for violent denunciations of a government proclamation In 1796 he joined the United Irishmen, whose aim was now avowedly the establishment of an independent Irish republic In May 1796 Wolfe Tone was in Paris endeavouring to obtain French assistance for an insurrection in Ireland In the same month Fitzgerald and his friend Arthur O'Connor proceeded to Hamburg, where they opened negotiations with the Directory through Reinhard, French minister to the Hanseatic towns The duke of York, meeting Pamela at Devonshire House on her way through London with her husband, had told her that "all was known" about his plans, and advised her to persuade him not to go abroad The proceedings of the conspirators at Hamburg were revealed by an informer, Samuel Turner The result of the Hamburg negotiations was Hoche's abortive expedition to Bantry Bay in December 1796 In Sept 1797 the informer MacNally betrayed Fitzgerald's share in directing the conspiracy of the United Irishmen He was head of the military committee, he had papers showing that 280,000 men were ready to rise, and the leaders were hoping for a French invasion to make good the deficiency in arms and to give support to a popular uprising But French help proving dilatory and uncertain, Fitzgerald advocated action without waiting for foreign aid On March 12, 1798 information given by Thomas Reynolds led to the seizure of a number of conspirators at the house of Oliver Bond Fitzgerald, warned by Reynolds, was not among them and the opportunity of leaving Ireland was open to him But he refused to desert others who could not escape, and whom he had himself led into danger On March 30 a proclamation establishing martial law and authorizing the military to act without orders from the civil magistrate, which was acted upon with revolting cruelty in several parts of the country, precipitated the crisis

On May 11 a reward of £1,000 was offered for Fitzgerald's apprehension May 23 was the date fixed for the general rising Since the arrest at Bond's, Fitzgerald had been in hiding, latterly at the house of one Murphy, a feather dealer, in Thomas Street, Dublin The secret of his hiding place was disclosed by a Catholic barrister named Magan, to whom the stipulated reward was ultimately paid through Francis Higgins, another informer. On May 19 Fitzgerald was arrested after a desperate struggle in which he mortally wounded one of his captors, and was himself disabled by a pistol shot He was taken to Newgate gaol, and there died of his wound on June 4, 1798 An Act of Attainder (repealed in 1819) was passed, confiscating his property, and his wife was compelled to leave the country before her husband died

Pamela, who was scarcely less celebrated than Fitzgerald himself, went to Hamburg, where in 1800 she married J Pitcairn, the American consul She remained to the last passionately devoted to the memory of her first husband; and she died in Paris in Nov 1831 A portrait of Pamela is in the Louvre She had three children by Fitzgerald. Edward Fox (1794–1863); Pamela, after-

wards wife of General Sir Guy Campbell; and Lucy Louisa, who married Captain Lyon, R N

Lord Edward Fitzgerald was of small stature and handsome features He had a winning personality, and a warm, affectionate and generous nature, which made him greatly beloved by his family and friends; he was humorous, light-hearted, sympathetic, adventurous But he was entirely without the weightier qualities requisite for such a part as he undertook to play in public affairs. Reinhard, who considered Arthur O'Connor "a far abler man," accurately read the character of Lord Edward Fitzgerald as that of a young man "incapable of falsehood or perfidy, frank, energetic, and likely to be a useful and devoted instrument, but with no experience or extraordinary talent, and entirely unfit to be chief of a great party or leader in a difficult enterprise"

See Thomas Moore, *Life and Death of Lord Edward Fitzgerald* (2 vols, 1832), also a revised edition entitled *The Memoirs of Lord Edward Fitzgerald,* edited with supplementary particulars by Martin MacDermott (1897), R R Madden, *The United Irishmen* (7 vols, Dublin, 1842–46), C H Teeling, *Personal Narrative of the Irish Rebellion of 1798* (Belfast, 1832), W J Fitzpatrick, *The Sham Squire, The Rebellion of Ireland and the Informers of 1798* (Dublin, 1866), and *Secret Service under Pitt* (1892), J A Froude, *The English in Ireland in the Eighteenth Century* (3 vols, 1872–74), Ida A Taylor, *The Life of Lord Edward Fitzgerald* (1903) For particulars of Pamela and especially as to the question of her parentage, *see* Gerald Campbell, *Edward and Pamela Fitzgerald* (1904); *Memoirs of Madame de Genlis* (1825), Georgette Ducrest, *Chroniques populaires* (1855), Thomas Moore, *Memoirs of the Life of R B Sheridan* (1825).

FITZGERALD, LORD THOMAS (10th earl of Kildare) (1513–1537), known as "Silken Thomas," the eldest son of Gerald Fitzgerald, 9th earl of Kildare, was born in London in 1513 He spent much of his youth in England, but in 1534 when his father was for the third time summoned to England to answer for his maladministration as lord deputy of Ireland, Thomas, at the council held at Drogheda, in February was made vice-deputy In June the Ormond faction spread a report in Ireland that the earl had been executed in the Tower, and that his son's life was to be attempted Inflamed with rage at this apparent treachery, Thomas rode at the head of his retainers into Dublin, and before the council for Ireland (June 11, 1534) formally renounced his allegiance to the king and proclaimed a rebellion His enemies, including Archbishop John Allen (of Dublin), who had been sent by Henry VIII to watch Fitzgerald, took refuge in Dublin castle In attempting to escape to England, Allen was taken by the rebels, and was murdered (July 28, 1534) by Fitzgerald's servants in his presence He was solemnly excommunicated by the Irish Church Leaving part of his army (with the consent of the citizens) to besiege Dublin castle, Fitzgerald himself went against Piers Butler, earl of Ossory, and succeeded at first in making a truce with him But the citizens of Dublin now rose against him, Ossory invaded Kildare, and the approach of an English army forced Fitzgerald to raise the siege Fitzgerald from his stronghold at Maynooth ravaged Kildare and Meath throughout the winter He succeeded to the earldom of Kildare, on his father's death in the Tower on Dec 13, 1534, but he does not seem to have been known by that title On March 23, 1535, the Geraldine stronghold fell and most of the garrison were put to the sword This proved the final blow to the rebellion Fitzgerald spent the next few months in raids against the English and their allies, but his party gradually deserting him, on Aug 18, 1535 he surrendered himself to Lord Leonard Grey (d 1541), probably on conditions He was placed in the Tower of London In February 1536 his five uncles were also, some of them with great injustice, seized and brought to England The six Geraldines were hanged at Tyburn on Feb 3, 1537

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FITZGERALD, EDWARD (1809–1883), English writer, translator of Omar Khayyám, was born as Edward Purcell, at Bredfield, Suffolk, on March 31, 1809 His father, John Purcell, who had married a Miss FitzGerald, assumed in 1818 the name and arms of his wife's family From 1816 to 1821 the FitzGeralds lived at St Germain and at Paris, but Edward was educated at Bury St Edmunds and at Trinity College, Cambridge, where he became acquainted with Thackeray and W H Thompson In 1830 he returned to Paris, but soon chose to settle in the Suffolk town of Woodbridge where he passed a secluded, leisurely life devoted to flowers, music and books With Tennyson, his intimacy began about 1835 and with Carlyle about 1842. In 1851, Fitzgerald published *Euphranor,* a Platonic dialogue, born of memories of the old happy life at Cambridge In 1852 appeared *Polonius,* a collection of aphorisms, some original, the rest borrowed from English classics In the following year he issued *Six Dramas of Calderon,* freely translated, and having turned to Oriental studies under the guidance of his friend E B Cowell, afterwards professor of Sanskrit at Cambridge, in 1856 he anonymously published a version of the *Salámán and Absál* of Jámi in Miltonic verse In the same year he married Lucy, daughter of Bernard Barton, the Quaker poet, but they were soon separated In Jan 1859 a little anonymous pamphlet was published as *The Rubáiyát of Omar Khayyám* The poem seems at first to have attracted no attention, until in 1860 Rossetti discovered it, and Swinburne and Lord Houghton quickly followed The expression which it gave to the perplexity of the times led to the demand for a second edition in 1868 Meanwhile FitzGerald had produced in 1865 a version of the *Agamemnon,* and two more plays from Calderon In 1880–81 he issued privately translations of the two Oedipus tragedies; his last publication was *Readings in Crabbe,* 1882.

From 1861 onwards FitzGerald's greatest interest centred in the sea, and for some years, till 1871, he spent the months from June to October mainly in "knocking about somewhere outside of Lowestoft" On June 14, 1883, he passed away painlessly in his sleep He was "an idle fellow, but one whose friendships were more like loves", his wit and human side are displayed in his inimitable letters Tennyson's dedication of his *Tiresias* to FitzGerald's memory, in some touching reminiscent verses to "Old Fitz" (1885) was the signal for the universal appreciation of Omar Khayyám in his English dress The exquisite melody of FitzGerald's verse has made the poem probably better known than any single poem of its class published since 1860 (E G)

An edition of FitzGerald's works appeared in 2 vols (New York, 1887), his *Letters and Literary Remains* were edited by W Aldis Wright (7 vols, 1902–03), other *Letters* were edited by F R Barton (1923), and those to Bernard Quaritch by C O Wrentmore (1926) His *Diet of Mme de Sévigné* was edited by his great niece, M E F Kerrich, 2 vols (1914) *See* also T Wright, *Life of E FitzGerald,* 2 vols (1904), A C Benson, *E FitzGerald* (1905), Morley Adams, *Omar's Interpreter, a New Life of E FitzGerald* (1909)

FITZGERALD, GEORGE FRANCIS (1851–1901), Irish physicist, was born at Dublin on Aug 3, 1851 He studied at Trinity college, Dublin, becoming a fellow in 1877 In 1879 he became tutor and in 1881 Erasmus Smith professor of natural philosophy at Trinity college, Dublin He retained this post until he died on Feb. 21, 1901 FitzGerald started classes in experimental physics at Dublin and developed the laboratories in spite of lack of encouragement He had a wide knowledge of physics and was a brilliant speculator, his services as a critic of scientific work were very much in demand and he had a great influence on the men who worked under him. Fitzgerald's own work is mainly on radiation and electrical theory, most of his papers were published in the *Proceedings* of the Royal Dublin Society and because of this were not as well known as they deserved to be One of his earliest and most important memoirs on the "Electromagnetic Theory of the Reflection and Refraction of Light" deals with the theoretical bearing of the magneto-optical phenomenon known as the Kerr effect He investigated the problem of electric radiation due to a variable current and pointed out that the oscillatory discharge of a condenser might be the means of producing electric radiation Soon after this work appeared Hertz succeeded in producing electric waves experimentally FitzGerald realized the importance of this work, he put himself in touch with Hertz and converted him to Maxwell's ideas. He wrote a memoir on the electro-magnetic effect due to the motion of the earth and he constructed a model of the aether

While studying the results of the Michelson-Morley experiment FitzGerald worked out the change in shape of a body produced by its motion through the aether This is now known as the Lorentz-FitzGerald hypothesis In conjunction with his pupils he carried out a number of investigations on the laws of polarization of Hertzian waves by reflection, on the detection of these waves and on the scattering of X-rays, he tested the validity of Ohm's law for electrolysis In addition to his scientific work FitzGerald was interested in education and it is largely through his efforts that technical education was established in Ireland He was appointed a commissioner of national education in 1898 and a member of the Irish board of intermediate education in 1900 FitzGerald was a member and officer of many learned societies, he was awarded the Royal Society's Royal medal in 1899

His papers, with an introduction, have been edited by Larmor under the title *The Scientific Writings of the Late George Francis FitzGerald* (1902)

FITZGERALD, RAYMOND or REDMOND (d *c* 1182), surnamed Le Gros, was the son of William Fitzgerald and brother of Odo de Carew He was sent by Strongbow to Ireland in 1170, and had the chief share in the capture of Waterford and in the successful assault on Dublin He was sent to Aquitaine to hand over Strongbow's conquests to Henry II , but was back in Dublin in July 1171, when he led one of the sallies from the town Strongbow offended him later by refusing him the marriage of his sister Basilea, widow of Robert de Quenci, constable of Leinster Raymond then retired to Wales, and Hervey de Mountmaurice became constable in his place At the outbreak of a general rebellion against the earl in 1174 Raymond returned with his uncle Meiler Fitz Henry, after receiving a promise of marriage with Basilea Reinstated as constable he secured a series of successes, and with the fall of Limerick in Oct 1175 order was restored Mountmaurice meanwhile obtained Raymond's recall on the ground that his power threatened the royal authority, but the constable was delayed by a fresh outbreak at Limerick, the earl's troop refusing to march without him On the death of Strongbow he was acting governor until the arrival of William Fitz Aldhelm, to whom he handed over the royal fortresses He was deprived of his estates near Dublin and Wexford, but the Geraldines secured the recall of Fitz Aldhelm early in 1183, and regained their power and influence. In 1182 he relieved his uncle Robert Fitzstephen, who was besieged in Cork The date of his death, sometimes stated to be 1182, is not known

FITZGERALD, a city of southern Georgia, U S A., 140m. W. by S of Savannah, the county seat of Ben Hill county It is served by the Atlanta, Birmingham and Coast and the Seaboard Air Line railways. The population was 6,870 in 1920 (36% negroes) and was estimated locally at 8,000 in 1928 The city is a shipping point for cotton, tobacco, peaches, melons, vegetables, lumber, naval stores and other products of the region It has railroad shops, wood-working plants, cotton mills, cotton-seed oil and peanut-oil mills and other manufacturing industries Fitzgerald was settled in 1895 by a group of Union veterans under the leadership of P H Fitzgerald, and was incorporated as a city in 1896 The streets running north and south in the eastern half of the city were named after Northern generals; those in the western half, after Southern generals; and the four drives around the city, after famous battleships

FITZHERBERT, SIR ANTHONY (1470–1538), English judge, was born at Norbury, Derbyshire, and from 1523 till within a short time of his death in 1538 was justice of the court of common pleas He is the author of *La Graunde Abridgement,* a digest of important legal cases written in Old French, first printed in 1514; *The Office and Authority of Justices of the Peace,* first printed in 1538 (last ed 1794), the *New Natura Brevium* (1534, last ed 1794), with a commentary ascribed to Sir Matthew Hale To Fitzherbert are sometimes attributed the *Book of Husbandry* (1523), the first published work on agriculture in the English language, and the *Book of Surveying and Improvements* (1523) (*see* AGRICULTURE)

FITZHERBERT, THOMAS (1552–1640), English Jesuit, was born at Swynnerton, Staffordshire, and educated at Oxford In London, he became a member of the association founded in 1580 to assist the Jesuits Campion and Parsons. In 1582 he withdrew to the continent, where he was active in the cause of Mary, queen of Scots. In 1598 he was charged with complicity in a plot to poison Queen Elizabeth. Later he went to Rome, where he was ordained priest (1601–02) and became agent for the English clergy. He was unpopular with them, however, owing to his subserviency to the Jesuits, and resigned the agency in 1607. In 1613 he joined the Jesuits and was appointed superior of the English mission at Brussels in 1616, and in 1618 rector of the English college at Rome, where he died on Aug 7, 1640.

His chief works are:—*A Defence of the Catholycke Cause* (1602); *A Treatise concerning Policy and Religion* (1606–10), and a trans. of Turcellini's Latin *Life of St. Francis Xavier* (1632).

FITZMAURICE, EDMOND GEORGE (1846–), BARON FITZMAURICE, son of the 4th Marquess of Lansdowne, was a Liberal in politics, and followed Mr. Gladstone in his home rule policy As Lord Edmond Fitzmaurice he entered the House of Commons in 1868, and was under-secretary for foreign affairs from 1882 to 1885. He was created Baron Fitzmaurice of Leigh in 1906, and made under-secretary for foreign affairs in Sir Henry Campbell-Bannerman's ministry. In 1908 he became chancellor of the duchy of Lancaster and a member of the Liberal cabinet, but resigned his post in 1909 He wrote biographies of the 1st marquess, of Sir William Petty (1895), and of Lord Granville (1905), under whom he had served at the Foreign Office

For the 1st marquess, *see* Lord Fitzmaurice, *Life of William, Earl of Shelburne* (3 vols , London, 1875–76).

FITZMAURICE-KELLY, JAMES (1857–1923), British man of letters, was born in Glasgow Educated at St Charles's college, London, he became Taylorian lecturer in Spanish at Oxford in 1902. From 1909 to 1916 he was Gilmour professor of Spanish language and literature at the University of Liverpool; and in 1908 and 1912 Norman MacColl lecturer at Cambridge university During 1907 and 1908 he lectured for the Hispanic Society of America at various American universities and at London university In 1916 he was appointed Cervantes professor of Spanish language and literature at the University of London, a post he held till his resignation in 1920 Among his numerous published works should be mentioned *The Life of Miguel de Cervantes Saavedra* (1892); an introduction to the *editio princeps* of *Don Quixote* (1898–99), a *History of Spanish Literature* (1898), *Cervantes in England* (1905), *Miguel de Cervantes: a memoir* (1913); *Cervantes and Shakespeare* (1916); *Góngora* (1918); and *Fray Luis de Leon* (1921) He edited among other publications, the *Oxford Book of Spanish Verse* (1913) and the complete works of Miguel de Cervantes Saavedra (1901, etc) He died at Sydenham, London, Nov 30, 1923

FITZ NEAL or **FITZ NIGEL, RICHARD** (d 1198), treasurer of Henry II and Richard I of England, and bishop of London His great uncle Roger, bishop of Salisbury, had held the office of treasurer under Henry I and his father Nigel, under Henry I and Stephen Richard, who was born before his father's elevation to the episcopate (1133), succeeded to the office of treasurer in 1158, and held it continuously for 40 years His name appears in the lists of itinerant justices for 1179 and 1194, but these are the only occasions on which he exercised that office Before 1184 he became dean of Lincoln and in 1189 Bishop of London

Richard Fitz Neal's *De necessariis observantiis Scaccarii dialogus,* commonly called the *Dialogus de Scaccario,* is of unique interest to the historian It is an account, in two books, of the procedure followed by the exchequer in the author's time, a procedure which was largely the creation of his own family When read in connection with the Pipe Rolls the *Dialogus* furnishes a most faithful and detailed picture of English fiscal arrangements under Henry II The speakers in the dialogue are Richard himself and an anonymous pupil. The date of the conversation is given in the prologue as 1176–77 This probably marks the date at which the book was begun; it was not completed before 1178 or 1179 Soon after the author's death we find it already recognized as the standard manual for exchequer officials It was

frequently transcribed and has been used by English antiquarians of every period Hence it is the more necessary to insist that the historical statements which the treatise contains are sometimes demonstrably erroneous; the author appears to have relied excessively upon oral tradition. Richard Fitz Neal also compiled in his earlier years a register or chronicle of contemporary affairs, arranged in three parallel columns This was preserved in the exchequer at the time when he wrote the *Dialogus*, but has since disappeared Stubbs' conjectural identification of this *Liber tricolumnis* with the first part of the *Gesta Henrici* (formerly attributed to Benedictus Abbas) is now abandoned as untenable.

See Madox's edition in his *History of the Exchequer* (1769), and that of A. Hughes, C G. Crump and C Johnson (Oxford, 1902). F. Liebermann's *Einleitung in den Dialogus de Scaccario* (Gottingen, 1875) contains the fullest account of the author.

FITZ-OSBERN, ROGER [ROGER FITZWILLIAM] (*fl* 1070), succeeded to the earldom of Hereford and the English estate of William Fitz-Osbern in 1071 In 1075, disregarding William I 's prohibition, he married his sister Emma to Ralph Guader, earl of Norfolk, at the famous bridal of Norwich, at which the two earls plotted a conspiracy against the king Roger, who was to bring his force from the west to join the earl of Norfolk, was held in check at the Severn by the King's forces On the collapse of his confederate's rising, Roger was tried before the Great Council (1075) deprived of his lands and earldom, and sentenced to perpetual imprisonment He died in prison

FITZ-OSBERN, WILLIAM, Earl of Hereford (d 1071), was an intimate friend of William the Conqueror, and the principal agent in preparing for the invasion of England He was the son of Osbern the seneschal, one of William's guardians during his minority, who had been murdered by the young duke's unruly barons Fitz-Osbern founded a monastery at Lire about 1042 He became seneschal to the duke, and urged on the plans for the invasion of England. At the Conquest he received the earldom of Hereford with the special duty of pushing into Wales During William's absence in 1067, English affairs were left in the hands of Fitz-Osbern and of Odo, bishop of Bayeux Fitz-Osbern also acted as William's lieutenant during the rebellions of 1069 Fitz-Osbern was one of the feudal lords of the Welsh marches, and built several castles for the defence of the border In 1070 William sent him to assist Queen Matilda in the government of Normandy But Richilde, widow of Baldwin VI of Flanders, having offered to marry him if he would protect her son Arnulf against Robert the Frisian, Fitz-Osbern accepted the proposal and joined Richilde in Flanders He was killed, fighting against Robert, at Cassel in 1071.

See E A. Freeman, *Norman Conquest*, vols iii and iv (1867–79); Sir J. Ramsey, *Foundations of England*, vol ii. (1898).

FITZ OSBERT, WILLIAM (d 1196), was a Londoner who had served in the Third Crusade, and on his return took up the cause of the poorer citizens against the magnates who monopolized the government of London. He complained in particular of the unfair assessments of the "aids" for the king's ransom (1194) The chronicler Roger of Hoveden gives Fitz Osbert a high character, and he was implicitly trusted by the poorer citizens He attempted to procure redress for them from the king; but the city magistrates persuaded the justiciar Hubert Walter that Fitz Osbert was planning a general rising The troops were sent to seize the demagogue, smoked him out of the sanctuary of St Mary-le-Bow, in which he had taken refuge, and dragged him to the Tower where he was sentenced to death. He was hanged in chains at Smithfield on April 6, 1196 with nine of his followers

FITZ PETER, GEOFFREY (d. 1213), earl of Essex and chief justiciar of England, was a sheriff, a justice itinerant and a justice of the forest under Henry II During Richard's absence on crusade he was one of the five justices of the king's court who stood next in authority to the regent, Longchamp In 1190 Fitz Peter succeeded to the earldom of Essex, in the right of his wife, who was descended from the famous Geoffrey de Mandeville In attempting to assert his hereditary rights over Walden priory Fitz Peter came into conflict with Longchamp, and revenged himself by joining in the baronial agitation through which the regent was expelled from his office Though refusing to give him formal investiture of the Essex earldom, Richard appointed him justiciar in succession to Hubert Walter (1198). Fitz Peter continued Walter's policy of encouraging foreign trade and the development of the towns, many of the latter received, during his administration, charters of self-government He was continued in his office by John, who found him an able instrument of extortion He profited to no small extent by the spoliation of church lands in the period of the interdict But he was not altogether trusted by the king The contemporary *Histoire des ducs* describes Fitz Peter as living in constant dread of disgrace and confiscation In the last years of his life he endeavoured to act as a mediator between the king and the opposition It was by his mouth that the king promised to the nation the laws of Henry I (at the council of St Albans, Aug. 4, 1213) But Fitz Peter died a few weeks later (Oct 2) Fitz Peter was neither a far-sighted nor a disinterested statesman; but he was the ablest pupil of Hubert Walter, and maintained the traditions of the great bureaucracy which the first and second Henries had founded

See the original authorities specified for the reigns of Richard I and John. Also Miss K Norgate's *Angevin England*, vol. ii. (1887) and *John Lackland* (1902), A. Ballard in *English Historical Review*, xiv. p. 93, H W. C Davis, *England under the Normans and Angevins* (1905).

FITZROY, ROBERT (1805–1865), English vice-admiral, hydrographer and meteorologist, was born at Ampton Hall, Suffolk, on July 5, 1805, being a grandson on the father's side of the third duke of Grafton, and, on the mother's, of the first Marquis of Londonderry He entered the navy in 1819 After service in the Mediterranean and on the South American station he was promoted in 1828 to the command of the "Beagle," a brig of 240 tons, which was employed on the survey of the coasts of Patagonia and Terra del Fuego She returned in 1830, and Fitzroy brought with him four Fuegians One of them died after reaching England, the others he took back the next year, when he was reappointed to the "Beagle" to continue the survey She sailed from Plymouth on Dec 27, 1831, carrying as a supernumerary Charles Darwin On Oct 2, 1836, she reached Falmouth again, having surveyed the Straits of Magellan and part of the coast of South America, and run a chronometric line round the world In 1839 Fitzroy published in two volumes *Narrative of the . . . Voyages of H M S S Adventure and Beagle, etc*, with a third volume by Darwin In 1843 he became member of parliament for Durham and was appointed conservator of the Mersey Early in 1843 he was appointed governor and commander-in-chief of New Zealand His policy favoured the natives, and the settlers secured his recall in Nov. 1845 After serving as superintendent of Woolwich Dockyard, and in command of the "Arrogant," an experimental screw frigate fitted out under his supervision, he was placed on half-pay in 1850 In 1854 he was appointed chief of the newly formed meteorological department of the Board of Trade, and henceforward his career was devoted to practical meteorology In 1863 he published his *Weather Book;* the views in it are far in advance of his time, and his system of observations of storm warnings is the basis of that in use to-day He also reduced to a practical form the wind charts of Capt. Maury. His last years were devoted to the Lifeboat Association This work overstrained his health, and he committed suicide on April 30, 1865.

His other Publications are *Remarks on New Zealand* (London, 1846); *Sailing Directions for South America* (London, 1848); and occasional papers in the *Journal* of the R.G S See *Symon's Monthly Meteorological Magazine*, No. 33, pp 161–164 (1898), and Biographical notes and portrait in *Marine Observer*, i, 50–52 (1924)

FITZROY, a north-eastern suburb of Melbourne, Australia (*q.v*). It is a manufacturing centre

FITZ STEPHEN, ROBERT (*fl* 1150), son of Nesta, a Welsh princess and former mistress of Henry I, by Stephen, constable of Cardigan, whom Robert succeeded in that office, took service with Dermot of Leinster when that king visited

England (1167) In 1169 Robert led the vanguard of Dermot's Anglo-Welsh auxiliaries to Ireland, and captured Wexford, which he was then allowed to hold jointly with Maurice Fitz Gerald Taken prisoner by the Irish in 1171, he was by them surrendered to Henry II, who appointed him lieutenant of the justiciar of Ireland, Hugh de Lacy Robert rendered good service in the troubles of 1173, and was rewarded by receiving, jointly with Miles Cogan, a grant of Cork (1177) He had difficulty in maintaining his position and was nearly overwhelmed by a rising of Desmond in 1182 It has been surmised that he died in 1183

FITZ STEPHEN, WILLIAM (d *c* 1190), biographer of Thomas Becket and justice itinerant, was born in London He entered Becket's service between 1154 and 1162 The chancellor employed him in legal work, made him sub-deacon of his chapel and treated him as a confidant Fitz Stephen appeared with Becket at the council of Northampton (1164) when the disgrace of the archbishop was published to the world; but he did not follow Becket into exile. He joined Becket's household again in 1170, and was a spectator of the tragedy in Canterbury cathedral His life of Becket is the most valuable we have Though he writes as a partisan he gives a precise account of the differences between Becket and the king It also contains a description of London which is our chief authority for the social life of the city in the 12th century Despite his connection with Becket, William was sheriff of Gloucestershire from 1171 to 1190, and a royal justice in the years 1176–80 and 1189–90

See his "Vita S Thomae" in J C Robertson's *Materials for the History of Thomas Becket*, vol iii (Rolls series, 1877). Sir T D. Hardy, in his *Catalogue of Materials*, ii 330 (Rolls series, 1865), discusses the manuscripts of this biography and its value W H Hutton, *St Thomas of Canterbury*, pp 272–274 (1889), gives an account of the author

FITZWALTER, ROBERT (d 1235), leader of the baronial opposition against King John of England, served John in the Norman wars, and was taken prisoner by Philip of France, and forced to pay a heavy ransom. He was implicated in the baronial conspiracy of 1212 He was outlawed, but returned under a special amnesty after John's reconciliation with the pope He continued, however, to take the lead in the baronial agitation against the king, and upon the outbreak of hostilities was elected "marshal of the army of God and Holy Church" (1215) He secured the support of the city of London The famous clause of Magna Carta (§ 39) prohibiting sentences of exile, except as the result of a lawful trial, refers more particularly to his case He was one of the 25 appointed to enforce the promises of Magna Carta, and his aggressive attitude was one of the causes which contributed to the recrudescence of civil war (1215) He was one of the envoys who invited Louis to England, and was the first of the barons to do homage when the prince entered London Though slighted by the French as a traitor to his natural lord, he served Louis with fidelity until he was captured at the battle of Lincoln (May 1217) Released on the conclusion of peace he joined the Damietta crusade of 1219, but returned at an early date to make his peace with the regency

BIBLIOGRAPHY—The *Histoire des ducs de Normandie et des rois d'Angleterre* (ed F Michel, 1840) gives the fullest account of his quarrel with the king *See* also Miss K Norgate's *John Lackland* (1902), W McKechnie's *Magna Carta* (1905), and Stubbs's *Constitutional History*, vol i ch xii. (1897)

FITZ THEDMAR, ARNOLD (1201–1274), London chronicler and merchant, was born in London, Aug 9, 1201, of parents whose families had come to London from Germany He became, as he tells us, alderman of a London ward and an active partisan in municipal politics In the Barons' War he took the royal side against the populace and the mayor, Thomas Fitz Thomas The pupular party planned, in 1265, to try him for his life before the folk-moot, but he was saved by the news of the battle of Evesham which arrived on the very day appointed for the trial. In 1270 he was one of the four citizens to whom the muniments of the city were entrusted To this we probably owe the compilation of his chronicle, *Chronica Maiorum et Vicecomitum*, which begins at the year 1188 and is continued to 1274 From 1239 onwards this work is a mine of curious information Though municipal in its outlook, it is valuable for the general history of the kingdom, owing to the important part which London played in the agitation against the misrule of Henry III Arnold was by no means blind to the faults of Henry's government, but preferred an autocracy to the mob-rule which Simon de Montfort countenanced in London

The *Chronica Maiorum et Vicecomitum*, with the other contents of Arnold's commonplace book, were edited for the Camden Society by T. Stapleton (1846), under the title *Liber de Antiquis Legibus* Our knowledge of Arnold's life comes from the *Chronica* and his own biographical notes Extracts, with valuable notes, are edited in G H Pertz's *Mon Germaniae historica, Scriptores*, vol xxviii *See* also J. M Lappenberg's *Urkundliche Geschichte des Hansischen Stahlhofes zu London* (Hamburg, 1851).

FITZWILLIAM, WILLIAM WENTWORTH FITZWILLIAM, 2ND EARL (1748–1833), English statesman, was the son of the 1st earl (U K peerage), who died in 1756. The English family of Fitzwilliam claimed descent from a natural son of William the Conqueror, and among its earlier members were a Sir William Fitzwilliam (1460–1534), sheriff of London, who in 1506 acquired the family seat of Milton Manor in Northamptonshire, and his grandson Sir William Fitzwilliam (*see* above) The latter's grandson was made an Irish baron in 1620; and in later generations the Irish titles of Viscount Milton and Earl Fitzwilliam (1716) and the English titles of Baron Milton (1742) and Viscount Milton and Earl Fitzwilliam (1746), were added. These were all in the English house of the Fitzwilliams of Milton Manor They were distinct from the Irish Fitzwilliams of Meryon, who descended from a member of the English family who went to Ireland with Prince John at the end of the 12th century, and whose titles of Baron and Viscount Fitzwilliam died out with the 8th viscount in 1833, the best known of these was Richard, 7th viscount (1745–1816), who left the Fitzwilliam library and a fund for creating the Fitzwilliam Museum to Cambridge university

The 2nd earl inherited not only the Fitzwilliam estates in Northamptonshire, but also, on the death of his uncle, the marquess of Rockingham, in 1782, the valuable Wentworth estates in Yorkshire, and thus became one of the wealthiest noblemen of the day He was an active supporter of the Whig party, and in 1794, with other "old Whigs," joined Pitt's cabinet, becoming president of the council At the end of the year, however, he was sent to Ireland as viceroy Fitzwilliam, however, had set his face against the jobbery of the Protestant leaders, and threw himself warmly into Grattan's scheme for admitting the Catholics to political power, and in March 1795 he was recalled, his action being disavowed by Pitt, the result of a series of misunderstandings which appeared to Fitzwilliam to give him just cause of complaint In 1806 he was president of the council, but his Whig opinions kept him mainly in opposition He died in February 1833, his son, Charles William Wentworth, the 3rd earl (1786–1857), and later earls, being notable figures in the politics and social life of the north of England.

FITZWILLIAM, SIR WILLIAM (1526–1599), lord deputy of Ireland, was the eldest son of Sir William Fitzwilliam (d 1576) of Milton, Northamptonshire, where he was born In 1559 he became vice-treasurer of Ireland and a member of the Irish House of Commons, and between this date and 1571 he was (during the absences of Thomas Radclyffe, earl of Sussex, and of his successor, Sir Henry Sidney) five times lord justice of Ireland In 1571 Fitzwilliam himself was appointed lord deputy, but like Elizabeth's other servants he received little or no money, and his period of government was marked by continuous penury and its attendant evils, inefficiency, mutiny and general lawlessness Moreover, the deputy quarrelled with the lord president of Connaught, Sir Edward Fitton (1527–1579), but he compelled the earl of Desmond to submit in 1574 Returning to England in 1575 he was governor of Fotheringhay Castle at the time of Mary Stuart's execution In 1588 Fitzwilliam was again in Ireland as lord deputy, and although old and ill he displayed great activity in leading expeditions, and found time to quarrel with Sir Richard Bingham (1528–1599), the new president of Connaught. In 1594 he finally left Ireland, and five years later he died at Milton From Fitzwilliam, whose wife was Anne, daughter of Sir William Sidney, were descended the barons and earls Fitzwilliam.

See R. Bagwell, *Ireland under the Tudors*, vol. ii. (1885).

FITZWILLIAM MUSEUM, a building erected to house the collection of music, books, paintings and other works of art, bequeathed in 1816 by Richard, Viscount Fitzwilliam, to the University of Cambridge, England Both the collection and the buildings have been greatly enlarged by the bequest of Charles Brinsley Marlay in 1912, and the gifts of two anonymous benefactors.

FIUGGI, a town of Italy, province of Frosinone, Lazio, 50 m S E. of Rome by rail, 2,450 ft above sea level Pop (1921), 2,801, town, 3,515, commune. The town, which lies on a hill, was known as Anticoli di Campagna till 1911, but has recently taken the name of the springs some 400 ft lower down, which have made it into a resort of considerable importance in summer The water is cold, quite tasteless, and is said to have the lowest mineral content of any known spring water, and to possess considerable radio-active properties

FIUME, Adriatic port, capital of the Italian Provincia del Carnaro, on the north of the Gulf of Quarnero, 70 m S E of Trieste Pop (1926), 46,063 After being taken by Charlemagne it long remained under the Franks and was then held by the bishop of Pola in feudal tenure from the patriarch of Aquileia The counts of Duino held it 1139–*c* 1400 The counts of Wallace held it next, and in 1471 emperor Frederick III incorporated it in Austria, it was made a free port in 1723 and was united to Croatia in 1776 and declared a *corpus separatum* of the Hungarian Crown in 1779 The French held it 1809–13, when the English took it and restored it to Austria in 1814 It was ceded to Hungary in 1822, was Croatia's in 1849–70, and thereafter under Hungary until it sprang into world-wide notoriety in connection with the matters discussed below

The town is built on a ridge of the Karst, while the newer parts are crowded into the amphitheatre between ridge and shore The old town has a 3rd century Roman triumphal arch The cathedral of the Assumption was founded in 1377 The Pilgrimage church hung with offerings from shipwrecked sailors is approached by a stairway of 400 steps The Maria Theresa road was opened in 1809 to connect Fiume with Hungary via Karolyváros or Karlstadt (Croatia) There are two railways, one connecting with Trieste and Ljubljanas, and the other running through Croatia to Zagreb The soil around Fiume is stony, but the climate favours the vine, the gulf yields abundant fish, especially tunny When Fiume was included in Hungary, it was a port of emigration, and had a torpedo factory Many Italian immigrants entered Fiume before 1914, and the pop (1910) was 22,488 Italians and 13,351 Slavs, as well as Hungarians, Germans and others, the suburb, Susak or Sushak, had an estimated population of 1,500 Italians and 11,000 Slavs, and others

The main harbour is formed within a long breakwater The entrance is deep and there are 27–30 ft of water at the quays A floating dock of 1,800 tons lifting capacity is part of the equipment Wood, rice, sugar, petrol are exported, and fuels and colonial articles, including rice, are imported (X)

THE 20TH CENTURY

Fiume became a burning question after the World War It even threatened to become the cause of a further war between Italy and Yugoslavia, although the secret treaty of London of April 26, 1915, which contained Italy's terms for entering into the War, assigned Fiume to Croatia.

The Italian Claims.—The first Italian claim to Fiume was made by Bissolati (*q v*) immediately after his resignation from the cabinet at the end of 1918 Baron Sonnino's inaction in this matter was due to the fact that in 1915 he had neither anticipated, nor desired, the total break-up of the dual monarchy But in 1919 the official Italians demanded Fiume on the principle of "self-determination," because its Italian inhabitants were in the majority, and in a larger majority still if Fiume proper were separated from its Yugoslav suburb of Sušak on the opposite side of the rivulet, which had given to Fiume its name, and which the Slavs called simply Rečina, and the Italians Eneo That Fiume was in 1919 predominantly Italian is true, but the Italian element had largely immigrated within comparatively recent years.

Meanwhile, on Oct. 23, 1918, Croat troops had seized Fiume and in November there was a dual occupation, against which the Yugoslav national council protested, by Italian and Serbian troops, while Italian naval forces entered the harbour. The Serbian troops were, however, withdrawn and replaced by an inter-Allied force, pending the decision of the Fiume question by the Peace Conference. The Italians' position was similar to that known in English law as "pleading inconsistent defences" They claimed North Dalmatia, overwhelmingly Slav by race, in virtue of the Treaty of London, which President Wilson repudiated, and Fiume in virtue of the Wilson principle of "self-determination"

The D'Annunzio Adventure.—They ultimately obtained Fiume, thanks to the raid made by Gabriele D'Annunzio (*q v*), who mustered a body of men at Ronchi near Trieste, and on Sept 12, 1919, occupied the contested town There, despite official notes, he remained as "commandant" He drew up a constitution for the "Carnaro," as he called his miniature state He descended with his "legionaries" upon Zara and meditated an extension of his territories still farther southward While successive Italian governments gave him no official support, he received considerable sympathy from the nationalist elements in Italy But when Signor Giolitti in 1920 became for the last time premier and concluded the Treaty of Rapallo with the Yugoslavs, he resolved to turn the poet out of Fiume The "commandant's" official residence was bombarded by the "Andrea Doria," and he narrowly escaped the martyrdom which he had proclaimed for himself and his followers After the "heroic age" of his rule there came the prosaic interlude of his local rival, Signor Zanella, who represented the autonomous, as opposed to the Italian national party, and aimed at bringing about a good understanding with Yugoslavia A *coup d'état* by *Fascisti* and "legionaries" took place in 1922, the government offices were stormed, Signor Zanella abdicated in favour of a "government of national defence," and was escorted over the frontier in an armoured car, Signor Prodan, a local engineer, succeeded him, and annexation to Italy was proclaimed Official Italy, however, acted with caution and persuaded Signor Giurati, a *Fascista* deputy, to decline the proffered post of "civil commissioner," while D'Annunzio from his retreat on the lake of Garda denounced the dissensions of Fiume, and refused to return and lead the Fiuman movement

Negotiations Between Italy and Yugoslavia.—Finally, General Giardino became governor, and Signor Mussolini made a serious attempt to come to terms with the Yugoslavs The river had in the course of generations changed its course, forming a "delta," as it was called, and thus rendering doubtful the boundary of Fiume towards Sušak Both parties claimed the "delta" The smaller harbour, too, called in Hungarian times "Port Baross" after a former governor, but re-christened by the Italians "Porto Nazario Sauro" after one of the heroes of the War, was a matter of dispute, but by a letter written by Count Sforza, then Italian minister of foreign affairs, a few hours after the signature of the treaty of Rapallo in Nov 1920 it was ceded to Yugoslavia

Even after the refusal of D'Annunzio the two rival races did their best to give one another economic pin-pricks and thereby nearly ruined the trade of the once flourishing port of Hungary. But at last a series of arrangements was concluded at Rome between the Italian and Yugoslav governments on Jan 27, 1924 Fiume, with the larger harbour, was definitely recognized as Italian, Porto Baross and "the delta" was left to Yugoslavia, and through railway traffic, after several years' intermission, was renewed. But the Fiuman frontier towards the north is fantastic, for a mere corridor, through which the road and railway run, connects the town with Abbazia, and is commanded by the old Roman fortress of Castua . The opening (in Aug 1925) of the last link in the Lika railway connecting Spalato with the Yugoslav hinterland is a fresh blow to Fiume, while the old Hungarian-Croatian steamship line now rechristened "Jadranska Plovidba" ("Adriatic Steamship Co") starts from Port Baross and boycotts Italian Zara An Italo-Hungarian convention providing for a Free Zone at Fiume for the benefit of Hungary was signed in Rome on July 25, 1927, and negotiations for its formation were initiated in the following October.

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FIVE NATIONS: *see* IROQUOIS

FIVES. A ball game played by two or four players in a court enclosed on three or four sides, the ball being struck with the hand usually protected by a glove Certain forms of the game in the United States, in Ireland and in some parts of the north of England are known as handball (*q v*) The origin of the game is probably the *Jeu de Paume* The derivation of the word fives is doubtful It may be from *Longue Paume* in which five on a side played or from the five fingers or that the winners formerly had to make five points There were buildings known as fives courts before the middle of the 18th century and the word fives was then applicable to games played both with the hand and with a racket or bat (Bat fives is still played at a number of British public schools) There are three forms of hand fives in Great Britain which require separate notice Eton fives, Rugby fives and Winchester fives. These games are chiefly played at public schools but there are a few other courts to be found in various parts of the country In Nov 1927, an Eton fives court covered in and artificially lighted was opened at Queen's club Among the schools which play Eton fives in addition of course to Eton, where the game was invented, are Harrow, Charterhouse, Shrewsbury, Repton, Uppingham, Aldenham and Highgate Among those which play Rugby fives are Rugby, Marlborough, Clifton, Cheltenham, Haileybury and St Paul's Winchester fives courts are few and far between but there are one or two other schools beside Winchester which have them There is a Fives Association which is affiliated to the Tennis and Rackets Association In 1925 two open competitions, one for Eton fives and one for Rugby fives were started, but the next year they were allowed to lapse In 1928, however, they were restarted

Eton Fives—The peculiar features of the Eton court arose from the fact that in early times the game was played against the chapel-wall, so that buttresses formed side walls and the balustrade of the chapel-steps projected into the court, while a step divided the court latitudinally These were reproduced in the regular courts, the buttress being known as the "pepperbox" and the space between it and the step as the "hole" The riser of the step is about 5in The floor of the court is paved; there is no back wall On the front wall is a ledge, known as the "line," 4ft 6in from the floor, and a vertical line, painted, 3ft 8in from the right-hand wall Four people usually play, two against two; one of each pair plays in the forward court, the other in the back court The server stands on the left of the forward court, his partner in the right-hand corner of the back court, the taker of the service by the right wall of the forward court, his partner at the left-hand corner of the back court The forward court is known as "on-wall," the other as "off-wall" The server must toss the ball gently against the front wall, above the line, so that it afterwards hits the right wall and falls on the "off-wall," but the server's object is not, as at tennis and rackets, to send a service that cannot be returned At fives he must send a service that hand-out can take easily; indeed hand-out can refuse to take any service that he does not like, and if he fails to return the ball above the line no stroke is counted After the service has been returned either of the opponents returns the ball if he can, and so on, each side and either member of it returning the ball above the line alternately till one side or the other hits it below the line or out of court Only hand-in can score If hand-in wins a stroke, his side scores a point, if he misses a stroke he loses his innings and his partner becomes server, unless he has already served in this round, in which case the opponents become hand-in The game is 15 points If the score is "13 all," the out side may "set" the game to five or three, *i e*, the game becomes one of five or three points; at "14 all" it may be set to three The game and its terminology being somewhat intricate, can best be learnt in the court. No apparatus is required except padded gloves and fives-balls, which are covered with white leather tightly stretched over a hard foundation of cork, strips of leather and twine The Eton balls are 1¾in in diameter and weigh about 1¼ oz apiece

Rugby Fives is much less complicated owing to the simpler form of the court This is a four-walled building with no hazard of any kind There are also a few courts which have no back wall The court is larger than an Eton court. No standard dimensions have been issued A play board is fixed on the front wall, about 34in from the ground The ball is rather smaller than that in use at Eton fives. The rules as to return of service, taking balls, etc, are similar to those at Eton fives.

Winchester Fives is like Rugby fives in nearly every particular except that in the left-hand wall of the Winchester court there is a small buttress built on the same lines as a tambour in the tennis court

See *Tennis, Rackets and Fives* in the All England Series (1890); official *Handball Guide* in Spalding's Athletic Library, *Winchester Fives* by an old Wykehamist (P. and G Wells, Winchester); Gaelic Athletic Association, *Playing Rules of Football, Hurling, Rounders and Handball* (E B N)

FIXED ASSETS, also known as capital assets, are assets (*q v*) of a lasting nature which are acquired for the purpose of carrying on a business and which are intended as a permanent investment Such assets as land, buildings, machinery and equipment, furniture and fixtures, patterns, drawings and durable tools are included in this group Ordinarily, securities such as stocks, bonds and long term notes are also regarded as fixed assets This is notably true if these securities represent holdings in affiliated companies If they do not, and if they might be disposed of without interference with the operation of the business, they may be grouped under "other" or "miscellaneous" assets. The practice of including the capitalized value of patents, trade-marks and goodwill in the fixed assets is open to attack, usually, tangible assets only are included

FIXED PRICE. A term sometimes applied to a price maintained by agreement between wholesale producers and retail distributors for the common benefit of both parties Sometimes such fixed prices are arranged by big producing firms as a condition of supply for retailing, *i e*, the producer binds the retailer not to sell his goods under a certain agreed price In other cases, agreements of this sort are arrived at between combinations of producers on the one hand and combinations of retailers on the other hand (*See* PRICE MAINTENANCE)

FIXTURES, in law, chattels which have been so fixed or attached to land (as it is expressed in English law, "so annexed to the freehold"), as to become, in contemplation of law, a part of it All systems of law make a marked distinction, for certain purposes, between immovables and movables, between real and personal property, between land and all other things In the case of fixtures the question arises under which set of rights they are to fall—under those of real or of personal property. The general rule of English law is that everything attached to the land goes with the land—*quicquid plantatur solo, solo cedit* The rigour of this rule has been modified by a large number of exceptions formulated from time to time by the courts as occasion arose

In order to constitute a fixture there must be some degree of annexation to the land, or to a building which forms part of it Thus it has been held that a barn laid on blocks of timber but not fixed to the ground itself is not a fixture, and the onus of showing that articles not otherwise attached to the land than by their own weight have ceased to be chattels rests with those who assert the fact On the other hand, an article, even slightly affixed to the land, is to be considered part of it, unless the circumstances show that it was intended to remain a chattel. The question is one of fact in each case—depending mainly on the mode, degree, and object of the annexation and the possibility of the removal of the article without injury to itself or the freehold In certain cases the courts have recognized a constructive annexation, when the articles, though not fixed to the soil, pass with the freehold as if they were, *e g*, the keys of a house, the stones of a dry wall, and the detached or duplicate portions of machines For the lease of a house the term "fixture" means something affixed to the premises after the structure was completed and does not include things forming part of the original structure (*Boswell* v *Crucible Steel Co*, 1925, 1 K B. 119.)

Questions as to the property in fixtures principally arise—(1) between landlord and tenant, (2) between heir and executor, (3) between executor and remainder-man or reversioner, (4) between seller and buyer.

(1) At common law, if the tenant has affixed anything to the freehold during his occupation, he cannot remove it without the permission of his landlord. But an exception was established in favour of *trade fixtures* It may be stated as a general rule that things which a tenant has fixed to the freehold for the purpose of trade or manufacture may be taken away by him, whenever the removal is not contrary to any prevailing practice or the particular terms of the contract of tenancy, and can be effected without causing material injury to the estate or destroying the essential character of the articles themselves (*Lambourn* v. *McLellan* 1903, 2 Ch 269) Agricultural tenants were not entitled, at common law, to remove trade fixtures. But the Landlord and Tenant Act 1851 granted such a right of removal in the case of buildings or machinery erected by a tenant at his own expense, and with his landlord's consent in writing, provided that the freehold was not injured or that any injury was made good, and that before removal a month's written notice was given to the landlord, who had an option of purchase. Under the Agricultural Holdings Act 1923 fixtures erected by the tenant are removable by him, within a reasonable time after the termination of the tenancy, subject to the landlord not electing to take them over at a valuation (s. 22) These provisions apply to market gardens; as to allotments *see* the Allotments Act 1922 and ALLOTMENTS and SMALL HOLDINGS.

Again, *ornamental* fixtures set up by the tenant for ornament and convenience, such as hangings and looking-glasses, tapestry, iron backs to chimneys, wainscot fixed by screws, marble chimney pieces, are held to belong to the tenant and to be removable without the landlord's consent Here again the extent of the privilege has been a matter of some uncertainty

In all these cases the fixtures must be removed during the term The tenant's right to the fixtures is not, however, destroyed by the mere expiry of the term if he still remains in possession; but if he has once left the premises he cannot come back and claim his fixtures The theft by a tenant or lodger, or the husband or wife of any tenant or lodger, of any fixture left to be used by any such person in or with any house or lodging is a felony. (Larceny Act 1916, s 16)

(2) As between heir and executor or administrator. The question of fixtures arises between these parties on the death of a person owning land The executor has no right to remove trade fixtures set up for the benefit of the inheritance As regards ornamental objects, the rule *quicquid plantatur solo, solo cedit*, was in early times somewhat relaxed in favour of the executor. As far back as 1701 it was held that hangings fixed to a wall for ornament passed to the executor; and, although the effect of this relaxation was subsequently cut down, it is supported by the decisions of the courts affirming the executor's right to valuable tapestries affixed by a tenant for life to the walls of a house for ornament and their better enjoyment as chattels (*Leigh* v *Taylor*, 1902 App. Cas. 157; and see *In re Hulse* 1905, Ch. 406), and the same has been held as to statues and bronze groups set on pedestals in the grounds of a mansion house

(3) When a tenant for life of land dies the question of fixtures arises between his representatives and the persons next entitled to the estate (the remainder-man or reversioner) The remainder-man is not so great a favourite of the law as the heir, and the right to fixtures is construed more favourably for executors than in the preceding cases between heir and executor Whatever are executor's fixtures against the heir would therefore be executor's fixtures against the remainder-man. Agricultural fixtures are not removable by the executor of a tenant for life.

(4) As between seller and buyer, a purchase of the lands includes a purchase of all the fixtures But here the intention of the parties is of great importance. Similar questions may arise in other cases, *e.g.*, as between mortgagor and mortgagee. The question of what is or is not a fixture must also often be considered in questions of rating or assessment. A sale of settled land may be made subject to a stipulation that fixtures shall be taken by the purchaser at a valuation, and the amount of such valuation is part of the price of the land and forms "capital money" accordingly *See* the Settled Land Act 1925, s 49 (2).

The law of Scotland as to fixtures is the same as that of England The Agricultural Holdings (Scotland) Act 1923, s 29 and, as to market gardens, s. 42, gives a similar statutory right of removal The law of Ireland has been the subject of special legislation. (*See* LANDLORD AND TENANT) The French Code Civil recognizes the right of the usufructuary to remove articles attached by him to the subject of his estate on the expiry of his term, on making good the place from which they were taken (Art 599); and there are similar provisions in the Civil Codes of Italy (Art 495), Spain (Arts 487, 489), and Germany (Arts 1037, 1049) Certain classes of movables are treated in law as immovable by destination and pass with the land as such *See* Burge, *Col and For Laws*, 2nd ed. IV pt. I. 644

The law of the United States as to fixtures is substantially identical with English common law Constructive, as well as actual, annexation is recognized The same relaxations (from the common law rule *quicquid plantatur solo, solo cedit*) as regards trade fixtures and ornamental fixtures, such as tapestry, have been recognized

In Mauritius the provisions of the Code Civil are in force without modification In Quebec (Civil Code, Arts 374 *et seq*) and St Lucia (Civil Code, Arts 368, *et seq*) they have been re-enacted in substance Some of the British colonies have conferred on tenants a statutory right to remove fixtures.

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FIZEAU, ARMAND HIPPOLYTE LOUIS (1819–1896), French physicist, was born at Paris on Sept 23, 1819 As he was wealthy he was able to follow his inclinations and devote himself to experimental work in physics Between 1845 and 1849 he worked in conjunction with Foucault (*q v*) They investigated the infra-red portion of the solar spectrum, and made other observations, in heat and light In 1849 Fizeau published the results of his experiments on the velocity of light (*q v*), he gave the first reliable value of this velocity by a terrestrial method, and the correct explanation of the Doppler principle (*see* LIGHT: *Waves and Interference*), as applied to the light coming from a star (*q v.*), and showed how it could be used to measure the relative velocities of stars in the line of sight In 1851 he carried out a series of experiments on the velocity of light in a moving medium, and measured the shift of interference fringes due to light passing through a column of moving water These experiments were designed to see if any relative motion of aether and matter could be detected (*see* ETHER) Later experiments describe the use of a condenser for increasing the efficiency of an induction coil and the application of interference methods for measuring the expansion of crystals He became a member of the French Academy in 1860 and of the Bureau des Longitudes in 1878; in 1863 he was appointed inspecteur de physique at the École Polytechnique, Paris He died at Venteuil on Sept. 18, 1896

FJORD or **FIORD** (fē'ord) is the name given to a narrow arm of the sea which runs far inland and with more or less precipitous sides The term is of Norwegian origin and is the name given to the characteristic sea lochs of the coast-line of that country Fiords differ from normal river estuaries in that their channels are long straight and narrow, with steep parallel sides which plunge far below the level of the water, and from which side arms of a similar shape branch off at constant angles Fiords are remarkable for their depth, Messier Channel (Patagonia) is 4,250 ft deep, and Sogne Fiord (Norway) is 100 m long and 4,000 ft. deep, but their deepest portion is always at some distance from the sea very shallow water occurring at their mouths Loch Moran (Inverness, depth 1,017 ft.) is a typical fiord but is separated from the sea by land 30 ft above sea

level. Fiords lie in deeply dissected plateau lands so that above the precipitous walls are gentle slopes and wide valleys J W Gregory (see *Nature and Origin of Fiords,* London, 1913) distinguishes three types of sea estuaries, *fiords,* as here described, *rias* and *fiards*

Several theories have been put forward to explain the formation of fiords A controlling factor in the formation of these theories has been the distribution of fiords and their occurrence in recently glaciated regions Fiords do not occur widespread but appear to be situated around the polar regions, in Norway, the west coasts of Scotland, Ireland and Iceland, Greenland, Alaska and British Columbia, in Patagonia, the south of New Zealand and in several Antarctic lands Sea erosion, glacial action or river denudation are not sufficient of themselves to account for the phenomena The most probable process appears to have been as follows Fiords occur in regions which have suffered faulting within geologically recent times, the faults being numerous and generally in more than one direction Such faulting occurred in regions of tension and was accompanied by regional uplift, and in consequence river activity was increased and quickly reduced to base level a new river system which followed the lines of weakness set up by the faulting The uplift and faulting took place before the Glacial Period, probably during the Pliocene, so that glaciers as well as rivers have played their part in fiord formation and modification The latest stage has been subsidence and in some places tilting and the drowning of the river valleys by the incursion of the sea Fiord coastlines are noted for their beauty In the past they have provided an easy—frequently the only—means of communication for the people in many districts and have therefore played an important part in the development of racial and national characteristics

FLACCUS, a cognomen in the plebeian gens Fulvia, one of the most illustrious in ancient Rome Cicero and Pliny state that the family came from Tusculum, where some were still living in the middle of the 1st century B C Of the Fulvii Flacci the most important were the following

QUINTUS FULVIUS FLACCUS, son of the first of the family, Marcus, who was consul with Appius Claudius Caudex in 264 B C He especially distinguished himself during the second Punic War He was consul four times (237, 224, 212, 209), censor (231) pontifex maximus (216), praetor urbanus (215) During his first consulships he did good service against the Ligurians, Gauls and Insubrians In 212 he defeated Hanno near Beneventum, and with his colleague Appius Claudius Pulcher began the siege of Capua The capture of this place was considered so important that their imperium was prolonged, but on condition that they should not leave Capua until it had been taken. Hannibal's diversion against Rome interfered with the operations for the moment, but his retirement enabled Flaccus, who had been summoned to Rome to protect the city, to return, and bring the siege to a successful conclusion He was appointed to the command of the army in Lucania and Bruttium, where he crushed all further attempts at rebellion Nothing further is known of him (*See* PUNIC WARS)

MARCUS FULVIUS FLACCUS, grandnephew of the foregoing, lived in the times of the Gracchi, of whom he was a strong supporter After the death of Tiberius Gracchus (133 B C) he was appointed in his place one of the commission of three for the distribution of the land He was suspected of having had a hand in the sudden death of the younger Scipio (129), but there was no direct evidence against him When consul in 125, he proposed to confer the Roman citizenship on all the allies This proposal, though for the time successfully opposed by the senate, eventually led to the Social War The attack made upon the Massilians (who were allies of Rome) by the Salluvii (Salyes) afforded a convenient excuse for sending Flaccus out of Rome After his return in triumph, he was again sent away (122), this time with Gaius Gracchus to Carthage to found a colony In 121 he was killed at the same time as Gracchus Cicero (*Brutus,* 28) speaks of him as an orator of moderate powers, but a diligent student

See Livy, *Epit* 59–61, Val. Max. ix 5. 1; Vell. Pat. ii 6; Appian, *Bell Civ* 1. 18, 21, 24–26, Plutarch, *C. Gracchus,* 10. 13; also A. H J. Greenidge, *Hist. of Rome* (1904), and authorities quoted under GRACCHUS.

FLACH, GEOFFROI JACQUES (1846–1919), French jurist and historian, was born at Strasbourg. After the war of 1870 he settled in Paris In 1884 he succeeded Edouard Laboulaye at the Collège de France in the chair of comparative legislation

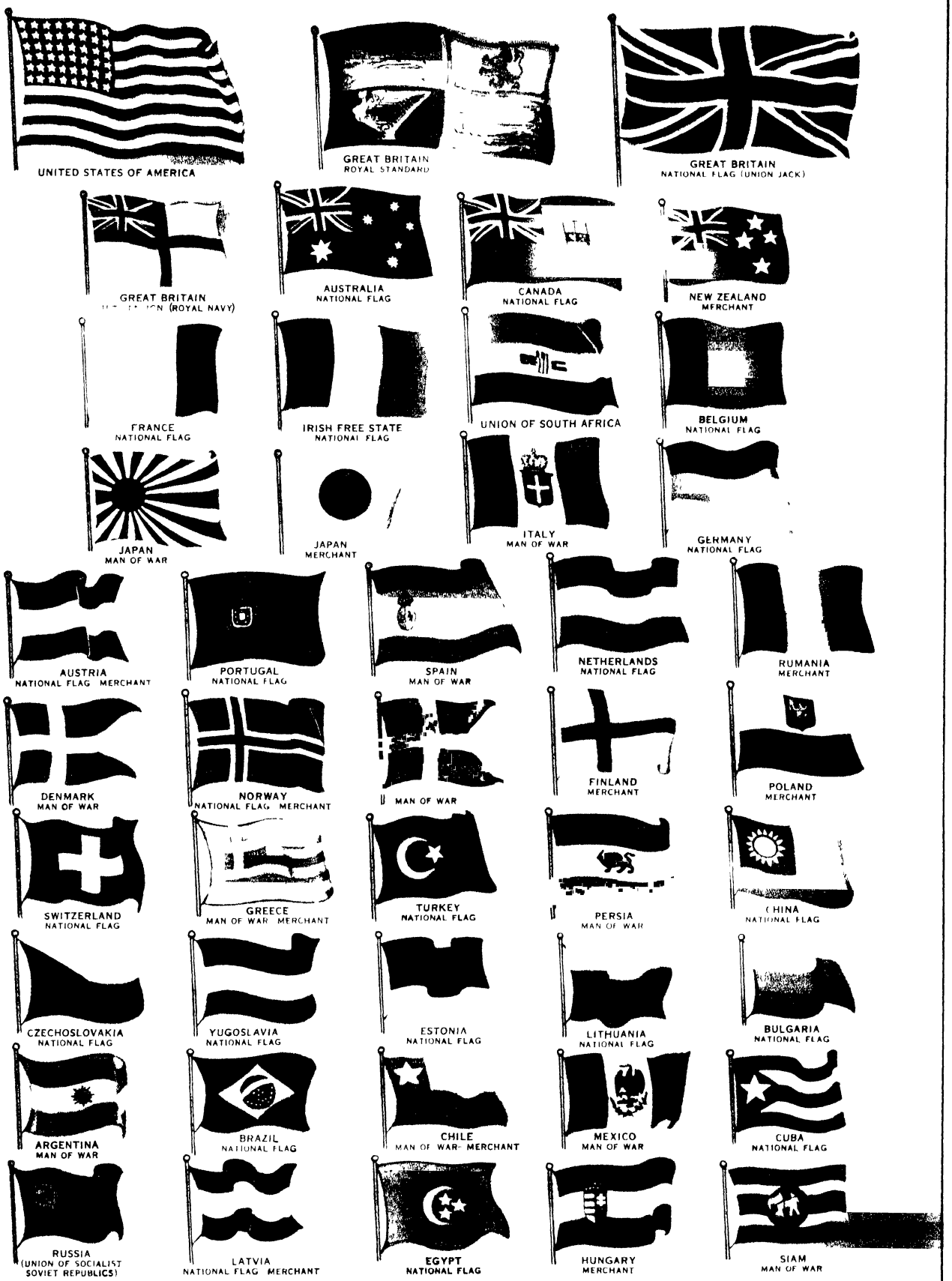
His great work, *Les Origines de l'ancienne France,* was produced slowly. Its three volumes—*Le Régime seigneurial* (1886), *Les Origines communales, la féodalité et la chevalerie* (1893) and *La Renaissance de l'état* (1904)—appeared at long intervals, and are not always in complete harmony, but they are marked by originality and vigour Flach gave them a solid basis by the wide range of his researches, utilizing charters and cartularies (published and unpublished), chronicles, lives of saints and even those dangerous guides, the *chansons de geste* He pursued the same method in his *L'Origine de l'habitation et des lieux habités en France* (1899), in which he discusses some of the theories circulated by A. Meitzen in Germany and by Arbois de Jubainville in France. Following in the footsteps of the jurist F C von Savigny, Flach studied the teaching of law in the middle ages and the Renaissance, and produced *Cujas, les glossateurs et les Bartolistes* (1883), and *Études critiques sur l'histoire du droit romain au moyen âge, avec textes inédits* (1890)

FLACIUS, MATTHIAS (1520–1575), surnamed ILLYRICUS, Lutheran reformer, was born at Albona, in Illyria, on March 3, 1520 He studied under Baptista Egnatius in Venice, and from 1539 onwards at Basel, Tubingen and Wittenberg Here he was welcomed (1541) by Melanchthon and here he came under the decisive influence of Luther In 1544 he was appointed professor of Hebrew at Wittenberg He took his master's degree on Feb 24, 1546, ranking first among the graduates He opposed strenuously the "Augsburg Interim," and the compromise of Melanchthon known as the "Leipzig Interim" (*see* ADIAPHORISTS) Melanchthon wrote of him with venom as a renegade ("alumnus in sinu serpentem"), and Wittenberg became too hot for him He removed to Magdeburg (Nov 9, 1551), where his feud with Melanchthon was patched up On May 17, 1557, he was appointed professor of New Testament theology at Jena, but was soon involved in controversy with Strigel, his colleague, on the synergistic question (relating to the function of the will in conversion) In October 1566 he became pastor of the Lutheran community at Antwerp In 1567–73 he sought asylum both in Frankfort and Strasbourg, but in both cases was compelled to leave Then the prioress, Catharina von Meerfeld, of the convent of White Ladies at Frankfort harboured him and his family in despite of the authorities He died on March 11, 1575 His son Matthias was professor of philosophy and medicine at Rostock In spite of his harried life, Flacius was a pioneer of the scientific study of church history, and—if we except, a great exception, the work of Laurentius Valla—of hermeneutics also There is permanent and continuous value in the principles embodied in Flacius' *Catalogus testium veritatis* (1556, revised edition by J. C Dietericus, 1672) and his *Clavis scripturae sacrae* (1567), followed by his *Glossa compendiaria in N Testamentum* (1570)

See J B Ritter, *Flacius's Leben u Tod* (1725); M. Twesten, *M Flacius Illyricus* (1844), W Preger, *M Flacius Illyricus u seine Zeit* (1859–1861), G Kawerau, in Herzog-Hauck's *Realencyklopadie* (1899).

FLAG (or **"FLAGGE,"** a common Teutonic word in this sense, but apparently first recorded in English), a piece of bunting or similar material, admitting of various shapes and colours, and waved in the wind from a staff or cord for use in display as a standard, ensign or signal.

Ancient Standards.—Among the remains of the people which has left the earliest traces of civilization, the records of the forms of objects used as ensigns are to be found frequently From their carvings and paintings, supplemented by ancient writers, it appears that several companies of the Egyptian army had their own particular standards. These were formed of such objects as, there is reason to believe, were associated in the minds of the men with feelings of awe and devotion Sacred animals, boats, emblems or figures, a tablet bearing a king's name, fan and feather-shaped



DRAWN FOR THE ENCYCLOPÆDIA BRITANNICA BY PAUL H. STONE AND A. SICONOLFI

symbols, were raised on the end of a staff as standards, and the office of bearing them was looked upon as one of peculiar privilege and great honour Somewhat similar seem to have been the customs of the Assyrians and Jews Among the sculptures unearthed at Nineveh, only two different designs have been noticed for standards. one is of a figure drawing a bow and standing on a running bull, the other of two bulls running in opposite directions We may say these resemble the emblems of war and peace which were attached to the yoke of Darius's chariot They are borne upon and attached to chariots, and this method of bearing such objects was the custom also of the Persians, and prevailed during the middle ages That the custom survived to a comparatively modern period is proved from the fact that the "guns," which are the "standards" of the artillery, have from time immemorial been entitled to all the parade honours of the flag, *i e*, the symbol of authority In days comparatively recent there was a "flag gun," usually the heaviest piece, which emblemized authority and served also as the "gun of direction." No representations of Egyptian or Assyrian naval standards have been found, but the sails of ships were embroidered and ornamented with devices, another custom which survived into the middle ages

In both Egyptian and Assyrian examples, the staff bearing the emblem is frequently ornamented immediately below with flag-like streamers Rabbinical writers have assigned devices to the Jewish tribes, but their testimony may be doubted Banners, standards and ensigns are frequently mentioned in the Bible "Every man of the children of Israel shall pitch by his standard, with the ensign of their father's house" (Num ii 2) "Who is she that looketh forth as the morning, fair as the moon, clear as the sun, terrible as an army with banners?" (Cant vi 10 *See* also Num ii 10, x 14, Ps xx 5, lx 4; Cant ii 4; Is. v 26, x 18, lix 19, Jer iv 21)

The Persians bore an eagle fixed to the end of a lance, and the sun, as their divinity, was also upon their standards, which appear to have been formed of some textile, and were guarded by the bravest men of the army The Carian soldier who slew Cyrus, the brother of Artaxerxes, was allowed the honour of carrying a golden cock at the head of the army, it being the custom of the Carians to wear that bird as a crest on their helmets The North American Indians carried poles fledged with feathers from the wings of eagles, and similar customs seem to have prevailed among other semi-savage peoples

The Greeks bore a piece of armour upon a spear in early times; afterwards the several cities bore sacred emblems or letters chosen for their particular associations—the Athenians the olive and the owl, the Corinthians a pegasus, the Thebans a sphinx, in memory of Oedipus, the Messenians their initial M, and the Lacedaemonians A A purple dress was placed on the end of a spear as the signal to advance The Dacians carried a standard representing a contorted serpent, while the dragon was the military sign of many peoples—of the Chinese, Dacians and Parthians among others—and was probably first used by the Romans as the ensign of barbarian auxiliaries

The question of the *signa militaria* of the Romans is a wide and very important one, having direct bearing on the history of heraldry, and on the origin of national, family and personal devices With them the custom was reduced to system "Each century, or at least each maniple," says Meyrick, "had its proper standard and standard-bearer " In the early days of the republic a handful of hay was borne on a pole, whence probably came the name *mampulus* (Lat *manus*, a hand) The forms of standards became very various, sometimes a cross piece of wood was placed at the end of a spear and surmounted by the figure of a hand in silver, below round or oval disks, with figures of Mars or Minerva, or in later times portraits of emperors or eminent generals. Figures of animals, such as the wolf, horse, bear and others, were borne; it was not till a still later period that the eagle became the special standard of the legion According to Pliny, it was Marius who, in his second consulship, ordained that the Roman legions should only have the eagle for their standard; "for before that time the eagle marched foremost with four others—wolves, minotaurs, horses and bears—each one in its proper order. Not many years passed before the eagle alone began to be advanced in battle, and the rest were left behind in the camp. But Marius rejected them altogether, and since this it is observed that scarcely is there a camp of a legion wintered at any time without having a pair of eagles "

The *vexillum*, the cavalry flag, is described by Livy as a square piece of cloth fastened to a piece of wood fixed crosswise to the end of a spear, somewhat resembling the mediaeval *gonfanon* These vexilla are to be seen on various Roman coins and medals, on the sculptured columns of Trajan and Antoninus, and on the arch of Titus. The *labarum*, the imperial standard of later emperors, resembled in shape and fixing the vexillum It was of purple silk richly embroidered with gold, and sometimes was not suspended like the vexillum from a horizontal crossbar, but displayed like our modern flags, *i e*, by the attachment of one of its sides to a staff After Constantine, the labarum bore the monogram of Christ It is generally supposed that the small scarf, which in mediaeval days was often attached to the pastoral staff or crook of a bishop, was derived from the labarum of the first Christian emperor, Constantine the Great The Roman standards were guarded with religious veneration in the temples at Rome It was not unusual for a general to order a standard to be cast into the ranks of the enemy, to add zeal to the onset of his soldiers by exciting them to recover what to them was perhaps the most sacred thing the earth possessed

Mediaeval Flags.—Although in earlier times drapery was occasionally used for standards, and was often appended as ornament to those of other material, it was probably not until the middle ages that it became their special material

Early flags were almost purely of a religious character. In Bede's description of the interview between the heathen king Aethelbert and the Roman missionary Augustine, the followers of the latter are said to have borne banners on which silver crosses were displayed The national banner of England for centuries—the red cross of St George—was a religious one, in fact the aid of religion seems ever to have been sought to give sanctity to national flags, and the origin of many can be traced to a sacred banner, as is notably the case with the oriflamme of France and the Dannebrog of Denmark Of the latter the legend runs that King Waldemar of Denmark, leading his troops to battle against the enemy in 1219, saw at a critical moment a cross in the sky This was at once taken as an answer to his prayers, and an assurance of celestial aid It was forthwith adopted as the Danish flag and called the "Dannebrog," *i e*, the strength of Denmark Apart from all legend, this flag undoubtedly dates from the 13th century

The ancient kings of France bore the blue hood of St Martin upon their standards The Chape de St Martin was originally in the keeping of the monks of the abbey of Marmoutier, and the right to take this blue flag into battle with them was claimed by the counts of Anjou Clovis bore this banner against Alaric in 507, for victory was promised him by a verse of the Psalms which the choir were chanting when his envoy entered the church of St Martin at Tours, Charlemagne fought under it at the battle of Narbonne At what precise period the oriflamme, which was originally simply the banner of the abbey of St Denis, supplanted the Chape de St Martin as the sacred banner of all France is not known Probably, however, it gradually became the national flag after the kings of France had transferred the seat of government to Paris, where St Denis was held in high honour, and the banner hung over the tomb of the saint in the abbey church The king of France himself was one of the vassals of the abbey of St Denis for the fief of the Vexin, and it was in his quality of count of Vexin that Louis VI , le Gros, bore this banner from the abbey to battle, in 1124 He is credited with having been the first French king to have taken the banner to war, and it appeared for the last time on the field of fight at Agincourt in 1415 The accounts of its appearance vary considerably. Guillaume Guiart, in his *Chronicle* says —

> Oriflambe est une bannière
> De cendal voujoiant et simple
> Sans portraiture d'autre affaire

It, therefore, would seem to have been a plain scarlet flag; whilst an English authority states "the celestial auriflamb, so by the French admired, was but of one colour, a square redde banner" The *Chronique de Flandres* describes it as having three points with tassels of green silk attached The banner of William the Conqueror was sent to him by the pope, and the early English kings fought under the banners of Edward the Confessor and St Edmund, while the blended crosses of St George, St Andrew and St Patrick still form the national ensign of the united kingdoms of England, Scotland and Ireland

The Bayeux tapestry, commemorating the Norman conquest of England, contains abundant representations of flags borne upon the lances of the knights of William's army They appear small in size, and pointed frequently indented into three points and bearing pales, crosses and roundels One, a Saxon pennon, is triangular, and roundly indented into four points, one banner is of segmental shape and rayed, and bears the figure of a bird, which has been supposed to represent the raven of the war-flag of the Scandinavian Vikings The figures are to some extent ornamental and symbolic rather than heraldic, the same insignia do not appear on the shields of the several bearers The dragon standard which he is known to have borne is placed near Harold, but similar figures appear on the shields of Norman warriors Standards in form much resembling these dragons appear on the Arch of Titus and the Trajan column as the standards of barbarians

At the battle of the Standard in 1138 the English standard was formed of the mast of a ship, having a silver pyx at the top and bearing three sacred banners, dedicated severally to St Peter, St John of Beverley and St Wilfrid of Ripon, the whole being fastened to a wheeled vehicle Representations of three-pointed, cross-bearing pennons are found on seals of as early date as the Norman era, and the warriors in the first crusade bore three-pointed pennons In 1244 Henry III gave order for a "dragon to be made in fashion of a standard of red silk sparkling all over with fine gold, the tongue of which should be made to resemble burning fire and appear to be continually moving, and the eyes of sapphires or other suitable stones" *The Siege of Carlaverock*, a poem of the 14th century, describes the heraldic bearings on the banners of the knights at the siege of that fortress Of the king himself the writer says:—

> En sa bannière trois luparte
> De or fin estoient mis en rouge,

and he goes on to describe the kingly characteristics these may be supposed to symbolize

The principal varieties of flags borne during the middle ages were the pennon, the banner and the standard. The "guydhommes" or "guidons," "banderolls," "pennoncells," "streamers" or pendants, may be considered as minor varieties The pennon variety was a purely personal ensign, sometimes pointed, but more generally forked or swallow-tailed at the end. A pennoncell (or penselle) was a small pennon Flags of this character were largely used on any special occasion of ceremony, and more particularly at State funerals Amongst the items that ran the total cost of the funeral of Oliver Cromwell up to an enormous sum of money, we find mention of 30 dozen of pennoncells a foot long and costing 20 shillings a dozen, and 20 dozen of the same kind of flags at 12 shillings a dozen

The banner was, in the earlier days of chivalry, a square flag, though at a later date it is often found greater in length than in depth, as is the case with the national flags of to-day In many early examples it is found considerably longer in the depth on the staff than in its outward projection from the staff. The banner was charged in a manner exactly similar to the shield of the owner, and it was borne by knights banneret and all above them in rank In fact flags were originally heraldic emblems, though in modern devices the strict laws of heraldry often have been abandoned

To create a knight banneret, the king or commander-in-chief in person might tear off the fly of the pennon on the lance of the knight, thus turning it roughly into the square flag or banner, and so making the knight a banneret. The date at which this dignity originated is uncertain, but it was probably about the period of Edward I John Chandos is said to have been made a banneret by the Black Prince and the king of Castile at Najara on April 3, 1367 In more modern times Capt. John Smith, who saved the royal banner from the parliamentary troops at Edgehill, is said to have been made a knight banneret by Charles I From this time the custom of creating knights banneret ceased

The "gonfalon" or "gonfanon" was a battle flag differing from the ordinary banner in that it was not attached to the pole but hung from it crosswise, and was not always square in shape but serrated, so that the lower edge formed streamers The gonfalon was in action borne close to the person of the commander-in-chief and denoted his position In certain of the Italian cities chief magistrates had the privilege of bearing a gonfalon, and for this reason were known as "gonfaloniere"

The standard used was a flag of noble size, long and tapering towards the fly (the "fly" is that portion of the flag farther from the pole, the "hoist" the portion of the flag attached to the pole), the edges of the flag fringed or bordered, and with the ends split and rounded off. The shape was not, however, by any means uniform during the middle ages nor were there any definite rules as to its charges It varied in size according to the rank of the owner The standard was, from its size, and as its very name implies, not meant to be carried into action, as was the banner, but to denote the actual position of its possessor on occasions of State ceremonial, or on the tilting ground, and to denote the actual place occupied by him and his following when the hosts were assembled in camp preparatory for battle It was essentially a flag denoting position, whereas the banner was the rallying point of its followers in the actual field Its uses are now fulfilled, as far as royalties are concerned, by the "banner" which has now become the "royal standard," and which floats over the palace where the king is in residence, is hoisted at the saluting point when he reviews his troops, and is broken from the mainmast of any ship in his navy the moment that his foot treads its deck The essential condition of the standard was that it should always have the cross of St George conspicuous in the innermost part of the hoist immediately contiguous to the staff, the remainder of the flag was then divided fesse-wise by two or more stripes of colours exactly as the heraldic "ordinary" termed "fesse" crosses the shield horizontally The colours used as stripes, as also those used in the fringe or bordering of the standard, were those which prevailed in the arms of the bearer or were those of his livery In the time of Henry V the English royal standard had, colours white and blue, a white antelope standing between two red roses, and in the interspaces more red roses The motto usually figured on most standards, though occasionally it was missing An excellent type of the old standard is that of the earls of Percy, which bore the blue lion, the crescent and the fetterlock—all badges of the family—whilst, as tokens of matrimonial alliances with the families of Poynings, Bryan and Fitzpayne, a silver key, a bugle-horn and a falchion were displayed. There was also the historic Percy motto, *Espérance en Dieu*. At Nelson's funeral his banner and standard were borne in the procession, and around his coffin were the banderolls—square, bannerlike flags bearing the various arms of his family lineage. Nelson's standard bore his motto, *Palmam qui meruit ferat*, but, in lieu of the cross of St George, it bore the union of the crosses of St. George, St Andrew and St. Patrick, the mediaeval England having expanded into the United Kingdom of Great Britain and Ireland. Again, at the funeral of the duke of Wellington we find amongst the flags his personal banner and standard, and ten banderolls of the duke's pedigree and descent

The guidon, a name derived from the Fr. *Guyd-homme*, was somewhat similar to the standard, but without the cross of St. George, rounded at the end, less elongated and altogether less ornate It was borne by a leader of horse, and according to one writer "must be two and a half yards or three yards long, and therein shall no armes be put, but only the man's crest, cognisance, and devyce"

The streamer, so called in Tudor days but now better known as the pennant or pendant, was a long, tapering flag; which it was directed "shall stand in the top of a ship or in the forecastle, and therein be put no armes, but the man's cognisance or devyce, and may be of length 20, 30, 40 or 60 yards, and is slitt as well as a guidon or standard" Amongst the fittings of the ship that took Beauchamp, earl of Warwick, to France in the reign of Henry VII was a "grete stremour for the shippe xl yardes in length viij yardes in brede" In the hoist was "a grete bere holding a raggid staffe," and the rest of the fly "powdrid full of raggid staves."

NATIONAL FLAGS

British.—The royal standard of Great Britain now bears the arms of England quartered with those of Scotland and Ireland From the time of Richard I. it had borne the arms of England only, until Edward III began to set the old arms of France in the first and fourth quarters with those of England in the second and third Following the custom of the French king, Henry V reduced the number of his *fleurs-de-lis* to three. The next change was made when James I. had the first and fourth quarters of France quartered with England, the second quarter of Scotland and the third of Ireland William III. set over all this an escutcheon of Nassau, Queen Anne's first and fourth quarters were of England parted with Scotland the second quarter of France, the third of Ireland George I showed the same, changing the fourth quarter for the arms of the electors of Hanover In 1801 the arms of the royal banner or standard were as they are now, save for Hanoverian arms on an escutcheon in the middle, which was removed at the accession of Queen Victoria It is worthy of note, however, that in the royal standard of King Edward VII. which hangs in the chapel of St. George at Windsor, the ordinary "winged woman" form of the harp in the Irish third quartering is altered to a harp of the old Irish pattern.

Up to the time of the Stuarts it had been the custom of the lord high admiral or person in command of the fleet to fly the royal standard as deputy of the sovereign. When royalty ceased to be, a new flag was devised by the council of State for the Commonwealth, which comprised the "arms of England and Ireland in two several escutcheons in a red flag within a compartment." In other words, it was a red flag containing two shields, the one bearing the cross of St George, red on a white ground, the other the harp, gold on a blue ground, and round the shields was a wreath of palm and shamrock leaves. One of these flags is still in existence at Chatham dockyard, where it is kept in a wooden chest which was taken out of a Spanish galleon at Vigo by Admiral Sir George Rooke in 1704. When Cromwell became Protector of the Commonwealth of England, Scotland and Ireland, he devised for himself a personal standard. This had the cross of St. George in the first and fourth quarters, the cross of St Andrew, a white saltire on a blue ground, in the second, and the Irish harp in the third. His own arms—a lion on a black shield—were imposed on the centre of the flag. No one but royalty has a right to fly the royal standard, and though it is constantly seen flying for purposes of decoration its use is irregular There has, however, always been one exception, namely that the lord high admiral when in executive command of a fleet has always been entitled to fly the royal standard. For example, Lord Howard flew it from the mainmast of the "Ark Royal" when he defeated the Spanish Armada; the duke of Buckingham flew it as lord high admiral in the reign of Charles I, and the duke of York fought under it when he commanded during the Dutch Wars

The national flag of the British empire is the Union Jack in which are combined in union the crosses of St. George, St. Andrew and St Patrick St. George had long been a patron saint of England, and his banner of silver with a cross gules its national ensign St. Andrew in the same way was the patron saint of Scotland, and his banner of azure with a saltire silver the national ensign of Scotland. On the union of the two crowns James I. issued a proclamation ordaining that "henceforth all our subjects of this Isle and Kingdom of Greater Britain and the members thereof, shall bear in their main-top the red cross commonly called St. George's cross, and the white cross commonly called St. Andrew's cross, joined together according to a form made by our heralds, and sent by us to our admiral to be published to our said subjects; and in their fore-top our subjects of south Britain shall wear the red cross only, as they were wont and our subjects of north Britain in their fore-top, the white cross only as they were accustomed" This was the first Union Jack, as it is generally termed, though strictly the name of the flag is the "Great Union," and it is only a "Jack" when flown on the jackstaff of a ship of war At the death of Charles I, the union with Scotland being dissolved, the ships of the parliament reverted to the simple cross of St George, but the union flag was restored when Cromwell became protector, with the Irish harp imposed upon its centre On the Restoration, Charles II. removed the harp and so the original union flag was restored, and continued as described until the year 1801, when, on the legislative union with Ireland, a cross styled like that of St Patrick, a saltire gules, in a field silver, was incorporated in the union flag. So to combine these three crosses without losing the distinctive features of each was not easy; each cross must be distinct, and retain equally distinct its fimbriation, or bordering, which denotes the original ground In the first union flag, the red cross of St. George with the white fimbriation that represented the original white field was simply imposed upon the white saltire of St Andrew with its blue field To place the red saltire of St. Patrick on the white saltire of St Andrew would have been to obliterate the latter, nor would the red saltire have its proper bordering denoting its original white field; even were the red saltire narrowed in width the portion of the white saltire that would appear would not be the St Andrew saltire, but only the fimbriation appertaining to the saltire of St Patrick The difficulty has been got over by making the white broader on one side of the red than the other. In fact, the continuity of direction of the arms of the St. Patrick red saltire has been broken by its portions being removed from the centre of the oblique points that form the St. Andrew's saltire. Thus both the Irish and Scottish saltires can be distinguished easily from one another, whilst the red saltire has its due white fimbriation

The Union Jack is the most important of all British ensigns, and is flown by representatives of the empire all the world over. It flies from the jackstaff of every man-of-war in the navy. When flown by the governor-general of India the star and device of the order of the Star of India are borne in the centre Colonial governors fly it with the badge of their colony displayed in the centre. Diplomatic representatives use it with the royal arms in the centre As a military flag, it is flown over fortresses and headquarters, and on all occasions of military ceremonial. Hoisted at the mainmast of a man-of-war it is the flag of an admiral of the fleet

Military flags in the shape of regimental standards and colours, and flags used for signalling, are described elsewhere, and it will here be only necessary to deal with the navy and admiralty flags.

The origin of the three ensigns—the red, white and blue—had its genesis in the navy In the days of huge fleets, such as prevailed in the Tudor and Stuart navies, there were, besides the admiral in supreme command, a vice-admiral as second in command, and a rear-admiral as third in command, each controlling his own particular group or squadron These were designated centre, van, and rear, the centre almost invariably being commanded by the admiral, the vice-admiral taking the van and the rear-admiral the rear squadron. In order that any vessel in any group could distinguish its own admiral's ship, the flagships of centre, van, and rear flew respectively a plain red, white, or blue flag, and so came into being those naval ranks of admiral, vice-admiral and rear-admiral of the red, white and blue which continued down to as late as 1864. As the admiral in supreme command flew the union at the main, there was no rank of admiral of the red, and it was not until Nov. 1805 that the rank of admiral of the red was added to the navy as a special compliment to reward Trafalgar About 1652, so that each individual ship in the squadron should be distinguishable as well as the flagships, each vessel carried a large red,

white or blue flag according as to whether she belonged to the centre, van, or rear, each flag having in the left-hand upper corner a canton, as it is termed, of white bearing the St George's cross These flags were called ensigns, and it is, of course, due to the fact that the union with Scotland was for the time dissolved that they bore only the St George's cross Even when the restoration of the Stuarts restored the *status quo* the cross of St George still remained alone on the ensign, and it was not altered until 1707 when the bill for the Union of England and Scotland passed the English parliament In 1801, when Ireland joined the Union, the flag, of course, became as we know it to-day All these three ensigns belonged to the royal navy, and continued to do so until 1864, but as far back as 1707 ships of the mercantile marine were instructed to fly the red ensign As ironclads replaced the wooden vessels and fleets became smaller the inconvenience of three naval ensigns was manifest, and in 1864 the grades of flag officer were reduced again to admiral, vice-admiral, and rear-admiral, and the navy abandoned the use of the red and blue ensigns, retaining only the white ensign as its distinctive flag The mercantile marine retained the red ensign which they were already using, whilst the blue ensign was allotted to vessels employed on the public service whether home or colonial

The white ensign is therefore essentially the flag of the royal navy. It should not be flown anywhere or on any occasion except by a ship (or shore establishment) of the royal navy, with but one exception By a grant of William IV dating from 1829 vessels belonging to the Royal Yacht Squadron, the chief of all yacht clubs, are allowed to fly the white ensign From 1821 to 1829 ships of the squadron flew the red ensign, as that of highest dignity, but as it was also used by merchant ships, they then obtained the grant of the white ensign as being more distinctive Some few other yacht clubs flew it until 1842, when the privilege was withdrawn by an admiralty minute By some oversight the order was not conveyed to the Royal Western of Ireland, whose ships flew the white ensign until in 1857 the usage was stopped Since that date the Royal Yacht Squadron alone has had the privilege Any vessel of any sort flying the white ensign, or pennant, of the navy is committing a grave offence, and the ship can be boarded by any officer of His Majesty's service, the colours seized, the vessel reported to the authorities, and a penalty inflicted on the owners or captain or both The penalty incurred is £500 fine for each offence, as laid down in the 73rd section of the Merchant Shipping Act, 1894.

Besides the white ensign the ship of war flies a long streamer from the maintopgallant masthead This, which is called a pennant, is flown only by ships in commission, it is, in fact, the sign of command, and is first hoisted when a captain commissions his ship. The pennant, which was really the old "pennoncell," was of three colours for the whole of its length, and towards the end left separate in two or three tails, and so continued till the end of the great wars in 1816. Now, however, the pennant is a long white streamer with the St. George's cross in the inner portion close to the mast Pennants have been carried by men-of-war from the earliest times, prior to 1653 at the yard-arm, but since that date at the maintopgallant masthead

The blue ensign is exclusively the flag of the public service other than the royal navy, and is as well the flag of the royal naval reserve It is flown also by certain authorized vessels of the British mercantile marine, the conditions governing this privilege being that the captain and a certain specified portion of the officers and crew shall belong to the ranks of the royal naval reserve When flown by ships belonging to British Government offices the seal or badge of the office is displayed in the fly. For example, hired transports fly it with the yellow anchor in the fly; the marine department of the Board of Trade has in the fly the device of a ship under sail, the telegraph branch of the post-office shows in the fly a device representing Father Time with his hour-glass shattered by lightning; the ordnance department displays upon the fly a shield with a cannon and cannon balls upon it. Certain yacht clubs are also authorized by special admiralty warrant to fly the blue ensign. Some of these display it plain; others show in the fly the distinctive badge of the club. Consuls-general, consuls and consular agents also have a right to fly the blue ensign, the distinguishing badge in their case being the royal arms

The red ensign is the distinguishing flag of the British merchant service, and special orders to this effect were issued by Queen Anne in 1707, and again by Queen Victoria in 1864 The order of Queen Anne directed that merchant vessels should fly a red flag "with a Union Jack described in a canton at the upper corner thereof next the staff," and this is probably the first time that the term "Union Jack" was officially used In some cases those yacht clubs which fly the red ensign change it slightly from that flown by the merchant service, for they are allowed to display the badge of the club in the fly Colonial merchantmen usually display the ordinary red ensign, but, provided they have a warrant of authorization from the admiralty, they can use the ensign with the badge of the colony in the fly

There are two other British sea flags which are worthy of brief notice These are the admiralty flag and the flag of the master of Trinity House. The Admiralty flag is a plain red flag with a clear anchor in the centre in yellow In a sense it is a national flag, for the sovereign hoists it when afloat in conjunction with the royal standard and the Union Jack It would appear to have been first used by the duke of York as lord high admiral, who flew it when the sovereign was afloat and had the royal standard flying in another ship When a board of commissioners was appointed to execute the office of lord high admiral this was the flag adopted, and in 1691 we find the admiralty, minuting the navy board, then a subordinate department, "requiring and directing it to cause a fitting red silk flag, with the anchor and cable therein, to be provided against Tuesday morning next, for the barge belonging to this board" In 1725, presumably as being more artistic, the cable in the device was twisted round the stock of the anchor It was thus made into a "foul anchor," the thing of all others that a sailor most hates, and this despite the fact that the first lord at the time, the earl of Berkeley, was himself a sailor The anchor retained its unseamanlike appearance, and was not "cleared" till 1815, and even to this day the buttons of the naval uniform bear a "foul anchor" The "anchor" flag is solely the emblem of an administrative board, it does not carry the executive or combatant functions which are vested in the royal standard, the union or an admiral's flag, but on two occasions it has been made use of as an executive flag In 1719 the earl of Berkeley, who at the time was not only first lord of the admiralty, but vice-admiral of England, obtained the special permission of George I to hoist it at the main instead of the union flag Again in 1869, when Childers, then first lord, accompanied by some members of his board, went on board the "Agincourt" he hoisted the Admiralty flag and took command of the combined Mediterranean and Channel Squadrons, thus superseding the flags of the two distinguished officers who at the time were in command of these squadrons It is hardly necessary to add that throughout the navy there was a very distinct feeling of dissatisfaction at the innovation. When the Admiralty flag is flown by the sovereign it is hoisted at the fore, his own standard being of course at the main, and the union at the mizzen

The flag of the master of the Trinity House is the red cross of St. George on its white ground, but with an ancient ship on the waves in each quarter, in the centre is a shield with a precisely similar device and surmounted by a lion

The sign of a British admiral's command afloat is always the same It is the St George's cross Of old it was borne on the main, the fore, or the mizzen, according as to whether the officer to whom it pertained was admiral, vice-admiral, or rear-admiral, but, as ironclads superseded wooden ships, and a single pole mast took the place of the old three masts, a different method of indicating rank was necessitated To-day the flag of an admiral is a square one, the plain St George's cross. When flown by a vice-admiral it bears a red ball on the white ground in the upper canton next to the staff, if flown by a rear-admiral there is a red ball in both the upper and lower cantons As nowadays most battleships have two masts, the admiral's flag is hoisted at the one which has no masthead semaphore. The admiral's flag is always a square one,

but that of a commodore is a broad white pennant with the St George's cross If the commodore be first class the flag is plain; if of the second class the flag has a red ball in the upper canton next to the staff The same system of differentiating rank prevails in most navies, though very often a star takes the place of the ball. In some cases the indications of rank are differently shown For instance, in the Japanese navy the distinction is made by a line of colour on the upper or lower edges of the flag

The flags of the British colonies are the same as those of the mother country, but differentiated by the badge of the colony being placed in the centre of the flag if it is the Union Jack, or in the fly if it be the blue or red ensign Examples of these are shown in the Plate, where over the red ensigns illustrated is that of New Zealand, the device of the colony being the southern cross in the fly The same flag, with a large six-pointed star, emblematic of the six States immediately under the union and an additional small star in the device of the Southern Cross, forms the merchant flag of the federated Commonwealth of Australia The government flag shown is precisely the same as the merchant flag except that the device is placed on the blue instead of the red ensign Another red ensign shown is that of the Dominion of Canada, the device in the fly being the armorial bearings of the Dominion As the lord-lieutenant of Ireland, as the representative of royalty, may fly the Union Jack with a harp in the centre, or the viceroy of India flies the same flag with, in the centre, the badge of the order of the Star of India, so too colonial governors or high commissioners fly the union flag with the arms of the colony they preside over on a white shield in the centre and surrounded by a laurel wreath In the case of Canada the wreath, however, is not of laurel but of maple, which is the special emblem of the Dominion

French.—To come to flags of other countries, nowhere have historical events caused so much change in the standards and national ensigns of a country as in the case of France The oriflamme and the Chape de St Martin were succeeded at the end of the 16th century, when Henry III., the last of the house of Valois, came to the throne, by the white standard powdered with *fleurs-de-lis* This in turn gave place to the famous tricolour The tricolour was introduced at the time of the Revolution, but the origin of this flag and its colours is a disputed question Some maintain that the intention was to combine in the flag the blue of the Chape de St Martin, the red of the oriflamme, and the white flag of the Bourbons By others the colours are said to be those of the city of Paris The tricolour is divided vertically into three parts of equal width—blue, white and red, the red forming the fly, the white the middle, and the blue the hoist of the flag During the first and second empires the tricolour became the imperial standard, but in the centre of the white stripe was placed the eagle, whilst all three stripes were richly powdered over with the golden bees of the Napoleons The tricolour is now the sole flag of France

American.—Before the Declaration of Independence the flags of those colonies which now form the United States of America were very various In the early days of New England the Puritans objected to the red cross of St George, not from any disloyalty to the mother country, but from a conscientious objection to what they deemed an idolatrous symbol By the year 1700 most of the colonies had devised badges to distinguish their vessels from those of England and of each other. In the early stages of the revolutionary war each State adopted a flag of its own; thus, that of Massachusetts bore a pine tree, South Carolina displayed a rattlesnake, New York had a white flag with a black beaver, and Rhode Island a white flag with a blue anchor upon it. Even after the Declaration of Independence, and the introduction of the stars and stripes, the latter underwent many changes in the manner of their arrangement before taking the position at present established. In 1775 a committee was appointed to consider the question of a single flag for the 13 States. It recommended that the Union Jack be retained in the upper corner next to the staff, the remainder of the field of the flag to be of 13 horizontally disposed stripes alternately red and white. This flag, known as the Grand Union or Cambridge flag, was first displayed when Washington first took command of the army at Cambridge. It was raised on December 3, 1775 on the "Alfred," flagship of the new American navy, by the senior lieutenant of the ship, John Paul Jones When the Declaration of Independence was signed in Philadelphia in 1776 the new nation would not use the Union Jack in their flag So on June 14, 1777, congress resolved "that the flag of the United States be 13 stripes, alternate red and white, that the union be 13 stars, white on a blue field, representing a constellation" The first American unfurling of the Stars and Stripes over a warship was by John Paul Jones when he took command of the "Ranger" in June, 1777 It was first carried into battle at the battle of Brandywine in September, 1777 This was the origin of the national flag, but at first, as the number of the stripes were unequal, the flag very often varied, sometimes having seven white and six red stripes, and at other times seven red and six white, and it was not for some considerable time that it was authoritatively laid down that the latter arrangement was the one to be adopted It has also been held that the stars and stripes of the American national flag, as well as the eagle, were suggested by the crest and arms of the Washington family. The latter supposition is absurd, for the Washington crest was a raven The Washington arms were a white shield having two horizontal red bars, and above these a row of three red "molets" This might, by a stretch of imagination, be supposed to have inspired the original idea of the flag which was that each State in the Union should be represented in the national flag by a star and stripe Naturally other States coming into the Union expected the same privilege After Vermont in 1790 and Kentucky in 1792 had entered the Union, the stars and stripes were changed in number from 13 to 15 Later on other States joined, and in the year 1818 it was determined to go back to the original 13 stripes, but to place a star for each State in the blue union canton in the top corner of the flag next the staff By the admission of Arizona as a State in 1912 the number of stars became 48, arranged in six horizontal rows of eight stars each Thus the stars show the exact number of States in the Union, whilst the stripes denote the original number of the States that formed the union The flag of the president of the United States is an eagle on a blue field, bearing on its breast a shield displaying stripes, and above the national motto *E pluribus unum*, and, above, a design of the 13 stars.

Other Countries.—The most general and a few of the newest of the various national flags are figured in the Plate Representing Great Britain are shown the royal standard and Union Jack (the national flag) The next line shows 4 other flags of Great Britain the white ensign of the royal navy, the blue ensign of Government service, and two red ensigns of the commercial marine, colonial flags being shown in the case of the three latter ensigns. The two Japanese flags shown are the man-of-war ensign—a rising sun, generally known as the sunburst—and the flag of the mercantile marine, in which the red ball is used without the rays and placed in the centre of the white field The imperial standard of Japan is a golden chrysanthemum on a red field It is essential that the chrysanthemum should invariably have 16 petals. Heraldry in Japan is of a simpler character than that of Europe, and is practically limited to the employment of *Mon* The great families of Japan possess at least one, and in many cases even three, *Mon*. The imperial family use two, the one *Kiku no go Mon* (the august chrysanthemum badge) and *Kiri no go Mon* (the august Kiri badge).

The German imperial standard had the iron cross with its white border displayed on a yellow field, diapered over in each of the four quarters with three black eagles and a crown. In the centre of the cross was a shield bearing the arms of Prussia surmounted by a crown, and surrounded by a collar of the Order of the Black Eagle. In the four arms of the crown was the legend *Gott mit uns 1870* The national flag of the German republican *Reich* is now a tricolour of three horizontal stripes—black, red and yellow The United States flag and the tricolour of France have already been fully dealt with, and in both countries the one flag is common to both men-of-war and ships of the mercantile marine

Austria's national flag now has three horizontal stripes. Red above, white in the centre and red below.

The green, white and red Italian tricolour was adopted in 1805, when Napoleon I. formed Italy into one kingdom It was adopted again in 1848 by the Nationalists of the peninsula, accepted by the king of Sardinia, and, charged by him with the arms of Savoy, it became the flag of a united Italy. The man-of-war flag is precisely similar to that of the mercantile marine, except that in the case of the former the shield of Savoy is surmounted by a crown The royal standard is a blue flag In the centre is a black eagle crowned and displaying on its breast the arms of Savoy, the whole surrounded by the collar of the Most Sacred Annunziata, the third in rank of all European orders In each corner of the flag is the royal crown.

For the Portuguese republic the flag is one of the few national flags that are parti-coloured. It is part green, part red, with, in the centre, the arms of Portugal.

In the Spanish ensigns red and yellow are the prevailing colours, and here again the arrangement differs from that generally used. The navy flag has a yellow central stripe, with red above and below. To be correct the yellow should be half the width of the flag, and each of the red stripes a quarter of the width of the flag. The central yellow stripe is charged in the hoist with an escutcheon containing the arms of Castile and Leon, and surmounted by the royal crown. In the mercantile flag the yellow centre is without the escutcheon, and is one-third of the entire depth of the flag, the remaining thirds being divided into equal stripes of red and yellow, the yellow above in the upper part of the flag, the red in the lower.

The flag of the Soviet Government in Russia (1929) is the red flag charged, in the upper quarter of the hoist, with a golden sickle crossed saltirewise with a golden hammer, a star (molet) above.

The flag of the Russian mercantile marine was a horizontal tricolour of white, blue and red Originally, it was a tricolour of blue, white and red, and it is said that the idea of its colouring was taken by Peter the Great when learning shipbuilding in Holland, for as the flag then stood it was simply the Dutch ensign reversed. Later, to make it more distinctive, the blue and white stripes changed places. The flag of the Russian navy was the blue saltire of St. Andrew on a white ground. The imperial standard was of a character akin to that of Austria, the ground was yellow, the centre bearing the imperial double-headed eagle, a badge that dates back to 1472, when Ivan the Great married a niece of Constantine Palaeologus and assumed the arms of the Greek empire. On the breast of the eagle was an escutcheon charged with the emblem of St. George and the Dragon on a red ground, and this was surrounded by the collar of the order of St. Andrew. On the splayed wings of the eagle were small shields bearing the arms of the various provinces of the empire.

The Rumanian flag is a blue, yellow and red tricolour, the stripes vertical, with the blue stripe forming the fly. Yugoslavia, the new kingdom of the Serbs, Croats and Slovenes has a horizontal tricolour, the top stripe blue, the middle white and the lower red. The Bulgarian flag is a similar tricolour, white, green and red, the white stripe uppermost.

The flags of all the three Scandinavian kingdoms are somewhat similar in design That of Denmark, the Dannebrog, has been already alluded to, and it is shown in our illustration as flown by the Danish navy. The mercantile marine flag is precisely similar, but rectangular instead of being swallow-tailed The Swedish flag is a yellow cross on a blue ground When flown from a man-of-war it is forked as in the Danish, but the longer arm of the cross is not cut off but pointed, thus making it a three-pointed flag as illustrated. For the mercantile marine the flag is rectangular When Norway separated from Denmark in 1814, the first flag was red with a white cross on it, and the arms of Norway in the upper corner of the hoist, but as this was found to resemble too closely the Danish flag, a blue cross with a white border was substituted for the white cross. This, it will be seen, is the Danish flag with a blue cross imposed upon the white one For a man-of-war the flag is precisely similar to that of Sweden in shape; *i e*, converted from the rectangular into the three-pointed design While Sweden and Norway remained united the flag of each remained distinct, but each bore in the top canton of the hoist a union device, being the combination of the Norwegian and Swedish national colours and crosses. In each of the three above nationalities the flag used for a royal standard is the man-of-war flag with the royal arms imposed on the centre of the cross

The Belgian tricolour is vertical, the stripes being black next the hoist, yellow in the centre and red in the fly. That of the Netherlands is a horizontal tricolour, red above, white in the centre and blue below. In both countries the same flag is common to both navy and mercantile marine, but when the flag is used as a royal standard the royal arms are displayed in the central stripe. The black, yellow and red of the Belgian flag are the colours of the duchy of Brabant, and were adopted in 1831 when the monarchy was founded. The original Dutch colours adopted when Holland declared its independence were orange, white and blue, the colours of the house of Orange, and when and how the orange became red is not quite clear, though it was certainly prior to 1643

The blue and white which form the colouring of the Greek flag shown in our illustration were adopted by the National Assembly at Epidaurus on Jan. 7, 1822 They also happen to be the colours of the house of Bavaria, a member of which, Prince Otho, was elected to the throne of Greece in 1832. The stripes are nine in number—five blue and four white—with, in the upper corner of the hoist, a canton bearing a white cross on a blue ground

The very simple flag of Switzerland is one of great antiquity, for it was the emblem of the nation as far back as 1339, and probably considerably earlier. In addition to the national flag of the Swiss confederation, each canton has its own cantonal colours. In each case the flag has its stripes disposed horizontally. Basel, for instance, is half black, half white; Berne, half black, half red; Glarus, red, black and white

The Turkish crescent moon and star were the device adopted by Mohammed II. when he captured Constantinople in 1453. Originally they were the symbol of Diana, the patroness of Byzantium, and were adopted by the Ottomans as a triumph, for they had always been the special emblem of Constantinople, and even now in Moscow and elsewhere the crescent emblem and the cross may be seen combined in Russian churches, the crescent badge, of course, indicating the Byzantine origin of the Russian church The symbol originated at the time of the siege of Constantinople by Philip the father of Alexander the Great, when a night attempt of the besiegers to undermine the walls was betrayed by the light of a crescent moon, and in acknowledgment of their escape the Byzantines raised a statue to Diana, and made her badge the symbol of the city. Both the man-of-war and mercantile marine flags are the same, but the imperial standard of the sultan was scarlet, and bore in its centre the device of the reigning sovereign This device was known as the "Tughra," and consisted of the name of the sultan, the title of khan, and the epithet *al-Muzaffar Daima*, which means "the ever victorious" The origin of the "Tughra" was that the sultan Murad I., who was not of scholarly parts, signed a treaty by wetting his open hand with ink, and pressing it on the paper, the first, second and third fingers making smears close together, the thumb and fourth finger leaving marks apart. Within the marks thus made the scribes wrote in the name of Murad, his title, and the epithet above quoted The "Tughra" dated from the latter part of the 14th century.

The imperial flag of Persia is a horizontal tricolour of green, white and red, with the lion and sun on the white ground The merchant flag is somewhat similar, but omits the lion and sun device.

The national flag of Siam has five horizontal stripes of red, white, blue, white and red. The naval flag is similar but has the addition of a red ball in the middle within which is a white elephant That of Korea, a white flag with, in the centre, a ball, half red, half blue, the colours being curiously intermixed, the whole being precisely as if two large commas of equal size, one red and the other blue, were united to form a complete circle.

The Chinese republic flies a flag of red with a blue field in the upper hoist bearing a white ball surrounded by 16 triangular rays.

Among the South American republics the Brazilian flag is peculiar inasmuch as it is the only national flag which carries a motto

Mexico flies precisely the same tricolour as Italy, but plain in the case of the merchant ensign, and charged on the central stripe with the Mexican arms when flown as a man-of-war ensign.

The Argentine flag is flown by the navy, but, when used by the mercantile marine, the sun emblazoned on the central white stripe is omitted, the flag otherwise being precisely the same.

The Venezuelan flag of the navy is also the flag of the mercantile marine, but the shield bearing the arms of the State is not introduced into the yellow top stripe in the corner near the hoist, as in the naval flag.

The Chilean ensign is used alike by men-of-war and vessels in the mercantile marine, but, when flown as the standard of the president, the Chilean arms and supporters are placed in the centre of the flag

The flag of the mercantile marine of Peru is plain red, white, red in vertical stripes, and becomes the naval ensign when charged on the central stripe with the Peruvian arms as shown in our illustration. In fact, in nearly every case with the South American republics, the ordinary mercantile marine flag becomes that of the war navy by the addition of the national arms, and in some cases is used in the same way as a presidential flag.

In nearly every case the flags of the lesser American republics are tricolours, and in a very great many of them the flags are by no means such combinations as would meet with the approval of European heralds. All flag devising should be in accordance with heraldic laws, and one of the most important of these is that colour should not be placed on colour, nor metal on metal, yellow in blazonry being the equivalent of gold and white of silver Hence, properly devised tricolours are such as, for example, those of France, where the red and blue are divided by white, or Belgium, where the black and red are divided by yellow On the other hand, the yellow, blue, red of Venezuela is heraldically an abomination.

Manufacture and Miscellaneous Uses.—Flags, the manufacture of which is quite a large industry, are almost invariably made from bunting, a very light, tough and durable woollen material. The regulation bunting used in the British navy is in 9in. widths, and the flag classes in size according to the number of breadths of bunting of which it is composed The great centre of the manufacture of flags, as far as the British navy is concerned, is the dockyard at Chatham. Ensigns and Jacks are made in different sizes, the largest ensign made is 33ft. long by 16½ft in width; the largest Jack issued is 24ft long and 12ft wide

The dimensions of a flag should be either square or in the proportion of two to one, and it is this latter dimension that is used in the British navy and generally

Signalling flags are dealt with elsewhere (*see* SIGNAL), and here it will only be necessary to make brief allusion to some international customs with regard to the use of flags to indicate certain purposes. For long a blood-red flag has always been used as a symbol of mutiny or of revolution. The black flag was in days gone by the symbol of the pirate; to-day, in the only case in which it survives, it is flown after an execution to indicate that the requirements of the law have been duly carried out. All over the world a yellow flag is the signal of infectious illness A ship hoists it to denote that there are some on board suffering from yellow fever, cholera or some such infectious malady, and it remains hoisted until she has received quarantine. This flag is also hoisted on quarantine stations. The white flag is universally used as a flag of truce.

At sea striking of the flag denotes surrender. When the flag of one country is placed over that of another the victory of the former is denoted, hence in time of peace it would be an insult to hoist the flag of one friendly nation above that of another. If such were done by mistake, say in "dressing ship" for instance, an apology would have to be made. This custom of hoisting the flag of the vanquished beneath that of the victor is of comparatively modern date, as up to about a century ago the sign of victory was to trail the enemy's flag over the taffrail in the water. Each national flag must be flown from its own flagstaff, and this is often seen when the allied forces of two or more powers are in joint occupation of a town or territory. To denote honour and respect a flag is "dipped." Ships at sea salute each other by "dipping" the flag, *i.e.*, by running it slowly down from the masthead, and then smartly replacing it. When troops parade before the sovereign the regimental flags are lowered as they salute him. A flag flying half-mast high is the universal symbol of mourning When a ship has to make the signal of distress, this is done by hoisting the national ensign reversed, *i.e.*, upside down If it is wished to accentuate the imminence of the danger it is done by making the flag into a "weft," *i.e.*, by knotting it in the middle. This means of showing distress at sea is of very ancient usage, for in naval works written as far back as the reign of James I. we find the "weft" mentioned as a method used by ships for showing distress

We have already alluded to the Union Jack as used for denoting nationality, and as a flag of command, but it also serves many other purposes For instance, if a court-martial is being held on board any ship the Union Jack is displayed while the court is sitting, its hoisting being accompanied by the firing of a gun. In a fleet in company the ship that has the guard for the day flies it. With a white border it forms the signal for a pilot, and in this case is known as a Pilot Jack. In all combinations of signalling flags which denote a ship's name the Union Jack forms a unit Lastly, it figures as the pall of every sailor or soldier of the empire who receives naval or military honours at his funeral.

BIBLIOGRAPHY.—*See* A MacGeorge, *Flags Some Account of their History and Uses* (1881), W. Bland, *National Banners Their History and Construction* (1892) (one of a series of Heraldic Tracts, 1850–92, Br Museum Library, No 9906, b 9, this pamphlet gives the design of the national banners of St George, St Andrew and St. Patrick, and illustrates and tells the story of the composition of the three flags into the great union flag, commonly known as the Union Jack), S Eardley-Wilmot, *Our Flags Their Origin, Use and Traditions* (1901), an excellent treatise, historical and narrative, on all flags of the British empire, G H Preble, *A History of the Flag of the United States* (Boston, 1872), E Hulme, *Flags of the World Their History, Blazonry and Associations* (1897), a most complete monograph on the subject, illustrated with a very complete series of plates; *Admiralty Book of Flags of all Nations*, printed for H M. Stationery office, 1889, kept up to date by the publication periodically of *Errata*, officially issued under an admiralty covering letter; *Flags of the United States and Other Countries*, published by the Hydrographic office of the navy, printed by authority (Washington, 1928) The last two works have no letterpress beyond titles, but contain, to scale, delineations of all the flags at present used officially by all nations. Between the two there are no discrepancies, and the delineation of a flag taken from either may be assumed as absolutely correct. Both are respectively the guides for flag construction in the British navy and the United States navy. (H. L. S.)

FLAGELLANTS, in religion, the name given to those who scourge themselves, or are scourged, by way of discipline or penance (Lat *flagellare*, to whip). Voluntary flagellation, as a form of exalted devotion, occurs in almost all religions. According to Herodotus, it was the custom of the ancient Egyptians to beat themselves during the annual festival in honour of Isis In Sparta children were flogged before the altar of Artemis Orthia till the blood flowed At Alea, in the Peloponnese, women were flogged in the temple of Dionysus. In the Christian church flagellation was originally a punishment, and was practised not only by parents and schoolmasters, but also by bishops, who thus corrected offending priests and monks. Gradually, however, voluntary flagellation appeared in the *libri poenitentiales* as a very efficacious means of penance In the 11th century this new form of devotion was extolled by some of the most ardent reformers in the monastic houses of the west. The early Franciscans flagellated themselves with characteristic rigour, and it is no matter of surprise to find the Franciscan, St. Anthony of Padua, preaching the praises of this means of penance. But the flagellant fraternities were the result of spontaneous popular movements, the real sources of which are not easily analysed. About 1259 these fraternities were distributed over the greater part of northern Italy. The contagion spread very rapidly, extending as far as the Rhine provinces, and, across Germany, into Bohemia. Day

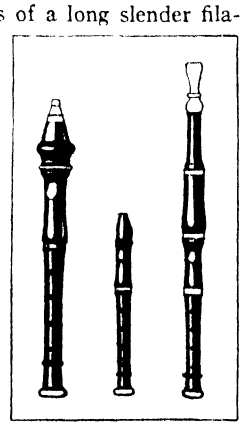
and night, long processions of all classes and ages, headed by priests carrying crosses and banners, perambulated the streets in double file, reciting prayers and drawing the blood from their bodies with leathern thongs The magistrates in some of the Italian towns expelled the flagellants with threats, and for a time the sect disappeared The disorders of the 14th century, however, the numerous earthquakes, and the Black Death, which had spread over the greater part of Europe, produced a condition of ferment and mystic fever which was very favourable to a recrudescence of morbid forms of devotion The flagellants reappeared from eastern Europe, and, in spite of discouragement, spread to the Rhine, and penetrated as far as Holland and Flanders A band of 100 marched from Basle to Avignon to the court of Pope Clement VI who saw in the movement a menace to the priesthood, and in October 1349 published a bull commanding the bishops and inquisitors to stamp out the growing heresy In pursuance of the pope's orders numbers of the sectaries perished at the stake or in the cells of the inquisitors and the episcopal justices In 1389 the leader of a flagellant band in Italy called the *bianchi* was burned by order of the pope, and his following dispersed John Gerson insisted that the flagellants were creating a cultus and ritual of their own in antagonism to those of the church This view was borne out by the facts, in Germany in 1414, when there was a recrudescence of the epidemic of flagellation which was preached as the only way to salvation It was suppressed by the Inquisition, but held its ground among the lower ranks of Catholic piety In the 16th century it subsisted in Italy, Spain and southern France Henry III of France met with it in Provence, and attempted to acclimatize it at Paris Flagellation was occasionally practised as a means of salvation by certain Jansenist convulsionaries in the 18th century In 1820 a band of flagellants appeared during a procession at Lisbon, and in the Latin countries, at the season of great festivals, one may still see brotherhoods of penitents flagellating themselves before the assembled faithful

BIBLIOGRAPHY —For an account of flagellation in antiquity *see* S Reinach, *Cultes, mythes et religions* (vol i pp 173–183, 1906), which contains a bibliography of the subject Also Rufus M Jones, article "Flagellants" in Hastings' *Encyclopaedia of Religion and Ethics*, vol vi 49, and J A MacCullough, article "Austeries" (§ 5), ibid vol ii 229, H Haupt, article "Geisselung, Kirchliche" in Herzog-Hauck, *Realencyklopadie*, vol vi 432 ff , W M Cooper, *Flagellation and the Flagellants* (1908)

FLAGELLATA, single-celled animals (Protozoa) characterized by the possession of *flagella*—delicate, hair-like, protoplasmic processes which serve as organs of locomotion (functioning similarly to an oar or to the propeller of an aeroplane) For further particulars *see* PROTOZOA

FLAGELLATION: *see* MUTILATIONS AND DEFORMATIONS

FLAGELLUM, an organ attached to various small animals for the purpose of locomotion It consists of a long slender filament, anterior in progression, which causes the body to be drawn along by an undulating movement These vibratile processes come from a distinct basal granula, may be either one or few in number and can move independently of each other In cases where the body is fixed, the flagellum causes a current towards it by which the animal obtains its food It also acts as a propeller like the tail of a fish by posterior movement See CYTOLOGY and PROTOZOA



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TYPES OF FLAGEOLET

FLAGEOLET, in music, a kind of *flûte-à-bec* with a new fingering, invented in France at the end of the 16th century, and in vogue in England from the end of the 17th to the beginning of the 19th century The flageolet differed from the recorder in that it had four finger-holes in front and two thumb-holes at the back instead of seven finger-holes in front and one thumb-hole at the back. This fingering has survived in the French flageolet still used in the provinces of France in small orchestras and for dance music

FLAGG, ERNEST (1857–), American architect, was born at Brooklyn (N Y), on Feb 6, 1857 He studied at the École des Beaux-Arts, Paris, and in 1891 began to practise as an architect in New York city He designed St. Luke's hospital and the Singer building, New York city, whose tower (612ft) was the highest commercial structure in America at the time of its erection (1908). Other public buildings he designed are the Corcoran Art gallery, Washington (D.C), and the U S Naval academy, Annapolis (Md) He has also designed many private residences and has lately devoted much attention to the problem of the cheap but durable small house In this connection he has devised new construction methods He has written *Small Houses —Their Economic Design and Construction* (1922)

FLAGSTAFF, a city of northern Arizona, U S A , at the foot of the San Francisco Peaks, 6,896ft above sea-level, the county seat of Coconino county It is on the National Old Trails highway and also Number 89, and on the main line of the Santa Fe railway, and has a municipal airport The population was 3,186 in 1920 Coconino is the largest county in the United States, more than twice the size of Massachusetts Nearly 90% of its 18,623sq m is under Government supervision, in national forests, parks, monuments and Indian reservations It contains the largest stand of virgin yellow pine left in the country, and vast deposits of coal and oil, not yet commercially exploited On its ranges graze 90,000 cattle and 250,000 sheep Around Flagstaff dry farming is a profitable industry, with potatoes for the leading crop The city has large lumber mills It is headquarters for the Coconino National Forest Service, and is the seat of the Northern Arizona State teachers college, the Lowell observatory (where Percival Lowell [*q v*] made his studies of Mars), the South-western experiment station of the forestry service and a large sanatorium for tubercular children Within easy reach by motor is an extraordinary variety of interesting places, including the Grand Canyon, petrified forests, the Painted Desert, Rainbow and Tonto natural bridges, Meteorite mountain, Mormon lake and Lake Mary, Hopi and Navajo Indian reservations, Montezuma castle (a large, well-preserved cliff dwelling), and the Wupatki ruins of ancient Indian pueblos Flagstaff took its name from a lofty pine which was stripped of its branches to serve as a pole for the United States flag by a party of engineers who camped here in July 4, 1876

FLAHAUT DE LA BILLARDERIE, AUGUSTE CHARLES JOSEPH, COMTE DE (1785–1870), French general and statesman, son of Alexandre Sébastien de Flahaut de la Billarderie, comte de Flahaut, beheaded at Arras in February 1793, and his wife Adélaide Filleul, afterwards Mme de Souza (*q v*), was born in Paris on April 21, 1785 Charles de Flahaut was generally recognized to be the offspring of his mother's liaison with Talleyrand, with whom he was closely connected throughout his life His mother took him with her into exile in 1792, and they remained abroad until 1798 He entered the army as a volunteer in 1800, and received his commission after the battle of Marengo. He became aide-de-camp to Murat, and was wounded at Landbach in 1805 At Warsaw he met Anne Poniatowski, Countess Potocka, with whom he became intimate He served at Friedland (1807), in Spain (1808), and then in Germany Meanwhile the Countess Potocka had established herself in Paris, but Charles de Flahaut was now the lover of Hortense de Beauharnais, queen of Holland by whom he had a son, known later as the duc de Morny (*q v*) Flahaut fought in the Russian campaign of 1812, and in 1813 became general of brigade, aide-de-camp to the emperor, and, after the battle of Leipzig, general of division After Napoleon's abdication in 1814 he was placed on the retired list The Hundred Days brought him into active service again A mission to Vienna to secure the return of Marie Louise resulted in failure. He was saved from exile by Talleyrand's influence, but was placed under police surveillance Presently he settled in England, where he married Margaret Elphinstone, afterward Baroness Keith in her own right The French ambassador opposed the marriage, and Flahaut resigned his commission His eldest daughter, Emily Jane, married Henry, 4th marquess of Lansdowne The Flahauts returned to France in

1827, and in 1830 Flahaut was made a peer of France He remained intimately associated with Talleyrand's policy, and was, for a short time in 1831, ambassador at Berlin He was afterwards attached to the household of the duke of Orleans, and in 1841 was sent as ambassador to Vienna, where he remained until 1848, when he was dismissed and retired from the army After the *coup d'état* of 1851 he was again actively employed, and from 1860 to 1862 was ambassador at the court of St James He died on Sept 1, 1870 The comte de Flahaut is perhaps better remembered for his exploits in gallantry, and the elegant manners in which he had been carefully trained by his mother, than for his public services, which were not, however, so inconsiderable as they have sometimes been represented to be

See A. de Haricourt, *Madame de Souza et sa famille* (1907)

FLAIL, a farm hand-implement formerly used for threshing corn It consists of a short thick club called a "swingle" or "swipple" attached by a rope or leather thong to a wooden handle in such a manner as to enable it to swing freely The "flail" was a weapon used for military purposes in the middle ages It was made in the same way as a threshing-flail but much stronger and furnished with iron spikes It also took the form of a chain with a spiked iron ball at one end swinging free on a wooden or iron handle. This weapon was known as the "morning star" or "holy water sprinkler" During the panic over the Popish plot in England from 1678 to 1681, clubs, known as "Protestant flails," were carried by alarmed Protestants

FLAMBARD, RANULF, or RALPH (d 1128), bishop of Durham and chief minister of William Rufus, was the son of a Norman parish priest Migrating at an early age to England, the young Ranulf entered the chancery of William I He was disliked by the barons, who nicknamed him Flambard in reference to his talents as a mischief-maker He appears to have played an important part in the compilation of the Domesday survey, in which he is mentioned as a clerk by profession, and as holding land both in Hants and Oxfordshire Before the death of the old king he became chaplain to Maurice, bishop of London, but early in the next reign Ranulf returned to the royal service He is usually described as the chaplain of Rufus, he seems in that capacity to have been the head of the chancery and the custodian of the great seal But he is also called treasurer, and there can be no doubt that he was an agent of the extortion from which all classes suffered between 1087 and 1100 He profited largely by the tyranny of Rufus, farming for the king a large proportion of the ecclesiastical preferments which were illegally kept vacant, and obtaining for himself the wealthy see of Durham (1099) On the accession of Henry I, he was imprisoned, but escaped from the Tower of London A popular legend represents the bishop as descending from the window of his cell by a rope which friends had conveyed to him in a cask of wine He took refuge with Robert Curthose in Normandy, and received the administration of the see of Lisieux After the victory of Tinchebrai (1106) the bishop made his peace with Henry, and was allowed to return to Durham where he passed the remainder of his life His private life created much scandal, but he distinguished himself, even among the bishops of that age, as a builder and a pious founder. He all but completed the cathedral which his predecessor, William of St Carilef, had begun, fortified Durham; built Norham Castle; founded the priory of Mottisfout and endowed the college of Christchurch, Hampshire As a politician he ended his career with his submission to Henry. Ranulf died on Sept 5, 1128

See Orderic Vitalis, *Historia ecclesiastica*, vols iii and iv. (edit le Prévost, Paris, 1845); the first continuation of Symeon's *Historia Ecclesiae Dunelmensis* (Rolls ed, 1882), William of Malmesbury in the *Gesta pontificum* (Rolls ed, 1870), and the *Peterborough Chronicle* (Rolls ed, 1861) Of modern writers E A Freeman in his *William Rufus* (1882) gives the fullest account.

FLAMBOROUGH HEAD, a promontory on the Yorkshire coast, England, between the Filey and Bridlington bays of the North sea It is a lofty chalk headland The cliffs of the Head are pierced with caverns and fringed with rocks of fantastic outline. Sea-birds breed abundantly on the cliffs. A lighthouse marks the point, in 54° 7′ N, 0° 5′ W

FLAMBOYANT STYLE, in architecture, the last phase of the Gothic in France, characterized by the dominance in tracery of the line of double curvature, known as the "ogee curve," which generates the flame-like forms that give the name flamboyant to the style Flamboyant forms begin to appear in the late 14th century, as in one of the chapels of Amiens cathedral (1373), by the middle of the 15th century they were almost universal Borrowing from the English the idea of the reversed curve and of flowing tracery (*see* DECORATED PERIOD and GOTHIC ARCHITECTURE), the French developed them with greater freedom The best flamboyant tracery is often simpler and more direct than the English curvilinear work, grace of form and attenuation of line, a restrained use of cusps and generally slim proportions, are the aims sought In the 16th century, tracery returned to lower and more stumpy proportions with a great use of round and elliptical arches and circular curves, with frequent barrenness and lack of invention All work of the flamboyant period is characterized by lavishness of detail, multiplication of miniature niches, fantastic and elaborate crockets, pierced, traceried gables, curved-sided pinnacles and the practice of intersecting and interpenetrating mouldings of different profiles, as, for instance, a cornice and a raking gable mould Double and triple bases are frequent, the upper bases being penetrated by projecting shafts which have their own bases below Among the outstanding examples of the style are the church of St Maclou at Rouen (begun 1432), the west front of Rouen cathedral (1481–92), the northern spire of Chartres cathedral (1512), St Wulfram at Abbeville (1480), the south transept of Beauvais cathedral (1500–48) and the Palais de Justice at Rouen (*c* 1500) (T F H)

FLAME. From the earliest times the phenomenon of flame became invested with a peculiar element of mystery, and little progress was made in elucidating it until a late stage in the history of human knowledge To people unable to discriminate between things material and immaterial, flame seemed to be a radiant nothingness, a sort of all-devouring element of divine or diabolic significance At last the prosaic idea gained currency that flame was merely burning smoke Newton, among others, expressed this view The fact that when the flames of oil lamps and candles are extinguished a visible smoke trails in the region just where the flame was, and that this smoke can be lit to re-establish the flame, no doubt gave rise to the idea that flame is burning smoke Very little alteration has to be made in this conclusion in order to render the modern view, namely, that flame is burning gas The visible smoke of any extinguished flame we now know to be due to the fact that the hot invisible vapour (gas) of the liquid or solid combustible which was feeding the flame gets chilled, and so produces a visible cloud of little drops or solid particles, just as invisible water vapour does when it is chilled A flame may contain solid matter as well as its burning gas, but it is the burning gas that is the basis of the flame No doubt the term flame is occasionally used for gases put into a state of glow by some other stimulus than that of the burning process, but in this article we shall use the term flame in the ordinary sense and in reference to the burning of coal-gas and other common combustibles

The fact that flame is burning gas leads at once to the question of what is meant by "burning," or by the process of combustion It will suffice here to say that by combustion is usually meant a chemical action between two different substances A and B, in which a large amount of heat is evolved owing to the union of A with B to form a compound AB, or, if A and B are composite bodies, to some exchange of chemical partnership The heat so generated gives hotness to the gases of the flame, and it might seem also that the light of the flame would be due to the glow of the hot gases The explanation of the light of flames, as will be seen later, is, however, not quite so simple The fact that a flame is ordinarily the outcome of a chemical transaction between two gaseous substances A and B gives us the key to explaining the structure of flames In the first place A and B are equal partners in the transaction, but practically all terrestrial flames are transactions in which the oxygen of the air takes part; thus we get flames by leading other gases into our oxygenated atmosphere and lighting them where they enter It is easily conceivable that on another

globe what we on earth call combustible gases might form the atmosphere, and in that case flames would be obtained by leading in oxygen or air and igniting it as it entered such an atmosphere. This inversion of the ordinary way of getting a gas flame can easily be shown in a well-known laboratory experiment. It will be seen then that the terms "combustible" and "supporter of combustion" are in some degree misleading, as they suggest a difference of function

In order that we may have a flame the gas A and the gas B have to become admixed and the temperature has to be raised until ignition takes place The mixing may occur spontaneously, as when one gas streams into the other, or by the use of some special device The temperature is usually raised not gradually but by the use of a match or a spark much hotter than is really necessary for the purpose It is true of all such gas mixtures that there are limits to the proportions within which the mixture will burn and also that the rate of burning will vary according to the proportions of the mixture These facts are now well-known among those who drive motor-vehicles In the case of average coal-gas and air at ordinary atmospheric temperature and pressure, mixtures of the two will not inflame if the proportion of coal gas is below about 7% or above 30% The maximum rapidity of burning—a travel of the flame through the stationary mixture at a rate rather more than one metre per second—is found in a mixture of about 18% of gas and 82% of air

Simple Flames.—With the foregoing principles in mind, we may begin by supposing a flame of the simplest kind, where a gas A is led into gas B through an ordinary pipe of circular cross section without the addition of any special burner At the low pressures (3 or 4 in water gauge) at which gas is usually led into our houses, it will flow out of such a pipe as a cylindrical column, which, rising vertically, becomes mixed with air on its outer surface If now we apply a light we may expect flame to set in wherever A and B have become mixed in proportions which lie within the limits of inflammability Considering then the column of ascending gas just where it issues from the tube and is mixing with air on its margin, we may, on applying a light, expect to have a thin ring of flame round it and within this the gas A (which we will assume to be the one being led) almost unmixed with B This unmixed central shaft of gas is however moving upwards so that in its turn its margin gets mixed with B and burns, and so the process will go on until the ascending column of gas gets burned through The effect will be in a way like pulling out the successive tubes of a telescope, except that there will be no sudden breaks in the rate of thinning of the column. The fact that the central part of the column of gas has not been subject to friction against the walls of the pipe, and is therefore moving upwards more rapidly than the rest of the gas, must also be remembered A flame conceived in the foregoing way would then be a hollow conical sheet of burning gases—the sheet being thin and the gas inside unburnt a flame so produced would therefore be hollow

The fact that flames—at any rate large flames—are hollow was discovered long since and is strongly emphasized by Francis Bacon who, by thrusting an arrow into a flame and finding it charred only where it passed through the edges, concluded "that flame burneth more violently towards the sides than in the midst; and, which is more, that heat or fire is not violent or furious but where it is checked and pent" Proofs of the hollowness of such flames and their content of unburned gas are easily made A flame of carbon monoxide gives a uniform blue cone of flame, and if a match head be passed through the cone to the middle, the stick of the match will catch fire whilst the head remains for a considerable time unignited A simpler experiment is to bring a card horizontally down on to a candle flame until it nearly touches the wick; it will be found that the upper side of the card shows a charred ring. Another simple proof is to lead off the gas from the middle of the flame by an inclined glass tube and to light it at the projecting end The appearance of some flames, however, is deceptive The flat flame given by the old fashioned gas-burner consists of thin sheets of flame, whose hollowness can be demonstrated without much difficulty. The bright yellow part of a candle flame looks as if it went right through the flame but is really an exceedingly thin sheet.

Apart from the question of shape, the actual appearance of a flame varies according to the nature of the gases A and B that are used in producing it and the variety of chemical changes taking place In the flame of hydrogen we have no reason to believe that there is any difference in the chemical processes taking place in different parts of the flame. Hydrogen and the oxygen of the air are throughout entering into chemical union to form water. With carbon monoxide the same chemical transaction —the union of the gas with oxygen to form carbon dioxide—is taking place everywhere in the flame. These flames therefore have the appearance of uniformity. But in the case of combustible gases of a more complex character, where the process of burning may take place in stages and where incidental chemical changes ensue, the flame loses its uniformity and becomes differentiated into distinct zones. The flame of coal gas, oil, tallow, wood, paper, string and in fact of all ordinary combustible bodies shows a differentiated structure. There is a distinctly blue part of no great luminosity and a distinctly yellow part of considerable brightness, to which the light is mainly due. The fact that the combustible substance in these cases contains at least two combustible elements, carbon and hydrogen, the first of which can burn in two stages, and the further fact that the gases enclosed in these flames undergo chemical changes when subject to a mere baking process from the burning walls, account, as we shall see, for the complexity in the structure of these flames.

Air-fed Flames.—A second type of flame is produced when a combustible gas is mixed by some special device with the air or oxygen necessary for its complete combustion and then ignited This is achieved by the use of a "blowpipe" or "blast-burner", a jet of air is sent into the combustible gas as it escapes from the wick or burner The burning is accordingly completed much more quickly than when an unmixed combustible gas has to wander into the air in order gradually to find its oxygen; and so the region of combustion becomes also much smaller and much hotter. The flame in this case is burning through and through and does not consist of a mere sheet with unburned gas within Its structure is very simple, the velocity of the gaseous stream makes the flame narrow, long, and pointed, and there is only a small conical region within it where the velocity of the mixture is so great that the flame cannot travel against it

In using the blowpipe for producing a hot flame we force in just enough air for complete combustion; more air would only reduce the temperature Less air would do the same, but it also gives a character to the flame which is desired when the blowpipe is being used for some special chemical or industrial purposes When the blowpipe supplies oxygen instead of air we get rid of the diluting atmospheric nitrogen, which has four times the bulk of the oxygen and takes no part in the combustion The flame therefore becomes still smaller and much hotter, the combustion being, as it were, still further condensed The hottest flame we can produce on a practical scale is that produced by burning with oxygen in a blowpipe the gas acetylene (*q.v.*), and this flame is now largely used as a source of intense heat for welding and cutting iron and steel

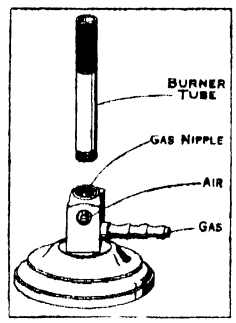


FIG. 1.

A third type of flame is that associated with the name of the great German chemist, R W Bunsen, who in 1855 devised his well-known burner for use in chemical laboratories. The object was to mix coal-gas before it issued from the burner with sufficient air, not for complete combustion, but enough to make it burn blue. The construction is shown in fig. 1, which is reproduced from Bunsen's original publication. The gas is led by a side-tube to the burner where it issues through a small punctured nipple into an upright tube. At the base are circular openings which in the usual form of burner can be varied in size or altogether closed by turning a metal collar. The passage of the jet of gas past these openings sucks in air, and if a light is applied at the top of the

TYPES OF FLAME STRUCTURE

1 Simplest type of flame a hollow conical sheet of burning gases, nearly invisible, and very hot showing almost complete combustion This flame is produced by carbon monoxide issuing into the air through a tube, lit at the orifice 2 Candle flame, a shell of flame containing glowing solid particles of carbon which produce the bright glow The blue "calyx" at base and bluish mantle surrounding flame are hardly visible in the photograph 3. Blowpipe flame, a sharp conical flame burning throughout, due to a jet of air sent into coal gas as it escapes from burner The pointed shape makes this flame useful in many ways, principally for soldering welding, cutting metals, brazing, etc 4–8 Bunsen flame consisting of two conical sheets When adjusted, the outer and hotter flame is pale blue, the inner flame yellowish red. Figures 4 to 8 show variations of flame when the same amount of gas is used but the amount of air is increased until it is about half that required for complete combustion

burner a flame is given which, as the saying is, "burns blue" and does not blacken objects to which it is applied. This principle has been applied to the construction of many different shapes of burners used with the gas mantle for lighting, and for innumerable purposes of heating in gas fires, cookers, furnaces and a great variety of scientific and industrial appliances They are often called "atmospheric burners" to distinguish them from burners where the gas is burned without air being admitted to it in the burner tube.

In burners of the Bunsen type it will be noticed that when the air-ports are closed the flame has the same character as that of a candle, while when they are gradually opened the flame loses its yellow luminosity and soon becomes wholly "blue" This blue flame does not at first show a very clearly differentiated structure, but as the air-ports are opened more widely the flame acquires a plainly evident double structure There is a distinct inner cone of flame, and outside this a sheet of flame of a slightly bulged conical form, with further increase of air the inner cone becomes smaller, more sharply defined and greener in colour If the air supply is carried beyond this stage the inner cone shows signs of instability in a tendency to retreat into the burner-tube and in the end will actually do so, and passing down the tube will light the gas at the nipple. The burner is now out of order and the gas is burning within the tube with an amount of air insufficient for its complete combustion. There may or may not be a second flame at the top of the tube where the combustion is completed If there is not, the half-burned gas escapes and the malodorous and poisonous constituents contaminate the surrounding air When the burner is in this condition the gas must be turned off and only re-lighted after the air-ports have been adjusted to give a smaller supply of air. The retreat of the inner cone down the burner tube ("lighting back," or "back-firing") in the case of long or large burners such as those of an ill-adjusted gas fire has the character of a small explosion. The principles of the Bunsen burner and the characteristics of the flames of atmospheric burners can be readily understood by use of the "Flame Separator," shown in fig 2.

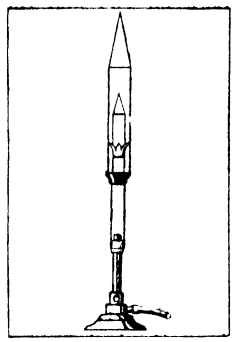


FIG 2

This apparatus consists of two tubes (best made of silica ware) arranged telescopically so that the wider tube will easily slide, gas-tight, up and down the narrower one When the separator is fixed to a Bunsen burner with closed airports and the gas is ignited, a luminous flame is obtained, and if the ports are gradually opened this acquires a clearly two-coned structure With further air supply the rate of inflammation of the mixture will eventually reach a state at which it is greater than the rate of up-flow of gases in the wider tube. The inner cone accordingly travels downwards against the stream until it reaches the mouth of the narrower tube, where the gas stream is more rapid, and there will remain if the air supply be kept steady The outer cone remains at the mouth of the wider tube. On sliding down the wider tube until its mouth is below that of the narrower one, the normal two-coned flame is established at the mouth of the narrower tube.

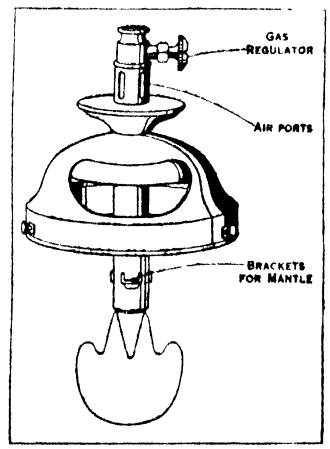
It is clear that in the atmospheric burner combustion takes place in two stages. If more air be admitted to the flame in the stage last described, the rate of inflammation will soon exceed that of the upward velocity of the gases and the inner cone will enter the narrow tube, travel down it, and ignite the gas at the nipple. A further phase of the flame cannot be obtained with the ordinary Bunsen burner, but by supplying air under pressure and gas by means of a T-piece to the separator the supply of air may be made greater than is necessary for complete combustion. The rate of travel of flame through the mixture then begins to fall and reaches a point at which it is no greater than the rate of upward flow of the gases. At this point a stable flame may be obtained at the mouth of the separator, in which complete combustion is taking place independently of the outside air. The flame is therefore single-coned and of the blowpipe type. A further supply of air merely dilutes and cools the flame until it is finally extinguished. The first phases of flame are illustrated in figs 4–8 of the Plate.

Much ingenuity has been expended on the construction of atmospheric burners so as to adapt them for special uses, and several types have become well-known by the names of their inventors The aim may be to adapt the burner for use in lighting with a Welsbach mantle, in which case the hottest possible shell of flame in which the mantle can be bathed is desired The best known upright burner in this connection is known as the "Kern," but it has been largely superseded by the inverted burner in which the flame is projected down into a mantle (fig. 3) By this inversion a higher duty is obtained from the gas and the inconvenience of any shadow of the burner is avoided. In designing burners for heating purposes, as for a gas fire, care has to be taken to obtain a set of noiseless flames, which are of the same dimensions and adjustable so as to give the right degree of aeration. The fire-clay "fuel" fits over the flames so as to be bathed in flame without actual contact with the inner cone.

It is important to remember that in an atmospheric burner consuming coal-gas the region between the two cones of the flame is rich in carbon monoxide, and that if in the use of such flames there is any intrusion into the inner cone by the object which is being heated, there is liability of the escape of carbon monoxide, so that if there is no flue provided there may in such circumstances be very undesirable and dangerous contamination of the air in an apartment

The Source of Light in Flames.—As already stated, the light of flames may come either from glowing gas alone or from this with the added glow of solid particles occurring in the flame. The light from the glowing gas alone is in the most familiar cases, such as hydrogen and carbon monoxide, not intense. It must suffice here to say that it may be regarded as a flash accompanying chemical action In the flames of common combustibles containing carbon, the bright yellow glow was shown by Humphry Davy to be due to "the deposition of solid charcoal which, first by its ignition and then by its combustion, increases in a high degree the intensity of the light" This solid charcoal in almost infinitely fine particles is, according to modern views, separated in the flame by a very simple process

In a candle flame the combustible gas is supplied by the wick which brings up from the little pool at the top of the candle a steady supply of melted paraffin wax The wick being in the form of a flat band bends over so that its tip gets into the air and burns with a red glow It thus remains constant in size and does not require the periodical snuffing which was one of the troubles of the old straight-wicked tallow candles In lighting a candle the heat of the match flame melts and vaporizes a little of the paraffin and the flame thus produced continues to maintain a pool of melted wax at the top of the candle The flame of the candle exhibits three distinct regions; within the flame is what we may call "candle-gas" streaming from the wick and becoming mixed on its outer borders with the atmospheric air When the mixture has attained certain proportions it becomes ignitable; this occurs long before the admixture of air is sufficient for complete combustion.



BY COURTESY OF THE WELSBACH LIGHT CO.

FIG. 3

The region where the candle gas is first ignited is clearly evident at the base of the flame where a thin sheet of bright blue colour is situated like the calyx of a flower, it shades off about a quarter of the way up the flame. Outside this bright blue calyx there will be seen a fainter region of flame, and in this the incompletely

burned gas is finding air sufficient for the completion of the burning process This faint sheath or mantle extends round the whole flame from top to bottom It is not easy to see it all in a candle unless the glare of the yellow part is masked by a screen, but it can usually be well seen in the flame of a piece of string These two parts of a candle flame really correspond to the two cones of a Bunsen flame, the combustible gas is burning in two stages or in two sheets, which are quite close together in the case of the candle Within this "blue burning" part of the flame is candle-gas streaming from the wick and being subject to a roasting process as it ascends Now it may be said generally of carbonaceous gases that when they are strongly heated in absence of air they deposit charcoal, so that in this we find a reason why, as the candle-gas gets heated within the blue burning walls of flame, it begins to yield particles of carbon Not only are these particles hot but as soon as they reach enough air they burn with a bright glow, and thus we have a sheet of bright yellow luminosity which shows a maximum glow about half-way up the flame Where the particles are sparse the glow is feeble, where they are superabundant, as may be the case near the tip of the flame, the glow is dull and merely ruddy, or indeed some of the particles may escape unburned as smoke

This explanation of the structure of a candle flame may be verified by simple observations of a small coal-gas flame as it is turned down until the yellow part of the flame has entirely disappeared, or when, before the yellow part has disappeared, a ring of wire is placed in the blue walls The cooling effect at once suppresses the separation of carbon and the yellow patch of light disappears (*See* also COMBUSTION, and SPECTROSCOPY)

(A SM)

FLAMEN, from *flare,* "to blow up" the altar fire, a Roman sacrificial priest The flamens were subject to the pontifex maximus and were consecrated to the service of some particular deity The highest in rank were the *flamen Dialis, flamen martialis* and *flamen quirinalis,* who were always patricians When the number of flamens was raised from three to 15, those already mentioned were entitled *maiores,* the other 12, called *minores,* were chosen from the *plebs* Towards the end of the republic the number of the lesser flamens diminished The flamens were elected for life, but they might be compelled to resign for neglect of duty, or on the occurrence of some ill-omened event during the performance of their rites The characteristic dress of the flamens was the *apex,* a white conical cap, the *laena* or mantle, and a laurel wreath The official insignia of the *flamen Dialis* (of Jupiter), the highest of these priests, were the white cap (*pileus, albogalerus*), at the top of which was an olive branch and a woollen thread, the *laena,* a thick woollen *toga praetexta* woven by his wife, the sacrificial knife, and a rod to keep the people from him when on his way to offer sacrifice He was entitled to a seat in the senate and a curule chair. The sight of fetters being forbidden him, his house was a sanctuary for a prisoner, and a criminal who met him in the street was respited He was not allowed to leave the city for a single night, to ride or even touch a horse, to swear an oath, to look at an army, to touch anything unclean, or to look upon people working His marriage, performed with the ceremonies of *confarreatio* (*q v*), was dissoluble only by death, and on the death of his wife (called *flaminica Dialis*) he was obliged to resign his office. The *flaminica Dialis* assisted her husband at the sacrifices and other religious duties which he performed The main duty of the flamens was the offering of daily sacrifices, on Oct. 1 the three *maiores* drove to the Capitol and sacrificed to *Fides Publica* (the Honour of the People)

Distinct from the above were the *flamen curialis,* who assisted the *curio* with the religious affairs of each *curia* (*q v*), the flamens of various sacerdotal corporations, such as the Arval Brothers (*q v*), and the *flamen Augustalis,* who superintended the worship of the emperor in the provinces

See the exhaustive article by C Jullian in Daremberg and Saglio, *Dictionnaire des antiquités;* also J. E Sandys, *Companion to Latin Studies* (1921).

FLAMETHROWER. This weapon was first used by the Germans in the winter of 1914–15, and with marked success in the Bois d'Avocourt (Verdun) on Feb 26, 1915 (Ger. *Flammenwerfer*). The French followed in their use The British used them on the Somme and in the Zeebrugge attack, St George's Day, 1918 The American Expeditionary Force did not use them at all Their value was chiefly moral.

Structure.—A flamethrower consists of (*a*) the container filled with some mixture of heavy and light oils, (*b*) the strong walled vessel filled with air, nitrogen, CO_2, etc, under high pressure, and (*c*) a discharge tube, with nozzle and, in most cases, an ignition device Between (*a*) and (*b*) is a reducing valve, and between (*b*) and the nozzle a firing valve or trigger Flamethrowers were short-range weapons, and were of two types, the heavy and the portable The heavy type attained an extreme range of 134yd (British model), while with the portable British model a range of 45yd was attained, and maintained some 15 to 18 shots from a single filling of three gallons The most satisfactory propellant was found to be nitrogen—either the pure product or a "deoxygenated air" produced in one field by a mobile plant (*See* also GREEK FIRE)

FLAMINGO, the name given to birds of the genus *Phoenicopterus* The common flamingo, *P roseus,* is in both sexes white in colour, with a rosy tinge above, the wings scarlet, bordered with black (as in all species) The legs of all these birds are very long, the feet webbed, the neck long and the beak bent in the middle *P roseus* ranges from the Cape Verde Islands to India and Ceylon, reaching Lake Baikal in the north and Madagascar in the south It is replaced in South Africa by *P minor* A third species, *P ruber,* light vermilion in colour, inhabits America from Florida to Para, while two other species also occur in South America Fossil flamingoes have been found in the Lower Miocene of France and the Pliocene of Oregon and in later rocks

The food of these birds consists of the small aquatic invertebrates, living in the mud of lagoons, these the bird sifts out with its bill, the roomy lower jaw being furnished with numerous lamellae The head is held upside down when feeding When flying the neck is stretched out straight The nest is built of mud, and is a conical structure rising a few inches out of the water—if the latter subsequently sinks, it may be much higher One or two chalky white eggs are laid and the young have a straight bill, short legs and white down The bird sits in the normal way, with the legs doubled up under it

FLAMINIA, VIA, the chief ancient northward high road of Italy, made by C Flaminius (220 B C) Augustus, when he instituted a general restoration of the roads of Italy, which he assigned for the purpose among various senators, reserved the Flaminia for himself, and rebuilt all the bridges except the Pons Mulvius, by which it crosses the Tiber, 2 m N of Rome (built by M Scaurus in 109 B C) and an unknown Pons Minucius Triumphal arches were erected in his honour on the former bridge and at Ariminum, the latter of which is still preserved Vespasian constructed a new tunnel through the pass of Intercisa, the modern Furlo, in A D 77 (*see* CALES), and Trajan repaired several bridges

The course of the Via Flaminia is due north from Rome, through difficult country, passing slightly east of the site of the Etruscan Falerii, through Ocriculi and Narnia Here it crossed the Nar by a splendid four-arched bridge to which Martial alludes, one arch of which and all the piers are still standing, and went on, followed at first by the modern road to Sangemini which passes over two finely preserved ancient bridges, past Carsulae to Mevania, and thence to Forum Flaminii Later on a more circuitous route from Narnia to Forum Flaminii was adopted, passing by Interamna, Spoletium and Fulginium (from which a branch diverged to Perusia), and increasing the distance by 6 m The road thence went on to Nuceria and Helvillum, and then crossed the main ridge of the Apennines, a temple of Jupiter Apenninus standing at the summit of the pass Thence it descended to Cales (where it turned northeast), and through the pass of Intercisa to Forum Sempronii (Fossombrone) and Forum Fortunae, where it reached the coast of the Adriatic Thence it ran northwest through Pisaurum to Ariminum The total distance from Rome was 209 m by the older road and 215 by the newer. The road gave its name to a juridical district of Italy from the 2nd century A.D. onwards,

the former territory of the Senones, which was at first associated with Umbria (with which indeed under Augustus it had formed the sixth region of Italy), but which after Constantine was always administered with Picenum.

See T. Ashby and R. A. L. Fell in *Journal of Roman Studies*, xi. (1921), 125 *seq.* for a full account of this road. (T. A.)

FLAMININUS, TITUS QUINCTIUS (*c.* 228–174 B.C.), Roman general and statesman. He was military tribune under M. Claudius Marcellus, the conqueror of Syracuse. In 199 he was quaestor, and consul the next year.

Flamininus was one of the first and most successful of the rising school of Roman statesmen, the opponents of the narrow patriotism of which Cato was the type, the disciples of Greek culture, and the advocates of a wide imperial policy. His personal charm, his knowledge of men, and his intimate knowledge of Greek, all marked him out as the fittest representative of Rome in the East. Accordingly, the province of Macedonia, and the conduct of the war with Philip V. of Macedon were assigned to him. Flamininus modified both the policy and tactics of his predecessors. He spent most of his first year in gaining control of Greece by diplomacy and force. Hostilities were renewed in the spring of 197, and Flamininus took the field supported by nearly the whole of Greece. At Cynoscephalae the Macedonian phalanx and the Roman legion met for the first time. It was a victory of superior tactics. The left wing of the Roman army was retiring before the Macedonian right led by Philip when Flamininus charged the left wing under Nicanor, which he caught still forming, and cut it to pieces. This defeat was turned into a general rout by a nameless tribune, who collected twenty companies and charged in the rear the victorious Macedonian phalanx. Macedonia was now at the mercy of Rome, but Flamininus contented himself with his previous demands. Philip lost all his foreign possessions, but retained his Macedonian kingdom almost entire. He was required to reduce his army, to give up all his decked ships except five, and to pay an indemnity of 1,000 talents (£244,000). At the Isthmian games a herald proclaimed to the assembled crowds that "the Roman people, and T. Quinctius their general, having conquered King Philip and the Macedonians, declare all the Greek states which had been subject to the king henceforward free and independent." Flamininus's last act before returning home was to ask the Achaeans to ransom the Italian captives who had been sold as slaves in Greece during the Hannibalic War. These, to the number of 1,200, were presented to him on the eve of his departure (spring, 194), and formed the chief ornament of his triumph.

In 192, on the rupture between the Romans and Antiochus III. the Great, Flamininus returned to Greece as the civil representative of Rome. He secured the wavering Achaean states, cemented the alliance with Philip, and contributed largely to the Roman victory at Thermopylae (191). In 183 he undertook an embassy to Prusias, king of Bithynia, to induce him to deliver up Hannibal, who forestalled his fate by taking poison. Nothing more is known of him.

There seems no doubt that Flamininus was actuated by a genuine love of Greece and its people. To attribute to him a Machiavellian policy, which foresaw the overthrow of Corinth fifty years later and the conversion of Achaea into a Roman province, is absurd. There is more force in the charge that his Hellenic sympathies prevented him from seeing the innate weakness and mutual jealousies of the Greek states of that period, whose only hope of peace and safety lay in submitting to the protectorate of the Roman republic.

His life has been written by Plutarch, and in modern times by F. D. Gerlach (1871), *see* also Mommsen, *Hist. of Rome* (Eng. tr.), bk. iii. chs. 8, 9.

FLAMINIUS, GAIUS, Roman statesman and general, of plebeian family. During his tribuneship (232 B.C.), in spite of the determined opposition of the senate and his own father, he carried a measure for distributing among the plebeians the *ager Gallicus Picenus*, an extensive tract of newly-acquired territory to the south of Ariminum (Cicero, *De senectute*, 4, *Brutus*, 14). In 223, when consul with P. Furius Philus, he took the field against the Gauls, who were said to have been roused to war by his agrarian law. Having crossed the Po to punish the Insubrians, he at first met with a severe check and was forced to capitulate. Reinforced by the Cenomani, he gained a decisive victory on the banks of the Addua. He had previously been recalled by the optimates, but ignored the order. The victory seems to have been due mainly to the admirable discipline and fighting qualities of the soldiers, the decree of the senate against his triumph was overborne by popular clamour. His name is further associated with two great works. He erected the Circus Flaminius on the Campus Martius, for the accommodation of the plebeians, and continued the military road from Rome to Ariminum, which had hitherto only reached as far as Spoletium (*see* FLAMINIA, VIA). He probably also instituted the "plebeian" games. In 218, as a leader of the democratic opposition, Flaminius was one of the chief promoters of the measure which debarred senators from commercial speculation (Livy xxi. 63). His support of this measure vastly increased the popularity of Flaminius with his own order, and secured his second election as consul in the following year (217), shortly after the defeat of T. Sempronius Longus at the Trebia. He hastened at once to Arretium, the termination of the western high road to the north, to protect the passes of the Apennines, but was defeated and killed at the battle of the Trasimene lake (*see* PUNIC WARS).

The testimony of Livy (xxi., xxii.) and Polybius (ii., iii.)—no friendly critics—shows that Flaminius was a man of ability, energy and probity. A popular and successful democratic leader, he cannot, however, be ranked among the great statesmen of the republic. As a general he was headstrong and self-sufficient and seems to have owed his victories chiefly to personal boldness favoured by good fortune. He was certainly to blame for the Trasimene disaster.

His son, GAIUS FLAMINIUS, was quaestor under P. Scipio Africanus the elder in Spain in 210, and took part in the capture of New Carthage. In 187 he was consul with M. Aemilius Lepidus, and built the branch of the Via Aemilia connecting Bononia with Arretium. In 181 he founded the colony of Aquileia.

FLAMMARION, NICOLAS CAMILLE (1842–1925), French astronomer, was born at Montigny-le-Roi, Haute Marne, on Feb. 25, 1842. He studied theology at Langre and Paris but was attracted to astronomy, and at the age of 16 he wrote a manuscript of 500 pages *Cosmologie Universelle;* this was the foundation of one of his later works, *La monde avant la création de l'homme*. He became a computer at the Paris observatory (1858–62) and at the Bureau des Longitudes (1862–65). He returned to the Paris observatory in 1867, where he took charge of a large telescope for the measurement of double stars. In 1882 an admirer, M. Méret, presented Flammarion with an estate and chateau at Juvisy, near Paris, here he installed and equipped a private observatory to which he added later a meteorological and climatological station.

Flammarion was interested in making observations with the telescope, he mapped Mars many times and made a number of observations on the moon. In 1879 he drew attention to the changes in colour of the crater Plato and explained them on the assumption of the presence of a primitive vegetation. He observed a number of double stars and computed their orbits, he also observed a number of cases of star drift.

More important, perhaps, than his actual observations was his effort to encourage and popularize the study of astronomy. Flammarion was a fine imaginative writer and he wrote a number of books which made astronomy interesting and intelligible to the lay reader. *L'Astronomie Populaire* (1879, translated into English by J. E. Gore, 1894) is the one best known to English readers; it gained the Montyon prize of the Paris Academie. Flammarion also edited a number of scientific and astronomic reviews. He began to edit *Cosmos* in 1862 and *Annuaire Astronomique*, which was an almanac and astronomical review, in 1864. He also edited *Siècle* and in 1882 he founded the review *L'Astronomie*. In addition to his writing Flammarion encouraged a number of amateur observers at Juvisy, and in 1887 founded the Société Astronomique de France. His services in popularizing interest in astron-

omy were acknowledged in 1922 by the award of Commander of the Legion of Honour Towards the end of his life Flammarion wrote on psychical research. He died in Paris on June 4, 1925.

His books have been translated into many languages and some have run into as many as 100 editions, amongst them are *Histoire du ciel* (1867), *Contemplations scientifiques* (1869), *Navigation aérienne* (1869), *L'Atmosphere* (1872), *La pluralité des mondes habités* (1875), *Les mondes imaginaires et les mondes réels* (1875); *Les Merveilles célestes* (1875), *Études sur l'astronomie* (9 vols, 1867–80), *Dieu dans la Nature* (1875). (E. Tr)

FLAMSTEED, JOHN (1646–1719), English astronomer, was born at Denby, near Derby, on Aug 19, 1646 He was educated at the free school of Derby, but was forced to leave in May 1662, because of bad health During his illness he began to study astronomy He read all the books on the subject that he could buy or borrow, observed a partial solar eclipse on Sept 12, 1662; and attempted the construction of measuring instruments A paper embodying his calculations of appulses to stars by the moon, which appeared in the *Philosophical Transactions* (iv 1099), signed *In Mathesi a sole fundes*, an anagram of "Johannes Flamsteedius," secured for him, from 1670, general scientific recognition

In 1670 he became acquainted with Isaac Newton at Cambridge, entered his name at Jesus college, and four years later, took a degree of M A by letters-patent An essay composed by him in 1673 on the true and apparent diameters of the planets furnished Newton with data for the third book of the *Principia*, and he fitted numerical elements to J Horrock's theory of the moon Flamsteed was appointed "astronomical observator" by a royal warrant dated March 4, 1675 He was presented by Lord North in 1684 to the living of Burstow in Surrey, his financial position was further improved by a small inheritance in 1688 He now ordered a mural arc, with which he began to observe systematically on Sept 12, 1689 (*see* Astronomy: *History*) The latter part of Flamsteed's life passed in a turmoil of controversy regarding the publication of his results He struggled to withhold them until they could be presented in a complete form, but they were urgently needed for the progress of science Newton led the movement for immediate communication, whence arose much ill-feeling between him and Flamsteed At last, in 1704, Prince George of Denmark undertook the cost of printing, and although the prince died in 1708 and in spite of Flamsteed's objections, the work was printed The *Historica coelestis*, embodying the first Greenwich star-catalogue, together with the mural arc observations made 1689–1705, was issued under Edmund Halley's editorship in 1712 Flamsteed denounced the production as surreptitious, he committed to the flames three hundred copies, and, in defiance of bodily infirmities, vigorously prosecuted his designs for the entire and adequate publication of his materials He died on Dec 31, 1719 The preparation of his monumental work, *Historia coelestis Britannica* (3 vols folio, 1725), was finished by his assistant, Joseph Crosthwait, aided by Abraham Sharp The first two volumes included the whole of Flamsteed's observations at Derby and Greenwich; the third contained the *British Catalogue* of nearly 3,000 stars A portrait of Flamsteed, painted by Thomas Gibson in 1712, hangs in the rooms of the Royal Society The extent and quality of his performance were the more remarkable considering his severe physical sufferings, his straitened means, and the antagonism to which he was exposed

Bibliography.—Francis Baily's *Account of the Rev. John Flamsteed* (1835) is the leading authority for his life It comprises an autobiographical narrative pieced together from various sources, a large collection of Flamsteed's letters, a revised and enlarged edition of the *British Catalogue*

See also *General Dictionary*, vol. v. (1737), from materials supplied by James Hodgson, Flamsteed's nephew-in-law, *Biographica Britannica*, iii (1750); J S Bailly, *Histoire de l'astronomie moderne*, ii (1779–82), J Granger, *Biographical History of England*, M Noble's Continuation, 3 vols (1806); J B J. Delambre, *Histoire de l'astronomie au XVIIIe siècle* (1827), G G Cunningham, *Lives of Eminent Englishmen* (1833–37), W. Whewell, *Flamsteed and Newton* (1836), *History of the Inductive Sciences* (1837); S Rigaud, *Correspondence of Scientific Men* (1841), R Grant, *History of Physical Astronomy* (1852); *Observatory*, vol. xv. (1877 etc).

FLANDERS (Flem. *Vlaanderen*), a name originally applied only to Bruges and neighbourhood but in the 8th and 9th centuries extended to the coast region from Calais to the Scheldt. In the middle ages this was divided into two parts, one looking to Bruges, the other to Ghent. The name is retained in the two Belgian provinces of West and East Flanders

1 West Flanders borders the North Sea, and its coast extends from the French to the Dutch frontier for a little over 40 miles. Its capital is Bruges, and the principal towns are Ostend, Courtrai, Furnes, Thielt, Ypres and Roulers There are fine market gardens and fishing employs a large coast population There are 31 cantons and 252 communes Area 1,263 sq. miles Pop. (1925), 865,006.

2 East Flanders lies east and north-east of the western province, and extends north to near Antwerp. It is more productive than West Flanders, and is well watered by the Scheldt The district of Waes, entirely reclaimed within the memory of man, is said to be the most productive district of its size in Europe The principal towns are Ghent (capital), St Nicolas, Alost, Termonde, Eecloo and Oudenarde There are 34 cantons and 297 communes. Area 1,172 sq miles Pop. (1925) 1,119,591. (X.)

HISTORY

The ancient territory of Flanders comprised not only the modern provinces known as East and West Flanders, but the southernmost portion of the Dutch province of Zeeland and a considerable district in north-eastern France In the time of Caesar it was inhabited by the Morini, Atrebates and other Celtic tribes, but in the centuries that followed the land was repeatedly overrun by German invaders, and finally became a part of the dominion of the Franks. After the break-up of the Carolingian empire Flanders was attached to the West Frankish monarchy (France). It thus acquired a position unique among the provinces of the territory known in later times as the Netherlands, which were included in that northern part of Austrasia assigned on the death of the emperor Lothaire (855) to King Lothaire II, and from his name called Lotharingia or Lorraine

The first ruler of Flanders of whom history has left any record is Baldwin, surnamed *Bras-de-fer* (Iron-arm), who married Judith, daughter of the emperor Charles the Bald and was created by him margrave of Flanders The Northmen were at this time continually devastating the coast lands, and Baldwin was entrusted with the defence of this outlying borderland of the west Frankish dominion. His son, Baldwin II., from his stronghold at Bruges, maintained, like his father, a vigorous defence of his lands against the incursions of the Northmen On his mother's side a descendant of Charlemagne, he strengthened the dynastic importance of his family by marrying Aelfthryth, daughter of Alfred the Great On his death in 918 his possessions were divided between his two sons Arnulf the Elder and Adalulf, but the latter survived only a short time and Arnulf succeeded to the whole inheritance. His reign was filled with warfare against the Northmen In his old age he placed the government in the hands of Baldwin, his son by Adela, daughter of the count of Vermandois, and the young man in a short reign did much for the commercial and industrial progress of the country, setting up the first weavers and fullers at Ghent, and instituting yearly fairs at Ypres, Bruges and other places.

On Baldwin III.'s death in 961 the old count resumed control and spent the few remaining years of his life in securing the succession of his grandson Arnulf II., who died in 989 He was followed by his son Baldwin IV, who fought successfully both against the Capetian king of France and the emperor Henry II Henry found himself obliged to grant to Baldwin IV in fief Valenciennes, the burgraveship of Ghent, the land of Waes and Zeeland The count of Flanders thus became a feudatory of the empire as well as of the French crown The French fiefs are known in Flemish history as Crown Flanders (*Kroon-Vlaanderen*), the German fiefs as Imperial Flanders (*Rijks-Vlaanderen*). His successor, Baldwin V. (1036–67), greatly extended his power. He obtained from the emperor Henry IV. the territory between the Scheldt and the Dender as an imperial fief, and the margravate of

Antwerp So powerful had he become that on the decease of Henry I of France in 1060 he was appointed regent during the minority of Philip I (*see* FRANCE) Before his death he saw his eldest daughter Matilda (d 1083) sharing the English throne with William the Conqueror, his eldest son Baldwin of Mons in possession of Hainaut in right of his wife Richilde, heiress of Regnier V (d 1036) (*see* HAINAUT), and his second son, Robert the Frisian, regent (*voogd*) of the county of Holland during the minority of Dirk V, whose mother Robert had married (*see* HOLLAND) On his death in 1067 his son Baldwin of Mons, already count of Hainaut, succeeded to the countship of Flanders Baldwin V had granted to Robert the Frisian on his marriage in 1063 his imperial fiefs His right to these was disputed by Baldwin VI, and war broke out between the two brothers Baldwin was killed in battle in 1070 Robert now claimed the tutelage of Baldwin's children and obtained the support of the emperor Henry IV, while Richilde, Baldwin's widow, appealed to Philip I of France The contest was decided at Bavenshoven, near Cassel, on Feb 20, 1071, where Robert was victorious Richilde was taken prisoner and her eldest son Arnulf III was slain Robert obtained from Philip I the investiture of Crown Flanders, and from Henry IV the fiefs which formed Imperial Flanders

The second son of Richilde was recognized as count of Hainaut (*see* HAINAUT), which was thus after a brief union separated from Flanders Robert died in 1093, and was succeeded by his son Robert II, who acquired great renown by his exploits in the first crusade He returned to Flanders in 1100, fought with his suzerain Louis VI of France against the English, and was drowned in 1111. His son and successor, Baldwin VII, died at the age of 27 from the wound of an arrow, in 1119, leaving no heir. He nominated as his successor his cousin Charles, son of Knut II of Denmark and of Adela, daughter of Robert the Frisian. Charles tried his utmost to put down oppression and to promote the welfare of his subjects, and obtained the surname of "the Good" His determination to enforce the right made him many enemies, and he was foully murdered on Ash Wednesday, 1127, at Bruges. He died childless, and there were no less than six candidates to the countship The contest lay between two of these, William Clito, son of Robert of Normandy and grandson of William the Conqueror and Matilda of Flanders, and Thierry or Dirk of Alsace, whose mother Gertrude was a daughter of Robert the Frisian William was killed before Alost, and Thierry then became count without further opposition He married the widow of Charles the Good and proved himself at home a wise and prudent prince, encouraging the growth of popular liberty and of commerce In 1146 he took part in the second crusade, in 1157 he resigned the countship to his son Philip of Alsace and betook himself once more to Jerusalem On his return from the East 20 years later Thierry retired to a monastery to die in his own land

Count Philip of Alsace did much to promote the growth of the municipalities for which Flanders was already becoming famous Ghent, Bruges, Ypres, Lille and Douai under him made much progress as flourishing industrial towns He also conferred rights and privileges on a number of ports, Hulst, Nieuwport, Sluis, Dunkirk, Axel, Damme, Gravelines and others But while encouraging the development of the communes and "free towns," Philip sternly repressed any spirit of independence He acted for a time as regent in France during the minority of his godson, Philip Augustus, whom he married to his niece Isabella of Hainaut (1180). Philip took part in the third crusade and died in the camp before Acre in 1191.

Union with Hainaut.—As he had no children the succession passed to Baldwin of Hainaut, who had married Philip's sister Margaret The countships of Flanders and Hainaut were thus united under the same ruler Baldwin did not obtain possession of Flanders without strong opposition on the part of the French king, and he was obliged to cede Artois, St Omer, Lens, Hesdin and a great part of southern Flanders to France, and to allow Matilda of Portugal, the widow of Philip of Alsace, to retain certain towns in right of her dowry Margaret died in 1194 and Baldwin in the following year, and their eldest son Baldwin IX succeeded to both countships. Baldwin IX is famous in history as the founder of the Latin empire at Constantinople He perished in Bulgaria in 1206 His two daughters were both under age, and the government was carried on by their uncle, Philip, marquess of Namur, whom Baldwin had appointed regent on his departure to Constantinople. Philip allowed his nieces to fall into the hands of Philip Augustus, who married the elder sister, Johanna of Constantinople, to his nephew Ferdinand of Portugal The Flemings were averse to the French king's supremacy, and Ferdinand, who acted as governor in the name of his wife, joined himself to the confederacy formed by Germany, England and the leading States of the Netherlands against Philip Augustus Ferdinand was, however, taken prisoner at the disastrous battle of Bouvines (1214) and was kept for 12 years a prisoner in the Louvre The countess Johanna ruled the united countships with prudence and courage until her death, without heir, in 1244 She was succeeded by her younger sister Margaret who died at the age of 80 in 1280, when her grandson, John II of Avesnes, became count of Hainaut, Guy of Dampierre, her second son by her second marriage, became count of Flanders

The government of Guy of Dampierre was unfortunate It was the interest of the Flemish weavers to be on good terms with England, the wool-producing country, and Guy entered into an alliance with Edward I against France. This led to an invasion and conquest of Flanders by Philip the Fair. Guy with his sons and the leading Flemish nobles were taken prisoners to Paris, and Flanders was ruled as a French dependency. But though in the principal towns, Ghent, Bruges and Ypres, there was a powerful French faction, the arbitrary rule of the French governor and officials stirred up the mass of the Flemish people to rebellion. The anti-French partisans were strongest at Bruges, where the French garrison was massacred (May 19, 1302), and on the following July 11 a French army of invasion was utterly defeated near Courtrai. Peace was concluded in 1305 but, owing to Guy of Dampierre and the leading Flemish nobles being in the hands of the French king, on terms very disadvantageous to Flanders Very shortly afterwards the aged count Guy died Robert of Bethune, his son and successor, had continual difficulties with France during the whole of his reign, the Flemings offering a stubborn resistance to all attempts to destroy their independence. Robert was succeeded in 1322 by his grandson Louis of Nevers, who had been brought up at the French court and had married Margaret of France. His sympathies were entirely French, and he made use of French help in his contests with the communes.

Under Louis of Nevers Flanders was practically reduced to the status of a French province The latter part of his reign was remarkable for the successful revolt of the Flemish communes under Jacob van Artevelde (*q v*) Louis of Nevers fell at the battle of Crécy (1346), and was succeeded by his son Louis II. of Mâle The reign of this count was one long struggle with the communes, headed by the towns of Ghent, for political supremacy. Louis was as strong in his French sympathies as his father, and relied upon French help in enforcing his will upon his refractory subjects Had the great towns with their organized gilds and great wealth held together in their opposition to the count's despotism they would have proved successful; but Ghent and Bruges, always keen rivals, broke out into open feud The power of Ghent reached its height under Philip van Artevelde (*q v*) in 1382 He defeated Louis, took Bruges and was made *ruward* of Flanders, but on Nov 27, 1382, he suffered a crushing defeat from a large French army at Roosebeke and was slain Louis of Mâle died two years later, leaving an only daughter Margaret, who had married in 1369 Philip the Bold, duke of Burgundy.

Subjection to Burgundy.—The history of Flanders as a separate State ceases from the time of the acquisition of the countship by the Burgundian dynasty (*see* BURGUNDY, NETHERLANDS) There were revolts from time to time of great towns against the exactions even of these powerful princes, but they were in vain The conquest and humiliation of Bruges by Philip the Good in 1440, and the even more relentless punishment inflicted on rebellious Ghent by the emperor Charles V exactly a century later are the most remarkable incidents in the long-continued but vain struggle of the Flemish communes to maintain and

assert their privileges The Burgundian dukes and their successors of the house of Habsburg were fully alive to the value to them of Flanders and its rich commercial cities It was Flanders that furnished to them no small part of their resources, but for this very reason, while fostering the development of Flemish industry and trade, they were the more determined to brook no opposition which sought to place restrictions upon their authority

The effect of the revolt of the Netherlands and the War of Dutch Independence which followed was ruinous to Flanders Albert and Isabel on their accession to the sovereignty of the southern Netherlands in 1599 found "the great cities of Flanders and Brabant had been abandoned by a large part of their inhabitants, agriculture hardly in a less degree than commerce and industry had been ruined" In 1633, with the death of Isabel, Flanders was restored to Spanish rule Under the Treaty of Munster the north-western portion of Flanders, since known as States (or Dutch) Flanders, was ceded by Philip IV to the United Provinces (1648) By a succession of later treaties—of the Pyrénées (1659), Aix-la-Chapelle (1668), Nijmwegen (1679) and others—a large slice of the southern portion of the old county of Flanders became French territory and was known as French Flanders

From 1795 to 1814 Flanders, with the rest of the Belgic provinces, was incorporated in France, and was divided into two departments—*département de l'Escaut* and *département de la Lys* This division has since been retained, and is represented by the two provinces of East Flanders and West Flanders in the modern kingdom of Belgium The title of count of Flanders was revived by Leopold I in 1840 in favour of his second son, Philip Eugene Ferdinand (d 1905) (G E)

FLANDRIN, JEAN HIPPOLYTE (1809–1864), French painter, was born at Lyons on March 24, 1809 His father, though brought up to business, had great fondness for art, and became a miniature painter Hippolyte was the second of three sons, all painters, and two of them eminent, the third son Jean Paul (b 1811) ranking as a leader of the modern landscape school of France Auguste (1804–1842), the eldest, passed the greater part of his life as professor at Lyons After studying for some time at Lyons, Hippolyte and Paul set out to walk to Paris in 1829 They entered the atelier of Ingres, who became their friend for life At first considerably hampered by poverty, Hippolyte's difficulties were removed by his taking, in 1832, the Grand Prix de Rome for his picture, the "Recognition of Theseus by his Father" On his return from Rome his reputation was established The works upon which his fame rests are his mural decorations Of these the principal are in the following churches St Severin, St Vincent de Paul, St Germain des Prés at Paris, St Paul at Nismes, the church of Ainay at Lyons He died of smallpox at Rome on March 21, 1864 There is in his works much of that austerity and coldness which spring from a faith which feels in opposition to the surrounding life He has been compared to Fra Angelico, but his saints and martyrs seem to express rather austerity of souls convicted of sin than the joy and purity which shine from the work of the early master. He was Ingres' most distinguished pupil, and followed in the paths of the Italian masters with little originality Only a certain blonde, slightly melancholy face of a maiden is Flandrin's own peculiar interpretation; by transferring his pure principles to portrait painting he acquired a large practice as the painter of the "femme honnête" among the ladies of the Second Empire

See Delaborde, *Lettres et Pensées de H Flandrin* (1877), L Flandrin, *H Flandrin* (1903)

FLANNAN ISLANDS. A group of islands off the coast of the outer Hebrides They are uninhabited

FLANNEL. A woollen stuff of various degrees of weight and fineness, made usually from loosely spun yarn The origin of the word is uncertain, but in the 16th century flannel was a well-known production of Wales, and a Welsh origin has been suggested The French form *flanelle* was used late in the 17th century and the Ger *Flanell* early in the 18th century. Baize, a kind of course flannel with a long nap, is said to have been first introduced to England about the middle of the 16th century by refugees from France and the Netherlands The manufacture of flannel has naturally undergone changes and, in some cases, deteriorations Flannels are frequently made with an admixture of silk or cotton, and in low varieties cotton has tended to become the predominant factor Formerly a short staple wool of fine quality from a Southdown variety of the Sussex breed was principally in favour with the flannel manufacturers of Rochdale, who also used largely the wool from the Norfolk breed, a cross between the Southdown and Norfolk sheep In Wales the short staple wool of the mountain sheep was used and in Ireland that of the Wicklow variety of the Cottagh breed, but now the New Zealand, Cape and South American wools are extensively employed and English wools are not commonly used alone Over 2,000 persons are employed in flannel manufacture in Rochdale alone, which is the historic seat of the industry and a good deal of flannel is now made in the Spen Valley district, Yorkshire Blankets, which constitute a special branch of the flannel trade, are largely made at Bury in Lancashire and Dewsbury in Yorkshire Welsh flannels have a high reputation, and make an important industry in Montgomeryshire There are also flannel manufactories in Ireland

A moderate export trade in flannel is done by Great Britain The following table gives the quantities exported in 1924–27

	sq yds		sq yds
1924	7,787,000	1926	4,427,900
1925	5,857,500	1927	5,545,900

FLANNELETTE, a descriptive term signifying a particular style of finishing and applied to an important class of cotton fabrics of simple texture, which have either one side only or, more usually, both sides formed with a short fleecy "nap" or fur This nap is developed after weaving, by submitting the fabric to a finishing operation variously described as "teasling," "raising," or "perching," during which the fibrous filaments of cotton are scratched up and raised, thereby producing the short furry nap which is the distinctive characteristic of flannelette

Flannelette is made in many different qualities ranging from comparatively coarse to fine textures that are used for a variety of domestic purposes, but mainly for clothing, and especially for undergarments and night attire, for which it is very suitable owing to its flannel-like and woolly character which imparts to the body a feeling of comfort and warmth This attribute of flannelette results, of course, more especially from the presence of air in the short nap, which, being a poor conductor of heat, serves the more effectively to insulate the body, and thus prevents the radiation of heat, after the manner of the furry coats of animals

It is this aerated property of flannelette which increases its susceptibility to ignition, for until the nap is formed on the surface it is no more inflammable than any other type of fabric, whether produced from cotton or other textile material Flannelette does not possess the inherent properties of highly inflammable volatile and ethereal fluids of an explosive character, which are liable to ignition by a flame at some distance Unless it comes into actual contact with fire, it is as immune from the risk of ignition as fabrics of any other textile material Garments made of flannelette are in universal use, especially as night attire for children, who are often foolishly allowed to crouch near the fire to warm themselves just before going to bed, or to retire to bed carrying a lighted lamp or candle. These are the occasions when flannelette becomes a dangerous material, and herein lies the only risk of its use, not in any inherent property of inflammability Indeed, it is highly probable that by providing a cheaper material for warm clothing, flannelette has saved infinitely more lives than it has destroyed Nevertheless, so strong is the prejudice of many people against the risk of fire incurred by using flannelette that it is, in some cases, submitted to chemical treatment in order to render it harmless. The additional cost of that process, however, is such as to prevent its becoming a commercial success

There is no feature of special technical interest attaching to the manufacture of flannelettes, which are usually based on plain calico, three-end 1x2 twill, four-end 2x2 twill, or a similar weave structure, calculated to produce a relatively close and firm texture, free from long "floating" threads that would be liable to break during the operation of raising the nap. Also, since the nap

is formed by raising the fibres composing the weft yarn, this is spun "soft," with less twist and of coarser counts than the warp yarn, which requires to be stronger than the weft

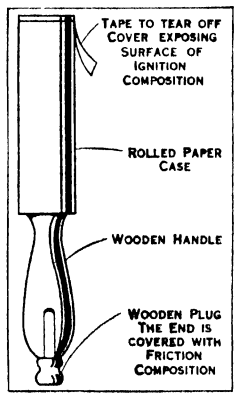
Flannelettes are produced in a variety of different styles, as "plain," striped, checked, and sometimes printed with simple diapered figuring The plain fabrics are usually woven in the "grey" state, or natural colour of cotton, and afterwards piece-dyed, or else bleached, while the stripes and check patterns are developed by employing threads of coloured warp and weft

(H. N)

FLARE. The term flare in pyrotechny is applied either to coloured fire composition burnt in a loose heap, or to a similar composition charged into a rolled paper case, thus ensuring longer and more regular burning Flares are used in pyrotechnic displays for the illumination of the surroundings and in a suitable setting, such as a background of trees and foliage, rocks or old buildings With expert arrangement most beautiful effects are to be achieved, particularly where flares charged with varying composition are used, producing changing and blending colouring

The flare, or light, in its present form can claim no greater antiquity than the early part of last century, when the introduction of chlorate of potash permitted the development of genuine colour composition (*See* FIREWORKS *Coloured Fire*) Previous to this the only colour achieved, in addition to flame colour, had been the bluish-white light produced by a mixture of sulphur, saltpetre and orpiment These blue lights, as they were called, were and still are much used at sea for signalling and illuminating purposes They were also known as Bengal lights, no doubt because Bengal was the chief source of supply of saltpetre

Signal Flares and Lights.—The introduction of colours which could readily be recognized at a considerable distance opened up a much wider field for the use of flares at sea, and from the middle of the 19th century many patents were taken out, most of these had for their object a means of self ignition The first of these inventions was that of Robson, who ignited the flare by breaking a small hollow bead containing sulphuric acid which came into contact with a pellet of chlorate of potash Subsequent inventions provided for ignition on the same principle as the modern safety match, and for the waterproofing of the surface, enabling the flare to be ignited in rough weather Lights of this kind are generally fitted with a wooden handle, in, or to which is secured the means of ignition The use of pyrotechnic signals for recognition purposes at sea suggested the Coston light, patented in 1859—a flare charged with layers of composition of varying colours An invention which has proved of great value at sea is the Holmes light, a device by which a lifebuoy fitted with a flare is automatically launched and the flare ignited on the alarm being given



FRICTION IGNITION FLARE

This is fired by withdrawing the plug from the handle and drawing the end across the surface of the exposed ignition composition

The introduction of wireless telegraphy has, to a great extent, rendered recognition signals obsolete, but large quantities of flares are still used by the fishing fleets and by the lifeboat and coast-guard services Ships' lifeboats are compelled to carry a supply of red friction ignition lights by British Board of Trade regulations

During the World War flares and lights of many kinds were designed for signalling and illuminating purposes, the largest ever made being the Dover flares, designed by the late Wing-commander Brock, for use on the anti-submarine defences in the English channel, the complete flare being 3ft in length, 8in in diameter and weighing 90 lb., giving a light estimated at one million candle power The smallest is that fired from a pistol by the infantryman to illuminate the ground in front. (A. ST. H B)

FLASH POINT: *see* ABEL TEST

FLASK, in its earliest meaning, a vessel, made of wood or leather, for carrying liquor The principal applications in current usage are (1) to a vessel of metal or wood, formerly of horn, used for carrying gunpowder; (2) to a long-necked, round-bodied glass vessel, usually covered with plaited straw or maize leaves, containing olive or other oil or Italian wines—it is often known as a "Florence flask"; (3) to similarly shaped vessels, used for experiments, etc, in a laboratory, (4) to a small metal or glass receptacle for liquor, of a size and shape to fit into a pocket or holster, usually covered with leather, basket-work or other protecting substance, and with a detachable portion of the case shaped to form a cup "Flask' is also used in metal-founding, it is a wooden frame or case to contain part of the mould The word "flagon," which is by derivation a doublet of "flask," is usually applied to a larger type of vessel for holding liquor, more particularly to a type of wine-bottle with a short neck and circular body with flattened sides The term is also used for a jug-shaped vessel with a handle, spout and lid, into which wine may be decanted from the bottle for use at table, and of a similarly shaped vessel to contain the eucharistic wine till it is poured into the chalice. (*See* DRINKING VESSELS)

FLAT. The word is generally applied by British usage to a self-contained residence or separate dwelling (in Scots law, the term *flatted house* is still used), consisting of a suite of rooms which form a portion, usually on a single floor, of a large building, called the tenement house, the remainder being similarly divided The approach to it is over a hall, passage and stairway, which are common to all residents in the building, but from which each private flat is divided off by its own outer door

There is in England a considerable body of special law applicable to flats The following points deserve notice —(1) The occupants of distinct suites of rooms in a building divided into flats are generally, and subject, of course, to any special terms in their agreements, not lodgers but tenants with exclusive possession of separate dwelling houses placed one above the other Apart from statute, they are therefore, liable to distress by the immediate landlord The protection given to tenants by the Rent Restriction Act, 1920–25 (*see* LANDLORD AND TENANT, RENT), extends, however, to flats other than those let at a rent including payments which are not of an unsubstantial or trivial character, for board, or as in the case of service flats, attendance or use of furniture (Act of 1920 s 12) Each flat is separately rateable, though as a general rule by the contract of tenancy the rates are payable by the landlord (2) The owner of an upper storey, without any express grant or enjoyment for any given time, has a right to the support of the lower storey (*Dalton* v *Angus*, 1881, 6 A C 740, 793) The owner of the lower storey, however, so long as he does nothing actively in the way of withdrawing its support, is not bound to repair, in the absence of a special covenant imposing that obligation upon him The right of support being an easement in favour of the owner of the upper storey, it is for him to repair He is in law entitled to enter on the lower storey for the purpose of doing the necessary repairs The duty of the landlord, who retains control and possession of a common staircase, is a common-law duty, and it cannot be put higher than this. that he is bound to maintain it under such a condition that those who are invited to use it will not be exposed to any dangers which cannot be avoided by the exercise of ordinary care (*Fairman* v *Perpetual Investment Building Society*, 1923 A C 74, 98, and see *Letang* v *Ottawa Electric Ry Co*, 1926, A C. 725) (3) In case of the destruction of the flat by fire, the rent abates *pro tanto* and an apportionment is made, *pari ratione*, where a flat is totally destroyed, the rent abates altogether, unless the tenant has entered into an express and unqualified agreement to pay rent when he will remain liable till the expiration of his tenancy (4) Where the agreements for letting the flats in a single building are in common form, an agreement by the lessor not to depart from the kind of building there indicated may be held to be implied (5) The porter is usually appointed and paid by the landlord, who is liable for his acts while engaged on his general duties; while engaged on any special duty for any tenant the porter is the servant of the latter, who is liable for his conduct within the scope of his employment (*See* also HOUSING)

In Scots law the rights and obligations of the lessors and lessees of flats, or—as they are called—"flatted houses," spring

partly from the exclusive possession by each lessee of his own flat, partly from the common interest of all in the tenement as a whole. The "law of the tenement" may be thus summed up The *solum* on which the flatted house stands, the area in front and the back ground are presumed to belong to the owner of the lowest floor or the owners of each floor severally, subject to the common right of the other proprietors to prevent injury to their flats, especially by depriving them of light. The external walls belong to each owner in so far as they enclose his flat; but the other owners can prevent operations on them which would endanger the security of the building The roof and uppermost storey belong to the highest owner or owners, but he or they may be compelled to keep them in repair and to refrain from injuring them The gables are common to the owner of each flat, so far as they bound his property, and to the owner of the adjoining house, but he and the other owners in the building have cross rights of common interest to prevent injury to the stability of the building The floor and ceiling of each flat are divided in ownership by an ideal line drawn through the middle of the joists, they may be used for ordinary purposes, but may not be weakened or exposed to unusual risk from fire The common passages and stairs are the common property of all to whose premises they form an access, and the walls which bound them are the common property of those persons and of the owners on their farther side

The French Code Civil provides (art. 664) that where the different storeys of a house belong to different owners the main walls and roof are at the charge of all the owners, each one in proportion to the value of the storey belonging to him The proprietor of each storey is responsible for his own flooring The proprietor of the first storey makes the staircase which leads to it, the proprietor of the second, beginning from where the former ended, makes the staircase leading to his, and so on There are similar provisions in the Civil Codes of Italy (art 562), Spain (art 396), Portugal (art 2335), Quebec (art 521), and St Lucia (art 471) As to Belgium, *see* law of July 8, 1924

In the United States the term flat has given way in use to "apartment house" and, in the congested city districts housing the poor, to "tenements" The States having cities of sufficient size to justify the construction of apartment houses have special legislation on the subject similar to that in England

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The term *flat* is used in the United States to describe a sale of bonds in which the price paid covers the bond itself and all accrued interest thereon Bonds are not usually sold *flat*, but rather at a given price plus accrued interest Stocks, on the contrary, are usually sold *flat; i.e.*, the purchase price entitles the buyer not only to the ownership of the stock but also to all dividends which may be forthcoming upon it (*See* ACCRUED INTEREST)

Flat, in music, is the sign ♭, signifying the lowering of the note to which it is attached by a semitone, the direction holding good to the end of the bar. Or, if placed at the beginning of the stave, as part of what is called the key signature, it governs the note concerned throughout the composition unless contradicted A double flat (♭♭) lowers a note two semitones (*See* ACCIDENTALS, CLEF, MUSICAL NOTATION)

FLATBUSH, formerly a township of Kings county, Long Island, N Y , since 1898 a part of the borough of Brooklyn, New York city. The first settlement was made here by the Dutch about 1651, and was variously called "Midwout," "Midwoud" and "Medwoud" (from the Dutch words, *med*, "middle" and *woud*, "wood") for about 20 years, when it became more commonly known as Vlachte Bos (*vlachte*, "wooded"; *bos*, "plain") or Flackebos, whence, by further corruption, the present name. On Aug. 23, 1776, the village was occupied by Cornwallis's division of the invading force under Lord Howe, and on the 27th, at the disastrous battle of Long Island (or "battle of Flatbush," as it is sometimes called), Flatbush pass, an important strategic point, was vigorously defended by Sullivan's troops.

FLAT-FISH is the name of the fishes of the order *Heterosomata*, which differ from all other fishes in having both eyes on one side They live at the bottom, with the eyed side uppermost; this is coloured, whereas the blind or underside is normally white, but exposure of this side to light will cause some development of pigment. Nearly all flat-fishes are marine, and they have minute floating eggs; the larvae are symmetrical, with an eye on each side, and swim near the surface of the sea, but after a time one eye moves round over the top of the head to the other side and the little fish, falling over gradually on its side, sinks to the bottom. In all but the primitive *Psettodes* the dorsal fin grows forward on to the head and in some with a long larval life this happens before the eye migrates, so that in pushing its way between the fin and the head it seems to go through the head from one side to the other. Many flat fishes are remarkable for their power of changing their coloration in order to resemble the ground on which they lie, and it has been established by experiment that they must see the ground in order to look like it. The eyes do not look upwards, but in life stand out from the head and can be turned independently in different directions looking sideways, or sometimes one forward and the other backward

Psettodes.—The most primitive genus, with two species, from West Africa and the Indo-Pacific, is typically perch-like in structure, and indicates the derivation of flat-fishes from some pescoid ancestor allied to the *Senanidae* or sea-perches The other flat-fishes, numbering about 600 species, are either flounders, with the lower jaw prominent, or soles, in which the rounded snout projects beyond the small curved mouth, each of these groups includes a family with the eyes on the right side, and another with the eyes on the left The *Pleuronectidae*, or dextral flounders, include the halibut, plaice and other important food-fishes of northern seas The *Bothidae*, or sinistral flounders, include the turbot, some of the American species of *Paralichthys* are also valued as food The *Soleidae*, or true soles, with eyes on the right side include the well known common sole of Europe. The *Cynoglonidae*, or tongue-soles, with eyes on the left side, inhabit tropical and subtropical waters

In the more specialized forms, which feed exclusively on bottom-living invertebrates, the jaws of the blind side are more strongly developed than those of the eyed side, and have stronger teeth, in the soles those of the eyed side are toothless



FLATHEAD INDIAN BRAVE

FLATHEAD. This name has been applied to a variety of tribes in north-western and south-eastern North America who practised frontal and occipital compression of infants' heads, resulting in permanent deformation of the skull, especially a low forehead and posterior breadth The process was not injurious, did not affect intelligence, and like other habitually practised deformations and mutilations the world over, was looked upon as correct and beautifying. The effects of course were not inherited In modern official and popular usage in the United States, Flathead is the designation of the Salst or Salish, the eponymous tribe of the Salish stock (*q.v.*), in western Montana, numbering 600, about the same as in 1805. (A. L. K.)

FLATMAN, THOMAS (1637–1688), poet and miniature painter, was educated at Winchester (1649–54) and New college, Oxford (1654–56). He left Oxford without a degree in 1657, having been made fellow of his college in the previous year. In 1866 he was created M.A. of Cambridge by the king's letters As a miniature painter he is highly esteemed by modern critics, but only a few of his poems have survived in anthologies. He died in London, on Dec. 8, 1688. His collected works first appeared in 1674, as *Poems and Songs*, and an enlarged edition in 1686; many of his verses, however, were printed separately,

the most notable being "A Thought of Death" (imitated by Pope); "Death, a Song"; and "Hymn for Morning." *Montélion's Almanack* for 1661 and 1662 and a mock romance, *Don Juan Lamberto,* have also been ascribed to Flatman, by Wood.

See Anthony à Wood, *Athenae Oxonienses,* vol iv. (edit P. Bliss, 4 vols., 1813–20), H. Walpole, *Anecdotes of Painting* (1762–71, later ed 1879), S Redgrave, *Dictionary of Artists* (new ed rev 1878), also F A. Child, *Life and Uncollected Poems of T Flatman* (Philadelphia, 1921)

FLATWORM, a general name for members of the phylum Platyhelminthes (*q v*), including the flukes (*see* TREMATODES), tapeworms (*q v*) and certain free-living forms. (*See* TURBELLARIA)

FLAUBERT, GUSTAVE (1821–1880), French novelist, was born at Rouen on Dec 12, 1821 His father was resident physician at the Rouen hospital; his mother belonged to an old Norman family He was educated in his native city, and went up to Paris to study law in 1840 He took no great interest in his legal studies From early childhood he had been writing, and he continued to write in Paris The two great friends of his Rouen schooldays, Chevalier and Le Poittevin, were fellow-students in Paris, and in Pradier's studio he met Victor Hugo, Louise Colet, Maxime du Camp and other figures in Paris literary society At this time he began to suffer from the attacks of a malady (not epilepsy, as is sometimes stated), which recurred throughout his life, and his father recalled him to Rouen in order to give him the necessary care A journey with his family to Italy seems to have given him little pleasure Change of scene was more fruitful in retrospect than at the time When he was abroad Flaubert felt homesick for Normandy, in Normandy he dreamed of the East His real life, as he told his friend Le Poittevin, was "dans l'idée et pas ailleurs."

In 1846, after the deaths of his father and of his sister Caroline, to whom he had been devotedly attached, Flaubert settled with his mother at Croisset, near Rouen, in the pleasant house with grounds going down to the Seine, which is familiar from his correspondence It was his home for the rest of his life, and he rarely left it except for occasional visits to Paris. At this time began his only serious *liaison,* that with Louise Colet (*q.v.*), whom he visited from time to time, and with whom he carried on an almost daily correspondence, which has been published, unfortunately only in an incomplete form The relation lasted until 1855. It had not been entirely peaceful, and the breach, when it came, was a violent one Louise asked of him more than he was willing to give He was absorbed in *Madame Bovary,* who was Louise's real supplanter His friends throughout this period were Louis Bouilhet (*q v.*), like himself a native of Rouen, with whom he regularly discussed his work, and Maxime du Camp Du Camp did not like Louise, and the fact may unconsciously have influenced Flaubert in the final breach With du Camp he travelled in Brittany in 1847, and in 1849 the two friends set out for the Mediterranean During this tour in the Levant the history of *Madame Bovary* seems to have taken shape He had already written an *Education sentimentale*—indeed two, between 1843 and 1845, and a *Tentation de Saint Antoine* in 1848–49, neither of which saw the light Later on he was to take up these subjects again He began his studies for the *Tentation* in 1846, and spent the months between May 1848 and Sept. 1849 in writing it He read the completed ms. to Bouilhet and Du Camp. Bouilhet found it too diffuse, and declared that Flaubert should write the story of Delamarre, a country doctor who had been driven to suicide by the infidelity of his wife. The *Tentation* was put aside, in deference to Bouilhet's opinion, and the way left clear for *Madame Bovary.* The actual writing of the book occupied more than four years, from the beginning of 1852 to May 1856 Up to the time of his breach with Louise Colet the progress of the work is registered in his letters to her. He despatched the manuscript in May, and in October it began to appear in the *Revue de Paris.* It was to be the centre of discussion on the art of the novel for years to come; every critic finds a new aspect in *Madame Bovary,* and it has been and is made to illustrate the most diverse literary doctrines. For the moment attention was focussed on the subject and its treatment, not on the writer's art, for the Government brought a charge of immorality against author and publisher. Both were acquitted, and the novel appeared in book form in 1857 Meanwhile he returned from time to time to the *Tentation,* but the scandal following the publication of *Madame Bovary* made him decide to lay it aside.

Flaubert's mind was already at work on *Salammbô* On its appearance in 1862 the critics fell foul of it, but the young generation read it with enthusiasm. The war of the mercenaries against Carthage was a great subject, greatly handled. From Carthage he turned again to contemporary life, and produced, after seven years' work, the final version of *L'Education sentimentale* (1869). Criticism was on the whole unfavourable, though some good judges, among them Metternich, recognized the justness and the greatness of this picture of the generation of 1840 to 1850

Up to this time the sequestered and laborious life of Flaubert had been comparatively happy, but misfortunes began to gather around him. He felt the anguish of the war of 1870 so keenly that the break-up of his health has been attributed to it; he began to suffer more from his distressing nervous malady His best friends were taken from him by death or by fatal misunderstanding; in 1872 he lost his mother, and his circumstances were reduced. He was very tenderly guarded by his niece; he enjoyed a rare intimacy of friendship with George Sand, with whom he carried on a correspondence which is supremely interesting both from the human and the artistic point of view, and occasionally he saw his Parisian acquaintances, Zola, A Daudet, Turgeniev, the Goncourts, but the later years of Flaubert's life were desolate and melancholy. He continued to work with the same intensity. *La Tentation de Saint-Antoine,* of which fragments had been published as early as 1857, was at length completed and sent to press in 1874 His drama *Le Candidat,* which was produced in that year, was a failure. In 1877 Flaubert published, in one volume, entitled *Trois Contes,* "Un Coeur Simple," "La Légende de Saint-Julien-l'Hospitalier" and "Hérodias" Those who were dismayed by the solidity of *L'Educat[illegible] sentimentale,* appreciated these short and perfect pieces They place him among the great masters of the short story, and all later writers in this *genre,* from Maupassant onwards, stand in debt to Flaubert He spent the remainder of his life in the toil of building up a vast satire on the futility of human knowledge and the omnipresence of mediocrity, which he left a fragment This is *Bouvard et Pécuchet* (posthumously printed, 1881), which he himself believed to be his masterpiece This is not the general view, but this gigantic attack on optimism has its enthusiasts; Rémy de Gourmont agreed with Flaubert Flaubert had rapidly and prematurely aged since 1870, and he was quite an old man when he died of apoplexy on May 8, 1880 He died at Croisset, but was buried in the family vault in the cemetery of Rouen A beautiful monument to him by Chapu was unveiled at the museum of Rouen in 1890

Flaubert had the build of a guardsman, with a magnificent viking head, but his health was uncertain from childhood, and he was neurotic to the last degree His hatred of the "bourgeois" began in his childhood, and developed into a kind of monomania He despised their habits, their lack of intelligence, their contempt for beauty, with a passionate scorn which has been compared to that of an ascetic monk His laborious methods of work have become a legend. He would spend a week in the completion of one page, never satisfied till he had found the best turn of a phrase, the final adjective. That he was one of the greatest French writers of his century is now recognized. Less perhaps than any other writer, not of France, but of modern Europe, Flaubert yields admission to the inexact, the abstract, the vaguely inapt expression. He never allowed a *cliché* to pass him, never indulgently or wearily went on, leaving behind him a phrase which "almost" expressed his meaning He hated the lax felicities of improvisation as a disloyalty to his art The absolute exactitude with which he adapts his expression to his purpose is seen in all parts of his work, but particularly in the portraits he draws of the figures in his principal romances.

The degree and manner in which, since his death, the fame of Flaubert has extended, form an interesting chapter of literary history The publication of *Madame Bovary* in 1857 had been

followed by more scandal than admiration; it was not understood at first that this novel was the beginning of a new thing, the scrupulously truthful portraiture of life Gradually this aspect of his genius was accepted, and began to crowd out all others At the time of his death he was famous as a realist, pure and simple Under this aspect Flaubert exercised an extraordinary influence over E de Goncourt, Alphonse Daudet and Zola But even since the decline of the realistic school other facets of his genius have caught the light It has been perceived that he was not merely realistic, but real; that his clairvoyance was almost boundless, that the significance of his character is the significance only attained by the great masters It was not for nothing that he studied increasingly *Don Quixote* Flaubert was a dreamer and a symbolist as well as a realist The creator of Saint Antoine and Hérodias exercised as important an influence on the symbolists as the creator of *Madame Bovary* on the realists The dualism which he describes in his own character of the two Flauberts, the one loving lyricism and "eagle flights," the other digging for facts and desiring to present with equal precision and detail the smallest as well as the greatest of the things he describes, is apparent in his works This is one of the reasons why the work of Flaubert is of inexhaustible interest to thinkers and writers of all temperaments

His *Oeuvres complètes* (8 vols, 1885) were printed from the original mss, and included, besides the works mentioned already, the two plays *Le Candidat* and *Le Château des Coeurs* Earlier editions of his works are practically superseded by the Conard edition of 1910 (18 vols), which includes *Madame Bovary, Salammbô, Notes de Voyages, Trois Contes, Correspondance,* the three texts of *La Tentation de Saint Antoine* (1849, 1856 and 1874), and two versions of *L'Education sentimentale* (1845 and 1880) A complete edition was also published by Charpentier in 1914 (13 vols)

See also J Wassermann, *Flaubert* (1906), L Bertrand, *Gustave Flaubert* (1912) and *Flaubert à Paris* (1921), J de Gaultier *Le Génie de Flaubert* (1913), A Coleman, *Flaubert's Literary Development* (1914), E Maynial, *La Jeunesse de Flaubert* (1913) and *Flaubert et son milieu* (1927), A Thibaudet, *Gustave Flaubert, 1821–1880* (1922), J Degoumois, *Flaubert à l'Ecole de Goethe* (1925).

FLAVIAN, SAINT (d 449), bishop of Constantinople and an adherent of the Antiochene school, succeeded Proclus in 447 He presided at the council which deposed Eutyches (*q v*) in 448, but in the following year he was deposed by the council of Ephesus (the "robber synod"), which reinstated Eutyches Flavian's death was attributed to ill treatment at the hands of his theological opponents The council of Chalcedon (451) canonized him as a martyr, and in the Latin Church he is commemorated on Feb 18

Three of Flavian's letters are preserved in Migne, *Patr Lat* 54 and *Patr Graec* 65 His appeal to Pope Leo I against the council of Ephesus was edited by Lacey (Cambridge, 1903)

FLAVIAN I. (*c* 320–*c* 404), bishop or patriarch of Antioch, was probably born in Antioch He supported the Catholic faith against the Arian Leontius, who had succeeded Eustathius as bishop of Antioch When Meletius was appointed bishop of Antioch in 361 he raised Flavian to the priesthood, and on the death of Meletius in 381 Flavian was chosen to succeed him The bishop of Rome and the bishops of Egypt refused to acknowledge Flavian, and Paulinus, who by the extreme Eustathians had been elected bishop in opposition to Meletius, still exercised authority over a portion of the church On the death of Paulinus in 383, Evagrius was chosen as his successor, but after the death of Evagrius (*c* 393) Flavian succeeded in preventing his being followed by a successor, though the Eustathians still continued to hold separate meetings Through the influence of Chrysostom and of the emperor Theodosius, Flavian was acknowledged in 399 as legitimate bishop of Antioch by the Church of Rome; but the Eustathian schism was not healed till 415 The Greek Church commemorates him on Sept 26

See MELETIUS OF ANTIOCH, and Herzog-Hauck's *Realencyklop.*

FLAVIAN II. (d 518), bishop or patriarch of Antioch, was chosen by the emperor Anastasius I to succeed Palladius, most probably in 498 He endeavoured to please both parties by a middle course in reference to the Chalcedon (*q v*) decrees, but after great hesitation accepted the Henoticon, or decree of union, issued by the emperor Zeno This brought upon him the anathema of the patriarch of Constantinople, and failed to secure the favour of Anastasius, who found in the riots between the rival parties in 511 a pretext for banishing Flavian to Petra, where he died

FLAVIGNY, a town of eastern France, in the department of Côte-d'Or, stands on a hill above the river Ozerain, 33 m W N W of Dijon by road Pop (1926) 559 The 8th century abbey has been rebuilt as a factory for the manufacture of anise, an industry connected with the town as early as the 17th century There are also a church of the 13th and 15th centuries, and ancient gateways About 3 m N W of Flavigny rises Mont Auxois, the site of the ancient Alesia, where Caesar in A D 52 defeated the Gallic chieftain Vercingetorix, to whom a statue has been erected on the top of the hill Many finds of the Gallo-Roman period have been made on the hill

FLAVIN, the commercial name for an extract or preparation of quercitron bark (*q v*), which is used as a yellow dye in place of the ground and powdered bark

FLAVIUS, BLONDUS (*c* 1388–1463), Italian historian, was born at Forlì After acting as ambassador to Milan, he was exiled to Venice from 1423–32, when he became secretary to Pope Eugene IV He died in Rome in 1463

His collected works, including the *Romae instauratae, lib iii, Romae triumphantis lib x, Italia illustrata, Decades* and *De origine et gestis Venetorum,* were often printed in the 16th century, notably at Basle in 1531 B Nogara has edited *Scritti inediti e rari di B Flavio* in "Studi e Testi" series, no 48 (1927)

FLAVOURINGS. Flavouring agents, with the exception of common salt, are obtained from vegetables and may be from any part of the plant, that is, leaf, stem, root or fruit Though useful in helping to make certain foods palatable and hence easier to digest, condiments have no food value and should be regarded purely as food "accessories" Flavourings should always be blended with food in cooking and not served with the food This rule should apply to salt and pepper but custom has largely prevailed to the contrary in this case All condiments ought to be used sparingly and in such proportions that they do not spoil the natural flavours of the other ingredients

Pot Herbs.—This expression is usually applied to a particular set of flavouring herbs (parsley, thyme, bay leaf and marjoram) which are used in the form of a "bouquet" for stews, sauces, etc A complete bouquet has other flavourings added such as lemon, celery, mace, tarragon, etc The term "pot herbs" is also familiarly given to onion, carrot and turnip added to stock

Essences.—These are made by immersing a flavouring agent (*e g*, celery seed) in spirits of wine for several days to form a tincture, or, an essential oil, obtainable at a pharmacy (*e g*, oil of bitter almonds) is added to spirits of wine when the natural volatile oil cannot be obtained by ordinary methods of immersion and soaking Examples of essences are cinnamon, nutmeg, lemon, ginger, etc Vinegars are made by soaking some strong flavouring agent (*e g*, chilli) in ordinary vinegar

Other Condiments.—Fresh herbs or those dried in leaf or powdered are used in making sauces, stews, etc It is usual to classify them according to the part of plant to which they belong (a) Leaves and stems Among these are sage (for flavouring forcemeats, etc), spearmint, commonly alluded to as "mint" and used in making mint sauce for mutton, bayleaf (bouquets), marjoram, thyme and sweet basil (bouquets), parsley, used as garnish as well as a popular flavouring agent, peppermint, principally used in confectionery (b) Flowers and buds Cloves, saffron (used chiefly for colour), capers (pickles, sauces, etc.). (c) Barks Cinnamon (d) Roots Horseradish (grated in sauce or eaten *au naturel* with beef, turmeric (chiefly for colour and as an ingredient in curry preparations); ginger (puddings, cordials and jams), garlic (stews and sauces), these are the best known (e) Seeds Aniseed (pastry, cakes, cordial), carraway (cakes), fennel (cakes and liqueurs), mustard; nutmeg and mace, cumin, coriander and various seeds used in curry preparations (f) Fruits In this class are certain immature fruits, such as all-spice, capsicum and vanilla pods, etc. *See* SAUCES

FLAX. The terms flax and lint are employed at once to denote the fibre so called, and the plant from which it is prepared The flax plant (*Linum usitatissimum*) belongs to the natural order *Linaceae,* and, like most plants which have been long under cultiva-

tion, it possesses numerous varieties, while its origin is doubtful As cultivated it is an annual with an erect stalk rising to a height of from 20 to 40 in , with alternate, sessile, narrowly lance-shaped leaves, branching only at the top, each branch or branchlet ending in a bright blue flower The flowers are regular and symmetrical, having five sepals, tapering to a point and hairy on the margin, five petals which speedily fall, ten stamens, and a pistil bearing five distinct styles The fruit or boll is round, containing five cells, each of which is again divided into two, thus forming ten divisions, each of which contains a single seed The seeds of the flat plant, well known as linseed, are heavy, smooth, glossy and of a bright greenish-brown colour They are oval in section, but their maximum contour represents closely that of a pear with the stalk removed The contents are of an oily nature, and when liquefied are of great commercial value



FROM KOHLER, 'MEDIZINAI PFLANZEN

FLAX (LINUM USITATISSIMUM), PROBABLY THE MOST USEFUL OF ALL PLANTS NOT BEARING FOOD

Development of Flax Culture.—The earliest cultivated flax was *Linum angustifolium*, a smaller plant with fewer and narrower leaves than *L usitatissimum*, and usually perennial This is known to have been cultivated by the inhabitants of the Swiss lake-dwellings, and is found wild in south and west Europe (including England), North Africa, and Western Asia The annual flax (*L usitatissimum*) has been cultivated for at least four or five thousand years in Mesopotamia, Assyria and Egypt, and is wild in the districts included between the Persian gulf, the Caspian sea and the Black sea This annual flax appears to have been introduced into the north of Europe by the Finns, afterwards into the west of Europe by the western Aryans, and perhaps here and there by the Phoenicians, lastly, into Hindustan by the eastern Aryans after their separation from the European Aryans (De Candolle, *Origin of Cultivated Plants*)

The cultivation and preparation of flax are among the most ancient of all textile industries, very distinct traces of their existence during the stone age being preserved to the present day "The use of flax," says Ferdinand Keller (*Lake Dwellings of Switzerland*, translated by J E Lee), "reaches back to the very earliest periods of civilization, and it was most extensively and variously applied in the lake-dwellings, even in those of the stone period But of the mode in which it was planted, steeped, heckled, cleansed and generally prepared for use, we can form no idea any more that we can of the mode or tools employed by the settlers in its cultivation . Rough or unworked flax is found in the lake-dwellings made into bundles, or what are technically called heads, and, as much attention was given to this last operation, it was perfectly clean and ready for use" As to its applications at this early period Keller remarks "Flax was the material for making lines and nets for fishing and catching wild animals, cords for carrying the earthenware vessels and other heavy objects; in fact, one can hardly imagine how navigation could be carried on, or the lake-dwellings themselves be erected, without the use of ropes and cords; and the erection of memorial stones (menhirs, dolmens), at whichever era, and to whatever people these monuments may belong, would be altogether impracticable without the use of strong ropes."

Flax Manufacture.—That flax was extensively cultivated and was regarded as of much importance at a very early period in the world's history there is abundant testimony Especially in ancient Egypt the fibre occupied a most important place, linen having been there not only generally worn by all classes, but it was the only material the priestly order was permitted to wear, while it was most extensively used as wrappings for embalmed bodies and for general purposes In the Old Testament we are told that Pharaoh arrayed Joseph "in vestures of fine linen" (Gen xlii 42), and among the plagues of Egypt that of hail destroyed the flax and barley crops, "for the barley was in the ear, and the flax was bolled" (Exod ix 31) Further, numerous pictorial representations of flax culture and preparation exist to the present day on the walls of tombs and in Egypt Sir J G Wilkinson in his description of ancient Egypt shows clearly the great antiquity of the ordinary processes of preparing flax "At Beni Hassan," he says, "the mode of cultivating the plant, in the same square beds now met with throughout Egypt (much resembling our salt pans), the process of beating the stalks and making them into ropes, and the manufacture of a piece of cloth are distinctly pointed out" The preparation of the fibre as conducted in Egypt is illustrated by Pliny (*q v*), who says "The stalks themselves are immersed in water, warmed by the heat of the sun, and are kept down by weights placed upon them, for nothing is lighter than flax The membrane, or rind, becoming loose is a sign of their being sufficiently macerated They are then taken out and repeatedly turned over in the sun until perfectly dried, and afterwards beaten by mallets on stone slabs That which is nearest the rind is called *stupa* ("tow"), inferior to the inner fibres, and fit only for the wicks of lamps It is combed out with iron hooks until the rind is all removed The inner part is of a whiter and finer quality Men are not ashamed to prepare it" (Pliny *N H* xix 1) For many ages, even down to the early part of the 14th century, Egyptian flax occupied the foremost place in the commercial world, being sent into all regions with which open intercourse was maintained Among Western nations it was, without any competitor, the most important of all vegetable fibres till towards the close of the 18th century, when, after a brief struggle, cotton took its place as the supreme vegetable fibre of commerce

Cultivation of Land.—Flax prospers most when grown upon land of firm texture resting upon a moist subsoil It does well to succeed oats or potatoes, as it requires the soil to be in fresh condition without being too rich Lands newly broken up from pasture suit it well, as these are generally freer from weeds than those that have been long under tillage The land, having been ploughed in autumn, is prepared for sowing by working it with the grubber, harrow and roller, until a fine tilth is obtained On the smooth surface, when the plants are intended for fibre, the seed is sown broadcast by hand or machine, at the rate of three bushels per acre, in order that the plants may be rank, and thus prevent branching especially from the lower parts It is advisable immediately to hand-rake it with common hay-rakes, and thus to remove all stones and clods, and to secure a uniform close cover of plants When these are about 2 to 3in long the crop must be carefully hand-weeded This is a tedious and expensive process, and hence the importance of sowing the crop on land as free as possible from weeds of all kinds The weeders, faces to the wind, if any, move slowly on hands and knees, and should remove every vestige of weed in order that the flax plants may receive the full benefit of the land The time of weeding should be chosen when the ground is damp When flax is cultivated primarily on account of the fibre, the crop ought to be pulled before the capsules are quite ripe, when they are just beginning to change from a green to a pale-brown colour, and when the stalks of the plant have become yellow throughout about two-thirds of their height

The various operations through which the crop passes from this point till flax ready for the market is produced are (1) Pulling, (2) Rippling, (3) Retting, (4) Drying, (5) Rolling, (6) Scutching

Pulling and Rippling.—*Pulling* and *rippling* may be dismissed very briefly Flax is always pulled up by the root, except in some parts of America and Canada where the plants are grown solely for seed. It is usually pulled by hand, but recently mechanical flax pulling machines have been introduced The pulling ought to be done in dry clear weather; and care is to be taken in this, as in all the subsequent operations, to keep the root-ends even and the stalks parallel At the same time it is desirable to have, as far as possible, stalks of equal length together—all these conditions

having considerable influence on the quality and appearance of the finished sample. As a general rule the removal of the "bolls" or capsules by the process of rippling immediately follows the pulling, the operation being performed in the field; but under some systems of cultivation, as, for example, the Courtrai method, alluded to below, the crop is made up into sheaves, dried and stacked, and is only bolled and retted in the early part of the next ensuing season The simplest type of rippler, or apparatus for separating the seed capsules from the branches, consists of a kind of comb having, set in a wooden frame, iron teeth made of round-rod iron $\frac{3}{16}$ of an inch asunder at the bottom and half an inch at the top, and 18in long, to allow a sufficient spring, and save much breaking of flax. The points should begin to taper 3in. from the top When such a rippler is used, a sheet or other cover may be spread on the field, the apparatus placed in the middle of it, and two ripplers, sitting opposite each other, with the machine between them, work at the same time Suitable machines are now made for this operation In any case, it is inadvisable to ripple the flax so severely as to break or tear the delicate fibres at the upper part of the stem The two valuable commercial products of the flax plant, the seeds and the stalk, are separated at this point We have here to do with the latter only.

Retting.—*Retting* or *rotting* is an operation of the greatest importance, and one in connection with which, during the last 50 years, numerous experiments have been made, and many projects and processes put forth, with the view of remedying the defects of the primitive system or altogether supplanting it Up to the present, however, the so-called primitive method remains the chief one. From the earliest times two leading processes of retting have been practised, termed respectively water-retting and dew-retting, and as no method has yet been introduced which satisfactorily supersedes these operations, they will first be described

For water-retting—the process by which flax is generally prepared—pure soft water, free from iron and other materials which might colour the fibre, is essential. Any water much impregnated with lime is also specially objectionable The dams or ponds in which the operation is conducted are of variable size, and usually between 4 and 5ft in depth, much retting is done in slowly running rivers The rippled stalks are tied in small bundles and packed occasionally root downwards, but often flat, in the dams till they are quite full, over the top of the upper layer is placed a stratum of rushes and straw, or sods with the grassy side downwards, and above all stones of sufficient weight to keep the flax submerged. Under favourable circumstances a process of fermentation should immediately be set up, which soon makes itself manifest by the evolution of gaseous bubbles. After a few days the fermentation subsides, and generally in from ten days to two weeks the process ought to be complete The exact time, however, depends upon the weather, the temperature, and the particular kind of water in which the flax is immersed The immersion itself is a simple matter; the difficulty lies in deciding when the process is complete If allowed to remain under water too long, the fibre is weakened by what is termed "over-retting," a condition which increases the amount of codilla in the scutching process, whilst "under-retting" leaves part of the gummy or resinous matter in the material, which hinders the subsequent preparing and spinning processes As the steeping is such a critical operation, it is essential that the stalks be examined daily and tested as the process nears completion When it is found that the fibre separates readily from the woody 'shive" or core, the beets or small bundles are ready for removing from the dams The plants are drained, and then spread, evenly and equally, over a grassy meadow to dry The drying, which takes from a week to a fortnight, must be uniform, so that all the fibres may spin equally well To secure this uniformity, it is necessary to turn the material over several times during the process It is ready for gathering when the core cracks and separates easily from the fibre At this point advantage is taken of fine dry weather to gather up the flax, which is now ready for breaking, but the fibre is improved by stooking and stacking it for some time before it is taken to the breaking and scutching mill

Dew-retting is the process by which all the Archangel flax and a large portion of that sent out from Leningrad are prepared By this method the operation of steeping is entirely dispensed with, and the flax is, immediately after pulling, spread on the grass where it is under the influence of air, sunlight, night-dews and rain The process is tedious, the resulting fibre is brown in colour, and it is said to be peculiarly liable to undergo heating (probably owing to the soft heavy quality of the flax) if exposed to moisture and kept closely packed with little access of air. Archangel flax is, however, peculiarly soft and silky in structure, although in all probability water-retting would result in a fibre as good or even better in quality

Retting is really a complicated process of fermentation, as the amount of retting bacteria is regulated by the rate of movement of the water and by the temperature

The only modification of water-retting which has hitherto endured the test of prolonged experiment, and taken a firm position as a distinct improvement, is the warm-water retting, the original of which was patented in England in 1846 by an American, Robert B Schenck For open pools and dams Schenck substitutes large wooden vats under cover, into which the flax is tightly packed in an upright position The water admitted into the tanks is raised to and maintained at a temperature of from 75° to 95° F during the whole time the flax is in steep In a short time a brisk fermentation is set up, gases at first of pleasant odour, but subsequently becoming very repulsive, being evolved, and producing a frothy scum over the surface of the water The whole process occupies only from 50 to 60 hours Since that time, several other methods have been tried and only recently Dr Pritchard's method formed the chief part of the prospectus of a new large limited company

Breaking.—On the completion of the retting operation, the flax stalks are treated in a breaking machine, where several pairs of fluted rollers break the woody centre of the stalks into small pieces without damaging the fibrous layer In passing, it should be stated that the fibrous layer is just under the cuticle or outer bark of the plant Specially constructed rollers are used to feed the stalks to the fluted rollers, and other rollers to deliver the treated stalks Scraping mechanism works in conjunction with the breaking rollers so that the bulk of the woody matter may be removed from the interior of the plant and from the fibrous layer When this operation is finished, the fibrous layer is ready for the scutching mill This is the process by which the woody matter not removed in the breaking is scraped off the fibrous layer, either by hand or machine

Scutching.—Hand labour, aided by simple implements, is still much used in Continental countries both for breaking and scutching; also in some parts of Ireland where labour is cheap, or when very fine material is desired; but the use of scutching mills is now very general, these being more economical A great many modified scutching machines and processes have been proposed and introduced with the view of promoting economy of labour and improving the turn-out of fibre, both in respect of cleanness and in producing the least proportion of codilla or scutching tow

The celebrated Courtrai flax of Belgium is the most valuable staple in the market, on account of its fineness, strength and particularly bright colour There the flax is dried in the field, and housed or stacked during the winter succeeding its growth, and in the spring of the following year it is retted in crates sunk in the sluggish waters of the river Lys After the process has proceeded a certain length, the crates are withdrawn, and the sheaves taken out and stooked It is thereafter once more tied up, placed in the crates, and sunk in the river to complete the retting process; but this double steeping is not invariably practised When finally taken out, it is unloosed and put up in cones, instead of being grassed, and when quite dry it is stored for some time previous to undergoing the operation of scutching In all operations the greatest care is taken, and the cultivators being peculiarly favoured as to soil, climate and water, Courtrai flax is a staple of unapproached excellence.

An experiment made by Professor Hodges of Belfast on 7,770lb of air-dried flax yielded the following results By rippling he separated 1,946lb. of bolls which yielded 91olb of seed The 5,824lb (52cwt) of flax straw remaining lost in steeping 13cwt left 39cwt of retted stalks, and from that 6cwt 1qr 2lb (702lb)

of finished flax was procured. Thus the weight of the fibre was equal to about 9% of the dried flax with the bolls, 12% of the bolled straw, and over 16% of the retted straw. One hundred tons treated by Schenck's method gave 33 tons bolls, with 27·50 tons of loss in steeping, 32·13 tons were separated in scutching, leaving 5 90 tons of finished fibre, with 1 47 tons of tow and pluckings. The following analysis of two varieties of heckled Belgian flax is by Dr Hugo Müller (Hoffmann's *Berichte uber die Entwickelung der chemischen Industrie*).—

	%	%
Ash	0 70	1 32
Water	8 65	10 70
Extractive matter	3 65	6 02
Fat and wax	2 39	2 37
Cellulose	82 57	71 50
Intercellular substance and pectose bodies	2 74	9 41

According to the determinations of Julius Wiesner (*Die Rohstoffe des Pflanzenreiches*), the fibre ranges in length from 20 to 140 centimetres, the length of the individual cells being from 2 0 to 4·0 millimetres, and the limits of breadth between 0·012 and 0·025 mm, the average being 0·016 mm

Vicissitudes of the Trade.—Among the circumstances that have retarded improvement both in the growing and preparing of flax, the fact that, till comparatively recent times, the whole industry was conducted only on a domestic scale has had much influence At no very remote date it was the practice in Scotland for every small farmer and cotter not only to grow "lint" or flax in small patches, but to have it retted, scutched, cleaned, spun, woven, bleached and finished entirely within the limits of his own premises, and all by members or dependents of the family. The same practice obtained and still largely prevails in other countries Thus the flax industry was long kept away from the most powerful motives to apply to it labour-saving devices, and apart from the influence of scientific inquiry for the improvement of methods and processes. As cotton came to the front, just at the time when machine-spinning and power-loom weaving were being introduced, the result was that in many localities where flax crops had been grown for ages, the culture gradually drooped and ultimately ceased. By degrees, the operations of spinning and weaving ceased to be followed as a domestic industry, and were ultimately merged into factory processes.

For a considerable number of years before the World War, the number of areas under flax cultivation in Russia exceeded the combined areas of all the rest of Europe There was also a complete classification of the various kinds All this, however, has been changed and any data referring to the subject is more or less unreliable. Nevertheless, those interested in the districts in which flax culture prevails, the present methods of classification, and other particulars, can obtain these from the booklets issued by the Northern and Eastern European Trading Company, Ltd. Many attempts have been made, and are still being made, to extend the cultivation of flax in Great Britain and Ireland Much progress has been made, but much more remains to be done, before the flax industry recovers its prestige

See T Woodhouse and P Kilgour "Flax and Flax Spinning" in *The Textile Recorder* (Jan. 1917 to July 1919); F Bradbury, *Flax Culture and Preparation* (1920). (T W)

FLAXMAN, JOHN (1755–1826), English sculptor and draughtsman, was born at York on July 6, 1755, the second son of John Flaxman, who carried on the trade of a moulder and seller of plaster casts at the sign of the Golden Head, New street, Covent garden, London. Within six months of his birth the family returned to London, and in his father's back shop he spent an ailing childhood

He early took delight in drawing and modelling from his father's stock-in-trade In 1770 he entered as a Royal Academy student and won the silver medal. In the competition for the gold medal of the Academy in 1772, Flaxman was defeated. But this reverse proved no discouragement, he continued to work both as a student in the schools and as an exhibitor in the galleries of the Academy, occasionally also attempting diversions into the sister art of painting. To the Academy he contributed a wax model of Neptune (1770); four portrait models in wax (1771), a terra-cotta bust, a wax figure of a child, a figure of History (1772); a figure of Comedy, and a relief of a Vestal (1773) During these years he received a commission from a friend of the Mathew family, for a statue of Alexander But by heroic and ideal work of this class he could, of course, make no regular livelihood In his 20th year he was employed by Josiah Wedgwood and his partner, Bentley, as modeller of classic and domestic friezes, plaques, ornamental vessels and medallion portraits, in "jasper" and "basalt" ware.

For 12 years, from his 20th to his 32nd (1775–1787), Flaxman subsisted chiefly by his work for the firm of Wedgwood, but by 1780 he had begun to earn something in another branch of his profession, which was in the future to furnish his chief source of livelihood, viz, the sculpture of monuments for the dead Three of the earliest of such monuments by his hand are those of Chatterton in the church of St. Mary Redcliffe at Bristol (1780), of Mrs Morley in Gloucester cathedral (1784), and of the Rev. T and Mrs Margaret Ball in the cathedral at Chichester (1785). During the rest of Flaxman's career memorial bas-reliefs of the same class occupied a principal part of his industry, they are to be found scattered in many churches throughout the length and breadth of England The best are admirable for pathos and simplicity, and for a Greek instinct for rhythmical design and composition

In 1782, Flaxman was married to Anne Denman They set up house at first in Wardour street, sometimes spending their summer holidays in the house of the poet Hayley, at Eartham in Sussex In 1787 they set out for Rome Flaxman soon ceased modelling for Wedgwood himself, but continued to direct the work for other modellers employed for the manufacture at Rome. He had intended to return after a stay of a little more than two years, but was detained by a commission for a marble group of a Fury of Athamas from the notorious Comte-Évêque, Frederick Hervey, earl of Bristol and bishop of Derry, and did not return until the summer of 1794, having in the meantime executed another commission (a "Cephalus and Aurora") for Mr. Hope, and having sent home models for several sepulchral monuments, including one in relief for the poet Collins, in Chichester cathedral, and one in the round for Lord Mansfield in Westminster Abbey.

But what gained for Flaxman in this interval a general and European fame was those outline designs to the poets, in which he showed his natural affinity to the ancients and belonged to them. The designs for the *Iliad* and *Odyssey* were commissioned by Mrs Hare Naylor, those for Dante by Mr Hope; those for Aeschylus by Lady Spencer, they were all engraved by Piroli, not without considerable loss of the finer and more sensitive qualities of Flaxman's own lines

In 1797 Flaxman was made an A R A. Every year he exhibited work of one class or another, occasionally a public monument in the round, like those of Paoli (1798), or Captain Montague (1802) for Westminster Abbey, of Sir William Jones for St. Mary's, Oxford (1797–1801), of Nelson or Howe for St Paul's; more often memorials for churches, with symbolic Acts of Mercy or illustrations of Scripture texts, both commonly in low relief (Miss Morley, Chertsey [1797], Miss Cromwell, Chichester [1800], Mrs. Knight, Milton, Cambridge [1802], and many more) Soon after his election as associate, he published a scheme, half grandiose, half childish, for a monument to be erected on Greenwich hill, in the shape of a Britannia, 200 ft high. In 1800 he was elected full academician. In 1810 he was appointed to a chair of sculpture specially created for him by the Royal Academy. The most important works which occupied Flaxman in the following years were the monument to Mrs Baring in Micheldever church, the richest of all his monuments in relief (1805–1811), that for the Worsley family at Campsall church, Yorkshire, which is the next richest; those to Sir Joshua Reynolds for St. Paul's (1807); to Captain Webbe for India (1810), to Captains Walker and Beckett for Leeds (1811), to Lord Cornwallis for Prince of Wales's island (1812), and to Sir John Moore for Glasgow (1813).

After his Roman period he produced for a good many years

no outline designs for the engraver except three for Cowper's translations of the Latin poems of Milton (1810) Other sets of outline illustrations drawn about the same time, but not published, were one to the *Pilgrim's Progress,* and one to a Chinese tale in verse, called "The Casket" In 1817 we find him returning to his old practice of classical outline illustrations and publishing the happiest of all his series in that kind, the designs to Hesiod, excellently engraved by the sympathetic hand of Blake Immediately afterwards he was much engaged in designing for the goldsmiths—a testimonial cup in honour of John Kemble, and following that, the great labour of the famous and beautiful (though quite un-Homeric "Shield of Achilles" Almost at the same time he undertook a frieze of "Peace, Liberty and Plenty," for the duke of Bedford's sculpture gallery at Woburn, and an heroic group of Michael overthrowing Satan, for Lord Egremont's house at Petworth His literary industry at the same time is shown by several articles on art and archaeology contributed to Rees's *Encyclopaedia* (1819–20) In 1822 he delivered at the Academy a lecture in memory of his old friend and generous fellow-craftsman, Canova, then lately dead, in 1823 he received from A W von Schlegel a visit of which that writer has left us the record He died on Dec 3, 1826

Of his completed ideal sculptures, the "St Michael" at Petworth is the best, and indeed is admirably composed from all points of view, but it lacks fire and force, and the finer touches of the chisel, a little bas-relief like the diploma piece of the "Apollo" and "Marpessa" in the Royal Academy compares with it favourably This is one of the very few things which he is recorded to have executed in the marble entirely with his own hand, ordinarily he entrusted the finishing work of the chisel to Italian workmen and was content with the smooth mechanical finish which they imitated from the Roman imitations of Greek originals Of Flaxman's complicated monuments in the round, such as the three in Westminster Abbey and the four in St Paul's, there is scarcely one which has not something heavy and infelicitous in the arrangement But when we come to his simple monuments in relief we find almost always a far finer quality He did not thoroughly understand composition on the great scale and in the round, but he did thoroughly understand relief, and found scope in it for his remarkable gifts of harmonious design, and tender, grave and penetrating feeling But if we would see even the happiest of his conceptions at their best, we must study them, not in the finished marble but rather in the casts from his studio sketches (marred though they have been by successive coats of paint intended for their protection) of which a comprehensive collection is preserved in the Flaxman gallery at University college And the same is true of his happiest efforts in the classical and poetical vein, like the well-known relief of "Pandora Conveyed to Earth by Mercury" We can realize the most essential charm of his genius in the study, not of his modelled work at all, but of his sketches in pen and wash on paper Of these the principal public collections are at University college, in the British Museum, and the Victoria and Albert Museum

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FLEA, a name given to insects forming the scientific order *Siphonaptera* (or *Aphaniptera*) and typically applied to the human flea (*Pulex irritans*) Fleas live as ecto-parasites on the bodies of mammals and birds, where they feed by sucking the blood They are remarkable for their powers of leaping, and about 500 species are known. They are wingless insects with the body laterally compressed, short stout antennae reposing in grooves, and the eyes minute or wanting The mouth-parts are adapted for piercing and sucking The skin of the host is perforated by the blade-like mandibles, and the blood is imbibed through a channel formed by these organs in close conjunction with the stylet-like labrum Fleas pass through a complete metamorphosis their larvae are worm-like, and live on organic refuse about the lairs of the hosts, and the pupae are enclosed in silken cocoons The human flea is nearly cosmopolitan and, in addition to man, it also infests certain other mammals. The eggs are found on the floors, carpets, etc , of uncleanly dwellings, where the larvae feed upon particles of refuse, and the whole life-history is completed in four to six weeks Several species of fleas infesting rats, and also known to suck the blood of man, are concerned with the spread of the bacillus of bubonic plague, the most important being *Xenopsylla cheopis,* which is the chief plague flea in India In the "jigger" or "chigoe" (*Dermatophilus penetrans*) of the tropics the female becomes embedded in the skin of the feet of man and other hosts, where she becomes distended to the size of a small pea, and causes extreme irritation. (A D I)

FLÈCHE, an architectural term which, in France, signifies any spire, but in English usage is limited to those small, slender spires which are placed on the ridge of a roof of a church and not upon a tower The *flèche* is usually built of a wood framework covered with lead or occasionally copper and is generally of rich, light, delicate design, in which tracery, miniature buttresses and crockets have an important part They are frequently of great height, that of Notre Dame, Paris, being nearly 100ft and that of Amiens, 148 feet The *flèche* is usually placed at the intersection of nave and transepts Reims cathedral had, however, an additional *flèche* at the summit of the apse

FLÉCHIER, ESPRIT (1632–1710), bishop of Nîmes, was born at Pernes on June 10, 1632 He entered the Congrégation des Doctrinaires, and afterwards left it, owing to the strictness of its rules, and went to Paris His French poems met with little success, but a description in Latin verse of a tournament given by Louis XIV in 1662, brought him a great reputation He subsequently became tutor to Louis Urbain Lefèvre de Caumartin (afterwards *intendant* of finances and counsellor of state), *lecteur* to the dauphin in 1668, abbot of St Séverin, in the diocese of Poitiers, almoner to the dauphiness, bishop of Lavaur, in 1685, and in 1687 bishop of Nîmes The edict of Nantes had been repealed two years before, but the Calvinists were still numerous at Nîmes Fléchier, by his leniency and tact, succeeded in bringing over some of them to his views During the troubles in the Cévennes (*see* HUGUENOTS) he softened to the utmost of his power the rigour of the edicts He died at Montpellier on Feb 16, 1710 As a preacher he cannot be compared with Bossuet or Bourdaloue, but he is always ingenious, often witty, his indisputable eloquence is sometimes marred by an affectation of symmetry and an excessive use of antithesis

The last complete edition of Fléchier's works appeared at Paris, 1828, the *Mémoires sur les Grands Jours* was published in 1844 by B Gonod (2nd ed , 1862) His other works are *Histoire de Théodose le Grand* (Eng trans. 1693), *Oraisons funèbres, Histoire du Cardinal Ximénès, Sermons de morale, Panégyriques des saints See* A Fabre, *Fléchier, orateur* (1886), A Delacroix, *Vie de Fléchier* (1865)

FLECKEISEN, ALFRED (1820–1899), German philologist and critic, was born at Wolfenbuttel on Sept 23, 1820 He was vice-principal of the Vitzthum'sches Gymnasium at Dresden from 1861 to 1889 He died on Aug 7, 1899 Fleckeisen is chiefly known for his work on Plautus and Terence, in the knowledge of these authors he was unrivalled, except perhaps by Ritschl, his life-long friend and a worker in the same field His chief works are. *Exercitationes Plautinae* (1842); "Analecta Plautina," printed in *Philologus,* ii. (1847); *Plauti Comoediae,* i , ii (1850–51, unfinished), introduced by an *Epistula critica ad F. Ritschelium; P. Terenti Afri Comoediae* (new ed , 1898).

FLECKER, JAMES ELROY (1884–1915), was born in London on Nov. 5, 1884, the son of Rev. W. H. Flecker, and christened Herman Elroy; this name he changed to James many years later. He was educated at Dean Close School, Cheltenham,

where his father was headmaster, Uppingham and Trinity College, Oxford. Desiring to enter the consular service, he went to Caius college, Cambridge, to learn oriental languages, and he was sent to Constantinople in June 1910 The same year his *Twenty-six Poems* was published In September, having fallen ill, he returned to England and went to a sanatorium; he returned to his post, apparently cured, in March 1911, and was transferred to Smyrna in April In May he married, in Athens, Miss Helle Skiadaressi He fell ill again early in 1913, and went to Switzerland; *The Golden Journey to Samarkand* was published in this year He died at Davos on Jan 3, 1915 The last few years of his life included, in addition to competent work at his profession and a desperate struggle with illness, a considerable poetic activity, some of it of very high quality

He belongs to no "school," though the Parnassians are known to have had some influence on him, and his work, some of which is in every modern anthology, never seems quite at home there. Nor is it easy to describe it; of his many themes the most recurrent are Greece, the East and England, and he has best portrayed himself in *Oak and Olive.* But at least it seems safe to conjecture that some of his lyrics, between the sculptured stillness of *A Ship, an Isle* and the movement, so expressive in utterly different ways, of *Saadabad* and the *Dying Patriot* will not be forgotten What is perhaps more disputable is Flecker's place as a dramatist He left behind him at his death two unpublished plays, *Hassan* (Haymarket, 1923) and *Don Juan Don Juan* is perhaps too slight and unequal to support a claim to dramatic genius *Hassan* is rather a different matter. No one would call it faultless, but as a play to read, with its colour and its wit and its passion, its alternation of merriment and tragedy, and the strange beauty of its rhythms it is entirely fascinating Flecker also wrote *The Grecians* (1910) and a novel, *The King of Alsander* (1914)

See *Collected Poems,* with an introduction by J. C. Squire (1916); *Hassan* (1922), *Don Juan* (1925), *Collected Prose* (1920 and 1922); *Letters to Frank Savery* (1926)

See also D Goldring, *J E Flecker* (1922); and the *Life* by Geraldine Hodgson (1925)

FLECKNOE, RICHARD (*c* 1600–*c* 1678), English dramatist and poet, was probably of English birth The few known facts of his life are derived from his *Relation of Ten Years' Travels in Europe, Asia, Affrique, and America,* consisting of letters written during his travels He fled from the Civil War to Ghent, and in 1645 he went to Rome for Béatrix de Cusance, to secure the legalization of her marriage to Charles IV Andrew Marvell has described him in his satire, "Flecknoe, an English Priest at Rome" He also travelled in the Levant, and in 1648 went to Brazil

His royalist and Catholic convictions did not prevent him from writing a book in praise of Oliver Cromwell, *The Idea of His Highness Oliver . . .* (1659) This publication was discounted at the Restoration by the *Heroick Portraits* (1660) of Charles II and others of the Stuart family John Dryden used his name as a stalking horse from behind which to assail Thomas Shadwell in *Mac Flecknoe* (1682) The opening lines run.—

> All human things are subject to decay,
> And, when fate summons, monarchs must obey.
> This Flecknoe found, who, like Augustus, young
> Was called to empire, and had governed long,
> In prose and verse was owned, without dispute,
> Throughout the realms of nonsense, absolute.

Dryden's aversion seems to have been caused by Flecknoe's affectation of contempt for the players and his attacks on the immorality of the English stage. His verse, which hardly deserved his critic's sweeping condemnation, was much of it religious, and was chiefly printed for private circulation. None of his plays was acted except *Love's Dominion,* announced as a "pattern for the reformed stage" (1654). He died probably about 1678

A *Discourse of the English Stage,* was reprinted in W. C. Hazlitt's *English Drama and Stage* (1869); Robert Southey, in his *Omniana* (1812), protested against the wholesale depreciation of Flecknoe's works. *See* also A. Lohr, "Richard Flecknoe," in *Münchener Beiträge zur . . . Philologie* (Leipzig, 1905).

FLEET AUXILIARY VESSELS. In addition to the fighting units—battleships, cruisers, destroyers, etc.—which go to make up a fleet, a modern navy, in war time, requires an array of auxiliary vessels and small craft. The World War produced many varieties of such auxiliaries, some for service with the main forces, but many to perform special functions, called for by the German submarine and mine-laying campaign, or for use in connection with landing operations. In the first category were the vessels required to carry oil fuel, ammunition, provisions and stores from the naval establishments to the fleet bases, in general, merchant ships were adapted for these services In addition, repair ships fitted with complete workshops were employed at the fleet bases For other services, existing ships were adapted or new vessels were built Space permits mention of the more important types only

Armed Merchant Cruisers.—Merchant ships of large and medium size were fitted out by the British Admiralty as armed merchant cruisers These vessels performed invaluable service in dealing with the German armed liners which were at large at the outbreak of war, a notable event in this connection being the sinking of the "Cap Trafalgar" by the "Carmania" on Sept 14, 1914 At a later stage of the war the A M C 's were principally employed on convoy duty across the Atlantic The standard fighting equipment of the largest of these was two 6in B L. guns, six 6in Q F. guns, two 11in. howitzers, two 6pdr. or other anti-aircraft guns and four depth charges In order to relieve some of the destroyers for essential duty with the fleet, certain vessels of cross channel type were converted into armed boarding vessels

Convoy Sloops and Kite Balloon Ships.—Sloops classified as convoy sloops were built to resemble merchant ships The guns were in concealed positions, and many of these vessels carried kite balloons to assist them in locating enemy submarines As auxiliaries to these and to other fighting vessels carrying kite balloons, one or two merchant ships were taken over and fitted with powerful hydrogen plants for inflating the kite balloons Merchant ships spotting with these balloons co-operated with the land forces during the Gallipoli campaign. They also did useful work in the Adriatic.

Whaling Ships.—In 1915, 15 vessels of whaler type were built for the convoying of merchant vessels of slow speed The whaler type was considered to be desirable (and proved to be so on service) on account of its good manoeuvring qualities, which enabled it to cope with enemy submarines despite its slow speed These vessels were 132ft long, 25ft beam, 8½ft mean draught and carried one 12pdr gun They were well subdivided by bulkheads and decks to give them the maximum safety in case of underwater damage Their gun could be effectively concealed, and a mock harpoon gun was fitted forward as an additional disguise to their real character.

Q-Ships.—No reference to the auxiliary vessels used during the war would be complete without mention of the famous Q-ships, and their campaign against the enemy submarines Merchant vessels, both sailing and steam driven and of many different types, were fitted out with guns and depth charges which were cleverly concealed behind dummy deck houses, boats, etc. They went to sea with the deliberate object of luring submarines into attacking them, and the crews would entice the enemy to close quarters by making a show of abandoning the ship. At the critical moment the hidden guns would be revealed and fire opened on the submarine. The Q-ships were manned by naval personnel disguised as ordinary merchant seamen and their heroic deeds were responsible for the destruction of a considerable number of submarines, although the ships themselves did not emerge from their campaign without numerous losses.

Mine-Sweepers and Trawlers.—The extensive minelaying operations of the Germans called for the provision of many mine-sweeping vessels. A number of smaller merchant ships were taken over for this purpose at the outset of the war, but it soon became necessary to build vessels specially suited to mine-sweeping as the demand became greater. Altogether about 100 of these vessels were built, merchant practice being adopted in order to simplify their construction and to bring them within the capacity of the smaller shipyards. They were of 750 tons displacement, and the 1,800h.p machinery provided enabled them to reach a full speed of 17 knots. They proved capable of remaining afloat after the

most severe damage from mines. Ordinary steam fishing trawlers were also used for mine-sweeping, and many new vessels of this type were built for the Admiralty during the war

P-Boats.—Patrol boats of the "P" class were designed to relieve destroyers of such duties as patrolling, escort work and operations against submarines. High speed was not a necessity for the particular work which they had to undertake, but their 22 knots was sufficient to overtake submarines, and their top-hamper was kept as low as possible to avoid their being easily visible They were of 600 tons displacement and developed full speed with 3,800h p geared turbines, and carried one 4in. and one 2pdr gun and two 14in torpedo tubes They proved very economical boats both in initial cost and upkeep and were very successful, especially in their anti-submarine work

Coastal Motor Boats.—A great deal of useful work in attacking submarines, in patrolling the coast and in operations against enemy bases on the Belgian coast was performed by the large fleet of coastal motor boats which were built during the war These boats varied from 40ft in length in the earlier types to 70ft in the later design and the speeds varied from 30 to 37 knots They were fitted with Lewis guns and depth charge apparatus and could carry alternatively either a mine or one or two 18in torpedoes They took part in many operations attended with great risks, notably in the raids on Zeebrugge and Ostend, and the fact that only five were lost in action out of the large number in service is evidence of their success and the skill with which they were handled

Oilers, Ammunition Ships, etc.—The Admiralty also designed some fast fleet oilers which could carry 5,000 tons of oil at a speed of 15 knots Many other types of auxiliary ships were designed and constructed including ammunition ships, gunboats for patrol work and also of special type for work in Mesopotamia, self-propelled lighters for landing troops, guns, etc , and blockships Examples of the last-named class are the "Vindictive" and her sister blockships which were used in the raids on Zeebrugge and Ostend (*See* BELGIAN COAST OPERATIONS)

(W. J. B.)

FLEET, NAVAL. "Fleet" usually implies a collection of ships in company, particularly one consisting of a large number of warships or it is "The collective naval force of a country" (Webster) It is also used in connection with a collection of fishing vessels and in sea fishing it is used to mean a row of drift nets secured together The term is derived from the root of the verb "to fleet," O Eng fleotan—to float, to flow In the British Navy the bigger sea commands are usually referred to as fleets, *e g* , Mediterranean Fleet, and the smaller commands as squadrons, *e g* , First Cruiser Squadron (*See* also ADMIRAL)

A fleet, in its naval sense, is generally composed of a number of squadrons of different types of ships, such as the battle squadron, battle cruiser squadron, cruiser squadron, as well as groups of lighter vessels which are more often referred to as flotillas, *e g.*, a destroyer or submarine flotilla The larger formations may be sub-divided for manoeuvring and administrative purposes into divisions; for instance the battleships of the British Grand Fleet in one of its organisations were grouped in seven divisions Normally each division of battleships or a squadron of cruisers is commanded by a flag officer. Destroyer flotillas are commanded by captains and half flotillas by commanders. (*See* also DESTROYER) The commander-in-chief generally flies his flag in a fleet flag-ship, usually a battleship, which is independent of the various organisations but which takes her allotted place in the battle line

A Fleet at Sea.—In order to understand the elementary principles of handling a fleet at sea, it is necessary to define certain simple formations

Line ahead (American term, Column) (Fig 1) Ships in single line, one astern of the other

Line abreast (American term, Line) Ships in single line, each abreast of the other.

Quarter line (the American term is line of bearing followed by the inclination to the squadron course in degrees, thus, "line of bearing, 50°). Ships in single line, disposed on a bearing of 45° from a line astern of the leading ship. Ships may also be disposed on any other line of bearing from the flagship or appointed leader

With a great number of ships in company it is inconvenient to keep station in a very long single line, therefore divisional formations are resorted to.

Divisions in line ahead—disposed abeam (American term, Line of division columns) (Fig 2) In this formation the ships of each division are in line ahead while the divisions are disposed abreast of each other, the distance between the lines, for manoeuvring purposes, is one equal to the length of each division. From the diagram it will be seen that this enables the whole fleet to be formed into single line by the simple method of each division wheeling astern of its leader This process is known as deploying and is one of the methods of getting into battle formation from cruising formation. (*See* also JUTLAND, BATTLE OF)

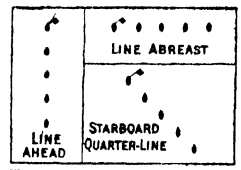

FIG. 1.—DIAGRAM OF FLEET FORMATIONS WITH UNITS KEEPING STATION 2½ CABLE LENGTHS (500 YARDS) FROM ONE ANOTHER, RECKONING FROM BOW TO BOW

A Fleet in Battle.—A considerable amount of freedom of movement in battle is allowed to the commanders of individual squadrons, especially in the case of cruisers and destroyers A certain amount of independence is also permissible to the flag officers commanding the divisions of a battle fleet, but in the handling of a fleet certain essentials must always govern any efforts at individual initiative Principal among these are (a) Collisions must be avoided, (b) Ships of lesser importance should not interfere with the gun-fire or other means of offense of ships of greater importance as regards their ability to inflict damage on the enemy. (c) The fleet must not become so divided that the enemy can defeat it piecemeal This particularly applies in the case of the battle fleet Where a force has greatly superior speed to the heavier ships of the enemy fleet, such as a squadron of battle cruisers or a fast battle squadron, like the 5th Battle Squadron at Jutland (*q v*), a considerable measure of individual tactics may be employed with advantage, but at all times it is of great importance that every group and unit composing a fleet should understand and conform to the principles governing the general tactical plan of the commander-in-chief.

The development of aircraft and the advent of the aircraft carrier as a fleet unit are likely to have a very considerable effect on the future conduct of fleets in action Where air observation is available on both sides, the element of surprise between rival fleets to a large extent disappears, as the respective commanders will be informed of their adversary's movements while they are still a long way out of sight of each other This same influence will make itself felt in the manner of engaging. On the one hand it may bring about an action, on the other it may enable a weaker force to escape The effect may well be to enhance the strategical importance of darkness

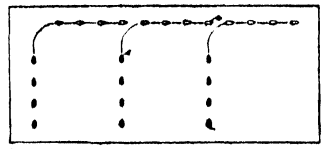

FIG 2.—DIAGRAM OF A FLEET IN DIVISIONS IN LINE AHEAD, DISPOSED ABEAM, SHOWING METHOD OF DEPLOYMENT INTO SINGLE LINE AHEAD

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(E. A.)

FLEET PRISON, an historic London prison, formerly situated on the east side of Farringdon street, and deriving its name from the Fleet stream It became prominent from being used as a

place of reception for persons committed by the Star Chamber, and, afterwards, for debtors, and persons imprisoned for contempt of court by the court of chancery It was burnt down in the great fire of 1666; rebuilt, destroyed in the Gordon riots of 1780 and again rebuilt in 1781–82 In pursuance of an act of 1842 by which the Marshalsea, Fleet and Queen's Bench prisons were consolidated under the name of Queen's prison, it was finally closed, and in 1844 sold to the corporation of the City and pulled down. The head of the prison was termed "the warden," who was appointed by patent It became a frequent practice of the holder of the patent to "farm out" the prison to the highest bidder It was this custom which made the Fleet prison long notorious for the cruelties inflicted on prisoners. The liberties or rules of the Fleet were the limits within which particular prisoners were allowed to reside outside the prison walls subject to certain conditions

Fleet Marriages.—By the common law a marriage was valid if the ceremony was conducted by a person in holy orders, even if those orders were not of the Church of England Neither banns nor licence were necessary, and the time and place were alike immaterial Thus, in the period of laxness which succeeded the Commonwealth, resulted innumerable clandestine marriages They were contracted at first to avoid expense, but an act of 1696, which imposed a penalty of £100 on any clergyman who celebrated, or permitted another to celebrate, a marriage otherwise than by banns or licence, acted as a considerable check To clergymen imprisoned for debt in the Fleet, however, such a penalty had no terrors, for they had "neither liberty, money nor credit to lose by any proceedings the bishop might institute against them" The earliest recorded date of a Fleet marriage is 1613, while the earliest recorded in a Fleet register took place in 1674, but it was only on the prohibition of marriage without banns or licence that they began to be clandestine. Then arose keen competition, and "many of the Fleet parsons and tavern-keepers in the neighbourhood fitted up a room in their respective lodgings or houses as a chapel," and employed touts to solicit custom for them. The scandal and abuses brought about by these clandestine marriages became so great that they became the object of special legislation Lord Hardwicke's Act, 1753, required, under pain of nullity, that banns should be published according to the rubric, or a licence obtained, and that, in either case, the marriage should be solemnized in church; and that in the case of minors, marriage by licence must be by the consent of parent or guardian. This act put a stop to clandestine marriages in England, and henceforth couples had to fare to Gretna Green (*q.v.*)

The Fleet Registers eventually came into private hands, but were purchased by the Government in 1821, and are now deposited in the office of the registrar-general, Somerset House Their dates range from 1686 to 1754. In 1840 they were declared not admissible as evidence to prove a marriage.

See J. S. Burn, *The Fleet Registers, comprising the History of Fleet Marriages, and some Account of the Parsons and Marriage-house Keepers*, etc. (1833); J Ashton, *The Fleet its River, Prison and Marriages* (1888).

FLEETWOOD, CHARLES (d. 1692), English soldier and politician, third son of Sir Miles Fleetwood of Aldwinkle, Northamptonshire, and of Anne, daughter of Nicholas Luke of Woodend, Bedfordshire, was admitted into Gray's Inn on Nov. 30, 1638. At the beginning of the Great Rebellion, he joined Essex's life-guard, was wounded at the first battle of Newbury, obtained a regiment in 1644 and fought at Naseby He had already been appointed receiver of the court of wards, and in 1646 became member of parliament for Marlborough He was said to have been the principal author of the plot to seize King Charles at Holmby, but he did not participate in the king's trial. In 1649 he was appointed a governor of the isle of Wight, and in 1650, as lieutenant-general of the horse, took part in Cromwell's campaign in Scotland and assisted in the victory of Dunbar Next year he was elected a member of the council of state, was entrusted with the command of the forces in England, and shared in the final triumph at Worcester In 1652 he married Cromwell's daughter, Bridget, widow of Ireton, and was made commander-in-chief in Ireland, to which title that of lord deputy was added. During his administration (1652–55) he carried out ruthlessly the settlement of the soldiers on the confiscated estates and the transplantation of the original owners He showed great severity in the prosecution of the Roman Catholic priests, and favoured the Anabaptists and the extreme Puritan sects to the disadvantage of the moderate Presbyterians

Fleetwood was a strong and unswerving follower of Cromwell's policy In Dec 1654 he became a member of the council, and after his return to England in 1655 was appointed one of the major-generals On Cromwell's death, he was regarded as a likely successor, and it is said that Cromwell had in fact so nominated him He, however, supported Richard Cromwell, but allowed subsequently, if he did not instigate, petitions from the army demanding its independence, and finally compelled Richard by force to dissolve parliament His project of re-establishing Richard in close dependence upon the army met with failure, and the Long Parliament was recalled. Fleetwood became a member of the committee of safety and of the council of state, and one of the seven commissioners for the army, on June 9 he was nominated commander-in-chief But on Oct 11 parliament declared his commission void The next day he assisted Lambert in his expulsion of the parliament and was reappointed commander-in-chief On Monk's approach from the North, he stayed in London and maintained order The army on Dec. 24 restored the Rump, when he was deprived of his command and ordered to appear before parliament to answer for his conduct At the Restoration he was included among the eighteen who were punished only by perpetual exclusion from public office, and his public career therefore closed, though he survived till Oct 4, 1692

FLEETWOOD, WILLIAM (1656–1723), English divine, was born in the Tower of London on New Year's Day 1656 He was educated at Eton and King's College, Cambridge About the time of the Revolution he took orders, and became bishop of St Asaph (1708), then of Ely (1714) He died at Tottenham on Aug 4, 1723 Fleetwood's opposition to the doctrine of non-resistance brought him into conflict with the Tory ministry of 1712 and with Swift, but he never entered into personal controversy

His principal writings are—*An Essay on Miracles* (1701); *Chronicum preciosum* (an account of the English coinage, 1707), and *Free Sermons* (1712), containing discourses on the death of Queen Mary, the duke of Gloucester and King William The preface to this last was condemned to public burning by parliament, but, as No 384 of *The Spectator*, circulated more widely than ever A collected edition of his works, with a biographical preface, was published in 1737

FLEETWOOD, a seaport and watering-place in the Fylde parliamentary division of Lancashire, England, at the mouth of the Wyre, 229¾ m N W by N from London, at the terminus of a branch from Preston of the L M S railway Pop of urban district (1921) 19,438 It dates its rise from 1836, and takes its name from Sir Peter Hesketh Fleetwood, by whom it was laid out The seaward views, especially northward over Morecambe Bay, are fine There are a town hall and public library The dock is provided with railways and traffic equipment, including a grain elevator The shipping is chiefly in the coasting and Irish trade Passenger steamers serve Belfast and the Isle of Man, and other ports during the season The fisheries are important, and there are salt-works in the neighbourhood There is a promenade, with other appointments of a watering-place. The council owns the electricity undertaking; the Blackpool tramways serve Fleetwood Rossall school, to the south-west, is one of the leading public schools in the north of England Rossall Hall was the seat of Sir Peter Fleetwood, but was converted to the uses of the school on its foundation in 1844

FLEGEL, EDWARD ROBERT (1855–1886), German traveller in West Africa, was born on Oct 1, 1855, at Vilna He obtained in 1875 a position in Lagos, West Africa In 1879 he ascended the Benue river some 125m. above the farthest point hitherto reached; he then received a commission from the German African Society to explore the whole Benue district In 1880 he went up the Niger to Gomba, and then visited Sokoto, where he obtained a safe-conduct from the sultan for his intended expedi-

tion to Adamawa This expedition was undertaken in 1882, and on Aug 18 Flegel discovered the source of the Benue near Ngaundere In 1883–84 he made another journey up the Benue. After a short absence in Europe Flegel returned to Africa in April 1885 with a commission to open up the Niger-Benue district to German influence, that is, to prevent Nigeria becoming British. The mission failed, and Flegel died at Brass, at the mouth of the Niger, on Sept 11, 1886.

Flegel wrote *Lose Blatter aus dem Tagebuche meiner Haussaafreunde* (Hamburg, 1885), and *Vom Niger-Benue; Briefe aus Afrika* (edit by K Flegel, Leipzig, 1890) *See* also "Il Giornale dell' ultimo viaggio . . . di E Flegel," in *L'esplorazione Com.* v. viii. (1893).

FLEISCHER, HEINRICH LEBERECHT (1801–1888), German orientalist, was born at Schandau, Saxony, on Feb 21, 1801 He was professor of oriental languages at Leipzig university from 1836 until his death (Feb 10, 1888) His most important works were editions of Abulfeda's *Historia ante-Islamica* (1831–34), and Beidhawi's *Commentary on the Koran* (1846–48).

FLÉMAL or **FLEMAEL, BERTHOLET** (1614–1675), a Flemish painter, born at Liége on May 23, 1614 He studied under Henri Trippez and Gerard Douffet He went to Italy in 1638, returning via Paris, where he decorated the churches of the Grands Augustines and the Carmes Déchaussés He returned to Liége in 1663 In 1670 he was elected member of the Paris Academy, and he painted the ceiling of the audience chamber in the Tuileries (destroyed in 1871). He is one of the most important masters of the later Flemish school, a pioneer of the classicist movement in his country. His style is modelled on that of Poussin. Most of his numerous religious pictures in the churches of Liége were destroyed and lost during the French Revolution However, there are several works still extant in the cathedral and in the churches of St. Jean, St. Barthelemy and Ste. Croix. Others are in the museums of Liége, Bamberg, Brussels, Dresden, Fontainebleau, Cassel, Stockholm, Niort, and in the Louvre Flémal was also a distinguished portrait painter His self portrait was engraved by Jean Duvivier.

FLÉMALLE, LE MAÎTRE DE: *see* CAMPIN, ROBERT.

FLEMING, JOHN AMBROSE (1849–), English physicist, was born at Lancaster on Nov 29, 1849 He studied at London and Cambridge, and held the posts of lecturer in applied mechanics, Cambridge, and professor of electrical engineering, University college, London (1885–1926). Fleming is a pioneer in the applications of electrical science He has carried out original investigations and has taken a prominent part in applying his and other people's researches to the development of electric lighting and wireless telegraphy and telephony. Fleming's earliest researches were on electrolysis but he soon turned his attention to the problem of the electric glow lamp of which he was one of the earliest investigators In a large number of ways Fleming helped in the development of the practical application of the glow lamp, he installed electric lighting on one of the first ships of the Royal Navy to be so equipped. He acted in an advisory capacity from 1882 to 1894 to the Edison Electric Light company and later he was with the Edison and Swan company. Fleming also assisted various corporations in matters concerned with electric lighting.

While making investigations on the glow lamp Fleming observed phenomena which led him to a study of thermionics and in 1904 he made the first form of thermionic valve He has helped to develop it and to make it the important instrument it now is in wireless. In addition to numerous other services to wireless, Fleming gave scientific assistance and helped with some of the constructional work on the first long-distance wireless station at Poldau. He also helped in the development of telephony and in 1879 acted as scientific adviser to the Edison Telephone company which was formed to set up telephone exchanges in London. Fleming invented a cymometer to measure wave lengths and an oscillating valve detector of electric waves. In conjunction with Dewar he carried out a series of investigations on the magnetic and electric properties of metals at low temperatures

Fleming is a member of numerous learned societies and has been awarded a number of honorary degrees. He has received the Hughes medal of the Royal Society (1910), the Albert Medal of the Royal Society of Arts (1921), and a number of other medals.

Amongst the numerous books written by Fleming are *Handbook of the Electrical Laboratory and Testing Room* (1901); *Waves and Ripples in Water, Air and Aether* (1902); *Alternate Current Transformer; Principles of Electric Wave Telegraphy* (1906); *Manual of Radiotelegraphy and Telephony* (1908); *The Thermionic Valve in Radiotelegraphy* (1919); *Fifty Years of Electricity* (1921), *Electrons, Electric Waves and Wireless Telephony* (1923); *The Interaction of Scientific Research and Electrical Engineering* (1927)

FLEMING, PAUL (1609–1640), German poet, was born at Hartenstein in the Saxon Erzgebirge, on Oct 5, 1609, the son of the village pastor. He studied at Leipzig until driven away by the troubles of the Thirty Years' War He was attached by Duke Frederick of Holstein-Gottorp to an embassy (1634–39) to Russia and Persia, to which the famous traveller Adam Olearius was secretary Fleming died at Hamburg on April 2, 1640

Though belonging to the school of Martin Opitz, Fleming is distinguished from most of his contemporaries by the ring of genuine feeling and religious fervour that pervades his lyric poems, even his occasional pieces

Fleming's *Teutsche Poemata* (pr. 1642) were edited by J. M Lappenberg, in the Bibliothek des litterarischen Vereins (2 vols, 1863, a third volume, 1866, contains Fleming's Latin poems) Selections by J Tittmann in *Deutsche Dichter des siebzehnten Jahrhunderts* (Leipzig, vol II, 1870), and by H. Österley (Stuttgart, 1885) *See* Rost, *Paul Fleming* (1909).

FLEMING, RICHARD (*c.* 1360–1431), bishop of Lincoln, and founder of Lincoln college, Oxford, was born in Yorkshire of a good family, and educated at University college, Oxford He was made prebendary of York in 1406 Becoming an ardent Wycliffite, he incurred the censure of Archbishop Arundel He afterwards became one of Wycliffe's most determined opponents, and to him was entrusted the execution of the decree of the council for the exhumation and burning of Wycliffe's remains Before 1415 he was rector of Boston, Lincolnshire, and in 1420 became bishop of Lincoln In 1423 he attended the councils of Pavia and Siena, and on his return, the see of York being vacant, the pope conferred it on Fleming, but Henry V refused to confirm the appointment In 1427 Fleming obtained the royal licence empowering him to found a college at Oxford for the training of disputants against Wycliffe's heresy He died at Sleaford on Jan 26, 1431

FLEMING, SIR SANDFORD (1827–1915), Canadian engineer and publicist, was born at Kirkcaldy, Scotland, on Jan 7, 1827, but in 1845 emigrated to Canada, where he was from 1867 to 1880 chief engineer of the Dominion Government Under his control were constructed the Intercolonial Railway and much of the Canadian Pacific After his retirement in 1880, when the Canadian Government handed over the construction of the latter to the Canadian Pacific Railway Company, he devoted himself to the study of Canadian and imperial problems, such as the unification of time reckoning throughout the world, and the construction of a state-owned system of telegraphs throughout the British empire He saw the first link forged in the chain, in the opening in 1902 of the Pacific Cable between Canada and Australia. He advocated Federation in 1864–67, and in 1891 attacked the Liberal policy of unrestricted reciprocity with the United States He died on July 22, 1915, at Halifax, Nova Scotia. He received the C M G in 1877 and the K C M G. in 1897

He published *The Intercolonial: a historical sketch 1832–76* (Montreal and London, 1876), *England and Canada* (London, 1884); and numerous *brochures* and magazine articles.

See L J Burpee, *Sandford Fleming, Empire-Builder* (with bibliography, 1915).

FLEMING, SIR THOMAS (1544–1613), English judge, was born at Newport, Isle of Wight, and was called to the bar at Lincoln's Inn in 1574. He sat in parliament from 1584 to 1601. He was recorder of London (1594), solicitor-general (1595), chief baron of the exchequer (1604), and chief justice of the king's bench (1607). He was one of the judges at the trial of the

post-nati in 1608, siding with the majority of the judges in declaring that persons born in Scotland after the accession of James I. were entitled to the privileges of natural-born subjects in England. He died on Aug. 7, 1613, at his seat, Stoneham Park, Hampshire.

FLEMISH LANGUAGE, THE. Flemish is spoken in the northern half of Belgium and by more than 200,000 persons in the Nord Departement of France, where the boundary formerly ran much farther south In Belgium its position has not changed much since the middle ages.

The Flemish language owes its existence and its character to the Salian Franks, who settled in the fertile valleys of the Scheldt and Lys, while it is believed that Ripuarians occupied Limburg Teutonic occupation can be traced to the time of Caesar when the Belgians differed in speech from the other Gauls, most of them being descended from Teutons, who crossed the Rhine long before (*de Bello Gallico*, ii, 4), while Teutonic tribes were living on the left side of the Rhine (*ibid*, 3)

Flemish means literally and originally the language or dialect of Flanders Maerlant quotes it in this sense in his *Leven van St Franciscus*, v 133, together with Duuts, Brabants and Zeeus It began to be used in writing in the first half of the 13th century The poem of Reinaert was composed about that time But very soon literary production became abundant Maerlant's example shows that the need for a language more generally accessible than a local dialect was already felt That language was known as "Dietsch" There were, of course, differences between the Dietsch of Flanders, Brabant and Limburg For instance, *uu*, the mutation of *ie* (*cf* "Duutsch" as against "Dietsch") was not used in the first-named province, and people pronounced there *du best, hi es, mes*—instead of *du bist, hi is, mis* In the last-named province, *ich, mich* were used and mutation was a regular phenomenon. As to the vocabulary, the three provinces were bilingual Literary influences came chiefly from the south, French words crept in, generally in the form of the neighbouring Picardian dialect, as is shown by the initial sound for example in *kasteel, kans, kaatsen* New words were formed by adding French suffixes to Flemish stems and the purity of the language suffered from gallicisms. The chambers of rhetoric aggravated the evil and under the rule of the house of Burgundy, French became compulsory at court and council. At the same time economic changes were in progress The decadence of Bruges prepared the rise of Antwerp, the hegemony of Flanders shifted in the 16th century to Brabant: *Dietsch* became *Duutsch* or *Duytsch*. By the end of that century the Dietsch speaking countries were cleft in two, the seven northern provinces fighting successfully for their independence and religious freedom, the south remaining Spanish and Catholic

As "the unity of a language can be kept up only by free and uniform intercourse between all the members of the community which speak the language," the political and religious estrangement between the north and the south was a serious threat to the unity of Dietsch The differentiation would have been enhanced but for the flight from the Spanish tyranny of many thousands who left their homes in Flanders and Brabant and carried to Holland and Zealand their energy, enterprise, science, wealth and habits of speech, the influence of which is only now beginning to be investigated thoroughly. (*See* DUTCH) Gradually the language of the Dutch Republic began to be considered in Belgium as that of the enemy and the heretic, and an opposition was created between Dutch and Flemish, so that after the revolution of 1830, when the attempt was made to realize unity of spelling between the two, it was opposed in parliament.

For nearly three centuries Flemish led a stagnant life. It had no cultural centre, like Amsterdam or Paris. It was the language of a nation cut off from its natural relations, while its higher classes and its fellow-citizens spoke French, so that many gallicisms, *i'e*, literally-translated French expressions, appear in the works of many writers in the past, and are now becoming rarer. The somewhat archaic character of Flemish is thus explained.

While the Dutch language (*q v.*) is getting rid of inflexions and simplifying the grammatical gender of the nouns and the government of prepositions, Flemish retains declensions, the loss of endings being considered in conservative quarters as an impoverishment. It distinguishes a merely grammatical masculine and feminine gender; *gij* (*ge*) is the only personal pronoun of the second person, the Dutch *U* being unknown There are other differences. For instance, in Flemish *schoon, kus, smijten* are used, not *mooi, zoen, gooien; ijzeren weg* not *spoorweg; rekenschap* instead of *rekening;* it mixes up *gelukken* and *slagen;* it forms, with the prefix *her,* many more verbs denoting repetition than Dutch.

Spoken Flemish is mainly dialect—each having its characteristic features. Thus initial *h* is dropped (except in Limburg), the difference between subject and object case has disappeared Flemish has preserved the old î and û (*scrîven, hûus*) and *ou* from *al* or *ol,* before dentals, sounds as English *oo* in *book*. Brabant with part of east Flanders has diphthongized the three sounds into *ai, oi, au*. The Germanic *ai, au,* which have become monophthongs (*ee, oo*) in written Flemish, sound as diphthongs (*ie, ue*); Limburg has preserved the Germanic û, though in the south it has become *au,* (*hûs, haus*) and in *al, ol* followed by a dental, the liquid has been dropped and the vowel lengthened The dialect of Flanders also preserves the old *e*-ending of many feminine nouns, suffixes, *i*-stem adjectives and adverbs In the novels of Teirlinck one encounters the words *vrouwe, ruste, mane, klinke, splete, ziele, katte, geruchte, gezichte, stille, dichte, omhooge* instead of *vrouw, rust,* and so on. Negative sentences have *en . . . niet,* as in French *ne . . . pas*.

Some of the best authors write for literary purposes an artificial but picturesque language which is neither dialect nor common Flemish On the other hand, thanks to the literary congresses, the first of which was held in 1849, and to the teaching of the universities, the number of those whose speech differs slightly or not at all from Dutch is increasing year by year

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FLENSBURG (Danish, *Flensborg*), a seaport in the Prussian province of Schleswig-Holstein, at the head of the Flensburg Fjord, 20 m. N W from Schleswig, at the junction of the main line Altona-Vamdrup (Denmark) Pop (1925) 63,447

Flensburg was probably founded in the 12th century It attained municipal privileges in 1284, was frequently pillaged by the Swedes after 1643, and in 1848 became the capital, under Danish rule, of Schleswig In the plebiscite after the war of 1914–18 it voted itself in Germany. The principal public buildings are the Nikolaikirche (built 1390, restored 1894), with a spire 295 ft. high and the Marienkirche, also a mediaeval church, with a lofty tower There are schools of marine engineering, navigation, woodcarving and agriculture. Flensburg is the most important town in what was formerly the duchy of Schleswig It possesses excellent wharves, does a large trade in coal, is famous for fish curing, and has shipbuilding yards, sugar, and paper factories, glass-works, copper-works, soap-works and iron foundries Its former extensive trade with the West Indies has lately suffered owing to the enormous development of the North Sea ports, but it is still largely engaged in the Greenland whale and the oyster fisheries.

FLERS, ROBERT DE LA MOTTE-ANGO, MARQUIS DE (1872–1927), French dramatist, born at Pont l'Évêque on Nov. 25, 1872, died at Vittel on July 30, 1927. His literary career opened with a volume of travel sketches (*Vers l'Orient*, 1896) and a series of critical essays notable for their delicacy of touch. He was on the staff of the *Soleil* and subsequently of *Figaro*. About 1900 he made the acquaintance of Arman de Caillavet, who was his close friend and collaborator for fifteen years. Their first theatrical venture was *Les Travaux d'Hercule* (1901), a mythological parody somewhat in the style of *La Belle Hélène* and *Orphée aux Enfers* by Meilhac and Halévy They found in Cl. Terrasse a composer gifted with a comic verve comparable to that of Offenbach. Terrasse contributed greatly to the success of *Le Sire de Vergy* (1903) and *Monsieur de la Palisse* (1904). De Flers and Caillavet however achieved their greatest successes after 1906; special mention is due to *Miquette et sa Mère* (1906), *L'Amour veille* (1907), *Papa* (1911), *Primerose* (1911) and *La Belle Aventure* (1913), written in collaboration with Étienne Rey. Those of their plays which seem most likely to live are *Le Roi*

(1908), which was written in collaboration with Emm-Arène, *Le Bois Sacré* (1910) and *L'Habit Vert* (1913), in which the political and literary life of the day are exposed to lively and good-humoured satire. Robert de Flers was mobilized on the outbreak of the World War, and was at one time entrusted with an important mission to the Rumanian army He was elected to the *Académie française* on June 3, 1920, in place of the marquis de Ségur. After the death of Arman de Caillavet in 1915 Robert de Flers collaborated with Fr. de Croisset The best of their joint works are *Le Retour* (1920), *Les Vignes du Seigneur* (1923) and *Les Nouveaux Messieurs* (1925) Robert de Flers was for some years president of the Society of Dramatic Authors He married a daughter of Victorien Sardou The plays of Robert de Flers have often been compared with those of Meilhac and Halévy; but, charming and lively as they are, it is not certain that they show the sound observation and the ingenious fancy which give the work of the latter writers its lasting value

FLERS, a manufacturing town of north-western France, in the arrondissement of Domfront, and department of the Orne, on the Vère, 41 m S of Caen on the railway to Laval Pop. (1926) 10,756 There is a restored château of the 15th century. Flers has a tribunal of commerce and a board of trade-arbitrators It is the centre of a cotton and linen-manufacturing region which includes the towns of Condé-sur-Noireau and La Ferté-Macé. Bricks and tiles, drugs, chemicals and dyes are made.

FLETA, a treatise on the common law of England written about the year 1290 It is little better than an ill-arranged epitome of Bracton The author also borrowed some information on husbandry from Walter of Henley. He is supposed to have written it during his confinement in the Fleet prison, hence the name *Fleta* was first printed by Selden in 1647

FLETCHER, ALICE CUNNINGHAM (1845–1923), American ethnologist, was born in Boston (Mass.) in 1845 She studied the remains of Indian civilization in the Ohio and Mississippi valleys, became a member of the Archaeological institute of America in 1879, and worked and lived with the Omahas as a representative of the Peabody museum of American Archaeology and Ethnology, Harvard university In 1883 she was appointed special agent to allot lands to the Omaha tribes, in 1884 prepared and sent to the New Orleans Exposition an exhibit showing the progress of civilization among the Indians of North America in the quarter-century previous, in 1886 visited the natives of Alaska and the Aleutian islands on a mission from the commissioner of education, and in 1887 was United States special agent in the distribution of lands among the Winnebagoes and Nez Percés. She was made assistant in ethnology at the Peabody museum in 1882, and received the Thaw fellowship in 1891, was president of the Anthropological Society of Washington and of the American Folk-lore Society, and vice-president of the American Association for the Advancement of Science, and working in co-operation with the Woman's National Indian Association, introduced a system of making small loans to Indians, wherewith they might buy land and houses In 1888 she published *Indian Education and Civilization,* a special report of the Bureau of Education She published also *Indian Story and Song from North America* (1900), illustrating "a stage of development antecedent to that in which culture music appeared" She died in Washington (D C), April 6, 1923.

FLETCHER, ANDREW, of Saltoun (1655–1716), Scottish politician, was the son and heir of Sir Robert Fletcher (1625–1664), and was born at Saltoun (Salton), East Lothian. He was a member of the Scottish parliament which met in 1681. Fletcher was a fearless and active opponent of Lauderdale's administration. He left Scotland about 1682, subsequently spending some time in Holland as an associate of the duke of Monmouth and other malcontents He accompanied Monmouth to the west of England, but left the army after killing one of the duke's trusted advisers.

During the next few years he is said to have travelled in Spain, and he fought against the Turks in Hungary. Having in his absence from Scotland lost his estates and been sentenced to death, he joined William of Orange at The Hague. On William's accession his estates were restored to him; he soon became a leading member of the "club," an organization which aimed at reducing the power of the crown in Scotland, and an active opponent of the English government. In 1703, at a critical stage in the history of Scotland, Fletcher again became a member of the Scottish parliament. The failure of the Darien expedition had aroused a strong feeling of resentment against England, and Fletcher and the national party seized the opportunity to obtain a greater degree of independence for their country. In the negotiations for the union of the two kingdoms Fletcher performed essential service He got the act of security passed, which declared that the two crowns should not pass to the same head till Scotland was secured in her liberties civil and religious. Therefore Lord Godolphin was forced into the Union, to avoid a civil war after the queen's demise.

After the passing of the Act of Union, Fletcher retired from public life. He did a real, if homely, service to his country by introducing from Holland machinery for sifting grain. He died in London in Sept. 1716

Fletcher was a fine scholar and a graceful writer. His chief works are: *A Discourse of Government relating to Militias* (1698), *Two Discourses concerning the Affairs of Scotland* (1698), and *An Account of a Conversation concerning a right regulation of Governments for the common good of Mankind* (1704), which contained his well-known remark, "I knew a very wise man so much of Sir Christopher's (Sir C. Musgrave) sentiment, that he believed if a man were permitted to make all the ballads, he need not care who should make the laws of a nation."

See *The Political Works of Andrew Fletcher* (1737), D S Erskine, 11th earl of Buchan, *Essay on the Lives of Fletcher of Saltoun and the Poet Thomson* (1792)

FLETCHER, GILES (*c.* 1548–1611), English author, son of Richard Fletcher, vicar of Cranbrook, Kent, and father of the poets Phineas and Giles Fletcher, was born in 1548 or 1549, and educated at Eton and King's college, Cambridge. In 1580 he married Joan Sheafe, of Cranbrook. In 1585 he sat in parliament for Winchelsea He was employed on diplomatic service in Scotland, Germany and Holland, and in 1588 was sent to Russia to the court of Tsar Theodore, with instructions to conclude an alliance between England and Russia, to restore English trade, and to obtain better conditions for the English Russia company The factor of the company, Jerome Horsey, had already obtained large concessions through the favour of the protector, Boris Godunov, but when Dr Fletcher reached Moscow in 1588 he found that Godunov's interest was alienated, and that the Russian Government was contemplating an alliance with Spain. He was badly lodged and treated with contempt, and was not allowed to forward letters to England, but the English victory over the Armada and his own patience secured for English traders exclusive rights of trading on the Volga and their security from the infliction of torture He returned to England in 1589 in company with Jerome Horsey, and in 1591 he published *Of the Russe Commonwealth,* a comprehensive account of Russian geography, government, law, methods of warfare, Church and manners. Horsey also wrote a narrative of his travels, published in *Purchas his Pilgrimes* (1626) The Russia company were alarmed at the freedom of Fletcher's book, and had it suppressed. In 1856 it was edited in full for the Hakluyt Society.

Fletcher was appointed "remembrancer" to the city of London, and an extraordinary master of requests in 1596, and became treasurer of St. Paul's in 1597. He was saved from imprisonment as surety for his brother's debts, in 1596, by Essex, and was actually imprisoned in 1601, apparently for attributing Essex's disgrace to Raleigh. Fletcher was employed in 1610 to negotiate with Denmark on behalf of the "Eastland Merchants"; he died next year, and was buried on March 11, in London.

The Russe Commonwealth was issued in an abridged form in *Hakluyt's Principal Navigations, Voyages,* etc. (vol. i., p. 473, ed. of 1598), a somewhat completer version in *Purchas his Pilgrimes* (pt. 3, ed 1625), also as *History of Russia* in 1643 and 1657. Fletcher also wrote *De literis antiquae Britanniae* (ed. by Phineas Fletcher, 1633), a treatise on "The Tartars," printed in *Israel Redux* (ed. by S[amuel] L[ee], 1677), to prove that they were

the ten lost tribes of Israel, Latin poems published in various miscellanies, and *Licia, or Poemes of Love in Honour of the admirable and singular vertues of his Lady, to the imitation of the best Latin Poets . . whereunto is added the Rising to the Crowne of Richard the third* (1593). This series of love sonnets, followed by some other poems, was published anonymously. Most critics, with the notable exception of Alexander Dyce (Beaumont and Fletcher, *Works*, i., p xvi, 1843), have accepted it as the work of Dr Giles Fletcher on the evidence afforded in the first of the *Piscatory Eclogues* of his son Phineas, who represents his father (Thelgon), as having "raised his rime to sing of Richard's climbing"

See E. A. Bond's Introduction to the Hakluyt Society's edition of *The Russe Commonwealth* (1856), also Dr. A. B. Grosart's prefatory matter to *Licia* (*Fuller Worthies Library*, Miscellanies, vol. iii., 1871), and to the works (1869) of Phineas Fletcher in the same series Fletcher's letters relative to the college dispute with the provost, Dr Roger Goad, are preserved in the Lansdowne mss. (xxiii, art 18 *et seq*), and are translated in Grosart's edition *See* also H. E. Cory, *Spenser, the School of the Fletchers, and Milton* (Univ of California Publications, No 5, 1912)

FLETCHER, GILES (*c* 1584–1623), English poet, younger son of the preceding, was educated at Westminster school and Trinity college, Cambridge. In 1603 he contributed a poem on the death of Queen Elizabeth to *Sorrow's Joy* His great poem of *Christ's Victory* appeared in 1610, and in 1612 he edited the *Remains* of his cousin Nathaniel Pownall His sermons at St. Mary's were famous Fuller tells us that the prayer before the sermon was a continuous allegory He left Cambridge about 1618, and soon after received, it is supposed from Francis Bacon, the rectory of Alderton, on the Suffolk coast His last work, *The Reward of the Faithful*, appeared in the year of his death (1623)

The principal work by which Giles Fletcher is known is *Christ's Victorie and Triumph, in Heaven, in Earth, over and after Death* (1610). The theme owes something to the *Semaines* of Du Portas, but the devotion, the passionate lyrism and the exquisite vision of paradise is Fletcher's own The metre is an eight-line stanza owing something to Spenser, of whom, like his brother Phineas, he was a disciple The first five lines rhyme a, b, a, b, b, and the stanza concludes with a rhyming triplet, resuming the conceit which nearly every verse embodies Like most amateurs of the conceit, he is sometimes grotesque, but when he forgets his ingenuity he attained a depth of melody that delighted Milton, who followed him to some extent in *Paradise Regained*.

Giles Fletcher's poem was edited (1868) for the *Fuller Worthies Library* (1876) for the *Early English Poets* by Dr A B Grosart, and, with this brother's works, by Prof Boas (2 vols, 1908–09) It was also reprinted for *The Ancient and Modern Library of Theological Literature* (1888), and in R. Cattermole's and H. Stebbing's *Sacred Classics* (1834, etc.) vol 20. In the library of King's college, Cambridge, is a ms. *Aegidii Fletcheri versio poetica Lamentationum Jeremiae*, and *see* H. E Cory, *Spenser, the School of the Fletchers, and Milton* (Univ of California Publications, No. 5, 1912).

FLETCHER, JOHN WILLIAM (1729–1785), English divine, was born at Nyon, Switzerland, on Sept. 12, 1729, his original name being DE LA FLÉCHIÉRE He was educated at Geneva for the Church, but went to Lisbon and enlisted. An accident prevented his sailing with his regiment to Brazil, and he went to England, picked up the language, and in 1752 became tutor in a Shropshire family. Here he came under the influence of the new Methodist preachers, and in 1757 took orders, being ordained by the bishop of Bangor. He often preached with John Wesley and for him. Refusing the wealthy living of Dunham, he accepted the humble one of Madeley, where for 25 years (1760–85) he lived and worked with unique devotion and zeal Fletcher was one of the few parish clergy who understood Wesley and his work, yet he never wrote or said anything inconsistent with his own Anglican position. In theology he upheld the Arminian against the Calvinist position, but always with courtesy and fairness; his resignation on doctrinal grounds of the superintendency (1768–71) of the countess of Huntingdon's college at Trevecca left no unpleasantness. The outstanding feature of his life was a transparent simplicity and saintliness of spirit Wesley preached his funeral sermon from the words "Mark the perfect man" Southey said that "no age ever provided a man of more fervent piety or more perfect charity, and no church ever possessed a more apostolic minister" It is said that Voltaire, when challenged to produce a character as perfect as that of Christ, at once mentioned Fletcher of Madeley. He died on Aug 14, 1785

Complete editions of his works were published in 1803 and 1836. The chief of them, written against Calvinism, are *Five Checks to Antinomianism, Scripture Scales to weigh the Gold of Gospel Truth*, and the *Portrait of St Paul* See lives by J Wesley (1786), L Tyerman (1882); F W Macdonald (1885), J. Maratt (1902); also C J. Ryle, *Christian Leaders of the 18th Century* (1869).

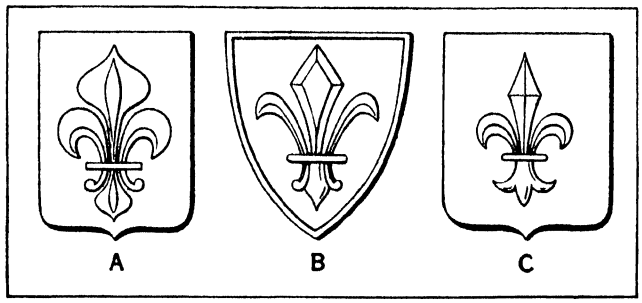
FLETCHER, PHINEAS (1582–1650), English poet, elder son of Dr Giles Fletcher, and brother of Giles the younger, noticed above, was born at Cranbrook, Kent, and baptized on April 8, 1582 He was educated at Eton and King's college, Cambridge His pastoral drama, *Sicelides or Piscatory* (pr 1631) was written (1614) for performance before James I, but only produced after the king's departure at King's college He became chaplain to Sir Henry Willoughby, who presented him in 1621 to the rectory of Hilgay, Norfolk, where he married and spent the rest of his life In 1627 he published *Locustae, vel Pietas Jesuitica The Locusts or Apollyonists*, two parallel poems in Latin and English attacking the Jesuits An erotic poem, *Britain's Ida* (1628), bearing Spenser's name, is included among his works by Dr. Grosart In 1632 appeared two theological prose treatises, *The Way to Blessedness* and *Joy in Tribulation*, and in 1633 his *magnum opus*, *The Purple Island* It included his *Piscatorie Eclogs and other Poetical Miscellanies* He died in 1650, his will being proved on Dec 13 *The Purple Island, or the Isle of Man*, is a poem in 12 cantos describing in cumbrous allegory the physiological structure of the human body and the mind of man The manner of Spenser is preserved throughout, and the chief charm of the poem lies in its descriptions of rural scenery Some critics see in the allegorist of *The Purple Island* a link between Spenser and Bunyan The *Piscatory Eclogues* are pastorals the characters of which are represented as fisher boys on the banks of the Cam, and are interesting for the light they cast on the biography of the poet himself (Thyrsil) and his father (Thelgon) The poetry of Phineas Fletcher has not the sublimity sometimes reached by his brother Giles The mannerisms are more pronounced and the conceits more far-fetched, but the verse is fluent, and lacks neither colour nor music

Editions of his works have been printed by Dr. A B. Grosart (Fuller Worthies Library, 4 vols, 1869) and Prof Boas (with those of Giles Fletcher, 2 vols, 1908–09) *See* also H E Cory, *Spenser, the School of the Fletchers, and Milton* (Univ of California Publications, No. 5, 1912)

FLEURANGES, ROBERT (III.) DE LA MARCK, SEIGNEUR DE (1491–1537), marshal of France and historian, was the son of Robert II de la Marck, duke of Bouillon, seigneur of Sedan and Fleuranges, whose uncle was William de la Marck, "The Wild Boar of the Ardennes" At the age of ten he was sent to the court of Louis XII., and placed in charge of the count of Angoulême, afterwards King Francis I He served in Francis's Italian campaigns, and in 1512 the French being driven from Italy, Fleuranges was sent into Flanders to levy a body of 10,000 men, in command of which, under his father, he returned to Italy in 1513, seized Alessandria, but failed to take Novara In 1515 he distinguished himself at Marignano, where the king knighted him with his own hand He next took Cremona, and was there called home by the news of his father's illness. In 1519 he was sent into Germany to canvass the electors in favour of Francis I Fleuranges fought at Pavia (1525), and was taken prisoner with Francis. The emperor, irritated by the defection of his father, Robert II. de la Marck, kept him in prison in Flanders for some years During this imprisonment he was created marshal of France In his *Histoire des choses mémorables advenues au règne de Louis XII. et de François I, depuis 1499 jusqu'en l'an 1521*, written in prison, ed Lambert 1735, also in the *Nouvelle Collection des mémoires pour servir à l'histoire de France* (edited by J F. Michaud and J J. F Poujoulat, series i vol v Paris, 1836 *seq.*), he gives many curious and interesting details of the events he had witnessed He died at Longjumeau in Dec 1537

FLEUR-DE-LIS (Fr "lilyflower"), an heraldic device, very

widespread in the armorial bearings of all countries, but more particularly associated with the royal house of France. The conventional fleur-de-lis, as Littré says, represents very imperfectly three flowers of the white lily (*Lilium*) joined together, the central one erect, and each of the other two curving outwards The fleur-de-lis is a common device in ancient decoration, notably in India and in Egypt, where it was the symbol of life and resurrection, the attribute of the god Horus It is common also in Etruscan bronzes It is uncertain whether the conventional fleur-de-lis was originally meant to represent the lily or white iris—the flower-de-luce of Shakespeare—or an arrow-head, a spear-head, an amulet fastened on date-palms to ward off the evil eye, etc. In Roman and early Gothic architecture the fleur-de-lis is a frequent sculptured ornament As early as 1120 three fleurs-de-lis were sculptured on the capitals of the Chapelle Saint-Aignan at Paris The fleur-de-lis was first definitely connected with the French monarchy in an *ordonnance* of Louis le Jeune (*c* 1147), and was first figured on a seal of Philip Augustus in 1180. The use of the fleur-de-lis in heraldry dates from the 12th century, soon after which period it became a very common charge in France, England and Germany, where every gentleman of coat-armour desired to adorn his shield with a loan from the shield of France, which was at first *d'azur, semé de fleurs de lis d'or* In Feb 1376 Charles V of France reduced the number of fleurs-de-lis to three—in honour of the Trinity—and the kings of France thereafter bore *d'azur, à trois fleurs de lis d'or* Tradition soon attributed the origin of the fleur-de-lis to Clovis, the founder of the Frankish monarchy, and explained that it represented the lily given to him by an angel at his baptism Whatever be the true origin of the fleur-de-lis as a conventional decoration, it is demonstrably far older than the Frankish monarchy, and history does not record the reason of its adoption by the royal house of France, from which it passed into common use as an heraldic charge in most European countries An order of the Lily, with a fleur-de-lis for badge, was established in the Roman states by Pope Paul III in 1546, its members were pledged to defend the patrimony of St Peter against the enemies of the Church Another order of the Lily was founded by Louis XVIII in 1816,

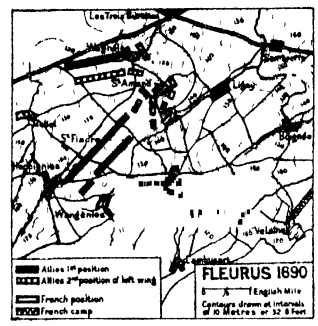


THREE MODIFICATIONS OF THE FLEUR-DE-LIS
A. 17th Century B 18th and 19th Centuries C. Middle Ages

in memory of the silver fleurs-de-lis which the comte d'Artois had given to the troops in 1814 as decorations, it was abolished by the revolution of 1830

FLEURUS, a village of Belgium, in the province of Hennegau, 5m. N E of Charleroi, famous as the scene of several battles The first of these was fought on Aug. 19–29, 1622, between the forces of Count Mansfeld and Christian of Brunswick and the Spaniards under Cordovas, the latter being defeated The second is described below, and the third and fourth, incidents of Jourdan's campaign of 1794, under FRENCH REVOLUTIONARY WARS. The ground immediately north-east of Fleurus forms the battlefield of Ligny (June 16, 1815), for which *see* WATERLOO CAMPAIGN

The second battle (for its strategic prologue *see* GRAND ALLIANCE, WAR OF THE) was fought on July 1, 1690, between 45,000 French under duke of Luxemburg, and 37,000 allied Dutch, Spaniards and Imperialists under George Frederick, prince of Waldeck The latter had formed up his army between Heppignies and St Amand in what was then considered an ideal position; a double barrier of marshy brooks was in front, each flank rested on a village, and the space between, open upland, fitted his army exactly. But Luxemburg, riding up with his advanced guard from Velaine, decided, after a brief survey of the ground, simultaneously to attack the front of the Allies' position, envelop their right flank and turn their left flank by a wide manoeuvre on to their rear, a boldness and breadth of tactical conception which was rare for the age, indeed for any age. The left wing of cavalry was to move under cover of woods, houses and hollows to gain Wangenies, where it was to connect with the frontal attack of the French centre from Fleurus and to envelop Waldeck's right Luxemburg himself with the right wing of cavalry and some infantry and artillery made a wide sweep round the enemy's left by way of Ligny and Les Trois Burettes, concealed by the high-standing corn At 8 o'clock the frontal attack began by a vigorous artillery engagement, in which the French, though greatly outnumbered in guns, held their own, and three hours later Waldeck, whose attention had been absorbed by events on the front, found a long line of the enemy already formed up in his rear He at once brought his second line back to oppose them, but while he was doing so the French leader filled up the gap between himself and the frontal assailants by posting infantry around Wagnelée, and also guns on the neighbouring hill whence their fire enfiladed both halves of the enemy's army up to the limit of their ranging power. At 1 P M Luxemburg ordered a general attack of his whole line He himself scattered the cavalry opposed to him and hustled the Dutch infantry into St Amand, where they were promptly surrounded The left and centre of the French army were less fortunate, and in their first charge lost their leader, de Gournay, one of the best cavalry officers in the service But Waldeck, hoping to profit by this momentary success, sent a portion of his right wing towards St Amand, where it merely shared the fate of his left, and the day was decided Only a quarter of the cavalry and 14 battalions of infantry (English and Dutch) remained intact, and Waldeck could do no more, but with these he emulated the last stand of the Spaniards at Rocroi 50 years before A great square was formed of the infantry, and a handful of cavalry joined them—the French cavalry, eager to avenge de Gournay, had swept away the rest Then slowly and in perfect order, they retired into the broken ground above Mellet, where they were in safety. The French slept on the battlefield, and then returned to camp with their trophies and 8,000 prisoners They had lost some 2,500 killed, the Allies twice as many, as well as 48 guns, and Luxemburg was able to send 150 colours and standards to decorate Notre-Dame But the victory was not followed up, for Louis XIV. ordered Luxemburg to keep in line with other French armies which were carrying on more or less desultory wars of manoeuvre on the Meuse and Moselle



PLAN OF THE SECOND BATTLE OF FLEURUS, JULY 1, 1690

FLEURY (ABRAHAM JOSEPH BENARD) (1750–1822), French actor, was born at Chartres on Oct 26, 1750, and began his stage apprenticeship at Nancy, where his father was an actor at the court of King Stanislaus He came to Paris in 1778, and almost immediately was made *sociétaire* at the Comédie Française, although the public was slow to recognize him as the greatest comedian of his time In 1793 Fleury was arrested in consequence of the presentation of Laya's *L'Ami des Lois,* and, when liberated, appeared at various theatres until, in 1799, he rejoined the rehabilitated Comédie Française He retired in 1818 and died on March 3, 1822.

See J. P B. Lafitte, *Mémoires de Fleury, de la Comédie Française* (6 vols. 1836–38); *The French Stage and the French People, as illustrated in the Memoirs of M. Fleury* (ed. Theodore Hooke, 2 vols. 1841); J. de Bourgogue, *Un comédien d'autrefois* (1914).

FLEURY, ANDRÉ HERCULE DE (1653–1743), French cardinal and statesman, was born at Lodève (Hérault) on June

22, 1653, the son of a collector of taxes Educated by the Jesuits in Paris, he entered the priesthood, and became in 1679, through the influence of Cardinal Bonzi, almoner to Maria Theresa, queen of Louis XIV, and in 1698 bishop of Fréjus Seventeen years later he became tutor to the king's great-grandson and heir, and in spite of an apparent lack of ambition, he acquired over the child's mind an influence which proved to be indestructible. On the death of the regent Orleans in 1723 Fleury, already 70 years of age, deferred his own supremacy by suggesting the appointment of Louis Henri, duke of Bourbon, as first minister Fleury was present at all interviews between Louis XV. and his first minister, and on Bourbon's attempt to break through this rule Fleury retired from court. Louis made Bourbon recall the tutor, who on July 11, 1726, took affairs into his own hands, and secured the exile from court of Bourbon and of his mistress Madame de Prie He refused the title of first minister, but his elevation to the cardinalate in that year secured his precedence over the other ministers He was naturally frugal and prudent, and carried these qualities into the administration, with the result that in 1738–1739 there was a surplus of 15,000,000 livres instead of the usual deficit In 1726 he fixed the standard of the currency and secured the credit of the government by the regular payment thenceforward of the interest on the debt By exacting forced labour from the peasants he gave France admirable roads, though at the cost of rousing angry discontent During the 17 years of his orderly government the country found time to recuperate its forces after the exhaustion caused by the extravagances of Louis XIV. and of the regent, and the general prosperity rapidly increased Internal peace was only seriously disturbed by the severities which Fleury exercised against the Jansenists He imprisoned priests who refused to accept the bull *Unigenitus*, and he met the opposition of the parlement of Paris by exiling 40 of its members

In foreign affairs his chief preoccupation was the maintenance of peace, which was shared by Sir Robert Walpole, and therefore led to a continuance of the good understanding between France and England But he reluctantly supported the ambitious projects of Elizabeth Farnese, queen of Spain, in Italy by guaranteeing in 1729 the succession of Don Carlos to the duchies of Parma and Tuscany Fleury had economized in the army and navy, as elsewhere, and when in 1733 war was forced upon him he was hardly prepared He was compelled by public opinion to support the claims of Louis XV's father-in-law Stanislaus Leszczynski, ex-king of Poland, to the Polish crown on the death of Frederick Augustus I, against the Russo-Austrian candidate; but the despatch of a French expedition of 1,500 men to Danzig only served to humiliate France Fleury was driven by Chauvelin to more energetic measures, he concluded a close alliance with the Spanish Bourbons and sent two armies against the Austrians. Military successes on the Rhine and in Italy secured the favourable terms of the treaty of Vienna (1735–1738) France had joined with the other powers in guaranteeing the succession of Maria Theresa under the Pragmatic Sanction, but on the death of Charles VI in 1740 Fleury by a diplomatic quibble found an excuse for repudiating his engagements, when he found the party of war supreme in the king's counsels After the disasters of the Bohemian campaign he wrote in confidence a humble letter to the Austrian general Königsegg, who immediately published it. Fleury disavowed his own letter, and died a few days after the French evacuation of Prague on Jan 29, 1743 He had enriched the royal library by many valuable oriental mss, and was a member of the French Academy, of the Academy of Science, and the Academy of Inscriptions

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FLEURY, CLAUDE (1640–1723), French ecclesiastical historian, was born at Paris on Dec. 6, 1640. Educated at the aristocratic college of Clermont (now that of Louis-le-Grand), he was nominated an advocate to the parlement of Paris in 1658, but nine years later, he turned to theology and by 1672 was in orders The king entrusted to him the education of the princes of Conti and of the count of Vermandois, one of his natural sons, on whose death in 1683 Fleury received for his services the Cistercian abbey of Loc-Dieu, in Rhodez. In 1689 he was appointed sub-preceptor of the dukes of Burgundy, of Anjou and of Berry, and thus became intimately associated with Fénelon, their chief tutor. On the completion of the education of the young princes the king appointed him prior of Argenteuil, near Paris (1706), and he resigned that of the abbey of Loc-Dieu Fleury, who had been made confessor to the young king Louis XV. in 1716, because, as the duke of Orleans said, he was neither Jansenist nor Molinist, nor Ultramontanist, but Catholic, died on July 14, 1723 His great learning was equalled by the modest simplicity of his life and the uprightness of his conduct

His chief work, the *Histoire ecclésiastique*, which comes down to 1414 and was completed by others down to 1684, has passed through many editions, the first being that of Paris, 20 vols, 1691, Partial Eng trs, 1842 ff. His other works include—*Histoire du droit français* (1674, Eng trs, 1724), *Moeurs des Israélites* (1681, Eng trs, 1805), *Moeurs des Chrétiens* (1682, Eng trs, 1698), *Traité du choix et de la méthode des études* (1686, 2 vols), *Les Devoirs des maitres et des domestiques* (1688), his *Catéchisme historique* (1679, Eng trs, 1726) and the *Institution du droit ecclésiastique* (1687) were put on the Index

See C E Simonetti, *Der Character eines Geschichtsschreibers in dem Leben und aus den Schriften des Abts C Fleury* (Gottingen, 1746), C F P Jaeger, *Notice sur C Fleury, considéré comme historien* (Strasbourg, 1847); Reichlin-Meldegg, *Geschichte des Christentums*, 1

FLEXNER, SIMON (1863–), American pathologist, was born at Louisville (Ky), on March 25, 1863 After he graduated from the University of Louisville in 1889 he pursued his studies further at Johns Hopkins university and the universities of Strasbourg, Berlin and Prague, and at the Pasteur institute, Paris He was associate professor and later professor of pathological anatomy at Johns Hopkins during 1889–99, becoming in 1899 professor of pathology at the University of Pennsylvania In 1903 he was appointed director of the laboratories of the Rockefeller institute for Medical Research, New York Dr Flexner became widely known in 1905 for his successful treatment of cerebrospinal fever by the use of a serum, the administration of which reduced the mortality rate from 75% in untreated cases to 25% in cases where the serum was used He has published numerous monographs, on *The Pathology of Toxalbumin Intoxication, Serum Treatment of Epidemic Meningitis* (1917); *Epidemic Poliomyelitis, Epidemiology.*

His brother ABRAHAM FLEXNER (b 1866) became in 1917, secretary of the General Education Board. His views on education as set forth in *A Modern School* (1916) and *A Modern College* (1923) occasioned much discussion He wrote also *Prostitution in Europe* (1914) and works on medical education (*See* SPINAL MENINGITIS)

FLICKER, the name given in North America to large, ant-eating woodpeckers of the genus *Colaptes* Both sexes have a red band on the nape The golden-winged flicker (*C. auratus*) has the under surface of wings and tail bright, golden yellow, it is found in the South Atlantic States, while a subspecies (*C A. luteus*) is widely distributed over the Northern States, east of the Rocky mountains The red-shafted flicker (*C cafer collaris*) with the under surface of wings and tail red, is found from the eastern slope of the Rocky mountains to the Pacific A subspecies extends to Alaska The gilded flicker (*C. chrysoides*) has the lining of wings and tail yellow, but lacks the red nuchal patch; it is found in southern California and Arizona

FLIEDNER, THEODOR (1800–1864), German Protestant divine and philanthropist, was born on Jan. 21, 1800, at Epstein (near Wiesbaden), and studied at Giessen, Gottingen and Herborn. In 1821 he became pastor of the Protestant church at Kaiserswerth, on the Rhine During a visit to England in 1823 he made the acquaintance of Elizabeth Fry. The German prisons were then in a very bad state. The prisoners were huddled together in dirty rooms, badly fed, and left in complete idleness. Fliedner applied for permission to be imprisoned for some time, in order to see prison life from the inside. This petition was refused, but he was

allowed to hold fortnightly services in the Dusseldorf prison, and to visit the inmates individually On June 18, 1826, the first Prison Society of Germany (*Rheinisch-Westfalischer Gefangnisverein*) was founded In 1833 Fliedner opened in his own parsonage garden at Kaiserswerth a refuge for discharged female convicts He then turned to the care of the sick poor, and he began a scheme for securing proper training for nurses In 1836 he began the first deaconess house, and the hospital at Kaiserswerth, the institution which gave Florence Nightingale fruitful ideas on the provision of nursing By their ordination vows the deaconesses devoted themselves to the care of the poor, the sick and the young, but their engagements were not final—they might leave their work and return to ordinary life if they chose Fliedner also founded (1835) an infant school, then a normal school for infant school mistresses (1836), an orphanage for orphan girls of the middle class (1842), and an asylum for female lunatics (1847) He assisted at the foundation and in the management of similar institutions, not only in Germany, but in various parts of Europe

In 1849 he resigned his pastoral charge, and till 1851 travelled over a large part of Europe, America and the East—the object of his journeys being to found "mother houses," which were to be not merely training schools for deaconesses, but also centres whence other training establishments might arise He established a deaconess house in Jerusalem, and after his return assisted by counsel and money in the erection of establishments at Constantinople, Smyrna, Alexandria and Bucharest He founded the Christian house of refuge for female servants in Berlin (connected with which other institutions soon arose) and the "house of evening rest" for retired deaconesses at Kaiserswerth Fliedner died on Oct 4, 1864, leaving behind him over 100 stations

His son FRITZ FLIEDNER (1845–1901), after studying in Halle and Tubingen, became in 1870 chaplain to the embassy in Madrid and founded several philanthropic institutions in Spain He was also the author of a number of books among which was an autobiography, *Aus meinem Leben, Erinnerungen und Erfahrungen* (1901)

See G Fliedner, *Theodor Fliedner, kurzer Abriss seines Lebens und Wirkens* (3rd ed, 1892) See also on Fliedner and his work *Kaiserswerth Deaconesses* (1857) J S Howson, *Deaconesses* (1862), E C Stephen, *The Service of the Poor* (1871), W F Stevenson, *Praying and Working* (1865)

FLIER, a purchase of stock that is known by the buyer to be of a highly speculative nature, and by which he hopes to make a quick turnover at a profit, though realizing that there is also a great possibility of loss *Taking a flier* is essentially a gamble and is so recognized

FLIGHT (NATURAL). The flight of birds has been from time immemorial a riddle as well as a source of inspiration The author of the Proverbs of Solomon describes "the way of an eagle in the air" as "too wonderful" for him, and for many centuries the paradox that a bird could for hours together maintain its motion without a flap of the wing or any appreciable expenditure of energy seemed hopeless of explanation But though the upward gliding of a vulture until it is almost invisible, or the effortless sailing of an albatross for hundreds of miles over the ocean are obviously marvellous, the ordinary flapping flight of a swift or a pigeon is in reality almost as wonderful For flapping flight involves a combination of a highly perfected mechanical design of the wings with a motive power of remarkable lightness, and, though men have carried on sailing flight in a motorless aeroplane for hours on end, a motor-driven flapping aeroplane has not been produced

Gliding, Soaring or Sailing Flight.—For comprehension of the fundamental principles underlying non-flapping flight, we are indebted to the late Lord Rayleigh who in 1883 remarked that "wherever a bird pursues his course for some time without working his wings we must conclude either (1) that the course is not horizontal, (2) that the wind is not horizontal, or (3) that the wind is not uniform" As we shall see these suggestions lead to the solution of the problem which, as far as flight inland is concerned, may be exemplified by the behaviour of an ordinary vulture He weighs about 10lb, has wings each about 3ft long and 1ft wide, and, about an hour after sunrise, when he throws himself off the bough on which he has roosted, he gives the impression of being too heavily loaded for any but the clumsiest of flying He flaps laboriously uphill, usually in a spiral path, until he has reached a height of 50 or 100ft and then a mysterious change begins to show itself, he flaps less and less hard and after a short time starts gliding steadily and majestically upwards in his spiral After reaching a considerable height, which may be between 500 and 2,000ft, he has no need of further effort, and seems able to float at will in any direction and at any pace that he likes until he descends for food or because sunset is approaching

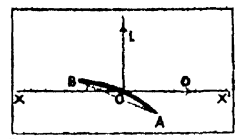


FIG 1.—AIR FORCES ACTING ON A WING SHOWING HOW WHEN MOVING HORIZONTALLY THE WING EXPERIENCES A VERTICAL LIFT, L AND A BACKWARD DRAG D

The details of his flight do not diminish our surprise, for the air in the plains is often so still that there is no suggestion of an up-current sufficient to support a 10lb weight, and with the plane of his wings inclined upwards (the forward edge being higher than that in the rear) a vertical up-current would seem to drive him backward, not forward His continued advance seems inexplicable

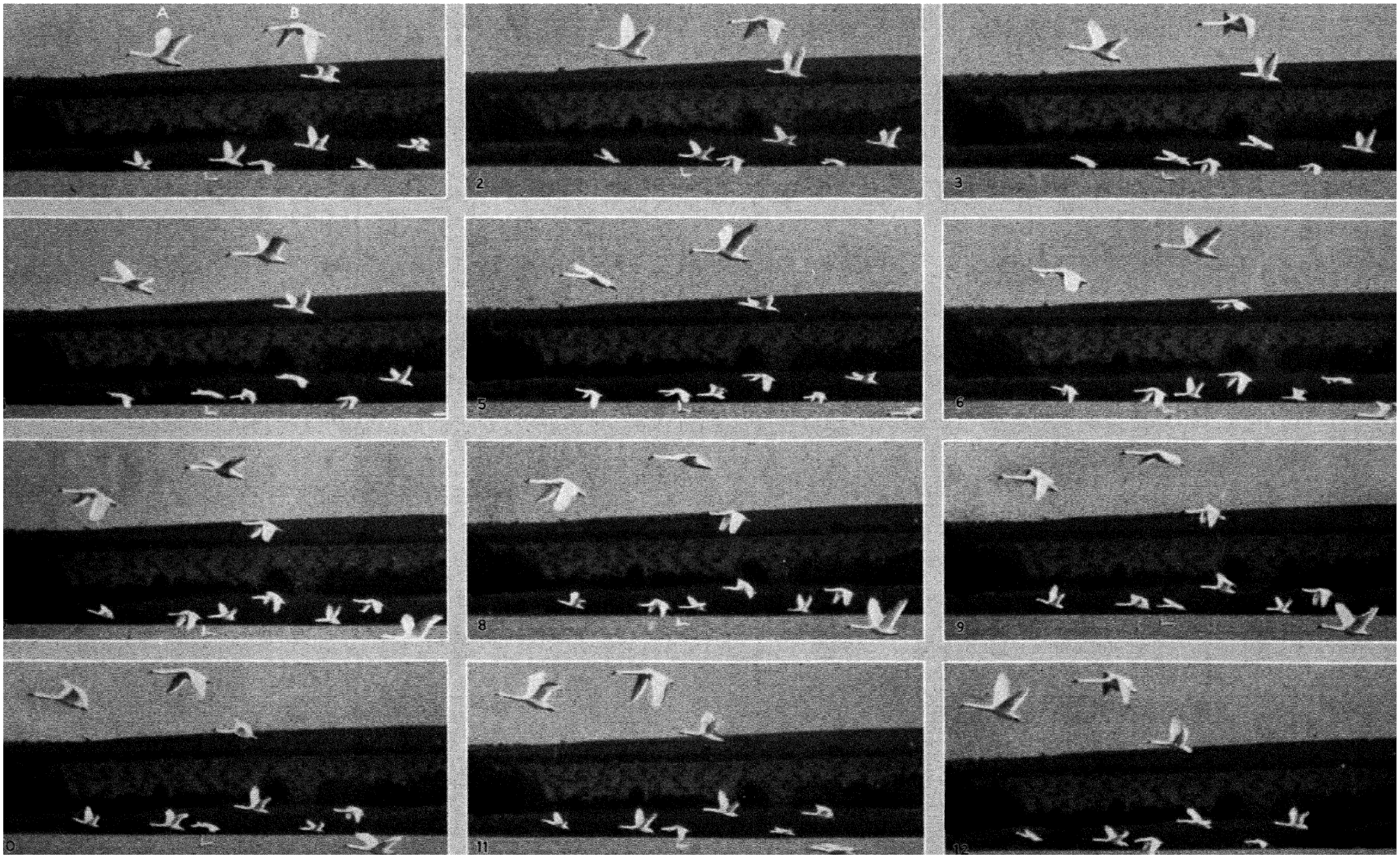
Downhill Gliding Through Still Air.—If a bird is gliding horizontally through still air the resistance of the air must lessen his speed, and on the other hand if he glides steeply downhill he will gain in speed There must be some slope for which he will neither gain nor lose speed and its inclination is called the "angle of descent" Much detailed information has been accumulated regarding the forces which act on wings of various cross-sections and on elongated bodies when travelling at different speeds through the air (*see* AERONAUTICS), and if we have a wing of cross section AB (*see* fig 1) travelling in the direction X'OX the air-forces acting on it are equivalent to (1) a resistance or "drag" D backwards in the reversed direction of motion, (2) a lifting force L at right angles to the direction of motion For a "high velocity" section, the ratio of L D may reach 17 So when our bird is gliding steadily downhill along a line inclined and to the horizon it is acted on by D, L and its weight W, and we must have

$$\frac{P}{\cos\alpha} = \frac{D}{\sin\alpha} = W$$

Now it may easily be calculated from well-known data that if we construct an artificial bird with rectangular wings of standard section and a torpedo-shaped body all of approximately the actual dimensions, the total weight being that of the bird, its angle of descent will be about 4° or 5° Further, we habitually see birds in the tropics gliding at a considerable height in all directions without any obvious descent, but we should not observe an angle of descent of 5° under these conditions, and for one who has been able to watch the gliding of kites from a hill it is impossible to believe that their angle of descent is as great as this Hence, although past measurements of the forces acting upon stuffed birds in wind tunnels have indicated great inferiority by comparison with aerofoils fitted to torpedo-shaped bodies, the ratio of lift/drag in the stuffed birds not exceeding 5, the failure must be explained by the difficulty of preserving the true shape of the wing Preliminary experiments made at S Kensington have confirmed this view and from measurements made on living birds in 1920 in Africa, P Idrac found a lift/drag ratio of about eighteen

Gliding When There Is an Upward Current of Air.—If a bird whose angle of descent is 1 in 12 is gliding through still air at 18 miles an hour he will be descending at the rate of $\frac{1}{12}$ of $1\frac{1}{2}$ miles an hour, and if there were a column of air ascending at over $1\frac{1}{2}$m an hour the bird would climb as long as he kept within it in a spiral path

Now an ordinary observer has no evidence of such vertical air motion, for near the ground that motion must be negligible, but there is complete proof, both meteorologically and by direct measurement, of its existence We know that in sunny weather, owing to the overheating of air near the ground, conditions in continental regions in summer in medium latitudes and in the tropics for much of the year are unstable, so that a mass of



WILD SWANS IN STEADY FLIGHT

Series of cinema photographs, showing wing movements of birds in course of flight The changes can best be observed by following the movements of the two birds at the top of the pictures The wings are straightened at the end of the upward beat, curved at the end of the downward beat At the beginning of the upward beat the wings are bent to avoid air resistance; at the beginning of the downward beat the wings are straightened to give maximum driving surface

air rising above a heated rock will climb to a considerable height before it cools to the same temperature as the surrounding air and comes to rest. These local upward currents are experienced by meteorological kites and balloons, and their effects are described by aviators as "bumps"; in Egypt, for instance, they extend to heights of 4,000 to 10,000 feet. In addition to large currents there are "small vertical currents" whose bottoms can in many cases be detected "in the vicinity of a town by kites or hawks soaring," and whose vertical speed over hilly country is probably as much as 16ft. a second. The dependence of soaring flight on vertical currents is also completely confirmed by the observations of Idrac in Senegal.

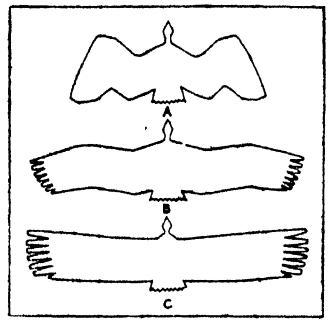


FIG. 2.—A VULTURE GLIDING ILLUSTRATING THE SHAPE OF WINGS WHEN (A) DESCENDING STEEPLY, (B) GLIDING EASILY AND (C) CLIMBING AS FAST AS POSSIBLE

When a bird of prey is "stooping" at a great speed he bends his wing considerably at the elbow and wrist joints as shown at (a) in fig. 2, when he is gliding and not troubling about climbing the bending is slight as at (b); but when he is trying to ascend all he can he straightens his wings and spreads out the primary quills (the pinions at the ends of his wings) so that they are separate from each other over a length of about a fifth of the wing, as at (c). Nature obviously attaches some importance to this feature for she employs a special device to increase the separation beyond that due to the mere fan-like spreading of the feathers; she deliberately leaves the primary quills of full width for about half their length and then steps down the width almost to half the previous amount for the outer half of the length of the quill. This feature, sometimes called the "notch" is apparently universal in birds of prey and the device, as a whole, strongly recalls the Handley-Page slotted wing which enables an aeroplane to climb at a much bigger angle of incidence. Thus G. T. Walker reports having seen vultures climbing on an upward current of about 12ft. a sec., their speed being about 25ft. a sec. up a slope of about 20°, the inclination of the wings also being 20°. If in fig. 3 OP=25 represents the velocity of the bird in space, PN the vertical rate of climb is about 8·5 f.s., so that if QP=12 represents the upward velocity of the air, the rate of climb through the ascending air is NQ=3·5 f.s. and OQ, the bird's path relation to the air, descends at about 8·5°, so that the real angle of incidence POQ is about 28·5°. At first sight it would seem as if the bird could not possibly maintain its forward motion against the resistance of the air. But if we consider the forces acting—the "lift" L (at right angles to the relative motion and so inclined forwards at 8·5° to the vertical) and the "drag" D—it is clear that the condition for maintenance of the forward motion is that the resultant of L and D shall be forward of the vertical, or that (since 8·5°=7·7) the lift shall exceed 7·7 times the drag; this condition is satisfied with a Handley-Page wing.

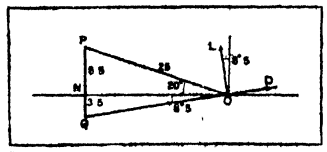


FIG. 3.—FORCES ON A BIRD GLIDING ON AN ASCENDING CURRENT SHOWING HOW THE BIRD IS DRIVEN FORWARD BY AN ASCENDING CURRENT ALTHOUGH THE UPWARD SLOPE OF ITS WINGS SUGGESTS A BACKWARD FORCE

When an aeroplane is losing pace the pilot is tempted to raise the nose of his machine so as to increase the angle of incidence of the wings and get an adequate lift; but this process checks his pace, and if he is still losing height, it may be that no further increase of the angle of incidence will support the aeroplane. The machine is thus said to "stall," control may be lost and a crash occur. Now at such times a Handley-Page slot is of great value in enabling control to be kept; and as a bird trying to climb fast is probably near the stalling angle very often, the slotted ends of its wings have probably the great advantage of enabling it to maintain control. Vultures when climbing may occasionally be seen to make sudden movement of the wings which ends in a short downhill path and probably indicates recovery from a difficult situation of this kind.

Gliding (or Sailing) When the Wind Is Not Uniform.—Lord Rayleigh indicated in general terms the mechanism by which the energy necessary to maintain flight could be derived from the variability of the wind. He pointed out that it is the velocity of the bird relative to the air, not its velocity relative to the ground, which determines the forces acting on it; and the bird can at any time by climbing upwards turn some of the energy of that relative velocity, with comparatively slight loss owing to air resistance, into energy of position; conversely he can with little loss by gliding downhill turn energy of position into velocity relative to the air.

Now if the bird is flying horizontally with relative velocity U, the potential height to which he could climb is $U^2/2g$, where g is the acceleration due to gravity; and if relative to the air he has an acceleration f in the direction of U, U^2 will after an extremely short interval τ become $(U \text{ and } f\tau)^2$ and will so increase at a rate $2Uf$; hence the potential height will grow at a rate Uf/g. Also as the bird is moving horizontally L the "lift" must be equal to his weight; and if the ratio L/D is k, D will be the weight divided by k; so as the weight would produce a downward acceleration g, the backward acceleration due to the drag is g/k. Now if the wind is changing in any continuous manner it will have some acceleration where the bird is, which we can call f′, and by steering always so as to meet that acceleration he will secure an acceleration $(f'-g/k)$ through the air and will gain potential height at a rate $U(f'-g/k)/g$ or $U(f'/g-1/k)$. If the bird does not fly directly against the direction of f′ so that there is only a component $-f''$ along his path, f″ must replace f′ in this formula.

Now it has long been known that the velocity of the wind is in general far from steady and much light has been gained regarding the gustiness due to eddymotion of the air under various conditions. It has been estimated by Walker that in an ordinarily gusty wind of 22m. an hour the acceleration due to turbulence is in excess of 2fss and for stronger winds proportionally higher. So for a bird with k=12, whose angle of descent would be 5°, we must have f/g not less than $\frac{1}{12}$ or f not less than $\frac{3}{12}$, *i.e.*, $2\frac{3}{4}$. Thus a wind averaging $22 \times 2\frac{3}{4} \div 2$, or, say, 30m. an hour would enable a bird to keep up its velocity without flapping.

It may be noted that not only do some inland birds of temperate regions, such as rooks, and many sea-birds avail themselves of turbulence for sailing flight, but also tropical birds of prey who usually depend on convection currents. Thus on overcast days when there are not enough upward currents for kites and scavenger vultures to glide they usually remain in their trees; but occasionally a sudden change in the weather will start them gliding in all directions as if aimlessly, or for pleasure; and it would appear that turbulence afforded the explanation. Nonflapping flight is also possible when the wind, though steady, varies from place to place, as when a gull uses the screening of the wind by a vessel to describe circles near its stern.

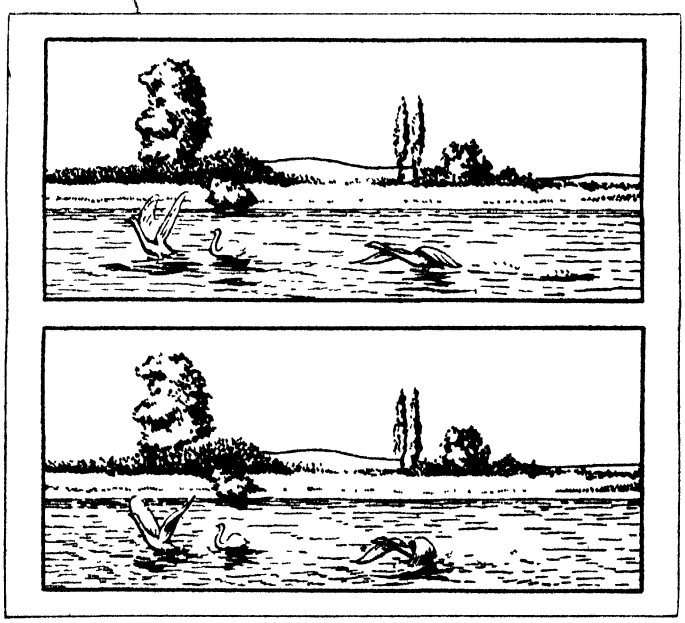
The principle also has an important application to the gliding or sailing flight of albatrosses and other large sea birds in windy weather away from the influence of ships. It is known that the velocity of the wind must diminish down to the surface of the water owing to the influence of friction at the surface and of eddymotion in the air; so by rising or falling a bird can get into a stronger or weaker current of air. If then he sails uphill against the wind, the air that he meets will be at increasing heights and will have an increasing velocity in the direction opposite to his motion, so that his rate of travel through it will not diminish as it would if the air were stationary; *i.e.*, he will gain potential height. Exactly the same happens if he sails downhill with the wind, which is then decreasing in speed and has an acceleration in the direction opposite to his velocity. The natural way to combine these effects is to describe circles in an inclined plane, always descending when moving to leeward and ascending when moving to windward. It is accordingly interesting that the results of a mission of Idrac to the south seas to study the problem entirely confirmed Rayleigh's ideas. He found (a) that such flight was

only possible for very swift birds, the average speed of the albatross being 72 f s or 49 miles an hour; and (b) it needs a minimum wind of 17 f s close to the water.

Now the rate of increase of wind with height varies greatly with the conditions; and in the absence of detailed observations close to the surface of the sea we must utilize those over land made by the London Meteorological Office which agree with those at Nauen in giving an excess of 47% in the wind at 50 feet (5 metres) compared with that at 6½ feet (2 metres) above ground So corresponding to a speed of 24 f s at 7ft we can deduce r, the velocity increase for 1ft. of height, as ·26 f.s. Further, it seems that over the sea in high latitudes the reduction of the velocity will not extend so high as over land, and r will be greater We shall not be very far wrong in taking it as ·3 though Idrac's formula leads to only 2

If the albatross climbs a slope of 1 in 3 at 72 f s against the wind his rate of ascent is 24 f s, so that the increase of the wind in a second is 7 2 f s If for simplicity's sake we may treat U as constant in the computation, the rate of gain of potential height U $(f/g - 1/k)$ is 1 6ft if $k=15$; so he would in 2 seconds of either climb against, or descend with, the wind gain enough energy to take him 116 yards before further thought was necessary. Of course, a greater rate of increase of wind with height, or a greater efficiency of design, would enlarge his powers, but a moderate rate would seem to give an albatross the ability to roam apparently at will If he describes a circle inclined at 20° with the lowest point to leeward and say 5ft. above the sea, while the highest point is 50ft above sea, Walker's approximate formula gives a gain of potential height of 13ft. on describing the circle. Reference may also be made to a letter to *Nature* by S L. Walkden

Flapping Flight.—Birds differ materially in the details of their flapping, the contrasts between the deliberate beat of a heron, the smooth silent flight of an owl, and the hurried whirr



BY COURTESY OF THE BRITISH INSTRUCTIONAL FILMS, LTD

FIG. 4–5 —WILD SWANS RISING FROM THE WATER

In this series the swans are seen taking off from the lake. As greater driving power is needed than for steady flight, the wings are more rotated on the up beat and brought more forward on the down beat

of a partridge being conspicuous enough. But the general character of the wing movements is the same, and as there have been differences of opinion, mainly owing to the difficulties of observation, regarding the fundamental facts, it will be useful to refer to the twelve reproductions in Plate I of wild swans derived from a "slow-motion" cinema film made by British Instructional Films, Ltd. In Plate I., fig. 1, the two top birds are marked (*a*) and (*b*), and in fig 6 will be found diagrams (1) to (12) showing approximately the positions of the wings of bird (a) at instants corresponding with the figures of the plate. In them two features stand out prominently; (a) the time interval between successive pictures being constant, the time of a down beat is half as long again as that of an upbeat; and (b) though the wings are kept straight during positions 2–6 of a down beat, they are bent during 8–11 of the up-beat, the outer portions remaining almost at the same angle with the horizontal for the time 7–9, and being then lifted with a flick in the second half of the upbeat, 9–11 As may be readily seen in Plate I., the motion of the wings relative to the body consists of an up and down beat roughly in a vertical plane when the bird is in horizontal steady flight. The rotation, or twisting of the wing about its own long axis also is of importance as it affects the angle of incidence, *i e*, the angle between the direction of motion and the plane of the wing (between X'X and AB in fig. 1) It will be seen from Pl I, fig. 3 that while the wings of *b*, during an upbeat, are inclined decidedly uphill, those of *a*, in a downbeat, are less clearly downhill, the same is true in figs 6, 7 with *a* and *b* interchanged If now the bird's body is describing from right to left an approximately straight line OQSU (fig. 7) a point in the outer portion of the wing will describe an undulating line OPQRSTU, with the upbeats steeper than the downbeats So if we indicate the plane of the wing as shown in the film, clearly uphill at O and slightly downhill at Q, it will be seen that on the downbeat, as at Q, the angle of incidence is positive and the lift L is upwards at right angles to the path, while on the upbeat, as at S, the angle of incidence is negative, so that L is downwards and forwards The drag D is always backwards along the path.

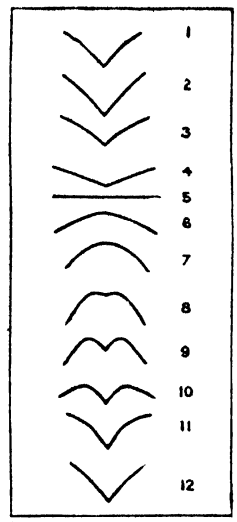


FIG 6.—PROFILES OF WINGS DURING A DOWN-BEAT AND AN UPBEAT MADE AT EQUAL INTERVALS SHOW THAT THE UP-BEAT TAKES PLACE MORE RAPIDLY THAN THE DOWN-BEAT, THE OUTER PORTION OF THE WINGS BEING RAISED WITH A FLICK

It will be seen that the force L always tends to drive the bird forwards; and as it is much greater than D which tends to retard the forward motion, the outer portion of the wing contributes propulsion Also both L and D have a downward tendency during the upbeat, though the tendency is upward during the downbeat; so this portion of the wing is of little avail for support With the inner portion, however, the situation is quite different Here the slight up-and-down motion is almost cancelled by the slight down-and-up motion of the bird's body, so that the flight is essentially non-flapping, the section of the wing must be adapted for high lift and the angle of incidence is positive so that there is lift all the time

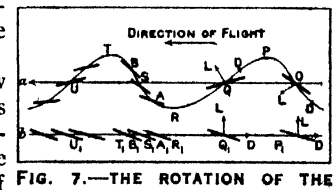


FIG. 7.—THE ROTATION OF THE WING (A) OUTER THIRD, (B) INNER THIRD, ILLUSTRATING WHY THE INCLINATION OF THE INNER AND OUTER PORTIONS OF A WING IS DIFFERENT DURING THE FLAPPING FLIGHT

Reference to fig. 7 will show that the plane of the wing is twisted. Near the top of the upbeat, when the upward flick of the outer portion occurs, the plane of the outer portion at B will be inclined more uphill than of the inner portion at B, but this is not so in the early portion of the upbeat at A and A_1. And during the downbeat the outer portions of the wing will be inclined downwards but not the inner portion. These inferences may be verified in the illustration of Plate II of Kittiwake gulls. In figs. 1, 2 of Pl. II., we have the downbeat of the marked bird with the downward inclined tips seen almost edge on. At the beginning of the upbeat in 15, the inner portions are inclined uphill more than the tips; but in 5, during the flick, the tips are inclined uphill more steeply than the inner portions

As will be seen from the reproductions, the swans (*a*) and (*b*) are ascending, so that their beats must be stronger than if they were flying horizontally; and it is worth while to see what modi-

KITTIWAKE GULLS IN FLIGHT

The pictures in the series are timed at equal intervals. By observing the top gull against the dark cliff throughout the series a cycle or flap of the wings can be followed ending in the rapid upward flick of the wings 1, beginning of downbeat, 2 3 & 4 movements in downbeat, showing twist or bend of wings; 5, 6, upbeat, wings raised in preparation for downbeat tips steeply inclined upward

BY COURTESY OF THE BRIT[illegible]

fications occur when a bird has to exert all his force. In the figures 4–6 we have some wild swans flapping hard to get into the air, that to left in 4 beginning his downbeat; that to right is beginning his upbeat. They have not yet acquired much pace, and are using their feet as well as their wings. It will be seen in 5, that, as far as rotation is concerned, the plane of the wings of one is inclined downhill, while that of the other is uphill, and the reason is that, with a speed insufficient for the inner portion to support the weight by mere gliding, the bird has to adopt an uphill path and aim at more propulsion; so he uses most of the wing as he previously used only the outer portion, and with marked rotation of the type indicated in fig 8. At the lowest point (*see* fig. 5) the wings are rather forward, partly in order to avoid the water, but also in order to secure propulsion along a more upward direction.

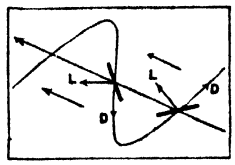


FIG. 8.—BIRD CLIMBING STEEPLY, SHOWING HOW THE WHOLE WING IS EMPLOYED IN PRODUCING FORWARD DRIVE

The question naturally arises whether a machine fitted with aerofoils of known properties as wings attached to a torpedo-shaped body would support and propel itself in the air if its dimensions and weight were those of a typical bird such as a rook; and the wings were flapped in approximately the same manner To this Walker, as the result of an approximate computation with a "high lift" inner third of the wings for support and a flat outer third for propulsion, replies "Yes." He also finds that the power requisite compares not unfavourably with that necessary for a screw propeller driving a gliding bird with fixed wings

Flight by Creatures Other Than Birds.—There is no evidence of the use by these of principles other than those described; and it will therefore suffice to indicate the chief types:—Bats, Flying Lemurs, Flying Squirrels, Flying Phalangers; Pterodactyles (extinct), Flying Lizards (or Dragons), the Flying Snake of Borneo; Flying-fishes, Flying-gurnards, American and African Fresh-water Flying-fishes; Insects.

See also AERONAUTICS and the long series of articles described under AERONAUTICAL ARTICLES.

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See also the following works of general reference:—O. Lilienthal, *Bird flight as the basis of aviation* (tran. A W. Isenthal, 1911), and the *First Report* of the Bird Construction Committee of the Aeronautical Society of Great Britain. (G. T. W.)

FLINCK, GOVERT (1615–1660), Dutch painter, born at Cleves in 1615, was sent to study art at Leuwarden, where he boarded in the house of Lambert Jacobszon. Here Flinck was joined by Jacob Backer. Amongst the neighbours of Jacobszon at Leuwarden were the sons and relations of Rombert Ulenburg, whose daughter Saske married Rembrandt in 1634. The pupils of Lambert probably gained some knowledge of Rembrandt by intercourse with the Ulenburgs. Certainly J. von Sandrart, who visited Holland in 1637, found Flinck acknowledged as one of Rembrandt's best pupils, and living habitually in the house of the dealer Hendrik Ulenburg at Amsterdam. For many years Flinck laboured on the lines of Rembrandt, following that master's style in all the works which he executed between 1636 and 1648; then he fell into peculiar mannerisms by imitating the swelling forms and grand action of Rubens's creations. Finally he sailed with unfortunate complacency into the Dead Sea of official and diplomatic painting. Flinck's relations with Cleves became in time very important. He was introduced to the court of the Great Elector, Frederick William of Brandenburg, who married in 1646 Louisa of Orange. He obtained the patronage of John Maurice of Orange, who was made stadtholder of Cleves in 1649. Flinck was enrolled in 1652 as a citizen of Amsterdam and married in 1656 an heiress, daughter of Ver Hoeven, a director of the Dutch East India company.

The earliest of Flinck's authentic pieces is a likeness of a lady, dated 1636, in the gallery of Brunswick. His first subject picture is the "Blessing of Jacob," in the Amsterdam museum (1638). Both are thoroughly Rembrandtesque in effect. The four "Civic Guards" of 1642, and "The Twelve Musketeers" with their president in an arm-chair (1648), in the townhall at Amsterdam, are fine specimens of composed portrait groups. But the best of Flinck's productions in this style is the "Peace of Münster" in the museum of Amsterdam. Flinck here painted his own likeness to the left in a doorway. The mannered period of Flinck is amply illustrated in the "Marcus Curius eating Turnips before the Samnite Envoys," and "Solomon receiving Wisdom," in the palace on the Dam at Amsterdam. In addition to the foregoing may be noted the "Grey Beard" of 1639 at Dresden, the "Girl" of 1641 at the Louvre, a portrait group of a male and female (1646) at Rotterdam, a lady (1651) at Berlin. Of several pictures which were painted for the Great Elector, Frederick William of Brandenburg, none are preserved except the "Expulsion of Hagar" in the Berlin museum. Flinck died at Amsterdam on Feb. 22, 1660.

FLINDERS, MATTHEW (1774–1814), English navigator, was born at Donington in Lincolnshire on Mar. 16, 1774, and entered the navy in 1789. He served in the "Bellerophon" at Ushant in 1794, and from 1795 to 1799 was engaged in exploration on the Australian coast, including the circumnavigation of Tasmania in 1798. On his return to England he was appointed to the command of an expedition for the thorough exploration of the Australian coasts. The sloop "Investigator" left Spithead on July 18, 1801, and reached Cape Leeuwin on Nov. 6. On his way round the coast he met the French exploring ship "Le Géographe" on Apr. 8, 1802, in what is now Encounter Bay. The narrative of the French expedition claimed discovery of most of the land west of the point of meeting, and the matter was not cleared up till the publication of Flinders' book in 1814.

Flinders reached Port Jackson on May 9, 1802. On July 22 he set out again to complete the circumnavigation of Australia. He examined the Great Barrier Reef and surveyed the gulf of Carpentaria, and then, finding the "Investigator" to be in a leaky state, sailed round the west and south of Australia back to Port Jackson, which he reached on June 9, 1803, after a voyage in which much suffering had been endured by everyone, particularly from scurvy. He left Port Jackson for England in the "Porpoise" which, together with the "Cato," was wrecked on a coral reef, about 800 miles out, on Aug 17. The officers and men camped on a small sandbank, while Flinders returned to Port Jackson in a six-oared cutter to obtain relief He got back and took them off on Oct. 8, and on the 11th sailed again in the "Cumberland." Putting in at Mauritius on Dec. 15, he found England and France at war, and his passport from the French government did not cover the "Cumberland." He was detained until June 1810, and reached England in October. His narrative, *"A Voyage to Terra Australis,* was published on July 19, 1814, on which day Flinders died. This work contains very valuable scientific observations, especially with regard to magnetism, meteorology, hydrography and navigation. He seems to have been the first to discover, and correct for, the errors of the compass caused by iron in ships. He also wrote *Observations on the coast of Van Diemen's Land,* etc., and two papers in the *Phil. Trans.* in 1805 and 1806.

See *Proc. R. G. S. Australasia,* South Australia branch, 14 (1912–1913), pp. 48–74; E. Scott, *Life of Captain Matthew Flinders* (Sydney, 1914); G G. McCrae, In *Victoria Geog Journal,* 28 (1910–1911), pp. 12–30 and 29 (1912–1913), pp. 1–19.

FLINDER'S BARS, vertical bars of soft iron placed in front of or behind a ship's compass to compensate the disturbing magnetic effects due to the vertical soft iron parts of the ship Other effects due to soft and hard iron in horizontal and vertical directions are also eliminated by bars or by spheres appropriately placed. (*See* COMPASS)

FLINDERS RANGE: *see* AUSTRALIA.

FLINSBERG, a village of Germany, in the Prussian province of Silesia, on the Queis, at the foot of the Iserkamm, 1,725 ft above the sea, south of Friedeberg, the terminus station of the railway from Greiffenberg Pop (1925) 2,700 It has some manufactures of wooden wares Flinsberg is celebrated for its chalybeate waters for bathing and drinking, and as a climatic health resort

FLINT, AUSTIN (1812–1886), American physician, was born at Petersham, Mass , on Oct. 20, 1812, and graduated in medicine at Harvard university in 1833 From 1847 to 1852 he was professor of medicine in Buffalo Medical college, of which he was one of the founders, and in 1852–56 he filled the same chair in the University of Louisville From 1861 to 1886 he was professor of medicine in Bellevue Hospital Medical college, New York He wrote many text-books on medical subjects, among these being *Diseases of the Heart* (1859–70), *Principles and Practice of Medicine* (1866), *Clinical Medicine* (1879); and *Physical Exploration of the Lungs* (1882) He died in New York on March 13, 1886.

His son, AUSTIN FLINT (1836–1915), who was born at Northampton, Mass , on March 28, 1836, after studying at Harvard and at the University of Louisville, graduated at the Jefferson Medical college, Philadelphia, in 1857 He then became professor of physiology at the University of Buffalo (1858) and subsequently at other centres, his last connection being with the Cornell University Medical college (1898–1906). His *Text-book of Human Physiology* (1876) was for many years a standard book in American medical colleges He also published an extensive *Physiology of Man* (5 vols , 1866–1874) and other valuable medical works He died in New York city on Sept 23, 1915

FLINT, TIMOTHY (1780–1840), American clergyman and writer, was born of Puritan stock in Reading, Mass., July 23, 1780 He graduated at Harvard in 1800, and after a rather troubled career as Congregational minister in Lunenberg (Mass), he became a home missionary He was also for a short period a teacher and a farmer His observations on the life and manners of the frontier were recorded in a picturesque work, *Recollections of the Last Ten Years Passed in the Valley of the Mississippi* (1826, reprinted in England and translated into French), one of the most valuable accounts of the West at this period The success of this volume and the failing health of the writer led him to relinquish his more active labours for literary pursuits, and, besides editing the *Western Monthly Review* in Cincinnati (1827–30) and *The Knickerbocker* in New York (1833), he published a number of books, including *Francis Berrian, or the Mexican Patriot* (1826), his best novel, *A Condensed Geography and History of the Western States* (1828); *George Mason, the Young Backwoodsman* (1829), a *Biographical Memoir of Daniel Boone* (1833), and *Indian Wars in the West* (1833) He also edited the *Personal Narrative* (1831) of J O Pattie, an adventurer in Mexico and the Far West Flint died in Reading (Mass), Aug 16, 1840, and was buried at Salem

See the biography *Timothy Flint* (1911) by J. E. Kirkpatrick, which contains a bibliography.

FLINT or **FLINTSHIRE** (Sir Gallestr), a county of north Wales, the smallest in Wales, bounded north by the Irish sea and the Dee estuary, north-east by the Dee, east by Cheshire, and south-west by Denbighshire Area, 163,707 acres Pop. (1921), 106,617. Included in Flint is the detached hundred of Maelor, lying 8 m S E of the main part of the county, and shut in by Cheshire on the north and north-east, by Shropshire on the south, and by Denbighshire on the west and north-west. Structurally the county is dominated by the Clwydian hills running south-south-east to north-north-west Their western slope to the Vale of Clwyd is steep but the eastern slope over much of the county to the Vale of Dee is less sharp The Clwydian hills are an uplift with a Silurian axis and with younger rocks outcropping on either side. Their highest point is Moel Fammau (1,820 ft.) on the Flintshire-Denbighshire boundary.

The Silurian strata of the Clwydian hills, mostly of Wenlock age, pass under the Triassic (Bunter) red beds in the Vale of Clwyd On the eastern flank of the anticlinal axis the Silurian is overlain by Carboniferous rocks, with Triassic deposits eastward in Cheshire Both for their influence on the physical features and for their economic value they are the most important rocks in the county A band of Carboniferous limestone passes from Prestatyn on the coast, close by Holywell and through Caerwen· it forms the Halkin mountain (943 ft) east of Halkin, whence it continues past Mold to beyond the county boundary Above these beds come the Holywell shales, possibly equivalent to the Pendleside series of Lancashire and Derbyshire, while upon them lies the Gwespyr sandstone Farther to the east the coal measures extend from Talacre through Flint, Northop, Hawarden and Broughton to Hope The Carboniferous rocks appear again through the intervention of a fault in the neighbourhood of St Asaph The Carboniferous mass of the Halkin mountains is separated from the Clwydian hills on the west by the valley of the Alyn and the small tributary of the Clwyd

The Alyn enters the county near Moel Fammau and passes Cilcen and Mold with a section of underground drainage in the Carboniferous limestone near Hesb-Alyn (the drying-up of Alyn), and bends south to Caergwrle, re-enters Denbighshire and joins the Dee The latter river enters Flintshire near Overton and divides Maelor from Denbigh on the west, then passes Chester and forms the eastern boundary of the county on the north-east It enters the Irish sea by means of a wide but shallow estuary The north-eastern part of Flintshire is a low-lying country bordering the Dee Estuary The low ground extends westwards to the mouth of the Clwyd valley This has been one of the great "ways" into Wales for many centuries Short stretches of blown sand occur on the north coast near Rhyl and Talacre

Archaeology.—Lead and zinc ores have been worked in the Lower Carboniferous rocks in the north of the county, and caves in the same formation known as Cae Gwyn, Gop and Ffynnon Beuno, have yielded remains of Pleistocene mammals Much boulder clay and glacial drift cover the older rocks on the east and north and in the Vale of Clwyd The palaeolithic occupation of Cae Gwyn cave is doubtful, though the find of an unpolished stone axe in the Gop cave may mark its occupation in neolithic times There is little evidence of occupation during the megalithic phase; one dolmen and one stone circle are known, though the standing stones are more numerous on the high ground A large number of the barrows are round ones belonging for the most part to the Bronze age. In the Late Bronze age the north coast route was apparently open, as was the edge of the forest lands on the eastern slopes of the Clwydian hills A breastplate of gold now in the British Museum and a gold torque from the parish of Ysceifiog are important finds, as is also the Caergwrle Cup of uncertain age. Hill-forts of the Romano-British period are important, upon the salient height of the Clwydian hills, and modern studies suggest correlation with the Roman trackways and the mineral wealth of the country A Roman trackway may be traced from south Denbighshire, through Ffrith along the east of the county to Flint, and it then turns westwards to St. Asaph (*?Varae*).

History.—The post-Roman centuries saw Flintshire under the influence of the Celtic saints, the Saxons and the Northmen Bangor is-y-coed had become an important ecclesiastical foundation and Bede records its destruction by Aethelfrith about 615. St. Asaph had also begun to gain ecclesiastical supremacy. The Maen Chwyfan in the parish of Whitford is a fine sculptured cross. The great boundary lines known as Offa's and Wat's Dykes played an important part during this period Recent examination of the remains in Flintshire (*see* Cyril Fox, "Offa's Dyke. A Field Survey," *Archaeologian Cambrensis*, vol. lxxxi., 1926, etc *sqq.*) have shown Offa's dyke to date from the time of the king whose name it bears; the builders used barrows and other prehistoric sites as guide points in the construction. The Flintshire section seems more of a political frontier than a military work for de-

fensive purposes The mineral deposits of Halkin mountain are cut off from Wales, suggesting that the dominant party in fixing the dyke was on the eastern side. The occupation of the Wirral peninsula by the Danes had also a profound effect on Flintshire, where many of their place-names still survive. The swampy upper section of the Dee estuary was less favourable for their settlement than the better land near the open sea When the region that is now Flintshire emerged from the troublesome times of the dark ages we find most of it in the Welsh principality of Powys.

Soon after the arrival of the Normans much of the county, particularly the part to the east of Offa's dyke, came under the control of the lordship of Chester.

The centres of control were Hawarden and Rhuddlan where motte and bailey castles were built It is, however, important to note that the early Norman penetration was confined to the lowlands, while the upland regions remained in the hands of the Welsh chieftains So strong did the native power become that in the hands of Owain Gwynedd (1135–70) and his grandson Llewellyn ap Iowerth (1198–1240), Welsh influence was dominant in the county It was with the building of the stone castles of Hawarden, Hope and Mold, in the middle of the 13th century, that Norman influence gained a stronger foothold, while the interesting castle of Ewloe shows a Welsh construction on a Norman model The final conquest was achieved with the establishment of the great Edwardian fortresses of Rhuddlan and Flint, in 1277, and the town of Flint was definitely planned at the time Maelor Saesneg was incorporated in the county in 1284 The county contains two mediaeval religious houses—Basingwerk abbey near Holywell, a Cistercian house founded in 1131 or 1132, and the ruins (now incorporated in a farm) of the Dominican friary of Rhuddlan, founded in the 13th century

The county had associations with England during the Renaissance, and Dr Morgan, bishop of St Asaph (1602–04) directed the translation of the Bible into Welsh Many of the castles were held for the king during the Civil War of the 17th century, but they soon fell into the hands of the parliament and were "slighted." The rise of the great religious denominations in the 18th and 19th centuries caused a profound change in the social life of Wales Flintshire, as a border county, had early associations with Puritanism and the Independents were strong in the 19th century The Calvinistic Methodism of the highlands of Denbighshire was not so marked in Flintshire, though the western section of the county was much affected The county has retained, in certain regions that still remained under the influence of some ancient landed families, a measure of adherence to the Roman Catholic Church

Agriculture and Industries.—The Vale of Clwyd is well known for its pasture lands. Out of the 163,707 ac. comprising the county, 120,917 were, in 1925, under crops and grass The amount of arable land was just under a third of this. Oats, turnips and swedes are the chief crops Stock and dairy farming prospers, native cattle being crossed with Herefords and Downs, native sheep with Leicesters and Southdowns, while the industrial regions of the county are a ready market for meat, butter, cheese, etc

The mineral wealth of the county seems to have been known from early times The location of metal mines in Halkin mountain seems to bear some relation to the Romano-British hill-top camps and the Roman trackways, while the mines were of undoubted importance at the time of King Offa. In the 18th and 19th centuries large numbers of Cornish miners settled in the neighbourhood, leaving their trace in many of the present family names. Halkin mountain was a great lead-mining district. Lead is also raised at Mold, Holywell, Prestatyn and Talacre. Zinc, formerly only worked at Dyserth, has increased in output. Copper is also raised at Talargoch. The exploitation of the coalfield during the latter half of the 19th century transformed the eastern half of the county The collieries began at Llanasa, then run through Whitford, Holywell, Flint, Halkin, Northop, Buckley, Prestatyn and Hawarden (Penarlâg) The use of the coal led to the extension of the local smelting of the iron and lead ore of the district, and from these occupations important chemical works have grown up at Flint and along the north coast of the county. Alkali works are most important. The limestone is also worked, and there are some coarse-clay potteries. The presence of the coal and the chemical industries, and expanses of relatively cheap sandy soil on the north coast, the whole being in close proximity to the Lancashire textile industries, has made the neighbourhood of Connah's Quay the site of important factories in the artificial silk industry Rhyl on the north coast is a seaside resort.

Administration and Communications.—There is one municipal borough—Flint (Pop 6,298). The county is in the North Wales and Chester circuit, the assizes being held at Mold Flint borough has a separate commission of the peace, but no separate court of quarter sessions. The county has portions in the dioceses of Chester, Lichfield and St Asaph It returns one member to parliament, the constituency known as the Flint Boroughs was abolished in 1918 The L M S line from Chester serves the north and east of the county where it is the main line to Holyhead Another branch from Chester reaches Hope Junction, where it is joined by a line from Wrexham, and proceeds to Mold The line from Mold proceeds through the centre of the county almost to Caerwys where it enters Denbighshire Rhuddlan is served by a branch line from Denbigh through St Asaph, joining the main line near the Clwyd estuary

FLINT, a municipal borough and county town in Wales, on the Dee estuary, 11½ m N.W of Chester by rail Pop (1921), 6,298 Flint castle was built on an isolated rock by the river side by Edward I, who made the little settlement that grew beneath the castle a borough The town received a charter from Edward III and the Black Prince, as earl of Chester It was held for the king during the civil war but twice taken, after siege, by the parliament, and finally dismantled in 1647. The town lived on as a country market town and small seaport until the 19th century, when it became associated with the coal and metal industries of the localities; now it has alkali and chemical works

FLINT, a city of Michigan, U S A, on the Flint river, 70m. N W of Detroit, the county seat of Genesee county, the third city of the State in size and the second in value of manufactures, and the second of the world in production of automobiles It is on Federal highways 10 and 23, and is served by the Grand Trunk and the Pere Marquette railways The population was 91,599 in 1920 (81·6% native white and 129 males to 100 females) and 145,000 in 1928 The area of the city is about 30 sq m, and the assessed valuation of property in 1927 was $176,477,939 The State school for the deaf (established 1854) is here. There are 40 public parks, with a total area of over 1,000 acres. Most of the schools, homes, hotels and business buildings have been built since 1900, over half of them since the World War Since 1917 development has been guided by a city planning board. The present industrial life of Flint centres around the several subsidiaries of the General Motors corporation which have been established in the city since 1904, including the companies making the Buick and the Chevrolet cars, and bodies, springs, spark plugs and other motor accessories This group of industries employed in 1928 over 47,000 persons. Other large concerns manufacture such contributory articles as carburetors, paints, varnishes and colours, axles and malleable castings The aggregate output of the factories in 1925 was valued at $422,644,236

A trading post was established here, at "the grand traverse of the Flint," in 1819 by Jacob Smith, a fur trader from Detroit, and in 1830 John Todd, a Pontiac storekeeper, bought 785ac of land for $800 as a speculation, settling here with his family The little village was made the judicial seat of Genesee county in 1835, two years before Michigan became a State, and was incorporated as a city in 1855. In 1860 the population was 2,950 The city grew gradually until 1900, when it had a population of 13,103. The fur trade was followed by lumbering as the dominating industry, and that in turn by the manufacture of wagons, carts, buggies and carriages, and Flint was known as "the vehicle city" long before an automotive vehicle had been made The automobile industry dates from 1904, when the Buick Motor Company was established. By 1910 the population had jumped to 38,550, almost three times that of 1900; between 1910 and 1920 the increase was

138%, and in the next eight years (using the local estimate of 1928 for the computation) 58% more Annexations of territory between 1910 and 1925 increased the area 135% The value of the manufactured products in 1925 was about 18 times the figure for 1909. Postal receipts in 1926 were over 50 times as much as in 1910 The industrial development necessitated a parallel activity in the building of homes, schools, banks, department stores, theatres and office buildings, and in street paving and lighting, expansion of the public utilities, and of the various city services for the protection of life, health and property The *per caput* expense for the operation and maintenance of the general city departments increased from $15 10 in 1918 to $28 19 in 1927

FLINT (a word common in Teutonic and Scandinavian languages, possibly cognate with the Gr πλινθος, a tile), in petrology a black, grey or brown form of hydrated silica which has an almost vitreous lustre, and when pure appears structureless to the unaided eye When unaltered by weathering, it is, in the mass, dark and opaque, but in thin plates or on the edges of splinters, it is pale yellowish or pale grey Its hardness is greater than that of steel, so that a knife-blade leaves a grey metallic streak across its surface It is brittle and if finely broken yields angular chips which are used as an abrasive The fracture is shell-like, and when resulting from a blow, perfectly conchoidal, so that a "cone" or "bulb" of percussion is formed Under thermal action (heat or frost) shell-like flakes are removed, but the bulb of percussion is absent Although the flint appears to be homogeneous, experienced flint "knappers," such as those engaged in gun-flint manufacture at Brandon, Suffolk, recognize a "grain" which permits easy flaking in certain directions For the removal of smaller flakes, pressure from another stone is sufficient

When flint is examined microscopically, it is usually found to be very finely crystalline and to consist of quartz and chalcedonic silica; some varieties, however, appear to be amorphous, resembling opal Sponge-spicules and fragments of other organisms, wholly or partially silicified, with retention of their structures, may be present

In Britain the term flint is restricted to concretionary nodules, veins and tabular masses found in the Chalk (*see* CRETACEOUS), and as pebbles in the gravels, etc, of Tertiary and Quaternary age derived from its erosion The coarser and less homogeneous similar substance occurring in the older rocks (Carboniferous Limestone, Devonian, Ordovician and pre-Cambrian) is known as *Chert* Some cherts contain tests of Radiolaria and thus resemble superficially the radiolarian oozes forming in the oceans at the present day

The principal use to which flint has been put is the fabrication of weapons in Palaeolithic and Neolithic time (for which *see* FLINTS) The making of gun-flints may be regarded as a survival of this industry. The rounded beach-pebbles of flint from the South Coast of England and the north of France are used for ball-mills in which pottery-materials, sand, etc, are finely ground Chert-slabs from the Carboniferous and Cretaceous rocks are used similarly in pan-mills Ground flint is used as a source of silica in glazes and pottery, and as an abrasive Its use in glass (*e g*, for *flint-glass*) has long been abandoned The use of flint-gravels for road-mending, is now confined to by-roads

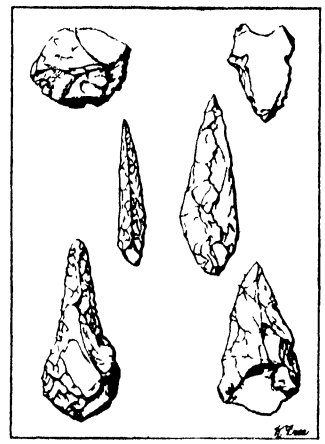
(P. G H. B.)

FLINT-LOCK: *see* GUN

FLINTS. The term "Flints" is popularly used to denote implements made by men of the Stone Age, since in Europe flint and flinty materials were frequently used for that purpose

Flint is a hydrated silica containing a varying amount of water loosely held in combination When pure it is translucent, but impurities render it opaque and coloured, commonly either black or brown. Irregular flint nodules occur native in horizontal bands in chalk Their origin is not clearly understood In some cases it is undoubtedly due to marine organisms, such as sponges which, requiring silica for their growth, secrete it from the water

Under certain imperfectly understood conditions the water in the flint seems to dry out, leaving on the exposed surface a thin film of white silica; this is known as the patina When thick it gives a quite white appearance; when very thin the colour of the unchanged flint underneath shows through, so that a black flint will have a blue appearance. Flint itself is impervious to moisture, but the patina is porous. Thus when patinated flint occurs in gravels containing iron salts a yellow staining, producing the well-known ochreous patina, results Patinated flint embedded in peats also gets stained in a characteristic manner. Other varieties of staining called by fanciful descriptive names are often due to the patina occurring in patches; thus we have the "toad-belly" patina found in certain gravel pits in East Anglia. Originally the patinated surface is matt, but where the object has been rolled to some extent in soft sands or loams it becomes polished and lustrous The thickness of the patina skin is partly a question of the length of time during which the weathering process has operated but it naturally depends on local conditions



BY COURTESY OF THE METROPOLITAN MUSEUM OF ART

FLINT IMPLEMENTS OF THE OLD STONE AGE

The discovery of artificially chipped flint in soil belonging to the Palaeolithic epoch has enabled science to trace, with firmer conviction, the history of man back to that period

Flints are fractured easily and evenly in three ways, by percussion, by pressure, and by temperature changes

Percussion Flaking.—If a lump of flint is struck with a sharp blow concentrated at a point it breaks in such a way that a sort of cap can be lifted off, exposing a double cone consisting of a broad angled cone resting on the truncated apex of another with steeper sides, there being a more or less sharply defined shoulder at the junction of the two. The cap which comes off naturally shows a hollow corresponding to these cones, this is known as the negative cone If the blow be delivered on the margin of the block a flake comes off showing a swelling near the point of impact This is the so-called bulb of percussion; it is a partially formed cone Around this bulb curved lines often appear on the flake, the concavity being always towards the apex of the bulb. This is important, as it sometimes happens in the case of an implement that the bulb has been removed subsequently; but it is still possible to tell from these curved lines the direction from which the blow originally came When the blow has been particularly intense, lines of fracture radiating from the point of impact also appear on the surface of the flake They form radii to the curved lines A small flake scar known as an *éraillure* is often seen on the surface of the bulb This is not due to an attempt by prehistoric man to get rid of the bulb, but appears under certain conditions when a flake is struck off.

When a piece of flint is struck the force of the blow rapidly diminishes as it penetrates the dense medium Should there be sufficient energy the fracture set up by the blow, especially if it is struck diagonally outwards near the edge, will go right through the flint, a flake being removed In this case the new flake-scar forms a clean angle where it meets the original surface of the flint Should the blow be directed inwards, however, and only penetrate a short way into the flint the shattering will cause a fragment to break off which leaves ridges where the two surfaces meet The first method is known as "feather-edge" flaking, the second as "resolved" or "step" flaking Both were used as secondary working to toughen an edge and it is important to differentiate between the two, as "resolved" flaking is especially common in certain prehistoric cultures. In nature percussion flaking takes place by torrent action, where materials are hurled together, the result being chipping in all directions (flint thus knocked about shows innumerable minute incipient cones of percussion); by sea action, where not only is beach material hurled by the waves against larger fixed rocks and so chipped indiscriminately, but also is sucked back by the waves, so that any chance lump of flint embedded in the beach becomes in time much chipped in one direction by the passing pebbles; by ice action in glaciated regions.

Pressure Flaking.—This method of flaking flint was employed by prehistoric man and is still used by many primitive peoples, such as the aborigines of Australia. The aborigine takes a flake and, using the sole of his foot as a tough anvil, presses off little flakes along the margin, wherever he requires a sharp edge or desires to remove material. When a large flake is thus removed a bulb of pressure corresponding to the bulb of percussion appears, but it is, as a rule, considerably flatter. Usually flakes removed by pressure are small and scalelike The resulting flake scar shows a large number of curved lines like those round a bulb of percussion but generally rather flatter and closer together; the consequent reflection and refraction of light give a characteristic glassy or waxy appearance to an unpatinated pressure-flaked surface. In nature pressure-flaking results from the differential movement of gravels containing a large number of pebbles, such movement being often due to the slipping of a gravel bed down the side of a valley or the caving-in of a gravel bed owing to the solution of some underlying limestone deposit by underground streams. Thus pebbles get forced against one another; and in the latter case especially the pressure tends to come all from one direction, and so definite trimmed edges are produced

Temperature Changes.—Flint is a very poor conductor of heat but it expands with a rise of temperature. If then the exterior is rapidly heated accommodation with the interior has to take place and there results a series of fractures. In this case no bulb of any sort occurs, but the fractured surface is covered with irregular closed rings This method has been rarely used by man, but thermal fractures, as they are often called, naturally caused by daily and seasonal changes in temperature, are of common occurrence. Frost action is especially characteristic As a rule the surface of the flint becomes pitted and covered, as it were, with small hemispherical depressions Under certain circumstances, too, prismatic bars of flint are found, the formation of these being analogous to that of the prismatic columns occurring in basalt This is commonly known as "starch" fracture At first sight these prismatic bars of flint might be taken for cores from which long narrow flakes had been removed The complete absence of any bulb, coupled with an appearance characteristic of a thermally fractured surface but difficult to describe, at once distinguishes the two

Mr. Reid Moir has attempted, by studying microscopically fractured surfaces of the flint, to distinguish between the various methods just described With regard to the appearance of percussion and pressure-flaked surfaces, a rough analogy may be made respectively with the surface of an apple cut by a knife, which is smooth, and that of an apple broken between the two hands, which is rougher and more hackly No results, of course, can be obtained where the surfaces have been subsequently patinated.

It has become desirable to find criteria which will demonstrate whether a chipped object has been fashioned by man or by nature As noted previously, when nature chips flint, whether by percussion or pressure, the direction of the blow or pressure comes either from one or an infinite number of directions. What nature cannot do is to apply blows or pressure in two or three definite directions more or less at right angles to one another. Thus it is difficult for nature to knock off a flake and then trim one of the edges, an action involving two directions of blows; and it is almost impossible to invoke nature as the agent if we find a specimen showing also a "prepared" platform on which the blow making the original flake had been struck, thus involving blows from yet a third definite direction Nor would it have been more possible for nature to achieve this result did we postulate, as might more probably be the case, that the direction of the blows remained constant and that the object itself was revolved once or twice through 90° while receiving the blows.

Of course prehistoric man did not only make his tools of flint, chalcedony, chert, and other flintlike materials which furnish a sharp but brittle working-edge, any kind of fine-grained rock was utilized. In these latter materials the fracture phenomena are similar to those of flint but are far less in evidence and much more difficult to identify. Such rocks, too, fracture irregularly, and it was not till Neolithic man adopted a grinding and polishing technique that a sharp regular edge was obtainable which had the added virtue of being tough.

Typology (*q.v.*) enables the prehistorian to group the various tools of the Stone Age into families according to their purposes or significant characteristics. The following is a summary of the more important of these tool families

Coups de poing (sometimes called hand-axes or bouchers) — Originally pear-shaped, boldly flaked, and with irregular edges, later they become flatter and finer An oval form also develops. In the latter case the edge shows the "S" twist characteristic of the Acheulean culture, where the top part of the tool is, as it were, slightly rotated upon the bottom half. The coup de poing family is especially characteristic of Lower Palaeolithic cultures

Scrapers.—The essential feature of the scraper is its sharp, convex edge. The chief varieties are side-scrapers, end-scrapers on blades or flakes, round-scrapers and core-scrapers Side-scrapers generally show the characteristic "resolved" flaking and belong to the Mousterian culture· the other varieties are post-Mousterian A special kind of core-scraper, in which the flakes removed are narrow and flat and rise fanwise to a well defined keel, is known as the keeled or *tarté*-scraper. It is a characteristic tool of the Middle Aurignacian culture, when such a fluting technique was common

Awls.—A true awl has a point prepared by careful trimming all round Pseudo-awls which have the point trimmed only halfway round, the under surface remaining a part of the general flake surface, are, however, common

Points.—These form a varied family comprising a number of related types and others the connection of which is more obscure. Some types were doubtless used as lance-heads, *e.g.*, the Mousterian Point and the Solutrean Laurel and Willow leaves, others, such as an important series which grade from what are known as Audi Points to Gravette Points were probably pointed knife blades. They have the side of the blade opposite the working edge blunted. This series enables us to subdivide the Aurignacian period into a number of stages

Pigmy Tools.—The pigmy family includes several distinct types which are named, according to their shape, lunates, crescents, triangles, trapezes, and pigmy scrapers. They are linked together by the fact that they formed the sharp working edges of finished tools, being hafted in various ways into handles made from some other material The chipping seen on them is generally intended to blunt the edge which is actually to be hafted lest it should cut into or split the haft Pigmies are found all over the world during widely different periods, they do not necessarily all belong to the same culture

Celts.—The Celt family is characteristic of Neolithic times, and a grinding and polishing technique is often employed in their manufacture. The original type when chipped only is not unlike the coup de poing at first view. But the carefully prepared sharp, convex working edge is at the broad end of the tool. Two evolutionary series can be determined—one North European, the other West European In the former the sides of the tool become squared and finally the upper and under surfaces become flat, a section through the tool being rectangular In the latter the round squat original type becomes flatter and more chisel-like.

Arrow-heads.—Many varieties of arrow-heads are known, some with wings and a central tang, others with wings or tang only; some again are lozenge or leaf shaped. Not only can an evolutionary series be to some extent determined, but certain types only occur commonly in definite areas.

Bone tools, found associated with stone tools during certain periods, can also be classed into families. Harpoons for example form an important evolutionary series, starting with a primitive form where the barbs are hardly detached from the stem and developing through the detached single-barbed varieties to the double-barbed specimens. This series is important for subdividing the Magdalenian culture Other important bone families are lance-heads, needles, and polishers

See W. J Sollas, *Ancient Hunters* (3rd ed., 1924), pp 78 *et seq*; M. C. Burkitt, *Prehistory* (2nd ed., 1925), chap. iv. (M C. B)

FLOAT, the action of moving on the surface of water, or through the air. The word is used of a wave, or the flood of the tide, river, backwater or stream, and of any object floating in water, as a mass of ice or weeds; a movable landing-stage, a flat-bottomed boat, or a raft, or, in fishing, of the cork or quill used to support a baited line or fishing-net It is also applied to the inflated organ by means of which certain animals, such as the "Portuguese man-of-war," swim, to a hollow metal ball or piece of whinstone used to regulate the level of water in a tank or boiler, and to a piece of ivory in the cistern of a barometer "Float" is also the name of one of the boards of a paddle-wheel or water-wheel

The word also denotes a low, broad cart for carrying heavy weights, and a platform on wheels used for shows in a procession. The term is applied to various tools, especially to trowels used in plastering It is also used of a dock where vessels may float, as at Bristol, and of the trenches used in "floating" land In geology and mining, loose rock or ore brought down by water is known as "float," and in tin-mining it is applied to a large trough used for the smelted tin In weaving the word is used of the passing of weft threads over part of the warp without being woven in with it, also of the threads so passed In the United States a voter not attached to any party and open to bribery is called a "float" or "floater"

FLOATING ASSETS: *see* CURRENT ASSETS

FLOATING BATTERY: *see* MONITOR

FLOATING DEBT. This term is usually applied to that form of National Debt which consists of very short-term obligations, such as Treasury Bills, which usually range from 3 to 6 months in duration, Exchequer Bonds not running beyond 3 years and loans from the State or Central Bank (*see* NATIONAL DEBT) Although somewhat similar in character, the term should not be confused with Floating Money or with "Floaters." The former term is usually employed to describe surplus funds in the hands of bankers, which are used from day to day in making advances to the London money market; the latter is a market expression signifying first-class bearer securities, usually in the shape of short-term British Government Debt, which is deposited with bankers against money lent by them for very short periods

In normal times a Floating Debt for any large amount is for many reasons to be avoided By the very fact of its short-dated character, it is usually held not by investors, but by bankers and money markets, and when outstanding in large amounts it becomes a dominant factor in determining the value of money and not infrequently weakens the power of the central banking institution to control local money conditions Not infrequently, too, when Floating Debt takes the form of direct borrowing from the State or central banking institution, actual inflation is caused and Britain's maximum period of inflation coincided with the creation of Treasury Bills of over £1,200,000,000 with large borrowings at the Bank of England on Ways and Means advances The first step in the direction of deflation took the form of steady reduction in the volume of the Floating Debt France also affords a classic example of the extraordinary dimensions to which floating indebtedness can grow during the periods of emergency, the total of the Funding Debt in March 1926 being 132,000,000,000 fr of which amount 36,250,000,000 fr. represented advances by the Bank of France.

In its broader aspects and as distinct from its special application to national debts the expression Floating Debt is also used in the case of large mercantile and industrial undertakings especially in the case of railways, and has been well defined in Palgrave's *Dictionary of Political Economy* as a term for distinguishing trade debts and debts borrowed from banks for temporary purposes from debts incurred by the issue of debentures or debenture stock. (A. W. K.)

FLOATING DOCK: *see* DOCKS, FLOATING.

FLOCK. 1. (A word found in O.E and O Norw., from which come the Danish and Swedish words, and not in other Teutonic languages), originally a company of people, now mainly, except in figurative usages, of certain animals when gathered together for feeding or moving from place to place. For birds it is chiefly used of geese, and for other animals most generally of sheep and goats It is from the particular application of the word to sheep that "flock" is used of the Christian Church in its relation to the "Good Shepherd," and also of a congregation of worshippers in its relation to its spiritual head

2. (Probably from the Lat. *floccus,* but many Teutonic languages have the same word in various forms), a tuft of wool, cotton, or similar substance The name "flock" is given to a material formed of wool or cotton refuse, or of shreds of old woollen or cotton rags, torn by a machine known as a "devil" This material is used for stuffing mattresses or pillows, and also in upholstery The name is also applied to a special kind of wall-paper, which has an appearance almost like cloth, or, in the more expensive kinds, of velvet. It is made by dusting on a specially prepared adhesive surface finely powdered fibres of cotton or silk The word "flocculent" is used of many substances which have a fleecy or "flock"-like appearance, such as a precipitate of ferric hydrate

FLODDEN or **FLODDEN FIELD,** near the village of Branxton, in Northumberland, England (10m NW of Wooler), the scene of a famous battle fought on Sept. 9, 1513, between the English and the Scots On Aug 22 a great Scottish army under King James IV. had crossed the border. For the moment the earl of Surrey (who in King Henry VIII's absence was charged with the defence of the realm) had no organized force in the north of England, but James wasted much precious time among the border castles, and when Surrey appeared at Wooler, with an army equal in strength to his own, which was now greatly weakened by privations and desertion, he had not advanced beyond Ford Castle The English commander promptly sent in a challenge to a pitched battle, which the king, in spite of the advice of his most trusted counsellors, accepted On Sept. 6, however, he left Ford and took up a strong position facing south, on Flodden Edge. Surrey's reproaches for the alleged breach of faith, and a second challenge to fight on Millfield Plain were this time disregarded The English commander, thus foiled, executed a daring and skilful march round the enemy's flank, and on the 9th drew up for battle in rear of the hostile army It is evident that Surrey was confident of victory, for he placed his own army, not less than the enemy, in a position where defeat would involve utter ruin On his appearance the Scots hastily changed front and took post on Branxton Hill, facing north The battle began at 4 P M Surrey's archers and cannon soon gained the upper hand, and the Scots, unable quietly to endure their losses, rushed to close quarters Their left wing drove the English back, but Lord Dacre's reserve corps restored the fight on this side In all other parts of the field, save where James and Surrey were personally opposed, the English gradually gained ground The king's corps was then attacked by Surrey in front, and by Sir Edward Stanley in flank. As the Scots were forced back, a part of Dacre's force closed upon the other flank, and finally Dacre himself, boldly neglecting an almost intact Scottish division in front of him, charged in upon the rear of King James's corps Surrounded and attacked on all sides, this, the remnant of the invading army, was doomed The circle of spearmen around the king grew less and less, and in the end James and a few of his nobles were alone left standing. Soon they too died, fighting to the last man Among the ten thousand Scottish dead were all the leading men in the kingdom of Scotland, and there was no family of importance that had not lost a member in this great disaster The "King's Stone," said to mark the spot where James was killed, is at some distance from the actual battlefield "Sybil's Well," in Scott's *Marmion,* is imaginary.

FLODOARD (894–966), French chronicler, was born at Epernay, and educated at Reims in the cathedral school which had been established by Archbishop Fulcon (822–900). As canon of Reims, and favourite of the archbishops Herivaeus (d 922) and Seulfus (d. 925), he occupied while still young an important position at the archiepiscopal court, but was twice deprived of his benefices by Heribert, count of Vermandois, on account of his steady opposition to the election of the count's infant son to the archbishopric Upon the final triumph of Archbishop Artold in 947, Flodoard became for a time his chief adviser, but withdrew to a monastery in 952, and spent the remaining years of his life

in literary and devotional work His history of the cathedral church at Reims (*Historia Remensis Ecclesiae*) is one of the most remarkable productions of the 10th century Flodoard had been given charge of the episcopal archives, and constructed his history out of the original texts, which he generally reproduces in full, the documents for the period of Hincmar being especially valuable. The *Annales* which Flodoard wrote year by year from 919 to 966 are doubly important, by reason of the author's honesty and the central position of Reims in European affairs in his time. Flodoard's poetical works are of hardly less historical interest. The long poem celebrating the triumph of Christ and His saints was called forth by the favour shown him by Pope Leo VII, during whose pontificate he visited Rome, and he devotes fourteen books to the history of the popes.

Flodoard's works were published in full by J P. Migne (*Patrologia Latina*, vol. 135), a modern edition of the *Annales* is the one edited by P Lauer (Paris, 1906). For bibliography *see* A. Molinier, *Sources de l'histoire de France* (No 932)

FLOE, a sheet of floating ice detached from the main body of polar ice, and of less extent than the field of "pack" ice, which is a compacted mass of greater depth drifting frequently under the influence of deep currents, while the floe is driven by the wind

FLOGGING has been one of the most universally utilized methods of punishing public crimes, as well as a means of preserving family, domestic, military and academic discipline. In the Mosaic code flogging was prescribed as punishment for crime Down to about 1800 imprisonment was not common as a mode of punishing crime, and not until the 19th century was imprisonment gradually substituted for corporal punishment Flogging is still frequently employed, being legal in Delaware, Canada, Great Britain and some Continental and Asiatic lands as a punishment for certain crimes, chiefly assault, robbery and rape As late as 1920 the British Parliament legalized the use of the "cat-o'-nine-tails" in flogging those convicted of robbery Where flogging was forbidden as a method of punishing criminals its use was often continued within the prisons as a method of enforcing penal discipline. Prison investigations have indicated that flogging as a method of disciplining convicts has not yet disappeared from prison systems Exponents of severity in dealing with convicts are found urging the revival of flogging in the United States Slaves were frequently flogged to death when they were sufficiently numerous so that they had little pecuniary value The flogging of negro slaves in the southern United States prior to the Civil War was exaggerated in Abolitionist literature, inasmuch as the negro slaves were too valuable to have their efficiency reduced by over severe punishment

The instruments and methods of flogging have varied greatly. In maintaining discipline in the home and school sticks, rods, straps, whips and other handy objects have been informally drafted into service In punishing criminals and maintaining discipline in army and naval circles the lash, with a variety of ingenious elaborations, has dominated. One of the most popular refinements of brutality with the lash has been the so-called "cat-o'-nine-tails" This gained the name because this flogging device was constructed of nine knotted cords or thongs of rawhide attached to a handle. Even more effective in producing pain and ultimately death is the Russian knout This is an instrument constructed of a number of dried and hardened thongs of rawhide interwoven with wire, the wires often being hooked and sharpened on the end so that they tear the flesh when the blow is delivered. Severe punishment with the knout means death almost invariably. A particularly painful, though not so deadly, type of flogging is the peculiarly Oriental custom known as the bastinado, or blows delivered upon the soles of the feet with a light rod or a knotted cord or lash. In the period before the reaction set in against corporal punishment, flogging was executed with great brutality. The backs of the condemned were frequently cut in strips and blood gushed freely from the wounds. Not infrequently salt was thrown upon the bleeding backs to increase the pain. With the use of the knout pieces of flesh are literally torn from the back as the hooked points are extracted.

With a growing consciousness that punishment is not so much a deterrent to crime as had been supposed, flogging, as a general practice, has been abandoned Modern psychiatry and genetic psychology have shown the dangers inherent in flogging children, in that such procedure may develop inhibitions, antipathies and neurotic traits likely to undermine the whole mental and nervous system of the child

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FLOOD, HENRY (1732–1791), Irish statesman, son of Warden Flood, chief justice of the king's bench in Ireland, was educated at Trinity college, Dublin, and at Christ Church, Oxford. He entered the Irish parliament for Kilkenny in 1759, and immediately began the creation of an opposition in that corrupt body and the education of public opinion in the country The English government was driven by his efforts to pass the Octennial bill, limiting the duration of parliament to 8 years (there had been no legal limit except that of the reigning sovereign's life), and, during the viceroyalty of Lord Townshend to mitigate the practice of allowing crown patronage to be dispensed by the owners of parliamentary boroughs The growth of an independent spirit in the Irish House was shown in 1769, when a money bill was sent over by the privy council in London for acceptance by the Irish House of Commons It was rejected on the ground that the bill had not originated in the Irish House Parliament was peremptorily prorogued, and a recess of 14 months was employed by the government in securing a majority by the most extensive corruption Nevertheless when parliament met in Feb 1771 another money bill was thrown out on the motion of Flood; and the next year Lord Townshend, the lord-lieutenant whose policy had provoked this conflict, was recalled The struggle was the occasion of a publication, famous in its day, called *Baratariana,* to which Flood contributed a series of powerful letters after the manner of Junius, one of his collaborators being Henry Grattan

Flood was now in a position such as no Irish politician had previously attained Under parliamentary conditions that were exceedingly unfavourable, and in an atmosphere charged with corruption, venality and subservience, he had created a party before which ministers had begun to quail, and had inoculated the Protestant constituencies with a genuine spirit of liberty and self-reliance Lord Harcourt, who succeeded Townshend as viceroy, saw that Flood must be conciliated at any price, accordingly, in 1775, he received a seat in the privy council and the office of vice-treasurer with a salary of £3,500 a year Flood may reasonably have held that he had a better prospect of advancing his policy by the leverage of a ministerial position than by means of any opposition party he could hope to muster in an unreformed House of Commons The result, however, was that the leadership of the national party passed from Flood to Grattan, who entered the Irish parliament in the same session that Flood became a minister

Flood continued in office for nearly seven years. During this long period he necessarily remained silent on the subject of the independence of the Irish parliament, and had to be content with advocating minor reforms as occasion offered. But in 1778 the creation of a volunteer force to defend Ireland against a possible invasion by France, which had become the ally of the revolted American colonies, changed the Irish situation. A Volunteer Convention, formed with all the regular organization of a representative assembly, but wielding the power of an army, began menacingly to demand the removal of the commercial restrictions which were destroying Irish prosperity. Under this pressure the government gave way; the whole colonial trade was in 1779 thrown open to Ireland for the first time, and other concessions were also extorted Flood, who had taken an active though not a leading part in this movement, now at last resigned his office to rejoin his old party. He found to his chagrin that he was eclipsed by Grattan. But though Flood had lost control of the movement for independence of the Irish parliament, the agitation, backed as it now was by the Volunteer Convention and by

increasing signs of popular disaffection, led at last in 1782 to the concession of the demand, together with a number of other important reforms (*see* GRATTAN, HENRY).

No sooner, however, was this great success gained than a question arose—known as the Simple Repeal controversy—as to whether England, in addition to the repeal of the Acts on which the subordination of the Irish parliament had been based, should not be required expressly to renounce for the future all claim to control Irish legislation This dispute led to the rupture of friendship between Flood and Grattan, each of whom assailed the other with unmeasured but magnificently eloquent invective in the House of Commons Flood's view prevailed—for a Renunciation Act such as he advocated was ungrudgingly passed by the English parliament in 1783—and for a time he regained popularity at the expense of his rival. Flood next (Nov 28, 1783) introduced a reform bill, after first submitting it to the Volunteer Convention. The bill, which contained no provision for giving the franchise to Roman Catholics—a proposal which Flood always opposed—was rejected, ostensibly on the ground that the attitude of the volunteers threatened the freedom of parliament. The volunteers carried a loyal address to the king, moved by Flood. The convention then dissolved, though Flood had desired, in opposition to Grattan, to continue it as a means of putting pressure on parliament for the purpose of obtaining reform.

In 1783 Flood purchased a seat for Winchester in the English House of Commons from the duke of Chandos, and for the next seven years he was a member at the same time of both the English and Irish parliaments He reintroduced, but without success, his reform bill in the Irish House in 1784, supported the movement for protecting Irish industries, but short-sightedly opposed Pitt's commercial propositions in 1785. He remained a firm opponent of Roman Catholic emancipation, even defending the penal laws on the ground that after the Revolution they "were not laws of persecution but of political necessity", but after 1786 he does not appear to have attended the parliament in Dublin. In the House at Westminster, where he refused to enrol himself as a member of either political party, he disappointed the expectations aroused by his achievements in Dublin At the dissolution in 1790 he lost his seat in both parliaments, and he then retired to Farmley, his residence in county Kilkenny, where he died on Dec. 2, 1791.

When Peter Burrowes, notwithstanding his close personal friendship with Grattan, declared that Flood was "perhaps the ablest man Ireland ever produced, indisputably the ablest man of his own times," he expressed what was probably the general opinion of Flood's contemporaries. Grattan never lost his respect for Flood and said that he was the best tempered and the most sensible man in the world In his youth he was genial, frank, sociable and witty; but in later years disappointment made him gloomy and taciturn. As an orator he was less polished, less epigrammatic than Grattan, but a closer reasoner and a greater master of sarcasm and invective Personal ambition often governed his actions, but his political judgment was usually sound; and it was the opinion of Bentham that Flood would have succeeded in carrying a reform bill which might have preserved Irish parliamentary independence if he had been supported by Grattan and the rest of his party in 1783. Though he never wavered in loyalty to the British crown and empire, Ireland never produced a more sincere patriot than Henry Flood

See Warden Flood, *Memoirs of Henry Flood* (1838); Henry Grattan, *Memoirs of the Life and Times of the Right Hon H. Grattan* (5 vols, 1839–46), Charles Phillips, *Recollections of Curran and some of his Contemporaries* (1822); *The Irish Parliament 1775,* from an official and contemporary manuscript, edited by William Hunt (1907); W J O'Neill Daunt, *Ireland and her Agitators;* Lord Mountmorres, *History of the Irish Parliament* (2 vols., 1792); W. E. H Lecky, *History of England in the Eighteenth Century* (8 vols., 1878–90); and *Leaders of Public Opinion in Ireland* (enlarged edition, 2 vols., 1903); F. Hardy, *Memoirs of Lord Charlemont* (1812), especially for the volunteer movement.

FLOOD, an overflow of water; an expanse of water submerging land; a deluge, hence "the flood" (*see* DELUGE, THE). In the sense of "flowing water," the word is applied to the inflow of the tide, as opposed to "ebb" (O.E. Flód).

FLOOD CONTROL: *see* RIVER ENGINEERING.

FLOOD PLAIN, the land-form term for a plain made of sediment deposited by a river. When the gradient of a river becomes very slight, it is unable to carry all the material brought downstream and consequently the lower valley becomes filled with alluvial deposits; in times of flood the river torrent tears off and transports an unusually large quantity of sediment; in the flooded lower valley the rush of water is checked, and the stream in consequence drops its extra load. These flood plains are sometimes of great extent That of the Mississippi below Ohio has an occasional width of 80 m with a total area estimated at 50,000 sq m. Flood plains may be caused by a graded river meandering from side to side, and thus widening its valley and ultimately covering the widened valley with sediment Any sudden increase in the river's velocity and volume such as by cutting into another stream (piracy) or by cutting through a barrier near its head waters, may result in a flood plain Any obstruction across a river's course, such as a band of hard rock, or ice flow, may form a flood plain behind it, but it is most commonly found in the lower reaches of such large rivers as the Rhine, Nile or Mississippi, where there are occasional floods and usually large amounts of sediment The flood-plain is usually bounded by levees (*q v*) Sections of the Missouri flood plain made by the United States Geological Survey show a great variety of material of varying depths and of varying coarseness, from heavy gravel through fine sand, to fine silt, and it is probable that any section of such an alluvial plain would show similar deposits

The flood plain during its formation is characterized by marshes, meandering or anastomosing streams, ox-bow lakes and bayous (*q v*), and is occasionally completely drowned When the drainage system is entirely diverted owing to any cause, the flood plain may become a smooth area of great fertility, similar in appearance to the floor of an old lake, from which it differs, however, inasmuch as it is not quite flat. It has a gentle slope along the original down-stream course, and also usually from the edges towards the centre.

FLOOR, the lower horizontal surface of a room; used, also, almost interchangeably with storey (*q v*), to designate the different levels or planes of rooms, one above the other, as ground floor, first floor, etc. Floors were, at first, simply of tamped earth (beaten down), covered with textiles or skins; later, all types of stone pavings were introduced; in Roman times floors of cement or *terrazzo* (small pieces of marble imbedded in cement) were common, as well as mosaic and marble floors, often of great richness. During the middle ages the use of tiles for floors increased, they seem to have been the rule in the great churches Wooden floors appear early, especially in domestic work and in buildings of many storeys (where their support by wooden beams is a simple matter). At the present time wooden floors are usually double (*see* BUILDING; CARPENTRY; MOSAIC).

FLOOR-CLOTH, a generic term applied to a variety of materials used in place of carpets for covering floors, and known by such trade names as kamptulicon, oil-cloth, linoleum, corticine, cork-carpet, etc. Kamptulicon was patented in 1844 by E. Galloway, but did not attract much attention till about 1862 It was essentially a preparation of indiarubber masticated up with ground cork, and rolled out into sheets between heavy steam-heated rollers, sometimes over a backing of canvas. Owing to its expensiveness, it has given place to cheaper materials serving the same purpose. Oil-cloth is a coarse canvas which has received a number of coats of thick oil paint, each coat being rubbed smooth with pumice stone before the application of the next. Its surface is ornamented with patterns printed in oil colours by means of wooden blocks. Linoleum (*linum,* flax, *oleum,* oil), patented by F. Walton in 1860 and 1863, consists of oxidized linseed oil and ground cork. These ingredients, thoroughly incorporated with the addition of certain gummy and resinous matters, and of pigments such as ochre and oxide of iron as required, are pressed on to a rough canvas backing between steam-heated rollers. Patterns may be printed on its surface with oil paint, or by an improved method may be inlaid with coloured composition so that the colours are continuous through the thickness of the linoleum, instead of being on the surface only, and thus do not disappear. (*See* LINOLEUM.)

FLOOR TRADERS, members of a (especially the New York) stock exchange who buy and sell securities for their own account and who do not conduct transactions for clients They are to be distinguished from the commission brokers whose exclusive function is to trade for the accounts of clients. Floor traders are often known as *Room traders.*

FLOQUET, CHARLES THOMAS (1828–1896), French statesman, was born at St Jean-Pied-de-Port (Basses-Pyrénées) on Oct. 2, 1828. He was called to the bar in 1851, and made his name by his fearless attacks on the government in a series of political trials When the tsar Alexander II visited the Palais de Justice in 1867, Floquet was said to have confronted him with the cry "Vive la Pologne, monsieur!" He delivered a scathing indictment of the Empire at the trial of Pierre Bonaparte for killing Victor Noir in 1870, and took part in the revolution of Sept 4 In 1871 he was elected to the national assembly by the department of the Seine. During the Commune he formed the *Ligue d'union républicaine des droits de Paris* to attempt a reconciliation with the government of Versailles He was imprisoned for a short time after the fall of the Commune Floquet edited the *République française,* was president of the municipal council, and entered the Chamber of Deputies in 1876 In 1885 he succeeded M Brisson as president of the chamber On the fall of the Tirard cabinet in 1888 he became president of the council and minister of the interior in a radical ministry pledged to secure the revision of the constitution Heated debates in the chamber during the Boulangist agitation culminated on July 13 in a duel between Floquet and Boulanger in which the latter was wounded In Feb. 1889 the government fell on the question of revision, and in the new chamber of November Floquet was re-elected to the presidential chair Implicated in the Panama scandals he lost the presidency of the chamber in 1892, and his seat in the house in 1893, but in 1894 was elected to the senate He died in Paris on Jan. 18, 1896

See *Discours et opinions de M Charles Floquet,* ed A Faivre (1885).

FLOR, ROGER DI, a military adventurer of the 13th-14th century, was the second son of a falconer in the service of the emperor Frederick II, who fell at Tagliacozzo (1268), and when eight years old was sent to sea in a galley belonging to the Knights Templars He entered the order and became commander of a galley At the siege of Acre by the Saracens in 1291 he was accused and denounced to the pope as a thief and an apostate, was degraded from his rank, and fled to Genoa, where he began to play the pirate. Roger then entered the service of Frederick, king of Sicily, who gave him the rank of vice-admiral. At the close of the war, in 1302, as Frederick was anxious to free the island from his mercenary troops (called *Almúgavares*), whom he had no longer the means of paying, Roger induced them under his leadership to seek new adventures in the East, in fighting against the Turks, who were ravaging the empire. The emperor Andronicus II accepted his offer of service; and in September 1303 Roger with his fleet and army arrived at Constantinople. He was adopted into the imperial family, was married to a grand-daughter of the emperor, and was made grand duke and commander-in-chief of the army and the fleet. After some weeks lost in dissipation, intrigues and bloody quarrels, Roger and his men were sent into Asia, and after some successful encounters with the Turks they went into winter quarters at Cyzicus In May 1304 they again took the field, and relieved Philadelphia, then invested and reduced to extremities by the Turks. But Roger determined to found in the East a principality for himself. He sent his treasures to Magnesia, but the people slew his Catalans and seized the treasures. He besieged the town, but was repulsed Being recalled to Europe, he settled his troops in Gallipoli and other towns, and visited Constantinople to demand pay for the *Almúgavares.* Dissatisfied with the small sum granted by the emperor, he plundered the country and carried on intrigues both with and against the emperor, receiving reinforcements all the while from all parts of southern Europe. Roger was now created Caesar, but shortly afterwards the young emperor Michael Palaeologus, not daring to attack the fierce and now augmented bands of adventurers, invited Roger to Adrianople, and there contrived his assassination and the massacre of his Catalan cavalry (April 4, 1306). His death was avenged by his men in a fierce and prolonged war against the Greeks

See Moncada, *Expedicion de los Catalanes y Aragones contre Turcos y Griegos* (Paris, 1840).

FLORA, Italian goddess of flowers, later identified with the Greek Chloris Her festival at Rome, the Floralia, instituted 238 B C. by order of the Sibylline books and at first held irregularly, became annual after 173 B C It lasted six days (April 28–May 3), the first day being the anniversary of the foundation of her temple. It included theatrical performances characterized by licentiousness She herself is an original Roman goddess (*indiges*), for she has a flamen (Ovid, *Fasti,* v. 183 *et seq.;* Tacitus, *Annals,* ii. 49).

The term "flora" is used in botany collectively for the plant-growth of a district.

FLOREAL. The name given to the eighth month of the year introduced into the French Republican calendar in 1793. It extended from April 20 to May 19 *See* CALENDAR.

FLORE AND BLANCHEFLEUR, a 13th-century romance This tale, generally supposed to be of oriental origin, relates the passionate devotion of two children, and their success in overcoming all the obstacles put in the way of their love. The romance appears in differing versions in French, English, German, Swedish, Icelandic, Italian, Spanish, Greek and Hungarian, but the French version of the tale is the most widespread The various forms of the tale receive a detailed notice in E Hausknecht's version of the 13th-century Middle English poem of "Floris and Blauncheflur" (*Samml. eng Denkmaler,* vol. v, 1885). Floire, the son of a Saracen king of Spain, is brought up in constant companionship with Blanchefleur, the daughter of a Christian slave of noble birth Floire's parents send the boy away at 15 and sell Blanchefleur to foreign slave-merchants Floire traces her to the tower of the maidens destined for the harem of the emir of Babylon, into which he penetrates concealed in a basket of flowers The lovers are discovered, but their constancy touches the hearts of their judges They are married, and Floire returns to his kingdom, when he and all his people adopt Christianity Of the two 12th-century French poems (ed Edelstand du Méril, 1856), the one contains the love story with few additions, the other is a romance of chivalry containing the usual battles, single combats, etc. Two lyrics based on episodes of the story are printed by Paulin Paris in his *Romancero français* (1883). The English poem renders the French version without amplifications; its author has less sentiment than his original, and less taste for detailed description. The similarity between the story of Floire and Blanchefleur and *Aucassin and Nicolete* (*q.v.*) has been repeatedly pointed out, and they have even been credited with a common source.

See also edition by I. Bekker (1844); the Swedish version by G. E Klemming (1844); the 13th-century version of Konrad Fleck, *Flore und Blanscheflur,* ed E Sommer (Leipzig, 1846); also H. Sundmacher, *Die altfr und mittelhochdeutsche Bearbeitung der Sage von Flore et Blanscheflur* (Gottingen, 1872); H Herzog, *Die beiden Sagenkreise von Flore und Blanscheflur* (1884), edition by E Hausknecht (1885); *Zeitschrift fur deut. Altertum* (vol. xxi) contains a Rhenish version; the Scandinavian *Flores Saga ok Blankiflur,* ed E Kölbing (Halle, 1896) The English poem was also edited by Hartschorne (*English Metrical Tales,* 1829), by Laing (Abbotsford Club, 1829) and by Lumly (Early Eng. Text. Soc., 1866, re-edited G. H. McKnight, 1901) J. Reinhold, *Floire et Blanchefleur* (1906) suggests a parallelism with the story of Cupid and Psyche.

FLORENCE, WILLIAM JERMYN (1831–1891), American actor, of Irish descent, whose real name was Bernard Conlin, was born on July 26, 1831, at Albany, N Y., and first attracted attention as an actor at Brougham's Lyceum in 1851. Two years later he married Mrs. Malvina Pray Littell (d. 1906), in association with whom, until her retirement in 1889, he won all his successes, notably in Benjamin Woolf's *The Mighty Dollar,* said to have been presented more than 2,500 times In 1856 they had a successful London season, Mrs Florence being one of the first American actresses to appear on the English stage His last appearance was with Joseph Jefferson (with whom he had maintained a successful partnership), on Nov 14, 1891, as Ezekiel Homespun in *The Heir-at-law,* and he died on Nov 18 in Phila-

delphia

FLORENCE OF WORCESTER (d. 1118), English chronicler, was a monk of Worcester, who died, as we learn from his continuator, on July 7, 1118 Beyond this fact nothing is known of his life He compiled a chronicle called *Chronicon ex chronicis* which begins with the creation and ends in 1117 The basis of his work was a chronicle compiled by Marianus Scotus, an Irish recluse, who lived first at Fulda, afterwards at Mainz Marianus, who began his work after 1069, carried it up to 1082. Florence supplements Marianus from a lost version of the English Chronicle, and from Asser He is always worth comparing with the extant English Chronicles, and from 1106 he is an independent annalist, dry but accurate Either Florence or a later editor of his work made considerable borrowings from the first four books of Eadmer's *Historia novorum* Florence's work is continued up to 1141 by a certain John of Worcester, who wrote about 1150 John is valuable for the latter years of Henry I. and the early years of Stephen He is friendly to Stephen, but not an indiscriminate partisan

The first edition of these two writers is that of 1592 (by William Howard) The most accessible is that of B Thorpe (Eng Hist Soc, 2 vols., 1848–49), but Thorpe's text of John's continuation needs revision Thorpe gives, without explanations, the insertions of an ill-informed Gloucester monk who has obscured the accurate chronology of the original Thorpe also prints a continuation by John Taxter (died *c* 1295), a 13th-century writer and a monk of Bury St. Edmunds Florence and John of Worcester are translated by J. Stevenson in his *Church Historians of England,* vol ii pt i (1853), T Forester's translation in Bohn's *Antiquarian Library* (London, 1854) gives the work of Taxter also

FLORENCE (Ital *Firenze,* Lat *Florentia*), formerly the capital of Tuscany, now the capital of a province of the kingdom of Italy, and the eighth largest city in the country It is situated 43° 46′ N, 11° 14′ E, on both banks of the river Arno, which here flows through a broad fertile valley enclosed between spurs of the Apennines The soil is very fertile; wheat, Indian corn, olives, vines, fruit trees of many kinds cover both the plain and the surrounding hills, the chief non-fruit-bearing trees are the stone pine, the cypress, the ilex and the poplar, while many other varieties are represented The gardens and fields produce an abundance of flowers which justify the city's title of *la città dei fiori*

Public Buildings.—Of the very numerous Florentine churches the Duomo (Santa Maria del Fiore) is the largest and most important, founded in 1298 on the plans of Arnolfo di Cambio, completed by Brunelleschi, and consecrated in 1436; the façade, however, was not finished until the 19th century; it was begun in 1875 on the designs of De Fabris and unveiled in 1888 Close by the Duomo is the no less famous Campanile built by Giotto and adorned with exquisite bas-reliefs Opposite is the Baptistery built by Arnolfo di Cambio in the 13th century on the site of an earlier church, and adorned with beautiful bronze doors by Ghiberti in the 15th century The Badia, Santo Spirito, Santa Trinita, Santa Croce, Santa Maria Novella, San Lorenzo, are a few among the famous and beautiful churches of Florence The streets and the piazze of the city are celebrated for their splendid palaces, formerly, and in many cases even to-day, the residences of the noble families of Florence Among others we may mention the Palazzo Vecchio, the seat of the government of the Republic and now the town hall, the Palazzo Riccardi, the residence of the Medici and now the prefecture, the palaces of the Strozzi, Antinori (one of the most perfect specimens of Florentine *quattrocento* architecture, now the seat of the British Institute founded by the British Government in 1918), Pitti (the Royal Palace), Davanzati, Corsini, etc. The palace of the Arte della Lana or guild of wool merchants, tastefully and intelligently restored, is the headquarters of the Dante Society, and many important monuments, such as the cloister of Santa Maria Novella, the Church of San Miniato, the Houses of the Alighieri family, etc., have been beautifully restored to their ancient splendour.

Libraries.—Florence possesses five important State libraries besides a number of private or circulating collections. The *Biblioteca Nazionale,* formed from the union of the Magliabechi library with the Palatine and opened in 1747, contains 650,000 printed volumes, 800,000 pamphlets, over 9,000 prints and drawings (including 284 by Albrecht Durer), 21,000 portraits, 3,847 maps, 3,575 incunabule, 20,000 mss. and 40,000 letters. The *Biblioteca Marucelliana* founded in 1752, contains 200,000 books including 700 incunabula, 17,000 engravings and 1,550 manuscripts, it is chiefly remarkable for its collection of illustrated works and art publications. The *Biblioteca Mediceo-Laurenziana,* formed from the collections of Cosimo the Elder, Piero dei Medici and Lorenzo the Magnificent, was first constituted as a public Library in Florence by Clement VII. who charged Michelangelo to construct a suitable edifice for its reception This was opened to the public by Cosimo I in 1571. The printed books it contains are only 11,000 in number, but are almost all of the highest rarity and interest, including 242 incunabula of which 152 are *editiones principes* It is however the precious collection of mss amounting to 9,693 articles, including a number of richly ornamented codices of great beauty and costliness, which gives its chief importance to this world famous library. The *Biblioteca Riccardiana,* founded in the 16th century by Romolo Riccardi, contains 3,905 mss., 33,000 volumes and 650 incunabula, chiefly relating to Florentine history. The *Biblioteca Universitaria,* founded in recent years is rapidly increasing owing to the generosity of many professors who bequeath their collections of books to the University, it contains over 300,000 books mostly of academic character. Among the other libraries is the famous *Gabinetto Vieusseux,* now belonging to the Comune, which contains over 400,000 volumes The libraries of the *British Institute* and the *Institut Français;* the *Philosophical Library;* and the fine collections at the *German Institute of Art,* at the *Academy of Fine Arts* and at the *Musical Institute* The State Archives are among the most complete in Italy, and contain over 450,000 *filze* and *registri* and 126,000 charters, covering the period from 726 to 1856.

Galleries and Museums.—Few cities are as rich as Florence in collections of works of artistic and historic interest, although the great majority of them belong to a comparatively limited period, from the 13th to the 16th century The chief Art Galleries are the Uffizi, the Pitti and Accademia The two former are among the finest in the world, and are filled with masterpieces by Raphael, Botticelli, the Lippi, Ghirlandaio, Perugino, Andrea del Sarto, Titian and many other Florentine, Umbrian, Venetian, Dutch and Flemish artists, as well as numerous admirable examples of antique, mediaeval and Renaissance sculpture The Pitti collection is in the Royal Palace, formerly the residence of the grand dukes, and connected with the Uffizi Gallery by means of a covered passage across the Ponte Vecchio There is a splendid museum of mediaeval and Renaissance antiquities in the Bargello, the ancient palace of the Podestà, itself one of the finest buildings in the city; among its many treasures are works of Donatello, Ghiberti, Verrocchio and other sculptors, and large collections of ivory, enamel and bronze ware The Museum of St Mark, once a monastery, should be mentioned as containing the most complete collection of Fra Angelico's works, besides authentic relics of Savonarola The Opera del Duomo contains models and pieces of sculpture connected with the cathedral The Etruscan museum, greatly enlarged in these last few years, deserves a special mention as being the finest in the world *The Egyptian museum, the gallery of tapestries,* the *Bardini gallery,* the *Stibbert museum, the Corsini Palace* gallery, *the Medici Chapel at San Lorenzo, the frescoes of Benozzo Gozzoli in the Riccardi Palace, the Cenacolo of Andrea del Castagno, the Michelangelo Museum, the museum of natural history,* are all important.

Administration.—Florence is the capital of a province of the same name, and the central government is represented by a prefect (*prefetto*), while local government is carried on by a *podestà* appointed by the government The city is the seat of a higher Court of Appeal, besides the ordinary civil and military tribunals It is the headquarters of an army corps, and an archiepiscopal see. Florence which has always been and still is the intellectual centre of Italy, is particularly fortunate from the point of view of education. The University, formerly *Istituto di Studi Superiori e di Perfezionamento,* which was given the university status in 1924, comprises the Faculties of Literature and

Philosophy, Medicine, Law, Mathematics and Natural Sciences, with 1,300 students in all. The original *Studio Fiorentino* was founded in the 14th century, and acquired considerable fame as a centre of learning under the Medici, enhanced by the presence in Florence of many learned Greeks who had fled from Constantinople after its capture by the Turks (1453). The revival of classical studies on scientific principles in modern Italy may be said to have begun in Florence, and great activity has also been displayed in reviving the study of Dante, Dante lectures being given regularly by scholars and men of letters from all parts of the country in the large hall above the church of Or San Michele as in the middle ages, under the auspices of the *Società Dantesca*. Palaeography, history and Romance languages are among the other subjects to which special attention is given. Other very important Institutes are. the *Istituto di Scienze Sociali*, particularly intended for diplomatic training; the Institute of Economics, the Academy of Fine Arts, the Conservatoire of music, the Agricultural Institute, the Institute of Forestry and the Training School for women

Several of the Florence hospitals are of great antiquity, the most important being that of Santa Maria Nuova, which, founded by Folco Portinari, the father of Dante's Beatrice, has been thoroughly renovated according to modern scientific principles

Population, Commerce and Industry.—The total population of Florence in June 1928, including foreigners, was 269,450. Florence is the centre of a large and fertile agricultural district, and does considerable business in wine, oil and grain, and supplies the neighbouring peasantry with goods of all kinds There are no important industries, except a few flour-mills, some glass works, iron foundries, a motor car factory, straw hat factories, and power-houses supplying electricity for lighting and for the numerous tram cars There are, however, some artistic industries in and around the city, of which the most important is the Ginori-Richard porcelain works, and the Cantagalli majolica works Another very important source of revenue is the so called "tourist industry," which in late years has assumed immense proportions

(L. V.)

HISTORY

Florentia was founded considerably later than Faesulae (Fiesole), which lies on the hill above it Tacitus mentions it, and Florus describes it as one of the *municipia splendidissima* A bishop of Florence is mentioned in AD 313 The first event of importance recorded is the siege of the city by the Goths, A.D. 405, and its deliverance by the Roman general, Stilicho. We find the Longobards in Tuscany in 570, and mention is made of one *Gudibrandus Dux civitatis Florentinorum*, which suggests that Florence was then the capital of a duchy

Guelphs and Ghibellines.—Under the Carolingian emperors, Tuscany was a march or margraviate, which, in 1054, passed to the famous countess Matilda, daughter of Boniface of Canossa In the Wars of the Investitures Matilda was on the papal (Guelph) side against the emperor and the faction afterwards known as Ghibelline (*see* GUELPHS AND GHIBELLINES), and she herself often led armies to battle While she presided at the courts of justice in the name of the empire, she was assisted by a group of great feudal nobles, judges, lawyers, etc , who formed, as elsewhere in Tuscany, the *boni homines* or *sapientes* The citizens found themselves in opposition to the nobility of the hills around the city, Teutonic feudatories of Ghibelline sympathies, who interfered with their commerce, and they began to form themselves into groups and associations, which were the germs of the *arti* or gilds

After the death of Countess Matilda in 1115 the *grandi* or *boni homines* continued to rule, but in the name of the people—a change which marks the foundation of the commune After 1138 the *boni homines* began to be called *consules*, while the population was divided into the *grandi* or *delle torri*, *i.e.*, the noble families possessing towers, and the *arti* or industrial and merchant gilds. At first the *consules* were chosen by the *grandi* and assisted by a council of 100, in which the *arti* were predominant In 1125 Fiesole was sacked and destroyed, but the feudal nobles of the *contado* (surrounding country), protected by the imperial margraves, were still powerful. The Florentines waged war against the Alberti family, whose castles they destroyed, and fought successfully against the powerful Counts Guidi Frederick Barbarossa, however, elected emperor in 1152, made his authority felt in Tuscany, and appointed one Welf of Bavaria as margrave, and a *potestas* or *podestà* who resided at San Miniato was appointed to represent the emperor and exercise authority in the *contado*. From the end of the 12th century the *podestà* was always a foreigner In the meantime Florence had already become an important industrial and banking centre

The work of crushing the nobles of the *contado* and of asserting the city's position among rival communes continued The tumults against the Paterine heretics (1244–45), among whom were many Ghibelline nobles, indicate a successful Guelphic reaction; but, when civil war broke out, Frederick of Antioch, imperial vicar in Tuscany, and natural son of Frederick II., entered the city with 1,600 German knights, the Ghibellines triumphed again, and in 1249 the Guelph leaders were driven into exile—the first of many instances in Florentine history of exile *en masse* of a defeated party

Comune and Popolo.—The Ghibellines being unable to maintain their supremacy, the city came to be divided into two almost autonomous republics, the *comune* headed by the *podestà*, and the *popolo* headed by the *capitano* and militarily organized into 20 companies; the central power was represented by 12 elders At this time the *podestà's* palace (the Bargello) was built, and the gold florin was first coined and soon came to be accepted as the standard gold piece throughout Europe. But, although greatly strengthened, the Guelphs were not wholly victorious, and in 1251 they had to defend themselves against a league of Ghibelline cities (Siena, Pisa and Pistoia) aided by Florentine Ghibellines. A Florentine army assisted by Guelphs of other towns was met by a Sienese army reinforced by Florentine exiles, and by the cavalry of Manfred of Sicily (*q.v.*), with the result that the Florentines were totally routed at Montaperti on Sept 4, 1260 Count Giordano, acting for Manfred, entered Florence, appointed Count Guido Novello *podestà*, and began a series of persecutions against the Guelphs The Ghibellines even proposed to raze the walls of the city Their triumph, however, was short-lived: Charles I of Anjou (*q.v.*), descended into Italy as the champion of the papacy; Manfred was defeated and killed (1266), and Guido Novello and the Ghibellines were expelled and their property confiscated But it was not the *popolo* who triumphed; the pope and Charles were the real masters of the situation Nevertheless much of the old order was restored; the *podestà* who represented King Charles was assisted by 12 *buoni uomini*, and by the council of the 100 *buoni uomini del popolo*, but the constitution of the republic, although of very democratic tendencies, seemed designed to promote civil strife and weaken the central power

While the constitution was evolving in a manner which seemed to argue small political ability and no stability in the Florentines, the people had built up a wonderful commercial organization Each of the seven *arti maggiori* or greater gilds was organized like a small State with its councils, statutes, assemblies, magistrates, etc., and in times of trouble constituted a citizen militia Florentine cloth especially was known and sold all over Europe, and the Florentines were regarded as the first merchants of the age In 1279 Pope Nicholas sent his nephew, Cardinal Latino Frangipani Malabranca, to reconcile the parties in Florence once more. He succeeded to some extent, and was granted a kind of temporary dictatorship. He raised the 12 *buoni uomini* to 14 (eight Guelphs and six Ghibellines), to be changed every two months; and they were assisted by a council of 100 A force of 1,000 men was placed at the disposal of the *podestà* and *capitano* (now both elected by the people) to keep order and oblige the Guelph nobles to respect the law After 1282 the signory was composed of the three (afterwards six) *priori* of the gilds, who ended by ousting the *buoni uomini*, while a *defensor artificum et artium* replaced the *capitano;* thus the republic became an essentially trading community, governed by the *popolani grassi*

or rich merchants.

The republic now turned to the task of breaking the power of the Ghibelline cities of Pisa and Arezzo In 1289 the Aretini were completely defeated by the Florentines at Campaldino, a battle made famous by Dante's presence. Peace was made in 1293.

The Ordinamenti Della Giustizia.—The nobles, who had largely contributed to the victory, especially men like Corso Donati and Vieri de' Cerchi, were becoming more powerful, but new laws were passed to reduce their influence. These were reinforced by the *Ordinamenti della Giustizia* of 1293, by which all who were not of the *arti* were definitely excluded from the signory The leading spirit of this reform was Giano della Bella, a noble who by engaging in trade had become a *popolano;* the nobles strenuously opposed the new measures, and in 1295 a signory favourable to them enacted a law attenuating the *Ordinamenti*

Charles of Valois and Henry of Luxembourg.—The nobles, however, had split into two factions, the *Neri* (Blacks), headed by the Donati, and the *Bianchi* (Whites) led by the Cerchi The pope's attempt to unite them having failed, he summoned Charles of Valois to come to his assistance, promising him the imperial crown, and in 1301 Charles entered Italy with instructions from the pope to crush the Bianchi and the *popolo* and exalt the Neri On Nov 1 Charles reached Florence. He promised to respect the laws, but the new *podestà,* Cante dei Gabrielli of Gubbio, who had accompanied Charles, punished many of the Bianchi; among those whom he exiled was the poet Dante (1302) Corso Donati, who for some time was the most powerful man in Florence, made himself many enemies by his arrogance, and the irritation against him resulted in a rising in which he was killed (1308). In the same year Henry of Luxembourg was elected king of the Romans, and with the pope's favour he came to Italy in 1310, the Florentine exiles and all the Ghibellines of Italy regarded him as a saviour and regenerator of the country, while the Guelphs of Florence regarded both him and the pope as dangerous to their liberties In 1312 Henry was crowned emperor as Henry VII. in Rome, but circumstances made him merely a German kaiser who tried to subjugate free Italian communes. He besieged Florence without success, and died in 1313.

The 14th Century.—In 1325 further constitutional reforms were enacted The former councils were replaced by the *consiglio del popolo,* consisting of 300 *popolani* and presided over by the *capitano,* and the *consiglio del comune* of 250 members, half of them nobles and half *popolani,* presided over by the *podestà.* The *priori* and other officers were drawn by lot from among the Guelphs over 30 years old who were declared fit for public office by a special board of 98 citizens (1329)

From 1313 to 1338, the Florentines waged war with varying success against Pisa and Lucca Finally, by the peace of 1339 they obtained a part of Lucchese territory At the same time they purchased from the Tarlati the protectorate over Arezzo for ten years But misfortunes fell on the city: Edward III of England repudiated the heavy debts contracted for his wars in France with the Florentine banking houses of Bardi and Peruzzi (1339), and this eventually led to their bankruptcy, shaking Florentine credit all over the world; Philip VI. of France extorted large sums from the Florentine merchants and bankers in his dominions by accusing them of usury; in 1340 plague and famine wrought terrible havoc in Florence, and riots again broke out between the nobles and the *popolo* To put an end to these disorders, Walter of Brienne, duke of Athens, was elected "conservator" and captain of the guard in 1342. An astute, dissolute and ambitious man, half French and half Levantine, he succeeded in getting himself acclaimed by the populace lord of Florence for life. But by his oppressive taxes, and his ferocious cruelty, he accumulated bitter hatred against his rule. On July 26, 1343, the citizens rose in arms, demanded the duke's abdication, and besieged him in the palace. Finally on Aug 1 he had to resign his lordship

A *balìa,* or provisional government, was appointed to institute reforms; new constitutional changes were introduced; the *Ordinamenti* were maintained, but in a somewhat attenuated form, and certain nobles as a favour were declared to be of the *popolo.* Florence became a thoroughly democratic and commercial republic, but Florentine democracy was limited to the walls of the city, for no one of the *contado* nor any citizen of the subject towns enjoyed political rights, which were reserved for the inhabitants of Florence alone, and not by any means for all of them.

Florence was, in the 14th century, a city of about 100,000 inhabitants, of whom 25,000 could bear arms; there were 110 churches, 39 religious houses; the shops of the *arte della lana* numbered over 200, producing cloth worth 1,200,000 florins, and Florentine bankers and merchants were found all over the world, often occupying responsible positions in the service of foreign Governments. It was already a centre of art and letters and full of fine buildings, pictures and libraries. But since the nobles had been suppressed politically, the lowest class of adventurer had come into prominence, thus paving the way for tyranny.

In 1347 the city was again stricken with famine, and in 1348 by a terrible plague, which carried off three-fifths of the population (according to Villani). Yet in spite of these disasters the republic was not vanquished, it soon regained the suzerainty over many cities which had broken off all connection with it and purchased the over-lordship of Prato. Giovanni Visconti, lord and archbishop of Milan, having purchased Bologna and allied himself with sundry Ghibelline houses of Tuscany with a view to dominating Florence, the city made war on him in 1351, and placed itself under the protection of the emperor Charles IV (1355). This enabled the nobles who dominated the *Parte Guelfa* to enact stringent measures, punishing with death or heavy fines all who, being Ghibellines, held office, and to exercise a veritable reign of terror Italy at this time began to be overrun by bands of soldiers of fortune The first of these bands with whom Florence came into contact was the Great Company, commanded by the count of Lando, which twice entered Tuscany but was expelled both times by the Florentine troops (1358–59). From 1362–64 Florence was again at war with Pisa and the latter called Sir John Hawkwood's English company to their aid Peace was finally made with no advantage gained on either side

The Parte Guelfa.—The tyranny of the *Parte Guelfa* continued unabated, and the *capitani* carried an enactment by which no measure affecting the *Parte* should be even discussed by the signory unless previously approved by them. This law, however, aroused so much opposition that some of the very men who had proposed it assembled in secret to discuss its abolition, and a quarrel between the Albizzi and the Ricci having weakened the *parte,* a *balìa* of 56 was agreed upon. Several of the Albizzi and the Ricci were excluded from office for five years, and a council called the Ten of Liberty was created to defend the laws and protect the weak against the strong

In 1375 Florence became involved in a war which showed how the old party divisions of Italy had been obliterated The papal legate at Bologna, Cardinal Guillaume de Noellet (d 1394), although the Church was then allied to Florence, was meditating the annexation of the city to the Holy See; he refused a request of the Florentines for grain from Romagna, and authorized Hawkwood to devastate their territory. An alliance with Bernabò Visconti was thereupon concluded, war declared, and a *balìa* of eight, the *Otto della guerra* (afterwards called the "Eight Saints" on account of their good management) was created to carry on the campaign. Pope Gregory XI. placed Florence under an interdict, but by 1378 peace was made, partly through the mediation of St. Catherine of Siena, and the interdict was removed in consideration of the republic's paying a fine of 200,000 florins to the pope.

During the war the eight had been practically rulers of the city, but now the *Parte Guelfa,* led by Lapo da Castiglionchio and Piero degli Albizzi, attempted to reassert itself. Salvestro de' Medici, however, who had always opposed the *parte,* was elected *gonfaloniere* in spite of its intrigues (1378), and the people were anxious to break the power of the *parte* for good. A large body of wool carders gathered outside the city and conspired to sub-

vert the signory and establish a popular Government. Although the plot, in which Salvestro does not seem to have played a part, was discovered, a good deal of mob violence occurred, and on July 21 the populace seized the podestà's palace, which they made their headquarters. Once the people were in possession of the palace, a carder named Michele di Lando took the lead. Master of Florence for one day, he quelled disorder and pillage, and reformed the Constitution But to satisfy the people several of the nobles, including Piero degli Albizzi, were put to death on charges of conspiracy, and many others were exiled Perpetual rioting and anarchy succeeded, until at last, in 1382, a reaction set in, and order was restored by the gild companies Again a new constitution was decreed by which the *gonfaloniere* and half the *priori* were to be chosen from the greater gilds and the other half from the lesser The demagogues were executed or forced to fly, Michele di Lando was exiled, and the Guelph families gradually regained much of their lost power

Pisa.—In 1393 Maso degli Albizzi was made *gonfaloniere,* and for many years remained almost master of Florence A severe persecution was initiated against the Alberti and other families, who were disfranchised and exiled Disorders and conspiracies against the merchant oligarchy continued, and the exiles caused the republic much trouble by intriguing against it in foreign States In 1397–98 Florence was at war with Gian Galeazzo Visconti, who, aspiring to the conquest of Tuscany, acquired the lordship of Pisa, Siena and Perugia; but just as the Milanese were about to march on Florence, Visconti died His territories were divided between his sons and his *condottieri* In 1404 the Florentines' attempt to capture Pisa single-handed failed, and Gabriele Maria Visconti, lord of Pisa, placed himself under the protection of the French king The Florentines then made overtures to France, who had supported the anti-popes all through the Great Schism, and suggested that they too would support the then anti-pope, Benedict XIII., in exchange for the sale of Pisa With French support they purchased the city in 1405, but a few days later the citizens rose in arms and recaptured it from the mercenaries There was great consternation in Florence at the news, and the Florentines attacked Pisa once more After a six months' siege it surrendered on terms (Oct 9, 1406), and Florence acquired a great seaport and was at last able to develop a direct maritime trade

Except in connection with the Pisan question, the republic had taken no definite side in the Great Schism which had divided the Church since 1378, but in 1408 she appealed both to Pope Gregory XII and the anti-pope, Benedict XIII., and suggested a council within her own territory Gregory refused, but after consulting a committee of theologians who declared him to be a heretic, the council promoted by Cardinal Cossa and other independent prelates met at Pisa The council deposed both popes and elected Pietro Filargi as Alexander V (June 26) But Ladislas of Naples still occupied the papal States, and Florence, alarmed at his growing power and ambition, formed a league with Siena, Bologna and Louis of Anjou who laid claim to the Neapolitan throne, to drive Ladislas from Rome. Cortona, Orvieto, Viterbo and other cities were recovered for Alexander, and in Jan 1410 Rome itself was captured by the Florentines under Malatesta dei Malatesti. Alexander having died in May, Cardinal Cossa was elected as John XXIII., and Florence purchased Cortona from the pope.

ASCENDENCY OF THE DE' MEDICI

Giovanni de' Medici.—In 1421 Giovanni de' Medici was elected *gonfaloniere* of justice, an event which marks the beginning of that family's power. The same year the republic purchased Leghorn from the Genoese for 100,000 florins, and established a body of "Consuls of the Sea" to superintend maritime trade. Filippo Maria Visconti, who had succeeded in reconquering most of Lombardy, seized Forlì. The Florentines declared war on him, and through Venetian intervention, Visconti was finally defeated and forced to accept peace on onerous terms (1427).

The old systems of raising revenue no longer corresponded to the needs of the republic, and as early as 1336 the various loans made to the State were consolidated into one national debt (*monte*). Subsequently all extraordinary expenditure was met by forced loans (*prestanze*), but owing to the general discontent a *catasto* or assessment of all the wealth of the citizens was made in 1427, and measures were devised to distribute the obligations according to each man's capacity, so as to avoid pressing too hardly on the poor. The *catasto* was largely the work of Giovanni de' Medici, who greatly increased his popularity thereby. He died in 1429

Cosimo de' Medici.—An attempt to capture Lucca led Florence, in alliance with Venice, into another costly war with Milan (1432–33) The mismanagement of the campaign brought about a quarrel between the aristocratic party, led by Rinaldo degli Albizzi, and the popular party led by Giovanni de' Medici's son Cosimo (1389–1464) Rinaldo succeeded in getting Cosimo exiled, but his proposal for a *coup d'état* met with no response from his own party, and he failed to prevent the election of a pro-Medici signory in 1434 A revolution was only averted through the intervention of Pope Eugene IV A *parlamento* was summoned, and the *balìa* appointed decreed the return of Cosimo and the exile of Rinaldo degli Albizzi and others. On Oct 6, 1434, Cosimo returned to Florence, and for the next three centuries the history of the city is identified with that of the house of Medici

Cosimo succeeded in dominating the republic while remaining nominally a private citizen He exiled those who opposed him, and governed by means of the *Balìa,* which, re-elected every five years, appointed all the magistrates and acted according to his orders In 1437 Florence and Venice were again at war with the Visconti, whose chief captain, Niccolò Piccinino (*q v*), on entering Tuscany with many Florentine exiles in his train, was signally defeated at Anghiari by the Florentines under Francesco Sforza (1440); peace was made the following year The system of the *catasto,* which led to abuses, was abolished, and a progressive income tax (*decima scalata*) was introduced with the object of lightening the burdens of the poor, who were as a rule Medicean, at the expense of the rich

Lorenzo the Magnificent.—In 1464 Cosimo died and was succeeded, not without some opposition, by his son, Piero, who was very infirm Various plots against him were hatched, but Piero's unexpected energy upset the schemes of his enemies He died in 1469, leaving two sons, Lorenzo (1449–92) and Giuliano (1453–78) The former at once assumed the reins of government and established his domination by means of Provisional Governments consisting entirely of Mediceans, to be renewed every five years (1471). In 1472 a quarrel having arisen with Volterra, Lorenzo sent an expedition against the city, which was sacked, and many of the inhabitants massacred. Owing to a variety of causes an enmity arose between Lorenzo and Pope Sixtus IV., and the latter, if not an accomplice, at all events had cognizance of the Pazzi conspiracy against the Medici (1478). The result of the plot was that Lorenzo strengthened his position, and put to death or exiled numbers of his enemies He was excommunicated by Sixtus, who, together with King Ferdinand of Naples, waged war against him Eventually the Florentines were defeated at Poggio Imperiale and the city itself was in danger. Lorenzo by his boldness in going to Naples succeeded in concluding a peace with the king, which led to a reconciliation with the pope (1479–80). He was received with enthusiasm on returning to Florence and became absolute master of the city. From that time until his death the city was free from party strife under a *de facto* despotism Owing to his political activity Lorenzo had neglected the business interests of his firm, and in order to make good certain heavy losses he seems to have appropriated public funds. His foreign policy, which was magnificent but expensive, rendered further forced loans necessary

An attempt by the Venetians to seize Ferrara led to a general Italian war, in which Florence also took part on the side hostile to Venice, and when peace was made in 1484, the republic gained some advantages The following year a revolt of the Neapolitan barons against King Ferdinand broke out, actively supported by Pope Innocent VIII; Lorenzo remained neutral at first, but he ended by giving Ferdinand assistance in spite of the king's un-

popularity in Florence. Peace was made in 1486, and in 1487 Lorenzo regained Sarzana, which Genoa had taken from Florence nine years previously. The general disorders and ceaseless intrigues all over Italy required Lorenzo's constant attention, and he succeeded in making Florence "the needle of the balance of power in Italy." At this time the Dominican friar, Girolamo Savonarola (*q v.*), was in Florence, and aroused the whole city by his denunciations of ecclesiastical corruption and also of that of the Florentines. He opposed Lorenzo's Government as the source of the immorality of the people, and to some extent influenced public opinion against him. Ill-health now gained on Lorenzo, and Savonarola, whom he had summoned to his bedside, refused to give absolution to the destroyer of Florentine liberties. Lorenzo died in 1492.

Expulsion of the Medici, 1494.—He was succeeded by his son Piero, who had none of his father's capacity and made many blunders When Charles VIII. of France came to Italy to conquer Naples, Piero decided to assist the latter, but as soon as Charles had entered Florentine territory and captured Sarzana, Piero went to his camp and asked pardon for opposing him. The king demanded the cession of Pisa, Leghorn and other towns, which Piero granted, but on returning to Florence on Nov. 8, 1494, he was refused admittance to the palace, and the people began to shout "Popolo e libertà!" in opposition to the Medicean cry of "Palle, Palle!" (from the Medici arms). With a small escort he fled from the city, followed soon after by his brother Giovanni. That same day Pisa rose in revolt against the Florentines, and was occupied by Charles The expulsion of the Medici produced some disorder, but Piero Capponi (*q v.*) and other prominent citizens succeeded in keeping the peace. Charles entered Florence on Nov. 17 at the head of 12,000 men. He was impressed with the wealth and refinement of the citizens, and above all with the solid fortress-like appearance of their palaces. But his demands by no means pleased the Florentines, and when the king began to hint at the recall of Piero de' Medici, whose envoys had gained his ear, the signory ordered the citizens to be ready to resort to arms The proposal was dropped, but Charles demanded an immense sum of money before he would leave the city The syndics refused to accept his insolent ultimatum, and the king said in a threatening tone, "Then we shall sound our trumpets," whereupon Capponi tore up the document in his face and replied, "And we shall ring our bells." The king, realizing what street fighting in Florence would mean, at once came to terms; he contented himself with 120,000 florins, agreeing to give up the fortresses he had taken and to keep the Medici in exile. But it was not until Nov 28, after an exhortation by Savonarola, whom he greatly respected, that he left Florence.

Savonarola.—It was intended to re-establish the Government on the basis of the old republican institutions, but it was found that 60 years of Medici rule had reduced them to mere shadows, and the condition of the Government was utterly chaotic Consequently men talked of nothing save of changing the Constitution, but, unfortunately, there was no longer an upper class accustomed to public affairs, while the lower class was thoroughly demoralized. Savonarola, who had already made a reputation as a moral reformer, began his famous series of political sermons, and gradually a new Government was evolved, each law being enacted as the result of his exhortations. A Greater Council empowered to appoint magistrates and pass laws was formed, to which all citizens who had paid their taxes, and *beneficiati* (*i e*, who had sat in one of the higher magistracies, or whose fathers, grandfathers or great-grandfathers had done so) were eligible. There were 3,200 such citizens, and they sat one-third at a time for six months The Greater Council was to elect another council of 80 citizens over 40 years old; this body was to appoint ambassadors and commissaries of war, and deal with other confidential matters. The system of forced loans was abolished and a 10% tax on real property introduced in its stead, and a law of amnesty for political offenders enacted. Savonarola also proposed a court of appeal for criminal and political offences tried by the *Otto di guardia e balìa;* this too was agreed to, but the right of appeal was to be, not to a court, as Savonarola suggested, but to the Greater Council, a fact which led to grave abuses, as judicial appeals became subject to party passions. But in spite of Savonarola's popularity, there was a party called the *Bigi* (greys) who intrigued secretly in favour of the return of the Medici, while the men of wealth, called the *Arrabbiati*, although they hated the Medici, were even more openly opposed to the actual regime. The adherents of Savonarola were called the *Piagnoni*, or snivellers, while the *Neutrali* changed sides frequently.

A league between the pope, the emperor, Venice and Spain having been made against Charles VIII, the French king was forced to return to France. On his return journey he violated his promise by giving aid to the Pisans in their revolt against Florence, and did not restore the other fortresses. Piero de' Medici's attempt to seize Florence failed, but the conditions of the city were not prosperous; its resources were strained by the sums paid to Charles and by the war, its credit was shaken, its trade paralysed; famine and plague visited the city, and the war to subjugate Pisa was proceeding unsatisfactorily. Worse still was the death, in 1496, of one of its ablest and most disinterested statesmen, Piero Capponi The league now attacked Florence, for Pope Alexander VI. hated Savonarola and was determined to destroy the republic, so as to reinstate the Medici temporarily, and prepare the way for his own sons; the Venetians and Imperialists besieged Leghorn, and there was great misery in Florence. All this decreased Savonarola's popularity to some extent, but the enemy having been beaten at Leghorn and the league being apparently on the point of breaking up, the Florentines took courage and the friar's party was once more in the ascendant Numerous processions were held, Savonarola's sermons against corruption and vice seemed to have temporarily transformed the citizens, and the carnival of 1497 remained famous for the burning of the "vanities" (*i e*, indecent books and pictures and carnival masks and costumes). The friar's sermons against ecclesiastical corruption, and especially against the pope, resulted in Savonarola's excommunication The party hostile to him gained ground with the support of the Franciscans, who disliked the Dominican order The pope again and again demanded that the friar be surrendered to him, but, in spite of his threats of an interdict against the city, without success. In 1498, however, a signory of *Arrabbiati* having been elected, Savonarola was arrested and imprisoned The commission appointed to try him on charges of heresy and treason was composed of his enemies; many irregularities were committed during the three trials, and the prisoner was repeatedly tortured. The outgoing signory secured the election of another which was of their way of thinking, and on May 22, 1498, Savonarola was condemned to death and executed the following day.

Piero Soderini.—The pope having been satisfied, the situation in Florence was less critical for the moment But Cesare Borgia suddenly demanded the reinstatement of the Medici in Florence, and the danger was only warded off by appointing him captain-general of the Florentine forces at a large salary (1501). The weakness of the Government became every day more apparent. In 1502, in order to give more stability to the Government, the office of *gonfaloniere*, with the right of proposing laws to the signory, was made a life appointment The election fell on Piero Soderini (1448–1522), an honest public-spirited man of no particular party, but lacking in strength of character. One useful measure which he took was the institution of a national militia, at the suggestion of Niccolò Machiavelli (1505). In the meanwhile the Pisan war dragged on until in 1509 the city was driven by famine to surrender and became a dependency of Florence once more.

The Schismatic Council of Pisa.—In 1510 Pope Julius II., having seceded from the league of Cambrai, in which he had joined France and Spain against Venice, raised the cry of "Fuori i Barbari" (out with the barbarians), with a view to expelling the French from Italy. King Louis thereupon proposed an oecumenical council and demanded that it be held in Florentine territory. The republic agreed to the demand, and the council was opened at Pisa, whereupon the pope immediately placed Florence under an interdict. A Spanish army under Raymundo de Cardona

entered the republic's territory and demanded 100,000 florins, the dismissal of Soderini, and the readmission of the Medici Soderini offered to resign, but the Greater Council supported him and preparations for defence were made. In August the Spaniards took Prato by storm and committed hideous atrocities on the inhabitants; Florence was in a panic, a group of the nobles forced Soderini to resign and leave the city, and Cardona's new terms were accepted, viz, the readmission of the Medici, a fine of 150,000 florins and an alliance with Spain.

Return of the Medici, 1512.—On Sept 1, 1512, Giuliano and Giovanni de' Medici, and their nephew, Lorenzo, entered Florence with the Spanish troops, and a constitution similar to that of Lorenzo the Magnificent was created. Giuliano became *de facto* head of the Government, but he did not pursue the usual vindictive policy of his house In 1513, on the death of Julius II, Giovanni de' Medici was elected pope as Leo X. In March 1514 Giuliano died, and was succeeded by Lorenzo, who was also created duke of Urbino. At his death, in 1519, Cardinal Giulio de' Medici took charge of the Government He did not rule badly and maintained at all events the outward forms of freedom In 1523 he was elected pope, as Clement VII, and sent his relatives, Ippolito and Alessandro, both minors and bastards, to Florence under the tutorship of Cardinal Silvio Passerini

Second Expulsion of the Medici, 1527.—Cardinal Passerini's regency proved most unpopular, and the city was soon seething with discontent Revolts broke out and Passerini showed himself quite unequal to the situation. The nobles were mostly anti-Medicean, and when Filippo Strozzi, and above all his wife, threw their influence in the scales against the Medici, and the magistrates declared for their expulsion from power, Passerini, Ippolito and Alessandro left Florence (May 17, 1527) A *Consiglio degli Scelti* was summoned and a constitution similar to that of Savonarola's time was established The Greater Council was revived and Niccolò Capponi created *gonfaloniere* for a year But Florence was torn by factions Having been re-elected *gonfaloniere* in spite of much opposition in 1528, Capponi tried to make peace with the pope, but his correspondence with the Vatican resulted in a quite unjustified charge of high treason, and although acquitted he had to resign office and leave the city for six months. Francesco Carducci was elected *gonfaloniere* in his place, and on June 29, 1529, the pope and the emperor concluded a treaty by which the latter agreed to re-establish the Medici in Florence

Siege of Florence and Restoration of the Medici.—Carducci made preparations for a siege, but the majority of the people were against him, either from Medicean sympathies or fear, although the *Frateschi*, as the believers in Savonarola's views were called, supported him strongly A body called the *Nove della Milizia*, of whom Michelangelo (*q v*) Buonarroti was a member, was charged with the defence of the city, and Michelangelo himself superintended the strengthening of the fortifications A most unfortunate choice for the chief command of the army was the appointment of Malatesta Baglioni In August an imperial army under Philibert, prince of Orange, advanced on the city In September Malatesta surrendered Perugia, and other cities fell before the Imperialists All attempts to come to terms with the pope were unsuccessful, and by October the siege had begun. Although alone against papacy and empire, the citizens showed the greatest spirit and devotion, and were successful in many sorties The finest figure produced by these events was Francesco Ferruccio (*q.v.*); by his defence of Empoli he showed himself a first-class soldier, and was appointed commissioner-general But Malatesta was a traitor at heart and hindered the defence of the city. Ferruccio, who had recaptured Volterra, marched to Gavinana above Pistoia, to attack the Imperialists in the rear; but in spite of his heroism he was defeated and killed (Aug. 3); the prince of Orange also fell in that desperate engagement. The signory, at last realizing that Malatesta was a traitor, dismissed him; but it was too late, and he now behaved as though he were governor of Florence; when the troops attempted to enforce the dismissal he turned his guns on them. On Aug. 9 the signory saw that all hope was lost and entered into negotiations with Don Ferrante Gonzaga, the new imperial commander. On the 12th the capitulation was signed; Florence was to pay an indemnity of 80,000 florins, the Medici were to be recalled, the emperor was to establish the new Government, "it being understood that liberty is to be preserved." Baccio Valori, a Medicean who had been in the imperialist camp, took charge, and the city was occupied by foreign troops. A *parlamento* was summoned, the usual packed *balìa* created, and all opposition silenced. The city was given over to Pope Clement, who, disregarding the terms of the capitulation, had Carducci and Girolami (the last *gonfaloniere*) hanged, and established Alessandro de' Medici, the natural son of Lorenzo, duke of Urbino, as head of the republic on July 5, 1531 The next year the signory was abolished, Alessandro created *gonfaloniere* for life, and his lordship made hereditary in his family by imperial patent Thus Florence lost her liberty, and came to be the capital of the duchy (afterwards grand-duchy) of Tuscany.

The 19th Century.—The Medici dynasty ruled in Tuscany until the death of Gian Gastone in 1737, when the grand-duchy was assigned to Francis, duke of Lorraine. In 1809 Florence was made capital of the Napoleonic kingdom of Etruria, but after the fall of Napoleon in 1814, the grand duke Ferdinand III was reinstated. He died in 1833, and was succeeded by Leopold II. In 1848 there was a liberal revolutionary movement in Florence and Leopold granted a constitution. But civil disorders followed, and in 1849 the grand-duke returned under an Austrian escort. In 1859, after the Franco-Italian victories over the Austrians in Lombardy, Leopold was expelled and Tuscany annexed to the Sardinian (afterwards Italian) kingdom.

In 1865 Florence became the capital of the kingdom of Italy, but after the occupation of Rome in 1870 during the Franco-Prussian War, the capital was transferred to the Eternal City (1871) (For the history of Florence, 1434–1737, *see* especially MEDICI. For the period 1530–1860, *see* TUSCANY)

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FLORENCE, a city of north-western Alabama, U S A., on the north bank of the Tennessee river, in the Muscle Shoals district; the county seat of Lauderdale county. It is on the Lee and the Jackson highways and is served by the Louisville and Nashville and the Southern railways, and by river steamers. The population was 10,529 in 1920 (22% negroes) and was estimated locally at 18,000 in 1928. Florence is in the fertile river valley, at the edge of the coal and iron region of the State. Just above it is the great Wilson dam, and across the river are the Government nitrate plants. The city has a number of manufacturing industries It is the seat of a State normal school, established in 1872, the oldest normal school in the entire South. Florence was founded in 1818, and for several years was a commercial rival of Nashville. Among the early property holders were Andrew Jackson and James Madison. During the Civil War the town was raided several times (on Feb 8, April 11, May 26, and Dec. 11, 1863), by the Federal forces. The city was chartered in 1889. It has a commission form of government

FLORENCE, a city of Fremont county, Colorado, U S.A., on the Arkansas river, 33m W N.W. of Pueblo, at an altitude of 5,187 feet. It is on Federal highway 50, and on the State highway running north through Phantom Canyon and south to the San Isabel national forest; and is served by the Denver and Rio Grande Western and the Santa Fe railways. The population was 2,629 in 1920, and was estimated locally at 3,500 in 1928 An irrigated agricultural district adjoins Florence on the east, and in the mountains to the south famous head lettuce is grown for the eastern markets. There is a large zinc smelter in the city, and two refineries which handle oil from the northern part of the State as well as from the local field Just east of Florence are two cement plants, with an annual output of over 2,000,000

barrels. Coal mines touch the city boundaries, and the lead mined in the Greenhorn mountains is shipped from here. Florence is a centre for many excursions. The city maintains a camp for motorists in the mountains of the San Isabel forest, 22m south. The city was settled about 1875 and incorporated in 1887

FLORENCE, a city of north-eastern South Carolina, U S A., in the Pee Dee section of the coastal plain; county seat of Florence county It is on Federal highways 17, 76 and 601; has a municipal airport (144ac); and is served by the Atlantic Coast Line and the Seaboard Air Line railways The population was 10,968 in 1920 (43% negro) and was estimated locally at 17,500 in 1928 It is an important wholesale distributing centre, and has large railroad shops, lumber mills, sash and door and veneer factories and various other manufacturing industries. Hydro-electric power is available Florence is the seat of the State industrial school for boys; of an experiment station of Clemson college, and the district offices of its extension service; and of a boll-weevil laboratory of the Federal department of agriculture The public library has an exceptionally good collection on Carolina colonial history There is a beautiful national cemetery here, containing 3,019 graves The city was founded about 1856 and incorporated as a city in 1890 It has a commission form of government. Between 1900 and 1920 the population increased 136%.

FLORENTIUM, the name given to element No 61 by L. Rolla and L. Fernandes, who claim to have deposited a paper announcing its discovery with the Accademia dei Lincei in June 1924 On the other hand, B. S. Hopkins disputes this claim (see *J Franklin Inst*, 1927, 204, p. 1) and has named the element "illinium," under which title it is described. (*See* also RARE EARTHS)

FLORES, capital of the Guatemalan province of Peten, located about 275m N N E of Guatemala city Population estimated at 6,000, the only town of such size in the region Its exports are chicle (the gum of the chicle-zapote tree and the basis of chewing-gum), mahogany and Spanish cedar. Flores can be reached via Chianaja, Guatemala, and up the River Pasión from Sebol, but the ordinary route is overland from Belize, British Honduras Flores is the distributing and exporting centre for the entire region, the chicle bales going via Belize and the hardwoods being floated down the river The whole region, except for the clearings where foods for local consumption are raised, is a heavily wooded tropical wilderness, abounding in an immense variety of hardwoods, which are not shipped as the market is limited and many of them are too heavy to float in water Flores is the centre of extensive archaeological expeditions into the history and ruins of the old Maya empire The ruins of hundreds of villages and scores of immense ancient cities are buried in the forests of Peten, their discovery as reported from time to time by American and British archaeologists following expeditions into the trackless, steaming forests, the only guides to which are the "chicleros" or chicle-gatherers Petroleum seepages have been discovered in Peten, but the cost of carrying in drilling equipment and the construction of pipe-lines should oil wells be struck, have, up to the present time, prevented the development of this resource (W. THO)

FLORES, an island forming part of the Azores archipelago. Pop. (1920) 6,662; area, 57 sq m Flores and the adjacent island of Corvo (pop 661; area, 7 sq m) constitute the westernmost group of the Azores, from the rest of which they are widely severed It derives its name from the abundance of the flowers that find shelter in its deep ravines. Its capital is Santa Cruz das Flores (3,202). In 1591 Flores was the station of the English fleet before the famous sea fight between Sir R. Grenville's ship "Revenge" and a Spanish fleet of 15 vessels. *See* AZORES.

FLORES, one of the Lesser Sunda islands, of the Dutch East Indies. It is the last large island of the chain which extends eastwards from Java, and lies between Celebes and Timor. Flores has an area of 8,870 sq. miles, is 224 miles in length, and 37 in width. It is attached politically to the residency of Timor, has an assistant-resident at Endeh, and is subdivided into Endeh, Larantuka, Maumere, Ngada, and Ruteng, each under a *controleur* Flores is a long, narrow island, extending from east to west, and with several deep inlets, the chief being Maumere bay, on the North coast, in the east, in which is the island of Great Bastard, or Pulo Besar. On the North coast, too, are Todo bay and Celebes bay, on the West coast, Bajo bay and Parapat bay (with Sendal island), on the South coast, Aimere bay and the Gulf of Endeh, and on the East coast Okka and Konga bays, two deep inlets, the former cutting through high mountains. The island is very mountainous, and heights are reached such as Amburombo (7,050 ft.), Rokka (7,366 ft.) and Pocho Likka (7,815 ft), in the north-west group, Mt. Egon (5,587 ft) and Mt Lobetobi (5,590 ft), in the east, and Mt. Aomasi (5,289 ft.) and Mt Bara (5,679 ft), in the centre The interior, which is heavily forested, has been but little explored, but the existence of slates, chalk and sandstones, with eruptive rocks, and volcanoes, indicates that geologically the island is similar in structure to others of the Lesser Sunda chain. The few rivers known run either northwards or southwards, and do not seem to be navigable, with the exception of the Reo river, for about a mile In northern Manggarai, in the north-west, where there is a considerable area of limestone, the rivers sometimes run underground The mean temperature ranges from 77° to 80° and the average yearly rainfall is 47 44 Little is known of the flora and fauna, but the former includes, in the forests, coconut palms, and the sapan, cinnamon and sandal tree. The population of Flores in 1920 was 433,038, it is mainly of a mixed Malay-Papuan type. In the west, the Manggarese have more of the Malayan characteristics, whilst in the central and eastern parts the people are more Papuan in appearance. In addition to these there are settlers all round the coast from Macassar, Sumba, Sumbawa and the Solor isles; in Todo, Manggarai, are colonists said to be descended from Menangkabau Malays; and on the Endeh coast are descendants of ship-wrecked Chinese. The indigenous population is largely heathen, but there are many Christians amongst the people of the east coast, and there are a number of Mohammedans in Manggarai The people of Endeh and Manggarai are the most developed, those of Central Flores the most savage and warlike, but industry everywhere is at a low stage of development, and the people get their living mostly by fishing, hunting and agriculture Maize is the chief food, though rice is also grown, and coconuts are cultivated, copra forming the chief article of export. Other items are coffee, sandal wood, cinnamon, tobacco, mother-of-pearl and trepang. Coffee is grown in the districts of Manggarai and Ngada, in the west, and tobacco, in the highlands, whilst cotton is cultivated under Dutch supervision Iron, brimstone, pumice-stone and saltpetre are found Horses, buffaloes, pigs, dogs and fowls are kept, but meat is little eaten, except at festivals *Baju* and *sarong,* or even trousers, are worn generally in the east and south, and often *sarong* only in the west, ceremonial garments are very elaborate, and many ornaments are worn The form of house varies greatly. In Ngada houses are built on terraces, often on piles, and they are neat and regular in arrangement, and are surrounded by a hedge of bamboo, in Manggarai they are conical in form, with a roof reaching to the floor, divided into separate rooms for different families, and a passage, where unmarried men and strangers sleep, in the east the houses are smaller and inhabited by one family only, whilst in Endeh they are square, roomy and well-built. Each village has its barns, and generally a *pemoli* house. Generally the ground is owned communally, by the tribe, and the head man, *tuan tanah,* has great power, but hereditary tenure of the individual prevails in Ngada, and here a stranger may own the uncultivated land he breaks up, whereas in the remainder of the island he has no rights. Marriage is patriarchal in character, the women having no freedom of choice. Large dowries are paid for wives, and the husband must assist, or work for, the bride's parents until the dowry is fully paid. Polygamy is rare, also divorce; child-betrothal is common. Generally the dead are buried, and if wealthy, in wooden coffins, but in central Flores, corpses are exposed on scaffoldings. Society is divided into the noble, middle and lower classes, but now that slavery has been abolished, this latter class tends to disappear. Dutch rule reaches the people through their own chiefs and is weaning them gradually from a state of savagery to one of semi-civili-

zation, which is apparent already in most of the coastal districts. Endeh, Aimere, Reo and Labuan, are ports of call for vessels of the Royal Packet Navigation Co. Flores originally was tributary to princes of Celebes, including Macassar, and when their power was broken by the Dutch in 1667, the island became open to Dutch influence, though Larantuka, in the east, together with some of the neighbouring islands, was claimed by Portugal, and in 1818 a commission confirmed Portugal's right. In this year the Dutch stationed an official at Endeh bay, to suppress piracy, but no impression was made until 1838, when the place was bombarded and seven chiefs journeyed to Kupang, in Timor, to apologize for their piratical activities A treaty was then made with these, and other chiefs of Endeh Trouble with the Portuguese authorities in Larantuka and the island of Solor in 1848 led to negotiations with Portugal when, in return for the remission of certain debts, the Portuguese Government renounced all claims to Larantuka and the neighbouring islands, and though the treaty embodying this was not ratified until 1859, Dutch troops were sent to garrison the ceded districts in 1851 Later the troops were withdrawn and a civil official appointed, to reside at Larantuka, and for many years afterwards there was considerable trouble here, and at Endeh, on account of slave raids and piracy. The Rajah of Larantuka, a Christian, was the principal cause of annoyance, and his arrest and banishment, in 1905, led to a peaceful state of affairs. A treaty was concluded in 1874 with one of the principal chiefs of central Flores, but attempts made in 1887, 1888 and 1889, to penetrate into the interior failed, and in 1890 two large military expeditions were compelled to withdraw, owing to the hostility of the natives. Eventually, from Endeh, as a base, a body of mounted police succeeded in penetrating and pacifying the whole of the inland region (1907), and civil government was established Manggarai has always been associated with the Sultan of Bima, in Sumbawa, the Dutch have only once interfered—to suppress a small rising, in 1909—and it remains so now, made into two divisions in 1915, with administrative officials at Reo and Ruteng. The other States of Flores are all under the "short declaration," which allows them some measure of self-government, under Dutch supervision (E E. L)

FLOREZ, ENRIQUE (1702–1773), Spanish historian, was born at Valladolid. He was responsible for collecting most of the material that appeared in the first 26 volumes of *España Sagrada, teatro geografico-historico de la Iglesia de España* (1754–1886), a vast compilation of Spanish ecclesiastical history which obtained a European reputation

FLORIAN, SAINT, a martyr honoured in Upper Austria. In the 8th century Puoche was mentioned as the place of his tomb, and on the site was built the celebrated monastery of canons regular, St. Florian, which still exists. His *Acta,* devoid of historical value, are based on the *Acta* of St. Irenaeus of Sirmium The cult of St. Florian was introduced into Poland in 1183 by Giles, bishop of Modena. His protection is often sought against fire and his feast kept on May 4

FLORIAN, JEAN PIERRE CLARIS DE (1755–1794), French poet and romance writer, was born at the château of Florian, near Sauve, in the department of Gard. His uncle and guardian, the marquis of Florian, who had married a niece of Voltaire, introduced him at Ferney and in 1768 he became page at Anet in the household of the duke of Penthièvre, who remained his friend throughout his life. He then studied at the artillery school at Bapaume and became a captain of dragoons. On the outbreak of the French Revolution he retired to Sceaux, but he was soon discovered and imprisoned; and though his imprisonment was short he survived his release only a few months, dying on Sept. 13, 1794 His famous collection of *Fables* appeared in 1792. Florian imitated Salomon Gessner, the Swiss idyllist, and his style has all the artificial delicacy and sentimentality of the Gessnerian school. Among the best of his fables are reckoned "The Monkey showing the Magic Lantern," "The Blind Man and the Paralytic" and "The Monkeys and the Leopard." He also wrote plays, pastoral novels and romances.

The best edition of Florian's *Oeuvres complètes* appeared in Paris in 16 volumes, 1820; his *Oeuvres inédites* in 4 volumes, 1824.

See "Vie de Florian," by L. F. Jauffret, prefixed to his *Oeuvres posthumes* (1802); A. J. N. de Rosny, *Vie de Florian* (Paris, An V), Sainte-Beuve, *Causeries du lundi,* t. iii.; A. de Montvaillant, *Florian, sa vie, ses oeuvres* (1879); *Lettres de Florian à Mme de la Briche,* published, with a notice by the baron de Barante, in *Mélanges* published (1903) by the Société des bibliophiles français; G. Gaillard, *Florian, sa vie, son oeuvre* (1912).

FLORIANOPOLIS (formerly *Desterro, Nossa Senhora do Desterro* and *Santa Catharina,* and still popularly known under the last designation), a city and port of Brazil and the capital of the State of Santa Catharina, on the western or inside shore of a large island of the same name, 485 m. S S W. of Rio de Janeiro, in 27° 30′ S., 48° 30′ W. Pop. (1920) 19,574; of the municipality, including a large rural district and several villages (1920) 41,338. The harbour is formed at a favourable part of the strait which separates the island from the mainland and is nearly 2 m. wide at this point It is approached by narrow entrances from the north and south, which are defended by small forts The island is mountainous and wooded, and completely shelters the harbour from easterly storms A steel bridge, 850 metres long, now spans the strait. The surroundings are highly picturesque and tropical in character, and the town is a flourishing commercial centre though lacking railway connection inland. Its public buildings include the governor's official residence, arsenal, lyceum, hospital and some old churches. The climate is warm for the latitude, but the higher elevations of the vicinity are noted for their mild climate and healthfulness There are some German colonies farther up the coast whose products find a market here, and a number of small settlements along the mainland coast add something to the trade of the town. The more distant inland towns are partly supplied from this point, but difficult mountain roads tend to restrict the trade greatly. There is a considerable trade in market produce with Rio de Janeiro, but the exports are inconsiderable Florianopolis was formerly one of the well known whaling stations of the south Atlantic, and is now a secondary military and naval station.

The island of Santa Catharina was originally settled by the Spanish, Cabeza de Vaca landed here in 1542 and marched hence across country to Asunción, Paraguay. The Spanish failed to establish a permanent colony, however, and the Portuguese took possession. The island was captured by a Spanish expedition under viceroy Zeballos in 1777. A boundary treaty of that same year restored it to Portugal In 1894 Santa Catharina fell into the possession of revolutionists against the Government of President Floriano Peixoto. With the collapse of the revolution the city was occupied by the Government forces, and its name was then changed to Florianopolis in honour of the president of the republic. (G. M McB)

FLORIANOPOLIS SUSPENSION BRIDGE. The Florianopolis bridge, Brazil, with a main span of 1,113ft. 9in., is the largest bridge in South America and at the date of its completion the longest eye-bar suspension span in the world. It was constructed (1923–26) for the State of Santa Catharina, Brazil, to carry a highway, electric railway and water-supply to the capital city Florianopolis situated on an island off the Atlantic coast.

The structure, designed by Robinson and Steinman, consulting engineers, is the first example of a new form of suspension bridge whereby greatly increased economy and rigidity are secured simultaneously. Its distinctive feature is the utilization of the cable to replace the middle half of the top chord of the stiffening truss and the consequent change from the conventional parallel chord truss to a stiffening truss of more effective outline, namely, with maximum depth near the quarter-points of the span These features combined yielded a structure four times as rigid as the previous conventional design, together with a saving of one-third of the steelwork. In proportion to span and loading, the Florianopolis bridge contains less steel than any other bridge.

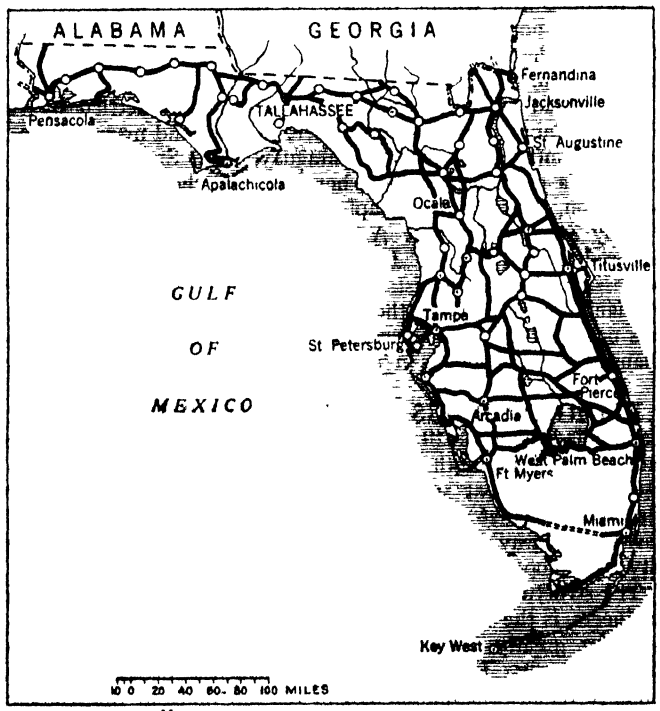
Another departure from conventional practice was the adoption of rocker towers, which, eliminating the customary bending stres elwork in the towe ed to concrete cylin high. Instead

of wire for the cables, eye-bars were adopted; these were made of the newly developed, high-tension, heat-treated carbon steel, having a yield point exceeding 75,000 lb. per sq in. and used with a working stress of 50,000 lb. per square inch.

In the foundation work for the main piers, novel construction methods had to be devised By excavating and concreting successive test pits, the entire foundation area of one pier was carried down 20ft. below the bottom of the coffer dam to bed rock at elevation —60 The concrete anchorages are of novel design, U-form in plan, for maximum efficiency. The island anchorage is on rock, the continent anchorage on piles An entirely new method was developed for the erection of the eye-bar cables and the suspended stiffening trusses, using overhead trolley, thus eliminating wooden falsework and working platforms. The bridge, which was over three years in building, provides a 28ft. roadway, a meter-gauge electric railway, a 24in. water main and a 9ft sidewalk Its over-all length is 2,690ft.; it contains 4,400 tons of steel and 14,500cu yd. of concrete; and the dead weight of the main span is 4,370 lb per linear foot

A detailed description of the design and construction is given in a paper by D. B Steinman and Wm. G Grove in the *Transactions* of the Am Soc. C E., 1928. (D. B. S)

FLORIDA, called the "Peninsula State" because of its peculiar outline, is the most southern State of the United States and is situated between 24° 30′ and 31° N, and 79° 48′ and 87° 38′ W. It is bounded on the north by Alabama and Georgia, on the east by the Atlantic ocean, on the south by the Strait of Florida, which separates it from Cuba, and by the Gulf of Mexico, and on the west by the Gulf and Alabama. The Florida Keys, a chain of islands extending in a general south-westerly direction from Biscayne bay, are included in the State boundaries The coast line is greater than that of any other State, extending 472m



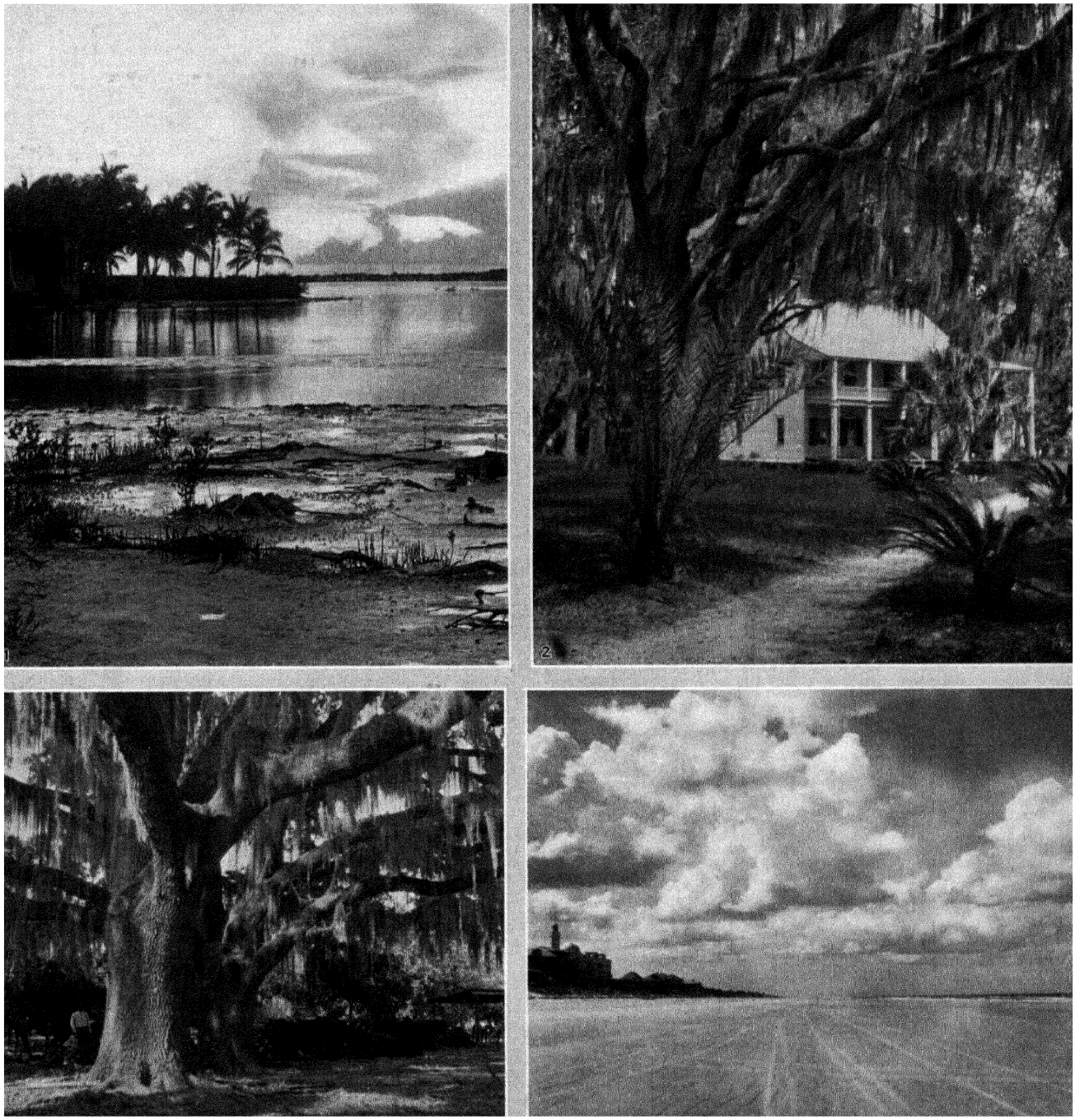
MAP OF THE MAIN ROADS OF FLORIDA

on the Atlantic and 674m. on the Gulf coast. The total area of the State is 58,666sq.m., of which 3,805sq.m. are water surface.

Physical Features.—The average elevation of the surface of the State above the sea level is less than that of any other State except Louisiana, but there is not the monotony of unbroken level which descriptions and maps often suggest. The north-western portion of the State is, topographically, similar to south-eastern Alabama, being a rolling hilly country; the eastern section is a part of the Atlantic coastal plain; the western coast line is less regular than the eastern, being indented by a number of bays and harbours, the largest of which are Charlotte harbour, Tampa bay and Pensacola bay. Along much of the western coast and along nearly the whole of the eastern coast extends a line of sand reefs and narrow islands, enclosing shallow and narrow bodies of water—such as Indian river and Lake Worth—called rivers, lakes, lagoons, bays and harbours. In the central part of the State there is a ridge extending north and south and forming a divide, separating the streams of the east coast from those of the west Its highest elevation above sea level is about 300 feet The central region is remarkable for its large number of lakes, about 30,000 between Gainesville (in Alachua county) and Lake Okeechobee. They are due largely to sink holes or depressions caused by solution of the limestones of the region Many of the lakes are connected by subterranean channels, and a change in the surface of one lake is often accompanied by a change in the surface of another. By far the largest of these lakes, nearly all of them shallow, is Lake Okeechobee, a body of water about 1,250sq m in area and almost uniformly shallow, its depth seldom being greater than 15 feet. Caloosahatchee river, flowing into the Gulf of Mexico near Charlotte harbour, is its principal outlet Among the other lakes are Orange, Crescent, George, Weir, Harris, Eustis, Apopka, Tohopekaliga, Kissimmee and Istokpoga The chief feature of the southern portion of the State is the Everglades (*q v*), an extremely level expanse of country, about 2,860,000ac in area, where the natural drainage is so poor that water stands on the surface the greater portion of the year Within the State there are many swamps, the largest of which are the Big Cypress swamp in the south, adjoining the Everglades on the west, and Okefinokee swamp, extending from Georgia into the north-eastern part of the State

A peculiar feature of the drainage of the State is the large number of subterranean streams and of springs, always found to a greater or less extent in limestone regions Some of them are of great size Many of the springs have curative properties, one of them, the Green Cove spring in Clay county, discharging about 3,000gal of sulphuretted water per minute Not far from St Augustine a spring bursts through the sea itself with such force that the ocean breakers roll back from it as from a sunken reef The springs often merge into lakes, and lake systems are usually the sources of the rivers, Lake George being the principal source of the St Johns, and Lake Kissimmee of the Kissimmee, while a number of smaller lakes are the source of the Oklawaha, one of the most beautiful of the Floridian rivers

Government.—The present constitution was framed in 1885 and was ratified by the people in 1886 Amended from time to time it is still the fundamental law of the State Its most important feature, when compared with the previous constitution of 1868, is its provision for the choice of State officials other than the governor (who was previously elected) by elections instead of by the governor's appointment; but the governor, who serves for four years and is not eligible for the next succeeding term, still appoints the circuit judges, who are usually nominated in primaries, and he may fill certain vacancies and may suspend, and, with the senate, remove officers not liable to impeachment. The governor is a member of the board of pardons, the other members being the attorney-general, secretary of State, controller and the commissioner of agriculture. The governor, secretary of State, attorney-general, controller, treasurer, superintendent of public instruction and commissioner of agriculture comprise a board of commissioners of State institutions; he is also a member of the Board of Education and of the Budget Commission The office of lieutenant governor was abolished by the present constitution The legislature meets biennially, the senators being chosen for four years, half from the odd numbered districts being elected in one election and two years thereafter half from the even numbered districts, and the representatives for two years. The senate consists of 38 members, and the house of representatives of 95, all chosen at one election; by a two-thirds vote of members present the legislature may pass a bill over the governor's veto. The judges of the supreme court and those of the 21 judicial circuits serve for six years, those of the county courts for four years, and justices of the peace (one for each justice district, of which the county commissioners must



BY COURTESY OF (1) THE AMERICAN MUSEUM OF NATURAL HISTORY (2, 3) JOSEPHINE DE LA BARRE (4) THE FLORIDA EAST COAST RAILWAY

THE LANDSCAPE IN FLORIDA

1 Marco Palms at sunset, between Marco and Caxambas, Lee County, in the Everglades, the big cypress swamp of southern Florida

2 A house of the Colonial period in Hibernia, northern Florida The two storey porch and the curiously shaped roof of the house are frequently seen in southern buildings of this period The large tree is live oak, with Spanish moss hanging from its branches A palmetto is close to the porch, and date palms are in the foreground

3 Live oak (*Quercus virginiana*) covered with Spanish moss, in Hibernia The live oak is a rugged species having small, evergreen leaves The ubiquitous Spanish moss (*Tillandsia usneoides*) is a rootless plant, which hangs in long, grey festoons from tree-branches It is covered with minute hairs which absorb moisture from the air

4 Ormond-Daytona Beach, a stretch of sand 30 miles long, on the Atlantic coast 68 miles south of St Augustine It is a famous speedway

form at least two in each county) hold office for four years. The constitutional qualifications for suffrage are: the age of 21 years, citizenship in the United States or presentation of naturalization certificates at registration centres, residence in the State one year and in the county six months, and registration. To these requirements the payment of a poll tax of one dollar has been added by legislative enactment, such an enactment having been authorized by the constitution. Insane persons and persons under guardianship are excluded by the constitution, and "all persons convicted of bribery, perjury, larceny or of infamous crime, or who shall make or become directly or indirectly interested in any bet or wager the result of which shall depend upon any election," or who shall participate as principal, second or challenger in any duel, are excluded by legislative enactment.

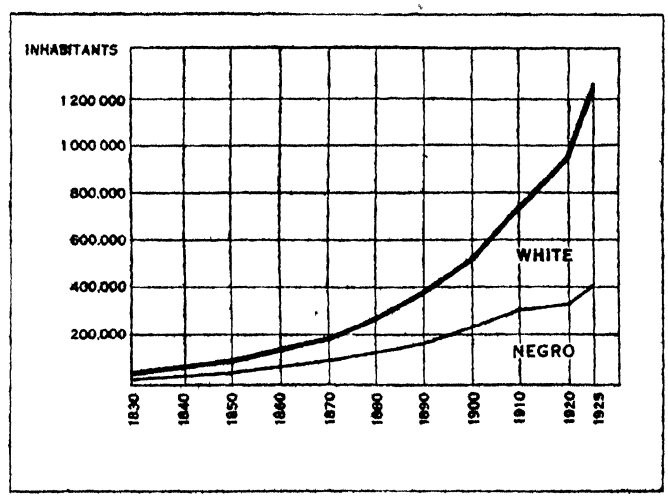
Amendments to the constitution may be made by a three-fifths vote of each house of the legislature, ratified by a majority vote of the people. A revision of the constitution may be made upon a two-thirds vote of all members of both houses of the legislature, if ratified by a majority vote of the people; a constitutional convention is then to be provided for by the legislature, such convention to meet within six months of the passage of the law therefor, and to consist of a number equal to the membership of the house of representatives, apportioned among the counties as are the members of that house.

A homestead of 160ac or of ½ac. in an incorporated town or city, owned by the head of a family residing in the State, with personal property to the value of $1,000 and the improvements on the real estate, is exempt from enforced sale except for delinquent taxes, purchase money, mortgage or improvements on the property. The wife holds in her own name property acquired before or after marriage, the intermarriage of whites and negroes (or persons of negro descent to the fourth generation) is prohibited All these are constitutional provisions

As an administrative division of the Government, the county is very important, for it is where the chief functions of local government are carried on Each county has a clerk of circuit court, a sheriff, constables, an assessor of taxes, a tax collector, a superintendent of public instruction and a surveyor All of these are elected for a period of four years, except the tax assessor and the tax collector, who are elected for two years. The constitution provides for the division of each county into five districts and "one county commissioner shall be selected for each such district" The commissioners, who individually have supervision over bridges and highways and collectively exercise a general supervision over the property and finances of the county, are elected for a term of two years The State census of 1925 showed Florida divided into 64 counties, but in 1927 this number was increased to 67

Population.—The first United States census of Florida was taken in 1830, when the territory had a population of 34,730. The population of Florida at other selected census periods was as follows: in 1850, 87,445; in 1880, 269,493; in 1890, 391,422; in 1900, 528,542; in 1910, 752,619; in 1920, 968,470. The State census taken in 1925 showed the population in that year to be 1,263,549. The United States census estimate for July 1, 1927, was 1,363,000. The increase for the decade 1910–20 was 28·7%, and for the period 1920–7 it was even more remarkable, being 394,530, or 40·7%. In 1920, 93·3% were native born, 65·9% were white and 34% were negro. In 1925 there were 21 cities with a population of over 5,000; those then exceeding 10,000 were: Jacksonville (95,206), Tampa (94,808), Miami (69,754), St Petersburg (26,706), Pensacola (24,958), Orlando (22,273), West Palm Beach (19,122), Key West (13,533) and St. Augustine (10,190). Tallahassee is the capital of the State. The rapid development of Florida cities and towns is giving the State a larger proportion of urban population than that of any other southern State. Florida's population, however, is still predominantly rural. In 1920 only 36·7% of the entire population was urban (living in cities or towns of over 2,500). During the winter months the population is largely augmented by thousands of tourists and winter residents, quite a number of whom become permanent residents or invest in Florida property. For many years the coast resorts were the chief objectives, but many of the inland towns and cities are now attracting visitors

Finance and Taxation.—Florida has one of the smallest bonded State debts in the Union. On June 30, 1926, it was $601,567 at 3% per annum and was held entirely by the educational funds of the State The treasurer's report for the fiscal year July 1, 1925, to June 30, 1926, showed the following sums: balance on hand July 1, 1925, $6,803,057, total receipts $40,763,393; total disbursements $29,911,133; balance on hand June 30, 1926, $17,655,317. The chief sources of revenue were: the State road license fund (gasolene) $7,568,858; the general revenue fund, which includes charter taxes on corporations, motor car licence fees and other taxes; the State Federal aid road fund; the State road tax fund; and the drainage bond fund. Disbursements from the principal funds were: State road licence fund $5,732,320; general revenue fund $4,877,185; drainage bond fund $3,459,981; county road licence fund $2,575,587. The total educational appropriation was $1,669,470. The assessed values in 1925 were: real estate $497,508,360; personal property $83,799,242. In 1924 Florida adopted an amendment to the State constitution forbidding the legislature to levy an income or inheritance tax.



GRAPH SHOWING GROWTH OF POPULATION IN FLORIDA 1830–1925, INDICATING THE RELATIVE PROPORTIONS OF NEGRO AND WHITE AT EACH CENSUS

Education.—As early as 1831 an unsuccessful attempt was made to form an adequate public school fund; the first real effort to establish a common school system for the territory was made after 1835; in 1840 there were altogether 18 academies and 51 common schools, and in 1849 the legislature made an appropriation in the interest of the public instruction of white pupils, and this was supplemented by the proceeds of land granted by the United States Government for the same purpose. In 1852 Tallahassee established a public school; and in 1860, there were, according to a report of the United States Census, 2,032 pupils in the public schools of the State, and 4,486 in "academies and other schools." The Civil War, however, interrupted the early progress, and the present system of common schools dates from the constitution of 1868 and the school law of 1869. The school revenue is derived from the interest of a permanent school fund, special State and county taxes, and a poll-tax. The State constitution prescribes that "white and coloured children shall not be taught in the same school, but impartial provision shall be made for both."

The total population between the ages of five and 17, inclusive, in 1924 was 298,897, of which 266,318, or 89·1%, were enrolled in public elementary and secondary schools; an increase of 41,158 over the census of 1920. The estimated attendance of private and parochial schools was 6,796 Of the 266,318 attending the public schools, 243,218 were in kindergarten and elementary schools and 23,100 in secondary schools. The average daily attendance per year per pupil enrolled increased from 98 days in 1920 to 106·3 in 1924. During the session 1923–24, 8,312 teachers

were engaged in the public schools and the average annual salary amounted to $698. The school expenditures in 1920 amounted to $7,030,000; in 1924 to $12,399,000; a per capita of population (5–17) of $25.79 and $41.48 respectively. Attendance is compulsory between the ages of seven and 16

Before 1905 the State provided for higher education by the Florida State college, at Tallahassee, formerly the West Florida seminary (founded in 1857), the University of Florida, at Lake City, which was organized in 1903 by enlarging the work of the Florida Agricultural college (founded in 1884); the East Florida seminary, at Gainesville (founded 1848 at Ocala); the Normal school (for whites), at De Funiak Springs; and the South Florida Military Institute, at Bartow, but in 1905 the legislature passed the Buckman Act abolishing all these State institutions for higher education and establishing in their place the University of the State of Florida and a State Agricultural Experiment Station, both now at Gainesville, and the Florida Female college, at Tallahassee. In 1909 the legislature changed the names of the university and the college to the University of Florida and the Florida State College for Women Both maintain the same standards for entrance and for graduation. The enrolment of the university for the session 1926–27 was 1,968, of the college for women, 1,361. Both counts are exclusive of the summer attendance. Denominational and private educational institutions of higher learning in Florida were 16 in number in 1923. Some of the more widely known of these are John B Stetson university (Baptist), at De Land, Rollins college (non-sectarian), at Winter Park, Southern college (Methodist Episcopal, South), at Lakeland, and Palmer college (Presbyterian) at De Funiak Springs The coloured have facilities for advanced education in the Florida Agricultural and Mechanical college, at Tallahassee, which was organized in 1909 by enlarging the work of the State Normal school for training Negro Teachers (founded 1887). Other coloured institutions are: the Florida Baptist Academy and Cookman Institute (Methodist Episcopal, South), both at Jacksonville, and the Normal and Manual Training school (Congregational) at Orange Park There is a school for the deaf and blind (founded 1885) at St. Augustine

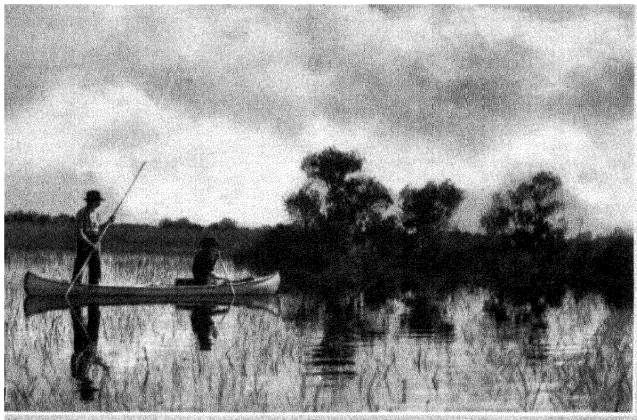
Charities and Houses of Correction.—The early history of the penal system may be characterized as one of aimless experiments followed by about 30 years of a lease system The convicts were hired to the one highest bidder who contracted for their labour, and who, in turn, subleased the prisoners in smaller groups. He, moreover, undertook to lease all other persons convicted during the term of his contract. In 1889 the prisoners were placed under the care of a supervisor of convicts, and in 1905 the law was amended so that one or more supervisors might be appointed at the will of the governor. By 1908 there were four supervisors and one State prison physician The present system began to take shape in 1911 when the legislature made an appropriation to establish a prison farm near Raiford In this session also an act was passed which provided that only the physically perfect coloured males should be leased, and that all women and white males, and those not physically fit of the coloured males, should be retained at the farm. Under this arrangement about 600 coloured males were leased. Until Jan. 1, 1914, however, leaseholders of State prisoners were under contract to care for women prisoners and the infirm of both races, the State owning nothing in the way of buildings and equipment. By an act of 1921 all persons upon being admitted to the State prison were to be examined and classified into one of two classes according to physical fitness. All able-bodied males, except a number not exceeding 50 for the farm and a few for other institutions, were to make up the State convict road force. Women and the physically unfit were to be retained at the farm. The lease system for State or county prisoners is prohibited by law since Dec 31, 1923. Corporal punishment was made unlawful by an act of the legislature in 1923 The State prison fund of three-eighths of one mill on the dollar on all property liable to assessment is to supplement the revenue of the prison farm. The general supervision of the prison farm and the convict road camps is in charge of the commissioner of agriculture and the board of commissioners of State institutions Florida maintains an Industrial School for Boys at Marianna, an Industrial School for Girls at Ocala, Florida Farm Colony (for feeble minded) at Gainesville, and an Insane Hospital at Chattahoochee. Orphanages and charitable institutions are maintained in various parts of the State by religious and benevolent organizations

Industry, Trade and Transportation.—Florida's most extensive industry is agriculture. According to figures of the Florida Experiment Station there were approximately 5,940,000ac. of land in farms in 1925, not including open or fenced range lands. Of this 1,400,000ac. were in crops, and 618,000ac of crop lands were idle; 275,000ac. were in fruit, 1,500,000ac. were in pasture; and 2,147,000ac. in woodland. On approximately one-third of the cultivated acreage crops were produced by intertillage (the growing of two or more crops on the same land at one time) and by succession planting (the growing of two or more crops in sequence on the same land in one year). The number of farms in Florida was 50,016 in 1910, 54,005 in 1920 and 59,817 in 1925 Fruit is Florida's most important crop. The citrus industry has prospered despite the fact that some of the groves in the more northern part of the State have suffered from heavy frosts in severe winters In 1920 the production of oranges was 8,500,000 boxes, and of grape-fruit 5,000,000 boxes In 1925 the production was 10,700,000 boxes of oranges and 6,300,000 boxes of grape-fruit In the sub-tropical part of the State pineapples, lemons, guavas and avocadoes are grown profitably on a commercial scale Other fruits produced are peaches, pears, bananas, grapes, figs and limes. The more important crops with their 1925 acreage yields and values are tabulated below

Chief Crops of Florida in 1925

	Acres	Production.	Value.
			$
Staple crops			
Corn (Maize)	580,000	8,700,000 bu.	8,700,000
Cotton	106,000	40,000 bales	3,541,000
Hay	82,000	57,000 tons	1,296,000
Sugar-cane	9,000	2,100,000 gal	2,205,000
Sweet potatoes	29,000	2,465,000 bu	4,060,000
Tobacco	7,000	5,460,000 lb.	1,693,000
Truck crops			
Irish potatoes	23,000	2,599,000 bu.	6,757,000
Snap beans	20,530	1,663,000 hmpr.	2,494,000
Celery	4,320	2,000,000 crates	3,700,000
Cucumbers	10,830	1,256,000 hmpr.	1,520,000
Lettuce	3,400	765,000 crates	1,170,000
Peppers	3,400	1,115,000 bu	2,787,000
Strawberries	3,170	6,023,000 qt	1,807,000
Tomatoes	33,470	2,811,000 bu.	6,325,000
Watermelons	20,910	7,841 cars	2,352,000
Fruit and nuts			
Grape-fruit		6,300,000 crates	11,340,000
Oranges		10,700,000 crates	26,750,000
Peaches		115,000 bu	190,000
Pecans		1,340,000 lb	348,000

There was a falling off in the production of cotton during the decade 1910–20, however, a good cotton season in 1925 and the use of short-staple cotton, which is more resistant to the boll weevil, more than doubled the State's production over the crop of 1920. The tobacco-growing section of western Florida produces profitably a shaded leaf, grown from Cuban and Sumatran seed, which is in great demand in cigar manufacturing. The pecan industry is comparatively new, most of the commercial groves having been planted since 1905. It is believed that in the northern part of the State the pecan crop may soon compete closely with the citrus crop of the southern part. The production of early vegetables for the northern markets is developing rapidly, and the Florida producer can put vegetables on the markets earlier than any of his competitors. The chief obstacles are costly transportation and inadequate railway freight and express service. Much attention was formerly paid to stock-raising, but with the taking up and development of much of what was formerly open range land, the figures for 1925 show a decided shrinkage in the production of livestock since 1920. In 1925 there were 662,000 cattle, including milch cows, valued at $13,240,000; 61,000 sheep, valued at $200,000; 506,000 swine, valued at $3,289,000; 31,000













BY COURTESY OF (1) THE AMERICAN MUSEUM OF NATURAL HISTORY (4) THE JACKSONVILLE CHAMBER OF COMMERCE, (5) THE FLORIDA EAST COAST RAILWAY, (6) CARL FISHER PROPERTIES PHOTOGRAPHS (2) BURTON HOLMES FROM EWING GALLOWAY, (3) WIDE WORLD PHOTO

FLORIDA SCENERY

1 A scene in the Everglades, the vast swamp of southern Florida The swamp-land, which is very fertile, is being gradually reclaimed An Everglades drainage district of about 4 200,000 ac was set aside by the State legislature in 1913, to be drained by a system of canals

2 A pine forest traversed by a modern improved road Great forests of pine and cypress are numerous in Florida

3. View from the sea of Miami, in the south-eastern part of Florida, situated on the Bay of Biscayne and the Miami River This photograph, showing new buildings in the business section, was made one year after the hurricane of 1926 which seriously damaged the greater part of the city

4 The principal port, Jacksonville, as seen from the air Jacksonville, known as the Gate city to Florida, is in the north-eastern part of the State, on the left bank of the St James River

5 Palm Beach, as seen across Lake Worth The famous city and winter-resort is partially separated from the mainland by Lake Worth, an arm of the Atlantic The district situated on the mainland proper is called West Palm Beach

6 Putting-green of the Bay Shore Golf Course at Miami Beach

horses, valued at $3,000,000; and 43,000 mules, valued at $5,934,000. These livestock statistics include only farm animals.

The fisheries of Florida are valuable In 1923 the catch was 160,162,189 lb. valued at $5,746,148 (Bureau of Fisheries report); canned and preserved sea foods were valued at $899,672 The total number of species of fish is about 600, and many species found on one coast are not found on the other. The kingfish and the tarpon are caught for sport, while mullet, shad, red snapper, pompano, trout, sheepshead and Spanish mackerel are of economic value The sponge, oyster and turtle fisheries are also important.

According to the Census of Manufactures in 1923, Florida had 1,690 manufacturing establishments, which gave employment to 72,411 persons and had an annual production worth $188,258,384 In 1914 there were 2,158 establishments with a yearly output valued at $81,112,000 The chief industry in 1923 was lumber and timber products, which engaged 22,258 persons, with an output valued at $45,150,478 Other important industries in the order of their importance were. cigars and cigarettes; turpentine and rosin; car and general construction in steam railway repair shops, and commercial fertilizer

In 1925 Florida produced mineral products to the value of $10,908,000, the principal of which were phosphates, lime, limestone, brick, tile, kaolin and fuller's earth, of which last Florida produces about three-fourths of the entire U S. output In 1924 the production of phosphates was. land pebble, 2,348,137 long tons, valued at $7,987,752, and hard rock, 199,516 long tons, valued at $1,071,675 Because of exploitation, Florida's lumber production shows a decline since 1916, when an output of 1,425,000,000 board ft was reached, the 1924 production, mainly cypress and yellow pine, was 980,014,000 board feet Some hard wood, (chiefly hickory) is produced Naval stores are produced from the pine forests, where the sap of the trees is collected and distilled, yielding turpentine and rosin In 1923 Florida produced 9,747,000gal of turpentine, valued at $10,000,000 and 660,000 bbl of rosin, valued at $4,000,000 In 1924 Florida manufactured 546,799,000 cigars, valued at $35,000,000 and 2,767,000 cigarettes, valued at $55,000

An important influence in the development of Florida has been the railways and other facilities for transportation and communication In 1880 the total railway mileage was 518, but since that date it has increased steadily, in 1900 it was 3,255, and in 1925, 5,511 The largest system is the Atlantic Coast Line, consisting of railways built or consolidated by H B Plant and once forming a part of the "Plant System" of railways The railway with the next greatest mileage is the Seaboard Air Line The Florida East Coast railway is an important system also It was the product of one man's faith in the country, H M Flagler. Other important railways are. The Louisville and Nashville, the Georgia Southern and Florida, and the Charlotte Harbor and Northern. The total freight and passenger revenues for the parts of the systems operating in Florida were in 1925 $75,000,709, according to the report of the Florida railroad commission This commission has certain regulatory powers over all means of transportation and communication within the State In 1925 there were 210m of electric railways in operation, wholly as city transportation systems.

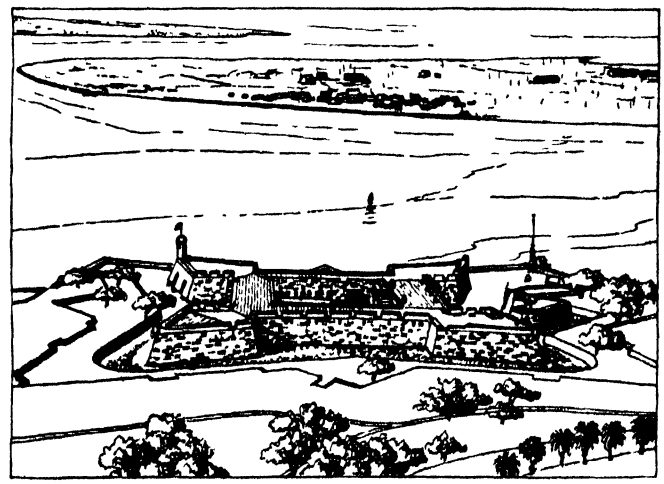
Florida's highway mileage on Dec. 31, 1926, according to U S Census figures, was 5,654 Of this number, 2,928m were earth and 2,725 were surfaced During the year 1926, 349m. of surfaced road were constructed.

In 1925, 2,328 vessels entered and 2,043 cleared from Florida ports. Of these 1,238 entered from Cuba and 1,175 cleared for that destination. The west coast ports were of chief importance in both import and export trade. For the import trade the four chief ports were: Jacksonville (with 436,930 cargo tons), Key West, Tampa and Miami; in the export trade Tampa led with 557,317 cargo tons; other ports being Key West, Pensacola and Fernandina. Within recent years much has been done by the national government, aided in some cases by the local authorities, to improve the harbours and to extend the limits of river navigation. In 1882 the Florida East Coast Line Canal and Transportation Co. was organized to develop a waterway from Jacksonville to Biscayne bay by connecting with canals the St. Johns, Matanzas and Halifax rivers, Mosquito lagoon, Indian river, Lake Worth, Hillsboro river, New river, and Snake creek; in 1908 this vast undertaking was completed, thereby opening a channel for light-draught boats. The drainage canals which connect Lake Okeechobee with the Atlantic ocean provide passage for light-draught boats between the two points

Some index of Florida's recent business growth can be gained from the following banking statistics. deposits in national banks in Jan 1920, $187,286,267; in Jan 1925, $375,042,947; in State banks and trust companies in Jan. 1920, $197,809,947, in Jan. 1925, $287,636,588.

HISTORY

The romance and the tragedies of the early history of Florida give it a unique place in the annals of the American States. Within 20 years after the first voyage of Columbus to the New World in 1492, an expedition was being organized to seek for a fabulous fountain of youth and for riches in the new and inviting land This expedition was followed by others seeking wealth or to establish the Christian faith among the savages. In turn these were followed by French Huguenots who were seeking a place of religious freedom, but the zeal of the Spaniards soon brought an unhappy end to their search Florida also has the honour of containing the oldest European settlement within the bounds of the original United States, as St Augustine was founded in 1565, 42 years before the English were successful at Jamestown The Spanish Council of the Indies claimed that since 1510 fleets and ships had gone to Florida, and Florida is shown on the earliest known map of the New World, the Cantino map of 1502 In 1513 Juan Ponce de Leon (*c.* 1460–1521), who had been with Christopher Columbus on his second voyage, and had later been governor of Porto Rico, obtained a royal grant authorizing him to discover and settle "Bimini"—a fabulous island believed to contain a marvellous fountain or spring whose waters would restore to old men their youth or, at least, had wonderful curative powers. Soon after Easter day he came in sight of the coast of Florida, probably near the mouth of the St. Johns river From the name of the day in the calendar, *Pascua Florida,* or from the fact that many flowers were found on the coast, the country was named Florida. De Leon seems to have explored the coast, to some degree, on both sides of the peninsula, and to have turned homeward fully convinced that he had discovered an immense island. He returned to Spain in 1514, and obtained from the king a grant to colonize "the island of Bimini and the island of Florida," of which he was appointed *adelantado* (civil and military governor), and in 1521 he made another expedition, this one for colonization as well as for discovery. He seems to have touched at the island of Tortugas, so named on account of the large number of turtles found there, and to have landed at several



BY COURTESY OF R S CAMBELL, ST AUGUSTINE

OLD FORT OF SAN MARCO, RENAMED FORT MARION, AT ST. AUGUSTINE
Begun by the Spaniards in 1656, this fortification successfully withstood repeated English and French assaults. It was here that the Indian chief Osceola, instigator of the second Seminole war, was confined before his permanent removal to Fort Moultrie

places, but many of his men succumbed to disease and he himself was wounded in an Indian attack, dying soon afterwards in Cuba Meanwhile, in 1516, another Spaniard, Diego Miruelo, seems to have sailed for some distance along the west coast of the peninsula The next important exploration was that of Panfilo de Narvaez In 1527 he sailed from Cuba with about 600 men (soon reduced to less than 400); he landed early in 1528, probably at the present site of Pensacola, and for six months remained in the country, he and his men suffering terribly from exposure, hunger and fierce Indian attacks In September, his ships being lost and his force greatly reduced in number, he hastily constructed a fleet of five boats, re-embarked, probably at Apalachee bay, and lost his life by having his boat blown out to sea while off the coast of Texas Only four of his men, including Nuñez Cabeza de Vaca, succeeded, after eight years of Indian captivity and of long and weary wanderings, in finding their way to Spanish settlements in Mexico Florida was also partially explored by Ferdinando de Soto (*q v*) in 1539–40 In the summer of 1559 another attempt at colonization was made by Tristan de Luna, who sailed from Vera Cruz, landed at Pensacola bay, and explored a part of Florida and (possibly) southern Alabama Somewhere in that region he desired to make a permanent settlement, but he was abandoned by most of his followers and gave up his attempt in 1561

The Huguenots.—In 1562, Jean Ribaut (1520–65), with a band of French Huguenots, landed first near St Augustine and then at the mouth of the St Johns river, which he called the River of May, and on behalf of France claimed the country, which he described as "the fairest, fruitfullest and pleasantest of all the world"; but he made his settlement on an island near what is now Beaufort, South Carolina In 1564 René de Laudonnière (d. *c* 1586), with another party of Huguenots, established Fort Caroline at the mouth of the St Johns, but the colony did not prosper, and in 1565 Laudonnière was about to return to France when (on Aug 28) he was reinforced by Ribaut and about 300 men from France On the same day that Ribaut landed, a Spanish expedition arrived in the Bay of St Augustine It was commanded by Pedro Menéndez de Avilés (1523–74), one of whose aims was to destroy the Huguenot settlement This he did, putting to death almost the entire garrison at Fort Caroline "not as Frenchmen but as Lutherans," on Sept 20, 1565 The ships of Ribaut were soon afterwards wrecked near Matanzas inlet, he and most of his followers surrendered to Menéndez and were executed Menéndez then turned his attention to the founding of a settlement which he named St Augustine (*q v*), he also explored the Atlantic coast from Cape Florida to St Helena and established forts at San Mateo (Fort Caroline), Avista, Guale and St Helena In 1567 he returned to Spain in the interest of his colony.

The news of the destruction of Fort Caroline and the execution of Ribaut and his followers was received with indifference at the French court, but Dominique de Gourgues (*c* 1530–93), a friend of Ribaut but probably a Catholic, so the widely accepted story goes, organized an expedition of vengeance, not informing his men of his destination until his three ships were near the Florida coast With the co-operation of the Indians under their chief, Saturiba, he captured Fort San Mateo in the spring of 1568 and on the spot where the garrison of Fort Caroline had been executed, he hanged his Spanish prisoners, inscribing on a tablet of pine the words. "I do this not as unto Spaniards but as to traitors, robbers and murderers" Feeling unable to attack St. Augustine, de Gourgues returned to France.

The Spanish settlements experienced many vicissitudes The Indians were hostile and the missionary efforts among them failed In 1586 St Augustine was almost destroyed by Sir Francis Drake, and it also suffered severely by an attack of Captain John Davis in 1665 Not until the last decade of the 17th century did the Spanish authorities attempt to extend the settlements beyond the east coast Then, jealous of the French explorations along the Gulf of Mexico, they turned their attention to the west coast, and in 1696 founded Pensacola When the English colonies of the Carolinas and Georgia were founded, there was constant friction with Florida The Spanish were accused of inciting the Indians to make depredations on the English settlements and of interfering with English commerce, and the Spanish were in constant fear of the encroachments of the English. In 1702, when Great Britain and Spain were contending in Europe, on opposite sides, in the war of the Spanish Succession, a force from South Carolina captured St Augustine and laid siege to the fort, but being unable to reduce it for lack of necessary artillery, burned the town and withdrew at the approach of Spanish reinforcements In 1706 a Spanish and French expedition against Charleston, South Carolina, failed, and the Carolinians retaliated by invading middle Florida in 1708 and again in 1722 In 1740 General James Edward Oglethorpe, governor of Georgia, supported by a naval force, made an unsuccessful attack upon St Augustine, two years later a Spanish expedition against Savannah by way of St Simon's island failed, and in 1745 Oglethorpe again appeared before the walls of St Augustine; but the Treaty of Aix-la-Chapelle in 1748 prevented further hostilities Pensacola, the other centre of Spanish settlement, though captured and occupied (1719–23) by the French from Louisiana, had a more peaceful history

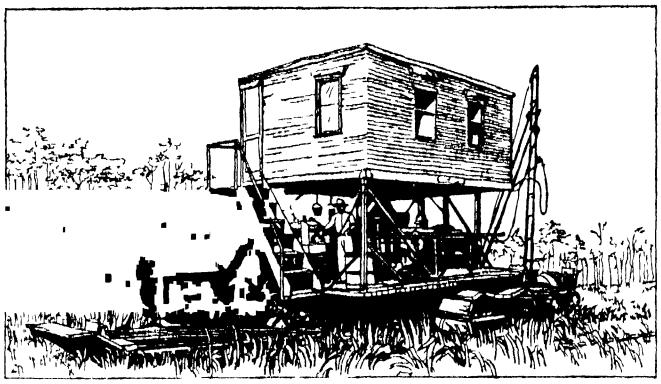
The Treaty of Paris and Cession to England.—By the Treaty of Paris in 1763 Florida was ceded to England in return for Havana The provinces of East Florida and West Florida were now formed, the boundaries of West Florida being 31° N lat (when civil government was organized in 1767, the northern line was made 32°28′), the Chattahoochee, and the Apalachicola rivers, the Gulf of Mexico, Mississippi sound, Lakes Borgne, Pontchartrain and Maurepas, and the Mississippi river A period of prosperity now set in Civil in place of military government was instituted, immigration began; and Andrew Turnbull, an Englishman, brought over a band of about 1,500 Minorcans (1769), whom he engaged in the cultivation of indigo at New Smyrna Roads were laid out, some of which yet remain; and in the last three years of British occupation the Government spent $580,000 on the two provinces Consequently, the people of Florida were for the most part loyal to Great Britain during the War of American Independence In 1776, the Minorcans of New Smyrna refused to work longer on the indigo plantations, and many of them removed to St Augustine, where they were protected by the authorities Several plans were made to invade South Carolina and Georgia, but none matured until 1778, when an expedition was organized which co-operated with British forces from New York in the siege of Savannah, Georgia In the following year, Spain having declared war against Great Britain, Don Bernardo de Galvez (1756–94), the Spanish governor at New Orleans, seized most of the English forts in West Florida, and in 1781 captured Pensacola.

Reversion to Spain.—By the Treaty of Paris in 1783 Florida reverted to Spain, and, no religious liberty being promised, many of the British inhabitants left East and West Florida A dispute with the United States concerning the northern boundary was settled by the treaty of 1795, the line 31° N. lat being established

Cession to the U.S.A.—The westward expansion of the United States made it highly desirable to have American ports on the Gulf of Mexico; consequently, the acquisition of West Florida as well as of New Orleans was one of the aims of the negotiations which resulted in the purchase of Louisiana in 1803. After the cession of Louisiana to the United States, the people of West Florida feared that that province would be seized by Napoleon. They, therefore, through a convention at Buhler's Plains (July 17, 1810), formulated plans for a more effective government When it was found that the Spanish governor did not accept these plans in good faith, another convention was held on Sept. 26 which declared West Florida to be an independent State, organized a government and petitioned for admission to the Union. On Oct 27, President James Madison, acting on a theory of Robert R. Livingston that West Florida was ceded by Spain to France in 1800 along with Louisiana, and was therefore included by France in the sale of Louisiana to the United States in 1803, declared West Florida to be under the jurisdiction of the United

States. Two years later the American Congress annexed the portion of West Florida between the Pearl and Mississippi rivers to Louisiana (hence the so-called Florida parishes of Louisiana), and that between the Pearl and the Perdido to the Mississippi Territory.

In the meantime war between Great Britain and the United States was imminent The American Government asked the



CLEARING A TRAIL THROUGH THE FLORIDA EVERGLADES WITH A COMBINED TRACTOR AND COMPRESSED-AIR DRILL

Spanish authorities of East Florida to permit an American occupation of the country in order that it might not be seized by Great Britain and made a base of military operations When the request was refused, American forces seized Fernandina in the spring of 1812, an action that was repudiated by the American Government after protest from Spain, although it was authorized in official instructions About the same time an attempt to organize a government at St Mary's was made by American sympathizers, and a petty civil war began between the Americans, who called themselves "Patriots," and the Indians, who were encouraged by the Spanish In 1814 British troops landed at Pensacola to begin operations against the United States In retaliation General Andrew Jackson captured the place, but in a few days withdrew to New Orleans The British then built a fort on the Apalachicola river, and there directed expeditions of Indians and runaway negroes against the American settlements, which continued long after peace was concluded in 1814 In 1818 General Jackson, believing that the Spanish were aiding the Seminole Indians and inciting them to attack the Americans, again captured Pensacola By the treaty of 1819 Spain formally ceded East and West Florida to the United States, the treaty was ratified in 1821, when the United States took formal possession, but civil government was not established until 1822.

Indian Affairs.—Indian affairs furnished the most serious problems of the new Territory of Florida Immediately after the cession of Florida to the United States, pressure was brought to bear upon Congress and the President to have the Seminole Indians removed and the country thrown open to settlement The Indians, who had been allowed to occupy their lands in peace by the Spaniards, could not understand why they should be forced to move to new lands west of the Mississippi; but they consented, by the Treaty of Fort Moultrie in 1823, to live within certain limits Conflicts followed, however, as the population increased, and a new demand was made to have the Indians removed By treaties made at Payne's landing in 1832 and Fort Gibson in 1833 the Indian chiefs agreed to exchange their Florida lands for equal territory in the western part of the United States. But a strong sentiment against removal suddenly developed, and the efforts of the United States to enforce the treaty brought on the Seminole War (1836–42), which resulted in the removal of all but a few hundred Seminoles whose descendants still live in southern Florida.

Secession.—In 1845 Florida became a State of the American Union. On Jan. 10, 1861, an ordinance of secession, which declared Florida to be a "sovereign and independent nation," was adopted by a State convention, and Florida became one of the Confederate States of America. The important coast towns were readily captured by Union forces—Fernandina, Pensacola and St. Augustine in 1862, and Jacksonville in 1863, but an invasion of the interior in 1864 failed, the Union forces being repulsed in a battle at Olustee on Feb 20, 1864 In 1865 a provisional governor was appointed by President Andrew Johnson, and a new State Government was organized The legislature of 1866 rejected the Fourteenth Amendment to the Federal Constitution, and soon afterwards Florida was made a part of the Third Military District, according to the Reconstruction Act of 1867. Negroes were now registered as voters by the military authorities, and another constitutional convention met in Jan and Feb., 1868. A factional strife in the dominant party, the Republican, threatened to break up the convention, but through the efforts of General George M Meade the differences were reconciled. In due time a constitution was framed and was ratified by the electors, and Florida passed from a quasi-military to a full civil government on July 4, 1868

Reconstruction.—The factional strife in the Republican party continued, a number of efforts being made to impeach Governor Harrison Reed (1813–99) The decisive year of the Reconstruction period was 1876 The canvassing board, which published the election returns, cast out some votes, did not wait for the returns from Dade county, and declared the Republican ticket elected George F Drew (1827–1900), the Democratic candidate for governor, then secured a mandamus from the circuit court restraining the board from going behind the face of the election returns, this was not obeyed and a similar mandamus was therefore obtained from the supreme court of Florida, which declared that the board had no right to determine the legality of a particular vote According to the new count thus ordered, the Democratic state ticket was elected By a similar process the board's decision in favour of the election of Republican presidential electors was nullified, and the Democratic electors were declared the successful candidates; but the electoral commission, appointed by Congress, reversed this decision. (*See* ELECTORAL COMMISSION) In 1879 the term of Simon B Conover, Republican senator from Florida, came to an end, and the election of Wilkinson Call placed the Democratic party in full control of the State and the State's representation in the national Congress. From that date, Florida was uniformly Democratic until 1928, when the Republicans carried the State for President and also elected a number of candidates for local offices In 1916 a contested primary election, which grew out of a new system of voting that permitted the voter to register a first and second choice, resulted in the nomination of Sidney J. Catts, as a Prohibitionist and in his election as governor, with this exception, all of the State's executives have been Democratic. The question of prohibition played a large part in State politics until the ratification of the Eighteenth Federal (Prohibition) Amendment by the Florida legislature Dec. 14, 1918.

Drainage and Internal Improvement.—Since the Civil War Florida has devoted much attention and money to drainage and internal improvement. By an act of Congress passed in 1850, the Federal Government turned over to the State practically all of the Everglades and other lands known as swamp or overflowed lands, with the provision that all proceeds from such lands be applied to their reclamation. The board of trustees for the internal improvement fund, created in 1855, had under its control, in 1879, about 13,000,000ac. of such land, from which grants and sales were made for the purpose of encouraging railway and drainage-canal construction Besides the various grants made to railway companies, the trustees in 1881 sold to Hamilton Disston, of Philadelphia, 4,000,000ac of swamp land at 25 cents per ac , in order to raise funds for internal improvement projects Between 1881 and 1896 a private company with large holdings in the Everglades attempted to dig a canal from Lake Okeechobee to the Gulf of Mexico, but the project had to be abandoned after overflows closed the canal in 1902. By the Drainage Act of 1905 the State board of drainage commissioners was created, with power to build canals, levees and dikes, to do other drainage work and to levy on the lands to be benefited taxes sufficient to maintain the work Under the board's control various drainage works were started, including six canals between Lake Okeechobee and

the Atlantic ocean to be used in draining the Everglades Little progress was made, however, until after 1910

In order to expedite the draining of the Everglades, the legislature in 1913 created the Everglades drainage district, consisting of about 4,200,000ac , and placed the work under a board of commissioners According to a report of the State engineer there were, in 1924, five main canals connecting Lake Okeechobee with the Atlantic and two others were under construction. At that time 427 miles of canal, using 14 locks, were in operation Such canals serve the double purpose of drainage and a passage way for light-draught vessels Much remains to be done, however, before the drainage of the Everglades is an accomplished fact The continuation of this work by the State and private interests, along with the construction of railways, has made possible the phenomenal development of southern Florida since 1920 The most outstanding feature in the recent history of the State was the great interest shown in Florida real estate during the period 1923–26, which resulted in many new developments and a consequent increase in wealth and population This movement, however, was checked in part, in 1926, when speculation reached the point of saturation

BIBLIOGRAPHY —The standard history is that by G R Fairbanks, *History of Florida* (1871) This should be supplemented by D G Brinton's *Notes on the Floridian Peninsula, Its Literary History, Indian Tribes and Antiquities* (1859) One of the best recent histories is that by C M. Brevard, *A History of Florida* (vol 1. 1924, vol 2 1925) Woodbury Lowery, *The Spanish Settlements within the Present Limits of the United States* (vol 1, 1901, vol 2, subtitle "Florida," 1905) is useful as a guide to monographic literature In vol 2 of Justin Winsor's *Narrative and Critical History of America* (1884) there is an excellent chapter by J G Shea on "Ancient Florida," to which a bibliography is appended R. L Campbell, *Historical Sketch of Colonial Florida* (1892), treats at length the history of Pensacola Useful monographs are H E Chambers, *West Florida and Its Relations to the Historical Cartography of the United States* (Johns Hopkins Studies in Historical and Political Science, series 16 No 5), W W Davis, *The Civil War and Reconstruction in Florida* (1913), and Herbert B Fuller, *The Purchase of Florida, its History and Diplomacy* (1906) The published collections of documents relating to the State are Buckingham Smith's *Coleccion de varios documentos para la historia de la Florida y tierras adyacentes* (1857), Benjamin F French's *Historical Collections of Louisiana and Florida* (1846–75), J T Connar's *Colonial Records of Spanish Florida* (1925), *Mississippi Provincial Archives*, and "Florida Historical Documents" in the *Gulf States Historical Magazine*, vol 6, pp 199–202 (1902). Recent books of description and travel are C D Fox, *The Truth about Florida* (1925), R H Barbour, *Let's Go to Florida* (1926), K L Roberts, *Florida* (1926), N O Winter, *Florida, the Land of Enchantment* (1918), and H Rhodes and M W Dumont, *A Guide to Florida for Tourists, with a Chapter on the Inland Waterways* (1912) Physical and economic conditions are discussed in a pamphlet (591 pp) published by the State Department of Agriculture—*Florida, a Pamphlet Descriptive of its History, Topography, Climate, Soil,* etc (1904), *All Florida* (1926) and *Florida To-day* (1925) by the Bureau of Immigration, State Department of Agriculture, *Florida, its Climate, Soil, Productions, and Agricultural Capabilities* (U S Department of Agriculture, 1882), *A Preliminary Report on the Soils of Florida* (U S Department of Agriculture, Division of Soils, Bulletin 13, 1898), Florida Geological Survey, 6th *Annual Report,* for 1912–13, which treats of the geography and vegetation of N Florida, and the volumes of the *Fourteenth Census of the United States* (for 1920) which treat of Agriculture and manufactures T. D A Cockerell's "West Indian Fauna in Florida" (*Nature,* vol 46), L. F. De Pourtales' "Flora and Fauna of the Florida Keys" (*American Naturalist,* vol 11), and C F Millspaugh's *Flora of the Sand Keys of Florida* (1907), a Field Columbian Museum publication, are of value. (J M. L)

FLORIDA BLANCA, DON JOSE MOÑINO Y REDONDO, COUNT OF (1728–1808), Spanish statesman, was born at Hellin, Murcia, on Oct 21, 1728 He was the son of a retired army officer He studied at Salamanca and practised as an advocate After a successful embassy to Rome, Florida Blanca succeeded Grimaldo as first minister to Charles III He regulated the police of Madrid, reformed many abuses, projected canals, took measures for the improvement of trade and agriculture, and encouraged learning, science and the fine arts The long-standing disputes with Portugal on the boundaries of the South American colonies were settled An agreement signed at San Ildefonso (Oct 1, 1771), was later followed by a treaty of alliance between the two powers signed at Pardo (Mar. 24, 1778). At the outbreak of war between Great Britain and the North American colonies, Florida Blanca advised a middle course, but Spain was drawn into the conflict in 1779 Florida Blanca was much under the influence of French *philosophes* and economic writers The French Revolution frightened him into reaction, and he advocated the support of the first coalition against France He retained his office for three years under Charles IV ; but in 1792, through the influence of the favourite Godoy, he was dismissed and imprisoned in the castle of Pampeluna Here he was saved from starvation only by the intervention of his brother He remained in seclusion till the French invasion of 1808 He was then nominated president of the central junta at Aranjuez He died at Seville on Nov 20 of the same year He left several short treatises on jurisprudence

See *Obras originales del Conde de Floridablanca,* edited, with biographical introduction, by A Ferrer del Rio, in the *Biblioteca de Rivadeneyra,* vol lix , and authorities quoted under CHARLES III. of Spain.

FLORIDOR [JOSIAS DE SOULAS, Sieur de Prinefosse] (d *c* 1671), French actor, was born in Brie early in the 17th century, the son of a gentleman of German family who had moved to France The son entered the French army, but left it for the theatre, where he took the name of Floridor His first Paris appearance was in 1640 Three years later he joined the company at the Hôtel de Bourgogne, where he played all the leading parts in tragedy and comedy and became the head of his profession He was a man of superb physique and excellent carriage, with a flexible and sonorous voice, and manners of rare distinction and elegance Louis XIV held him in particular esteem

FLORIN, the name of several coins of the continent of Europe and of two coins struck in England at different times The word comes through the Fr *florin* from the Ital *fiorino,* flower, Lat *flos, florem* Fiorino was the Italian name of a gold coin issued at Florence in 1252, weighing about 54 grains This coin bore on the obverse a lily, from which it took its name of "the flower," on the reverse the Latin name of the city *Florentia,* from which it was also known as a "florence" "Florin" and "florence" seem to have been used in English indiscriminately as the name of this coin The Florentine florin was held in great commercial repute throughout Europe, and similar coins were struck in Germany, other parts of Italy, France, etc

The English gold florin was introduced by Edward III in 1343, half and quarter florins being struck at the same time This gold florin weighed 108 grains and was to be current for six shillings It was found, however, to be over-valued in proportion to the silver currency and was demonetized the following year The florin did not appear in the English coinage until 1849, when silver coins with this name, having a nominal value of two shillings (one-tenth of a pound) were struck In 1887 a double florin or four-shilling piece was issued, but its coinage was discontinued in 1890. (*See* also NUMISMATICS)

FLORIO, GIOVANNI (1553?–1625), English writer, was born in London about 1553 He was of Tuscan origin, his parents being Waldenses who had taken refuge in England from persecution In 1578 he published a work entitled *First Fruits,* which was accompanied by *A Perfect Induction to the Italian and English Tongues* It was dedicated to the earl of Leicester Three years later Florio was admitted a member of Magdalen college, and became a teacher of French and Italian in the University of Oxford In 1591 appeared his *Second Fruits,* to which was annexed the *Garden of Recreation, yielding six thousand Italian Proverbs* These manuals contained an outline of the grammar, a selection of dialogues in parallel columns of Italian and English, and longer extracts from classical Italian writers in prose and verse Florio's Italian and English dictionary, entitled *A World of Words,* was published in folio in 1598. After the accession of James I , Florio was French and Italian tutor to Prince Henry, and afterwards to the queen. His *magnum opus* is the admirable translation of the *Essayes on Morall, Politike, and Millitarie Discourses of Lo Michaell de Montaigne,* published in folio in 1603 in three books, each dedicated to two noble ladies. A second edition in 1613 was dedicated to the queen Special interest attaches to the first edition from the circumstances that, of the several copies in the British Museum library, one bears the autograph of

Shakespeare—long received as genuine but now supposed to be by an 18th century hand—and another that of Ben Jonson This is one of the most famous of all translations, and, like all the great ones, cannot be called faithful to the letter of the original Full of idiomatic turns of phrase, and even of words of his own invention, it does not so much render Montaigne as make him live in the new language It was suggested by Warburton that Florio is satirized by Shakespeare under the character of Holofernes in *Love's Labour's Lost* He married the sister of the poet Daniel, and had friendly relations with many writers of his day Ben Jonson sent him a copy of *Volpone* with the inscription, "To his loving father and worthy friend, Master John Florio, Ben Jonson seals this testimony of his friendship and love" He died at Fulham, London, in the autumn of 1625

His translation of the *Essays* was issued (1892–93) in the Tudor Translations Series

See C P de Chambrun, *Shakespeare et Florio* (1916); L Chambrun, *Giovanni Florio* (1921).

FLORIS, FRANS, or more correctly FRANS DE VRIENDT, called FLORIS (1520–1570), Flemish painter Son of a stonecutter, Cornelis de Vriendt, who died at Antwerp in 1538, he began life as a student of sculpture, but afterwards gave up carving for painting At the age of 20 he went to Liége and studied with Lambert Lombard Following in the footsteps of Mabuse, Lambert Lombard had visited Florence, and caught the manner of Salviati and other pupils of Michelangelo and Del Sarto It was about the time when Schoreel, Coxcie and Heemskerk, after migrating to Rome and imitating the masterpieces of Raphael and Buonarroti, came home to execute Dutch-Italian works beneath the level of those produced in the peninsula itself by Leonardo da Pistoia, Nanaccio and Rinaldo of Mantua Fired by these examples, Floris in his turn wandered across the Alps and appropriated without assimilation the various mannerisms of the schools of Lombardy, Florence and Rome He came home and joined the guild of Antwerp in 1540 He is known to have illustrated the fable of Hercules in ten compositions, and the liberal arts in seven, for Claes Jongeling, a merchant of Antwerp, and adorned the duke of Arschot's palace of Beaumont with 14 colossal panels The earliest extant canvas by Floris is the "Mars and Venus ensnared by Vulcan" in the Berlin museum (1547), the latest a "Last Judgment" (1566) in the Brussels gallery Floris owed much of his repute to the cleverness with which his works were transferred to copper by Jerome Cock and Theodore de Galle He was engaged on a Crucifixion and a Resurrection for the grand prior of Spain when he died on Oct 1, 1570, at Antwerp.

FLORUS, Roman historian, flourished in the time of Trajan and Hadrian He compiled, chiefly from Livy, a brief sketch of the history of Rome from the foundation of the city to the closing of the temple of Janus by Augustus (25 B C) The work, which is called *Epitome de T Livio Bellorum omnium annorum DCC Libri duo,* is a rhetorical panegyric of the greatness of Rome Though often wrong in geographical and chronological details, it was much used in the middle ages In the mss the writer is variously given as Iulius Florus, Lucius Annaeus Florus, or simply Annaeus Florus From certain similarities of style he has been identified with Publius Annius Florus (*q v*) author of a Virgilian dialogue, of which the introduction has been preserved

The best editions are by O Jahn (1852), C Halm (1854), which contain the fragments of the Virgilian dialogue There is an English translation in Bohn's *Classical Library*.

FLORUS, IULIUS, poet, orator, and jurist of the Augustan age Horace dedicated to him two of his *Epistles* (i 3; ii 2), from which it would appear that he composed light lyrics. The statement of Porphyrion, the old commentator on Horace, that Florus himself wrote satires, is probably erroneous, but he may have edited selections from the earlier satirists (Ennius, Lucilius, Varro) He was one of the young men who accompanied Tiberius to Armenia He has been variously identified with Iulius Florus, orator and uncle of Quintilian's friend Iulius Secundus (*Instit* x. 3, 13); with the leader of an insurrection of the Treviri (Tacitus, *Ann.* iii. 40); with the *Postumus* of Horace (*Odes,* ii 14) and even with the historian Florus.

FLORUS, PUBLIUS ANNIUS, Roman poet and rhetorician, identified by some authorities with the historian Florus (*q v.*). The introduction to a dialogue called *Virgilius orator an poeta* is extant, in which the author (whose name is given as Publius Annius Florus) states that he was born in Africa, and at an early age took part in the contest of poets instituted by Domitian in honour of Capitoline Jove Having been refused a prize owing to the prejudice against African provincials, he left Rome and after travelling for some time set up at Tarraco as a teacher of rhetoric But he must have returned to Rome, for it is agreed that he is the Florus who wrote the lines quoted, with Hadrian's answer, by Spartianus (*Hadrian* 16) Twenty-six trochaic tetrameters, *De qualitate vitae,* and five graceful hexameters, *De rosis,* are also attributed to him Florus is important as being the first in order of a number of second century African writers who exercised a considerable influence on Latin literature, and also the first of the *poëtae neoterici* or *novelli* (new-fashioned poets) of Hadrian's reign, whose special characteristic was the use of lighter and graceful metres (anapaestic and iambic dimeters), which had hitherto found little favour

The little poems will be found in E Bahrens, *Poetae Latini minores* (1879–83), for an unlikely identification of Florus with the author of the *Pervigilium Veneris* (*q v*) *see* E H O Muller, *De P Annio Floro poeta et de Pervigilio Veneris* (1855) and, for the poet's relations with Hadrian, F Eyssenhardt, *Hadrian und Florus* (1882), *see* also F Marx in Pauly-Wissowa's *Realencyclopadie,* 1 pt 2 (1894).

FLOTATION: *see* COMPANY PROMOTION

FLOTATION PROCESS: *see* METALLURGY

FLOTOW, FREIHERR FRIEDRICH FERDINAND ADOLF VON (1812–1883), German operatic composer, was born on his father's estate at Teutendorf, Mecklenburg, on April 27, 1812. His first real success was in Paris with *Le Naufrage de la Méduse* at the Renaissance Théâtre in 1838 Greater success, however, attended his later works, *Alessandro Stradella* (1844), *Martha* (Vienna, Nov 25, 1847), *Die Grossfurstin* (1850), *Indra* (1853), *Rubezahl* (1854), *Hilda* (1855), *Albin* (1856) and *L'Ombre* (1870). He died on Jan 24, 1883, at Darmstadt

See *Friedrich von Flotows Leben* (1892), by his widow

FLOTSAM, JETSAM and **LIGAN,** in English law, goods lost at sea, as distinguished from goods which come to land, which are technically designated *wreck* (*q v*) Jetsam (the same word as *jettison*) is when goods are cast into the sea and there sink and remain under water, flotsam is where they continue floating on the surface, ligan (or *lagan*) is where they are sunk in the sea, but tied to a cork or buoy in order to be found again Flotsam, jetsam and ligan belong to the sovereign in the absence only of the true owner Wreck, on the other hand (*i e*, goods cast on shore), was by the common law adjudged to the sovereign in any case, because it was said by the loss of the ship all property was gone out of the original owner (*See* WRECK.)

FLOUNDER, a name given generally to flat fishes, other than soles, and in England particularly to *Pleuronectes flesus,* which range from northern Europe to the Mediterranean, and often enter fresh water *P stellatus* of the Pacific coast of North America is a related species In America the name is given to several species of flat fish, *e g*, the winter flounder (*Pseudopleuronectes americanus*) and the summer flounder (*Paralichthys dentatus*)

FLOUR AND FLOUR MANUFACTURE. Flour is defined as the fine, clean, sound product made by bolting wheat meal The word is used in a less definite sense of other cereals and even non-cereals or other substances in a finely powdered state, though in these cases it is usual to use such terms as bean, rice, potato or other flour The term so defined is generic and covers a wide range of products differing by reason of the variety or form of wheat used in their manufacture, or by reason of certain distinctive qualities required for several purposes

The modern miller usually provides many types and grades of flour, each in the highest degree suitable for certain purposes This specialization has led to the modification of older milling processes and the adoption of new ones, to meet the demands for cleaner, whiter and better bread-stuffs, as well as owing to the

necessity for producing these better flours from wheats differing fundamentally from those available 50 years ago

Bread Flours.—As compared with wheat-flour, all other materials used for making bread are of secondary importance. Rye bread is consumed in some of the northern parts of Europe and is popular in many parts of the United States, and breads commonly called corn-pone, hoe-cake, Johnny cake, made from corn-meal are largely eaten in the Southern States and less generally throughout the corn belt In southern Europe the meal of various species of millet is used and in India and China durra and other cereal grains are baked for food Buckwheat is employed in Russia, Holland and the United States, and in South America the meal of the tapioca plant, the flour of peas, beans and other leguminous seeds is also baked in cakes But, excepting rye, none of these substances is used for making vesiculated or fermented bread, for only wheat and rye yield flours which, mixed with water, form doughs capable of satisfactory aeration or leavening

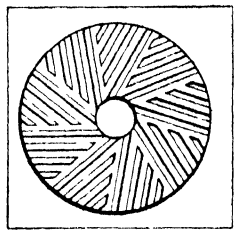


FIG 1.—MILLSTONE FOR GRINDING WHEAT

Aside from its high nutritive value, due to its starch and gluten or protein content, and to a less degree to the mineral substances present, the most important characteristic of wheat flour is its capacity, when made into a dough, to enmesh gas, thus forming an open-textured, spongy, light bread The gas formed either by the use of yeast as a leavening agent, or by the chemical reaction between an acid ingredient and bicarbonate of soda, is carbon dioxide (CO_2) Gas required for inflating the dough is produced by the growth of yeast Yeast is a plant requiring food, and it must have sugar, nitrogenous matter and mineral salts in forms which it can assimilate, all flours contain some of these necessary yeast foods They also contain certain enzymes, which may be called generically diastase When dough is made these enzymes begin to operate on the starch of the flour, converting some of it, by stages, into sugar The limiting factor in the quantity of gas evolved during panary fermentation is frequently a shortage of yeast-food, for example, the quantity of pre-existing sugar is insufficient, particularly if the proportion of yeast used is substantial and a prolonged fermentation is required Therefore the yeast depends largely, and in the later stages of fermentation exclusively, for its saccharine food on the sugar produced in the dough by diastatic action Modern bakery practice, in which all the operations between the mixing of the dough and the removal of the bread from the oven are performed to a definite time schedule, will not wait on the development of sugar in sufficient quantity to feed the growing yeast Under certain conditions the addition of sugar or of special sugars made from corn starch is good practice, but it is preferable to use a highly diastic malt extract which produces sugar as the yeast uses it, in any case the yeast requires a sufficiently mixed food which includes some form of assimilable nitrogenous matter (*See* BREAD and BREAD MANUFACTURE)

Baking Powder Leavening Agents.—Much of the bread baked in the home is of the hot bread or biscuit variety and is made by adding chemical leavening agents to the flour and water, or milk mixture Baking powders are used in very large quantities in the production of biscuits, cakes and special forms of bread commonly known as doughnuts, pancakes, etc The formulae for baking powders vary somewhat, but all depend upon the release of carbon dioxide.

TYPES OF FLOUR

Self-rising Flour.—In recent years millers have added the chemical reagents necessary to the evolution of carbon dioxide gas directly to their flour The proportion of the alkaline body, bicarbonate of soda, is generally 1% of the flour Theoretically, a quantity of the acid body should be used just sufficient to neutralize the bicarbonate of soda, but in practice it is desirable and usual to use slightly more of the acid body. In 1928 the acid substance used, in self-rising flours is generally acid phosphate of lime In recent years the manufacture of this chemical product has been very greatly improved and it is now excellent as to purity and constitution. When the finished self-rising flour contains 1% of bicarbonate of soda, from 1½% to 2¼% of this phosphate should be used

In the making of bread the growth of the yeast and the evolution of gas was a relatively long process, ranging from 3 to 20 hours Modern practice has, however, speeded up the fermentation process until the usual period of gas production is not more than four hours While these processes are proceeding the flour as dough is being gradually rendered capable of easy distension and gas retention It follows that the constitution and characteristics of the flour used must conform to the conditions as to time, temperature and proportion of yeast used: so that there is no fixed standard of excellence in flour which can be always measured by any known factor, *e g*, the percentage of nitrogenous matter insoluble in water On the contrary, widely differing characteristics are required, which the miller, as a specialist, must know and satisfy So far as self-rising flour is concerned, he knows that the evolution of gas is rapid, and that the flour as dough must be capable of rapid distension and good gas retention. Therefore the wheats used in the manufacture of such flour differ substantially from those used for the manufacture of bread flours, and even in the manufacture of the latter regard must be paid to the conditions of time and temperature and to the sort and proportion of yeast used These considerations have led to many refinements of manufacture and to the most modern developments of milling

In Great Britain the type of bread-stuff consumed has changed to a substantial extent and has been affected by the increase in the number of tea-shops and the growth of the "tea" habit, that is to say, while the consumption of bread per head of the population has declined, the consumption of cakes, scones and "small goods" has greatly increased The consumption of flour and wheatmeal per head of the population appears to have been stationary in recent years in Great Britain, and stands at 227 lb per head of the population per annum In the United States until 1900 this was also true, standing at about 224 lb, but then it declined and seems now to be about 176 pounds In France the figure appears to be much higher than in either Great Britain or America

Brown Bread Flours.—The consumption of brown bread or whole-wheat bread appears to have varied little in recent years, although there is at present more interest in whole-wheat breads "Wheatmeal" is not defined in Great Britain It may be the entire product obtained by grinding cleaned wheat, and if designated whole wheatmeal it should be the 100% article, but it is usual and legitimate to describe as wheatmeal either the 100% article or the product from which bran equalling 5% to 10% of the whole has been abstracted In the United States the nomenclature used is different There the 100% is called Graham flour and the terms whole-wheat or entire wheat-flour connote a meal from which a portion of the bran has been removed

Numbers benefit by the presence of bran or "roughage" in their food, and a proportion of whole-wheat bread is widely recommended. During the World War it was ascertained that brown flours formed 5% of the total flours consumed in Great Britain This group of bread-stuffs comprises certain well-known proprietary flours that are not whole-meal, and it is safe to say that wheatmeals then formed only from 2% to 3% of the total flours consumed There is no reason to think (1928) that this proportion has been substantially increased either in Great Britain or the United States Wholemeals remain much discussed.

Biscuit Flours.—For the manufacture of biscuits (crackers) certain types of flour are required, which differ materially from those used for bread There are very many kinds of biscuits, and specialization as to the types of flour required for them is carried to great lengths

WHEAT

Wheat as Raw Material.—The embryo or germ from which the new plant originates forms from 1½% to 2% of the wheat berry The endosperm is the food upon which the young plant lives till it is able to obtain its sustenance from the soil and air. The endosperm in its original form cannot, however, be assimi-

lated by the embryo, and certain enzymes in the presence of moisture gradually bring about the necessary changes As a consequence the endosperm becomes liquid, and the bran functions as a container to it This bran is very resistant to disintegration and can be found in the soil as an empty sac weeks or months after sowing

The miller essentially divides wheat into two products, flour and offal, though there are several grades of each. The embryo or germ is sometimes regarded as a third product, but actually it goes into the two named. Until modern methods of milling were invented it was never obtained as a separate product, and even to-day it is impossible to separate more than about ¼ of the whole, that is to say, more than about ¼ of the 2% contained in the wheat berry. Germ, because of its oily nature, is particularly resistant to disintegration. Pressure applied either by millstones or rolls may flatten the particles and express some of its oil from the germ into the flour; but it is an error to suppose that flours manufactured by millstones contained the germ, and that those manufactured by modern methods do not Formerly the germ went mainly or wholly into the by-products, to-day some of it is extracted as substantially a separate product and is added, after cooking (which is necessary), to white flour to form certain special flours, *e g*, Hovis, a well known English product The remainder goes mainly or wholly into the by-products of milling Flours containing raw germ will not remain sound under trying conditions for a considerable period The enzymes provided by nature to convert the endosperm into plant food reside mostly in or near the embryo or germ, and their activities have to be controlled or nullified in preparing the germ for use in bread, but ways have been devised whereby to some extent it can be included in certain flours

Wheats and the Wheat Berry.—There are several races and very many varieties of wheat, some hard, some soft some possessing so-called red bran, others white bran, some yielding white flours, others yellow flours, some growing and maturing rapidly, others slowly On arrival at the mill their moisture content varies from 9% to, say, 20% Natural conditions of soil and climate enter into the selection of the varieties chosen for cultivation, and when a mill is situated in a great wheat-growing district the types of wheat available for its economic use may not differ widely; nevertheless, there are diversities in their constitution and character But when, as in Great Britain, the wheats come from all parts of the world in an irregular supply, the miller has somehow to manufacture flours of regular quality from raw material of very great diversity

The miller divides the berry essentially into two products, flour and branny husk The bran is made up of several layers For present purposes it is unnecessary to deal with other than two of them The outer skin (epidermis) is, to some extent, separated from the inner layers during the processes of milling, and is the principal constituent of the material known to millers as "bee's wing," a name indicative of its appearance. This bee's wing has a very high fibre content and is of low or little food value.

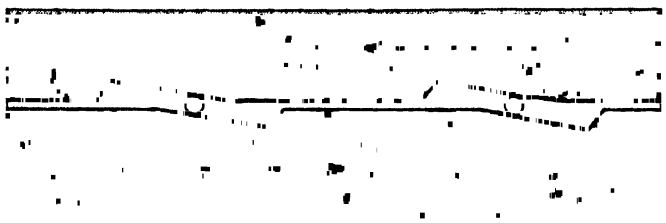


FIG 2.—MILLSTONES RUNNER AND BEDSTONE FACE

On the inner side of the bran there is a layer of rectangular cells known as the aleurone cells, of higher nutritive value than the bran. Theoretically wheat should yield much more flour than millers usually extract. Hence, if any attempt were made in commerce to increase the extraction, it is the inner side of the branny husk which should be attacked, not the outer one. When wheat was passed between millstones, it was principally the epidermis which was removed and passed as bran powder into the flour; the aleurone cells were left then, as they are now, on the finished bran. The addition of such powdered material to flour darkened it and had some effect in lowering its food value

All wheats, moreover, have a crease. This greatly impedes an easy and satisfactory separation of wheat into its component commercial parts. It is also a receptacle for dust and dirt In the early days of modern milling, millers attempted to split each berry down the crease and obtained a very dark product known as crease flour or crease dirt This attempt proved to be a failure A pair of fluted rolls, 60 in long, grinds as a normal feed about 50,000,000 berries of wheat per hour, and it proved impossible to split each berry, or even most of them, in the desired way Instead, wheat washing was introduced The berry, furthermore, is furnished at one end with "hairs of beard" (which must not be confounded with the awns attached to the glumes), and these hairs have also to be removed by the miller

Constitution of Flour.—The chemical constitution of flour may be stated as follows.—

Starch	65 to 70%
Proteins	9 to 14%
Cellulose and fat	1%
Sugars	2½%
Mineral matter (ash)	½%
Water	13 to 15%

Actually, in exceptional cases, there are deviations beyond these limits The principal proteins are gliadin and glutenin When flour is made into a dough these two proteins constitute at least 80% of the material known as gluten They are colloidal bodies and are of the greatest importance It is wrong to say that very white bread is pure starch or relatively very starchy, for colour of crumb is largely due to the refraction and reflection of light, and the crumb of a loaf to be very white and bright must be well aerated, without a substantial or large proportion of these proteid bodies satisfactory aeration is impossible

The proportions of cellulose and ash present in flour are largely under the control of the miller The cellulose is sometimes described as woody fibre, and by excluding particles of branny husk the proportion present of this indigestible matter is low The ash consists principally of phosphates of potash and to a much smaller extent of phosphates of magnesia and lime, with traces of other constituents The proportion of ash may be as low as 0 35% in the highest grades of flour or may rise to, say, 1% in the commercially lowest grades In no case is the presence of calcium salts of substantial significance, and this applies to wheatmeals also The form in which these constituents are combined in wheat has not been definitely ascertained, but if such salts may be divided into two groups, organic and inorganic, they are at that stage mainly or wholly organic, but become largely inorganic as a result of inorganic action during the milling and bread making processes

MILLING PROCESSES

Milling processes may be conveniently divided into two stages, (1) the cleaning and conditioning of wheat and (2) the separation of husk from kernel Stated in these terms, milling may appear to be a simple process, actually it is a complicated one and, although modern milling developments have been in the direction of simplification, the diagram or flow sheet of a large modern mill would probably be unintelligible except to those trained in the technics of milling From the economic or technical point of view the amount added by milling to the value of the raw material is the measure of the merit of the work involved.

Wheat Cleaning and Conditioning.—The extraneous matter found in wheat consists principally of other cereals, seeds of many kinds, shapes and sizes, stones, chaff, straw, dust and dirt (earth). To extract these, many devices are employed Sieves of perforated metal can extract substances either larger or smaller than wheat But wheats differ so much as to size and shape of berry that better instruments than sieves are also necessary Cylinders covered on their inner side with holes of varying sizes bored in zinc provide means of making more precise separations Discs so bored rotating in a body of wheat are also employed.

Ascending currents of air capable of precise regulation are passed through descending showers of wheat, and carry away particles which by reason of their shape or compactness of particle can be so separated Wheat is scoured and brushed in various ways One well-known machine consists essentially of a cylinder, clothed on its inner side with emery, beaters revolving on a shaft serve the double purpose of scouring the wheat against the emery surface and of passing it through the length of the cylinder

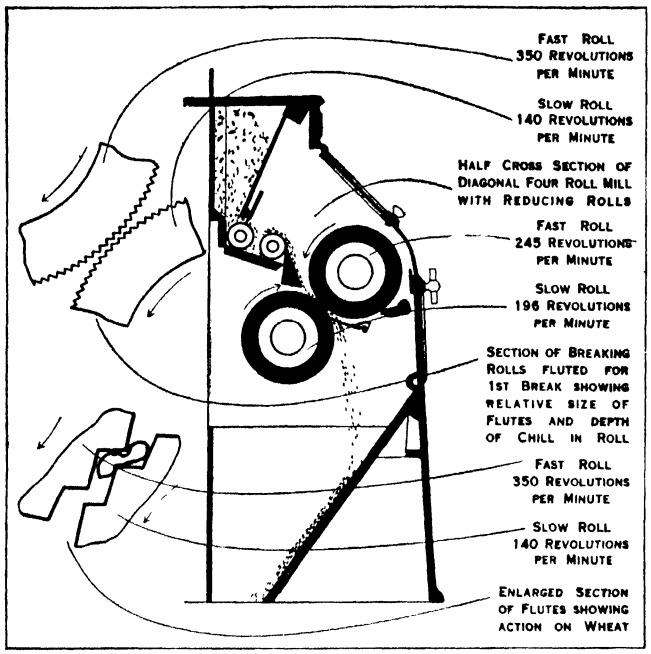


FIG 3 —HALF CROSS-SECTION DIAGONAL ROLLER MILL (ENGLISH PRACTICE)

Conditioning is an English term, in the United States a somewhat similar operation is called tempering Essentially it means that the physical condition of any given wheat is adjusted so that optimum separations of husk from kernel can be made Sometimes water is added, sometimes it is abstracted. Adjustments must be made to suit the wheat under treatment, the conditions as to atmosphere and milling machinery subsequently used, and the flours to be produced The factors employed are water, time and temperature The methods of conditioning are still in the process of evolution. The results obtained by conditioning are mainly or wholly physical.

Grinding.—Roller mills are almost invariably employed for grinding to-day When millers attempted at one operation to perform the whole of the grinding required, millstones were employed This involved the use of friction, very great in amount and intensity· one passage between millstones involved at least 4 ft of rough handling. Even when the wheats used were soft or mellow and therefore relatively resistant to disintegration, some of the husk of the wheat was reduced to powder. The Hungarians grew wheat of excellent quality, but the grain was hard and its skin friable They therefore began, about 60 years ago, to use roller mills In other parts of Europe and in the eastern United States the wheats available were then mellow and the necessity for relatively gentle grinding was not great. But when the States of the north-west and the western provinces of Canada were developed, the varieties of wheat found to be suitable were hard and had friable skins Hence the American millers adopted the new Hungarian methods and British millers were compelled to follow suit, for the ultimate users and consumers of flour would not accept flour or bread containing a large proportion of powdered husk For these reasons gradual reduction by roller mills superseded the sudden death methods of grinding wheat by millstones

A pair of cylindrical rollers, running at the point of contact in the same direction, nip and grind their feed at one point only in their circumferences. But a release of endosperm particles from the branny husk, and not mere crushing, being the object desired, the two rolls forming a pair are made to revolve at different speeds This differential varies with the stage of milling Furthermore, to effect optimum separations of husk from kernel it is necessary to obtain during the earlier stages of actual milling the endosperm particles in granular form To effect this the rolls used in those stages are corrugated The number and shape of these corrugations or flutes involve complicated technical points The numbers range from 9 to 26 per in of the roll's circumference Still further to improve the separations the flutes are cut at varying angles in relation to the rolls' axes.

In conformity with the principle of gradual reduction, no attempt is made to obtain finished bran at one grinding; on the contrary, the wheat is broken down on the roller mills, known as the breaks, gradually by successive stages These now number three, four or five, occasionally in some parts of the world six are used Generally, millers aim to make as little flour as possible on the breaks, but some is made. The commercial article known as bran is separated from the stock, leaving the last break The breaks as a stage of the milling process yield as finished products flour equalling from 8% to 18% of the original cleaned wheat and bran equalling from 10% to 15% of it The remainder exists at that stage as granular products, known as middlings and semolina These contain particles of pure endosperm, particles of pure husk and other particles consisting of endosperm with husk attached The means of separating these constituents will be described in a succeeding paragraph

Ultimately, to resolve these intermediate products into finished flour and finished husk (known commercially in Great Britain as offals and in North America as feed) further grinding by rolls is required These are known technically as reduction rolls or reductions, and generally have either smooth surfaces or very fine flutes ranging from 70 to 120 per in of the roll's circumference The speed and differential are adjusted to the work to be done, but the principle of gradual reduction is employed at these stages also The central idea of such grinding is a release of endosperm particles from husk In the case of particles consisting of endosperm only, it is desirable to reduce them in size by grinding In no case should granular particles, however fine, be merely crushed

Bolting.—This term in modern milling has a generic significance In its simplest form it means separating by means of a sieve Sieves are used largely in milling, they sort by size Frequently several sieves are superimposed one above another to form the milling machine known as the plansifter Though the principle of the plansifter is simple, it required a generation of experiment before a machine acceptable to millers generally was developed. Another form of bolting machinery is the octagonal, hexagonal or round reel which revolves at a slow speed. Here also separations are made according to size of particle A framework is mounted on a central slightly inclined shaft The framework is clothed with wire or silk cloth and the material to be separated is passed into the interior of the reel, whence it passes either through the cover or over the tail end of the reel Another form of bolting is performed by the centrifugal In this machine there is a reel or cylinder, generally hexagonal, revolving slowly and covered with silk or wire cloth Inside are beaters revolving quickly which are set to throw the stock against the cover and to move it longitudinally Primarily this also performs separations according to size of particle, but to some extent it sorts according to compactness of particle The same thing can be said of the plansifter, but any such sorting depends on a nice adjustment of sieve space to the quantity of feed treated After each grinding, whether by break or reduction rolls, some sort of separation by one or another of these bolting methods is performed, and the divisions and sub-divisions of stock cause complexity The meshes used vary from 10 to 140 per lineal inch.

PURIFYING AND BLEACHING

Purifying.—In a technical sense purifying connotes separations of the granular products known as semolinas and middlings according to compactness of particle For this purpose the

machines known as purifiers have been designed and built Before sorting by compactness of particle can be performed, sorting by size of particle is necessary, and must be carried out in great detail. There are various forms of this purification Generally there is a sieve divided into a number of sections, each one having above it a separate air compartment Through the sieve and each air compartment a current of air, under control as to intensity, is drawn The best particles pass through the meshes of the sieve, some are held in suspension on the sieve and are floated over its end, others are caught in receptacles placed above the sieve

Bleaching.—The colouring matter of both flour and carrots is carotin, though there is less of it present in flour than in carrots As a constituent of flour it seems to serve no useful purpose, and generally consumers do not like bread which is even moderately yellow On the other hand, some farmers prefer, for some reason or another, to grow those varieties of wheat which, on milling, yield yellow, sometimes intensely yellow, flour. If such flour be exposed to the atmosphere for a sufficient time it becomes whiter, the oxides of nitrogen which exist in the atmosphere entering into combination with the carotin to remove or diminish its yellowness In the processes of bleaching flour this is effected by artificial means A small current of air is pumped through a chamber in which flaming electrical discharges are produced intermittently As a consequence, nitrogen peroxide is produced, and this, mixed with the excess air, is passed into the flour and oxidizes the colouring matter Flour thus treated may contain up to four parts per million of residual nitrites This process has been examined at great length in the law courts and elsewhere and found to be innocuous to the ultimate consumer of bread-stuffs Bleached flours must however be so labeled if intended for sale in the United States.

Minute proportions of benzoyl peroxide will also bleach flour, and so will traces of nitrogen trichloride These substances have been very closely investigated and are permitted in several countries A departmental committee appointed by the British Ministry of Health has advised against their use but they have not been prohibited in Great Britain The development of new processes for the bleaching of flour is still in an active state of investigation The question of the merits of the natural aging of flour versus bleaching and the use of "chemical substances" as yeast foods or as flour or bread "improvers" or enrichment mediums will probably remain a subject of controversy until more is definitely known of the factors which determine flour quality The physiological side of the problem has not been the subject of extensive investigation in the light of the new knowledge of nutrition, and this too will probably remain in the field of controversy until scientific opinion is more in accord (*See* GRAIN PRODUCTION AND TRADE, SEMOLINA, MIDDLINGS, etc.) (A E HU, H E BA)

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FLOUR BEETLE, a minute weevil or beetle of the *Tenebrionidae* which infests flour, meal, etc. The eggs develop rapidly from minute larvae into beetles which feed on flour and other cereals and also do considerable damage by boring holes into wood *See* COLEOPTERA

FLOURENS, GUSTAVE (1838–1871), French revolutionary and one of the most romantic figures of the Commune, was born on Aug. 4, son of Pierre Flourens (*see* below). Gustave was trained by his father to succeed him, and had a brilliant scientific career up till his father's death in 1867, when the Collège de France, to which his evolutionary theories and his republican opinions were equally objectionable, abruptly signified that it had no further use for his services. Flourens indignantly left the country and went to Crete, where he joined the ranks of the insurrection against Turkey In this hard guerrilla warfare he gained his chief military experience, and acquired such prestige among the Cretans that he was chosen president of the delegation elected by Crete in 1868 to sit in the Hellenic parliament Had it been admitted (*see* TURKEY *History*), war between Greece and Turkey might well have resulted, the Greek government solved their difficulties by kidnapping Flourens and sending him to France, while they turned his colleagues back to Crete He then carried on republican propaganda in Naples till he was imprisoned, and in France, where he was dangerously wounded in a duel with Paul de Cassagnac At the funeral of Victor Noir (Jan 12, 1870) he attempted with his usual impetuosity, to lead an insurrection, but was thwarted by Rochefort, Delescluze, and Blanqui (*qq v*). he did in fact attempt a rising on Feb 7, which collapsed at once, and he was condemned to imprisonment in a fortified place During the siege of Paris he was ardently patriotic and commanded, first five battalions raised in Belleville, then a corps of tirailleurs Together with 23 other *chefs de bataillon* he overturned the government on Oct 31, 1870, charging it with treachery, but as he received support from no politician but Blanqui, withdrew from the hotel de ville after negotiation On the outbreak of the Commune (March 18, 1871) Flourens was elected for the 19th and 20th *arrondissements* and made a colonel He attempted by a personal example of bravery and devotion to diminish the incoherence and disorder around him he exposed himself too rashly at Rueil in the sortie of April 3, was captured, and killed while a prisoner by a sabre cut from an officer

See the *Grand Dictionnaire, etc., Larousse* (1869 etc.) *s v*

(R W P.)

FLOURENS, PIERRE (1794–1867), French physiologist, was born at Maureilhan, near Béziers, on April 15, 1794 After taking his M D at Montpellier, Flourens began physiological research in Paris and in 1822 published his *Recherches expérimentales sur les propriétés et les fonctions du système nerveux dans les animaux vertébrés,* in which he, from experimental evidence, sought to assign their special functions to the cerebrum, corpora quadrigemina and cerebellum He was chosen by Cuvier in 1828 to deliver for him a course of lectures at the Collège de France In 1832 a professorship of comparative anatomy was created for him at the museum of the Jardin In 1833 Flourens, in accordance with the dying request of Cuvier, was appointed a perpetual secretary of the Academy of Sciences, and in 1838 was returned as a deputy for the arrondissement of Béziers In 1840 he was elected, in preference to Victor Hugo, to succeed J F Michaud at the French Academy, and in 1846 he was created a peer of France In 1847 Flourens directed the attention of the Academy of Sciences to the anaesthetic effect of chloroform on animals At the revolution of 1848 he withdrew completely from political life, and in 1855 he accepted the professorship of natural history at the Collège de France He died at Montgeron, near Paris, on Dec 6, 1867

Besides numerous shorter scientific memoirs, Flourens published *Expériences sur le système nerveux* (1825), *Cours sur la génération, l'ovologie, et l'embryologie* (1836). *Analyse raisonnée des travaux de G Cuvier* (1841), *Buffon, histoire de ses travaux et de ses idées* (1844), *Fontenelle, ou de la philosophie moderne relativement aux sciences physiques* (1847), *Oeuvres complètes de Buffon* (1853), *De la longévité humaine* (1854), *Histoire de la découverte de la circulation du sang* (1854), *Cours de physiologie comparée* (1856), *De la vie et de l'intelligence* (1858), *De la raison, du génie, et de la folie* (1861); *Examen du livre de M Darwin sur l'Origine des Espèces* (1864) For a list of his papers *see* the Royal Society's *Catalogue of Scientific Papers*

FLOWER, SIR WILLIAM HENRY (1831–1899), English biologist, was born at Stratford-on-Avon on Nov 30, 1831 He took his M B at London in 1851, and went out to the Crimea as assistant-surgeon On his return he became a member of the surgical staff of the Middlesex hospital, London, and in 1861 curator of the Hunterian museum of the Royal College of Surgeons. In 1870 he also became Hunterian professor, and in 1884 was appointed to the directorship of the Natural History Museum

at South Kensington where he endeavoured to satisfy the demands of both the public and the student He died in London on July 1, 1899 He made valuable contributions to structural anthropology and to the comparative anatomy of mammals

His chief publications are *Diagrams of the Nerves of the Human Body* (1861), *The Osteology of the Mammalia* (1870); *Fashion in Deformity* (1881), *The Horse: a Study in Natural History* (1890), *Introduction to the Study of Mammals, Living and Extinct* (1891); *Essays on Museums and other Subjects* (1898)

See C J Cornish, *Sir W H Flower* (1904), and R Lydekker, *Sir William Flower* (1906).

FLOWER, a term popularly used for the blossom of a plant, and so by analogy for the finest part or aspect of anything Here it is dealt with only botanically. The flower is characteristic of the highest group of plants—the flowering plants (Phanerogams)—and is the association of more or less leaf-like organs which are concerned with the production of the seed In modern botany the group is often known as the seed-plants or Spermophyta (*see* Angiosperms and Gymnosperms) As the seed develops from the ovule, fertilised by the pollen, the essential structures for seed-production are the pollen-bearer or *stamen* and the ovule-bearer or *carpel* In comparative morphology, these are known as sporophylls because they bear the microspores (pollen-grains), developed in the microsporangia (pollen-sacs) or the megaspore, contained in the megasporangium (ovule) In the more primitive gymnosperms (*q v*) the micro- or mega- sporophylls are generally associated in separate cones, to which the term "flower" has been applied But it is to more definite and elaborate structures in the higher angiosperms (*q v*) that "flower" generally refers.

Bracts.—Flowers are produced from flower-buds in the axils of leaves called *bracts;* "bract" is properly restricted to the leaf from which the primary floral axis arises, while leaves which arise between the bract and the flower are *bracteoles* Their arrangement is similar to that of foliage leaves In many cases, bracts protect the young flower, but they are sometimes undeveloped, and usually fall off early Sometimes, especially with bracteoles, no flower-buds arise in their axils At the base of the general umbel in umbelliferous plants is often a whorl of bracts, the *general involucre*, while *partial involucres* or *involucels* are found at the base of the umbellules In Compositae the involucre surrounds the head of flowers (fig 1 *i*) When bracts become united, the outer ones often do not produce flowers A sheathing bract or *spathe,* enclosing one or several flowers is common among monocotyledons and may, in some palms, reach 20 ft. in length and enclose 200,000 flowers The spathe may be coloured (*Anthurium*) or white (arum lily, *Richardia ethiopica*) In grasses, the outer scales (glumes) of the spikelet are sterile bracts (fig 2 *gl*) Bracts may be changed into leaves (phyllody)

Inflorescence.—The arrangement of flowers on the axis is called the *inflorescence* The primary axis of the inflorescence is the *rachis;* its branches, when present, are *peduncles,* which in turn may give rise to *pedicels* A flower having a stalk is pedunculate or pedicellate; one with no stalk is sessile To obviate any confusion, it is common to speak of the rachis as the *primary* floral axis, the peduncles as the *secondary* floral axes, and so on The peduncle may be simple, bearing a single flower, or branched When it proceeds from radical leaves, it is a *scape* The floral axis may be shortened, as in daisy and fig, or flattened, convex or concave in form and bearing numerous flowers, as in marigold or in fig Adhesions occasionally take place between the peduncle and the bracts, as in the lime-tree (fig 3) The termination of the part upon which the whorls of the flower are arranged is the *receptacle*

There are two types of inflorescence—one in which the flowers arise as lateral shoots from a primary axis, which goes on elongating, and the lateral shoots never exceed in their development the length of the primary axis beyond their point of origin; the flowers are thus *axillary* and the inflorescence is *indeterminate* In the other type, the primary axis ends in a single flower, but lateral axes arise from the axils of bracts and repeat the process, the development of each lateral axis being stronger than that of the primary axis beyond its point of origin. The flowers are thus *terminal* and the inflorescence is *definite.* In indeterminate inflorescences, the lower or outer flowers expand first (*centripetal*); in determinate inflorescences, it is the upper or inner flowers that open first (*centrifugal*). In some inflorescences (*mixed*), the primary axis has an arrangement belonging to one type, the branches one of the opposite type

Amongst indefinite forms, the simplest is when a lateral shoot in the axil of a single foliage leaf ends in a single flower In this case the flower is *solitary.* A more complicated inflorescence is commoner Thus if the primary axis, as in fig. 5, is elongated and gives off pedicels ending in a single flower, a *raceme* is produced, which becomes a *panicle* if the secondary axes branch If the lower flower-stalks are developed more strongly than the upper, and thus all the flowers are on a level, a *corymb* is formed, which may be simple (fig 4) or branched If the pedicels are wanting, so that the flowers are sessile, the result is a *spike* If this bears unisexual flowers it is a *catkin*, if it becomes succulent and surrounded by a spathe it is a *spadix,* which may be simple (fig 7) or branched A spike with female flowers only and covered with scales, as in the hop, is a *strobilus* In grasses there are usually numerous sessile flowers in small spikes (*spikelets*), if these are borne not on the primary but on secondary axes, they form a *panicle*

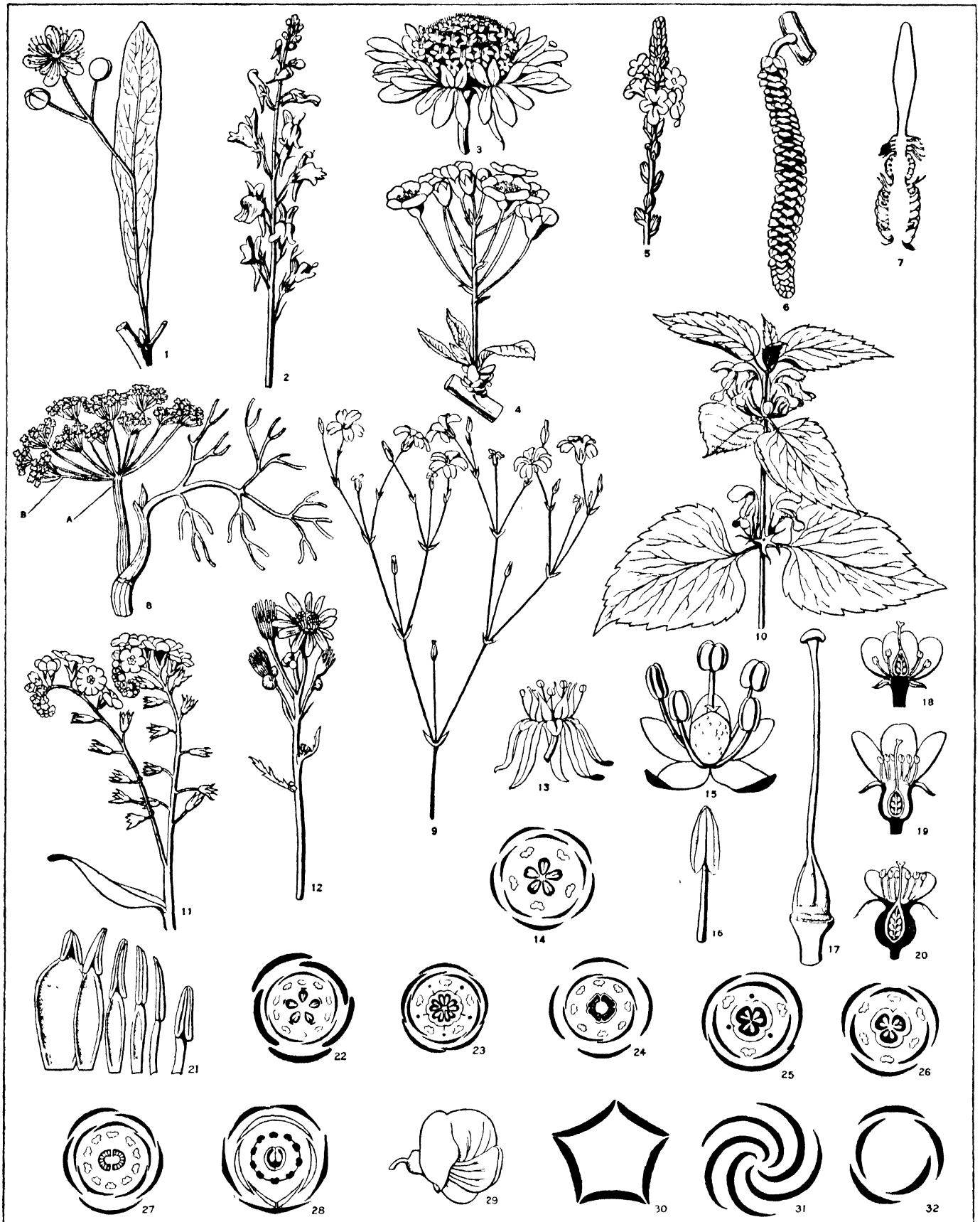
If the primary axis is contracted, other forms result When it is so short that the secondary axes arise from a common point and spread out as radii of nearly equal length each ending in a single flower or dividing again similarly, an *umbel* (fig 8) is produced If there are numerous flowers on a flattened, convex or concave receptacle, having short pedicels or none, a *capitulum* is formed, as in marigold and scabious (fig 3) If the margins of the receptacle are developed upwards, they may ultimately give rise to the *hypanthodium* of the fig

In compound indefinite inflorescences, the lateral shoots, developed centripetally, bear numerous bracteoles from which floral shoots arise, which may have a centripetal arrangement similar to that on the mother shoot, or a different one Thus we may have a group of racemes arranged in a racemose manner; compound umbels as in most Umbelliferae (fig 8); a raceme of capitula; a raceme of umbels, as in ivy, and so on.

The simplest type of definite inflorescence is where, as in *Anemone nemorosa*, the axis terminates in a single flower, no other flowers being produced on the plant This is a *solitary terminal* inflorescence When the primary floral axis, before ending in a flower, gives off lateral unifloral axes which repeat the process, the result is a *cyme* A cyme with two axes is a *biparous* cyme or *dichasium* (fig 11), with one axis, it is uniparous In the dead-nettle (*Lamium*) the flowers arise in the axis of each foliage leaf and appear as if arranged in a whorl, but there is a central flower expanding first, and from its axis spring secondary axes bearing single flowers (fig 10) The inflorescence is thus a dichasium and the clusters are called *verticillasters.* Where numerous lateral axes arise from the primary axis, a *cymose umbel* is produced When these lateral axes grow strongly and develop irregularly, as in species of *Juncus*, the inflorescence is an *anthela* In a uniparous cyme, the basal portion of the consecutive axes may become thickened and arranged more or less in a straight line, forming a false axis or *sympodium,* the inflorescence thus simulating a raceme The uniparous cyme presents two forms; in a *scorpoid* cyme the flowers are arranged alternately in a double row along one side of the sympodium, the bracts forming another double row on the opposite side (*e.g*, Boraginaceae). In a *helicoid* cyme, the flowers are in a single row and form a spiral round the false axis

Compound definite inflorescences are by no means common, but in *Streptocarpus polyanthus* and in several calceolarias we probably have examples Here we find *scorpoid cymes of pairs of flowers,* each pair consisting of an older and a younger flower.

Both the definite and indefinite types are represented in mixed inflorescences. Thus in the ragwort (fig 44) the *heads* of flowers are developed centrifugally, while the *florets* open centripetally. Various combinations occur in different families.



1 Inflorescence of the Lime; 2 Raceme of Linaria striata; 3 Head of Scabiosa atropurpurea; 4 Corymb of Cerasus Mahaleb; 5. Spike of Vervain; 6 Amentum of Hazel, 7 Spadix of Arum maculatum (female flowers below, male above), 8 Compound umbel of Common Dill, 9 Cymose Inflorescence of Cerastium collinum; 10 Flowering White Dead-Nettle, 11 Scirpioidal of Forget-me-not; 12 Flowering Ragwort, 13. Flower of Sedum rubens, 14 Completely symmetrical flower; 15. Flower of Goosefoot; 16. Stamen showing opening and shedding pollen, 17 Pistil of Tobacco; 18, 19 & 20 Diagrams illustrating hypogyny, perigyny, and epigyny of the flower; 21 Stamens of White Water Lily; 22 Flower of Stonecrop; 23 Flower of Flax, 24 Flower of Heath; 25 Flower of Iris, 26. Flower of Fritillary 27 Flower of Saxifrage 28 & 29 Garden Pea 30 Reduplicate aestivation; 31 Contorted aestivation; 32. Quincuncial aestivation

Tabular View of Inflorescences

A. Indefinite Centripetal Inflorescences
- I Flowers solitary, axillary, *Veronica hederifolia*
- II Flowers in groups, pedicellate
  - 1 Elongated form (Raceme), *Hyacinth*, (Corymb), *Prunus.*
  - 11 Contracted form (Umbel), *Cowslip*
- III Flowers in groups, sessile
  - 1 Elongated form (Spike), *Plantago*
    (Spikelet), *grasses.*
    (Catkin), *Hazel.*
    (Spadix), *Arum*
    (Strobilus), *Hop*
  - 11 Contracted form (Capitulum), *Daisy.*
- IV Compound Indefinite Inflorescences
  - *a* Compound Spike, *Rye-grass*
  - *b* Compound Spadix, *Palms*
  - *c* Compound Raceme, *Astilbe*
  - *d* Compound Umbel, most *Umbelliferae.*
  - *e* Raceme of Capitula, *Petasites*
  - *f* Raceme of Umbels, *Ivy*

B Definite Centrifugal Inflorescences
- I Flowers solitary, terminal, *Tulip*
- II Flowers in cymes
  - 1 Uniparous Cyme
    - *a* Helicoid Cyme
      - (1) Elongated, *Alstroemeria*
      - (11) Contracted, *Wittsteinia corymbosa.*
    - *b* Scorpoid Cyme.
      - (1) Elongated, *Forget-me-not*
      - (11) Contracted, *Erodium*
  - 2 Biparous Cyme (including Dichasium, Cymose Umbel)
    - *a* Elongated, *Cerastium*
    - *b* Contracted (Verticillaster), *Dead-nettle*
  - 3 Compound definite Inflorescence Many *Calceolarias*

C. Mixed Inflorescences
- Raceme of Scorpoid Cymes, *Horse-chestnut*
- Scorpoid Cyme of Capitula, *Vernonia scorpioides*
- Compound Umbel of dichotomous Cymes, *Viburnum*
- Capitulum of contracted Scorpoid Cymes (Glomerulus), *Sea-pink*
- Cyme of Capitula, *Ragwort*

Parts of the Flower.—The flower consists of the floral axis bearing the sporophylls (stamens and carpels) usually with protective envelopes The axis is normally contracted, no internodes being developed and the portion bearing the floral leaves, the receptacle, is frequently a conical, flattened or hollowed expansion, rarely the axis is elongated and internodes are developed Upon the receptacle the parts of the flower are crowded, usually forming a series of whorls, the parts of which alternate, but sometimes arranged spirally, especially if the axis is elongated In a typical flower (fig 22) there are four distinct whorls, an outer *calyx* of *sepals;* within it, the parts alternating with those of the calyx, is the *corolla* of *petals;* next alternating with the parts of the corolla, the *androecium* of *stamens;* and in the centre, the *gynoecium* of *carpels* Fig 14 is a diagrammatic representation (*floral diagram*) of such a flower, supposed to be cut transversely, the parts of each whorl being distinguished by a different symbol The sepals are usually greenish, their function is mainly protective, shielding the delicate internal organs before the flower opens The petals are usually showy Sometimes (usually in monocotyledons) the calyx and corolla are similar, in such cases the term *perianth* is applied, and the parts of the calyx are *petaloid.* In some cases the petals resemble sepals (*sepaloid*) In plants, as *Nymphaea alba* (fig 21), where a spiral arrangement of floral leaves occurs, these whorls pass insensibly into each other When both calyx and corolla are present, the plant is *dichlamydeous;* when one is absent, *monochlamydeous* (fig 15). Sometimes both are absent (*achlamydeous*), as in willow The stamens in their most differentiated form, consist each of a stalk, the *filament* (fig 16) consisting of *pollen-sacs* containing the powdery *pollen* (microspores) which is ultimately discharged. The *gynoecium* or *pistil* terminates the floral axis It consists of one or more carpels (megaspores), separate or combined (fig 17) The pistil is composed of the *ovary* (fig 20), the lower portion enclosing the *ovules* destined to become seeds; and the *stigma* loose cellular tissue, the receptive surface on which the pollen is deposited and either sessile on the apex of the ovary (poppy) or separated by a prolonged *style* The androecium and gynoecium are not present in all flowers When both are present the flower is *hermaphrodite* and is represented by the symbol ☿. When only one is present the flower is *unisexual* or *diclinous,* and is either male (*staminate*), ♂, or female (*pistillate*), ♀ When all four whorls of leaves are present the flower is *complete* Usually the successive whorls of the flower, disposed from below upwards or from without inwards upon the floral axis, are of the same number of parts, or are a multiple of the same number of parts, those of one whorl alternating with those of the whorl next to it

In the more primitive types of flower the receptacle is more or less convex, and the series of organs follow in regular succession, culminating in the carpels (fig 18) This arrangement is *hypogynous,* the other series being beneath (*hypo*) the gynoecium In other cases, the apex of the growing point ceases to develop and the parts below form a cup around it, from the rim of which the outer members of the flower are developed (perigynous, fig 19) In many cases this is carried further and a cavity is formed roofed over by the carpels, so that the outer members of the flower spring from the edge of the receptacle which is immediately above the ovary (epigynous, fig 20)

Symmetry of the Flower.—When a flower consists of parts arranged in whorls it is *cyclic,* and if all the whorls have an equal number of parts and are alternate it is *eucyclic* (figs 16, 17) In contrast to cyclic flowers are those where the parts are in spirals (*acyclic*) Flowers which are cyclic at one portion and spiral at another (as many Ranunculaceae) are *hemicyclic* In spiral flowers there is usually a gradual passage from sepaloid through petaloid to staminal parts (water lily, fig 21) In some cases the parts of one whorl are opposite or *superposed* to those of the next The superposition of the stamens on the sepals in the Caryophyllaceae is due to the suppression of the petals

A flower is *symmetrical* when each whorl consists of an equal number of parts, or when the parts of any one whorl are multiples of that preceding it Thus, a symmetrical flower may have five sepals, five petals, five stamens and five carpels (fig 14) or the number of any of these parts may be a multiple of five In the staminal whorl especially it is common to find additional rows In fig 24 the parts are in fours, in figs 25 and 26, in threes The floral envelopes are rarely multiplied Flowers in which the number of parts in each whorl is the same are *isomerous,* when the number in some whorls is different, the flower is *anisomerous* It often happens that when fully formed, the number of parts in the pistillate whorl is not in conformity with that in the other whorls In such circumstances a flower is called symmetrical, provided that the other whorls are normal (fig 27) A flower in which the parts are arranged in twos is *dimerous;* in threes, fours or fives, *trimerous, tetramerous* or *pentamerous* respectively. Trimerous symmetry is the rule in the monocotyledons, pentamerous the commonest in the dicotyledons, though dimerous and tetramerous flowers also occur in the latter group

The various parts of the flower have a definite relation to the central axis Thus in a tetramerous flower, one sepal may be next the axis (superior or posterior), another next the bract (inferior or anterior) and the other two *lateral* (fig 24) A plane passing through the anterior and posterior sepals and through the floral axis is the *median* plane of the flower, a plane cutting it at right angles and passing through the lateral sepals, is the *lateral* plane; whilst the planes which bisect the angles formed by the lateral and median planes are *diagonal* planes In a pentamerous flower one sepal may be superior (Rosaceae and Labiatae) or inferior (pea family, figs. 28, 29); in the latter case the odd petal (*vexillum*) is then superior In the Scrophulariaceae one of the two carpels is posterior, the other anterior, whilst in the Convolvulaceae the carpels are lateral.

When the different members of each whorl are alike, the flower is *regular;* differences in size and shape of the parts of a whorl make the flower *irregular* (fig. 28) When a flower can be divided by a single plane into two similar parts it is zygomorphic (as in Papilionaceae). Polysymmetrical flowers have a radial sym-

metry and can be divided by several planes into similar portions, such are all regular, symmetrical flowers When the parts of any whorl are not equal to, or some multiple of, the others, the flower is *asymmetrical* This alteration in the symmetrical arrangement has been traced to *suppression* or *non-development* of parts, *degeneration* or imperfect formation, *cohesion* or union of parts of the same whorl, *adhesion* or union of parts of different whorls, *multiplication* of parts and *deduplication* (*chlorosis*) or splitting of parts Cultivation has a great effect in causing changes in the various parts of a plant The changes in colour and form of flowers thus produced are endless

As a convenient method of expressing the arrangement of the parts of a flower, *floral formulae* have been derived The following is a simple mode the whorls are represented by the letters *S* (sepals), *P* (petals), *A* (stamens), *C* (carpels) and a figure marked after each indicates the number of parts in that whorl Thus $S_5P_5A_5C_5$ means that the flower is perfect, isomerous and pentamerous The flower of *Sedum* (fig 22) would be represented by $S_5P_5A_5+_5C_5$, where A_5+_5 indicates that the staminal whorl consists of two rows of five parts each

Aestivation.—The manner in which the parts are arranged in the flower-bud with respect to each other before opening is the *aestivation* or *praefloration*, and distinctive names have been given to the different arrangements exhibited, both by the leaves individually and in their relation to each other As regards each leaf of the flower, it is either spread out, as the sepals in the bud of the lime-tree, or folded upon itself (conduplicate), or slightly folded inwards or outwards at the edges, as in the calyx of some species of *Clematis*, or rolled up at the edges (involute or revolute), or folded transversely, becoming *crumpled* or *corrugated* as in the poppy

When the parts of a whorl are in an exact circle, and are applied to each other by the edges only, without overlapping or folding, aestivation is *valvate* The edges of each of the parts may be turned inwards (induplicate) or outwards (reduplicate) When the parts of a single whorl are placed in a circle, each of them exhibiting torsion so that by one of its sides it overlaps its neighbour, whilst its side is overlapped in like manner by that standing next to it, aestivation is *twisted* or *contorted* When the flower expands, traces of twisting sometimes remain These forms of aestivation occur in cyclic flowers and are included under *circular* aestivation In spiral flowers the leaves may cover each other partially, like tiles on a house, or the parts may envelop each other completely (*convolute*) When the parts are five, as in many dicotyledons, there may be two parts external, two internal and a fifth which partially covers one of the inner parts by its margin and is in turn partially covered by one of the external parts (*quincuncial*), as in the corolla of Rosaceae In the Leguminoseae, the vexillum is often large and folded over the others (*vexillary*) or the carina may perform a similar office (*carinal*) Circular aestivation is generally associated with a regular calyx and corolla while spiral aestivation is connected with irregular as well as regular forms.

FLORAL ENVELOPES

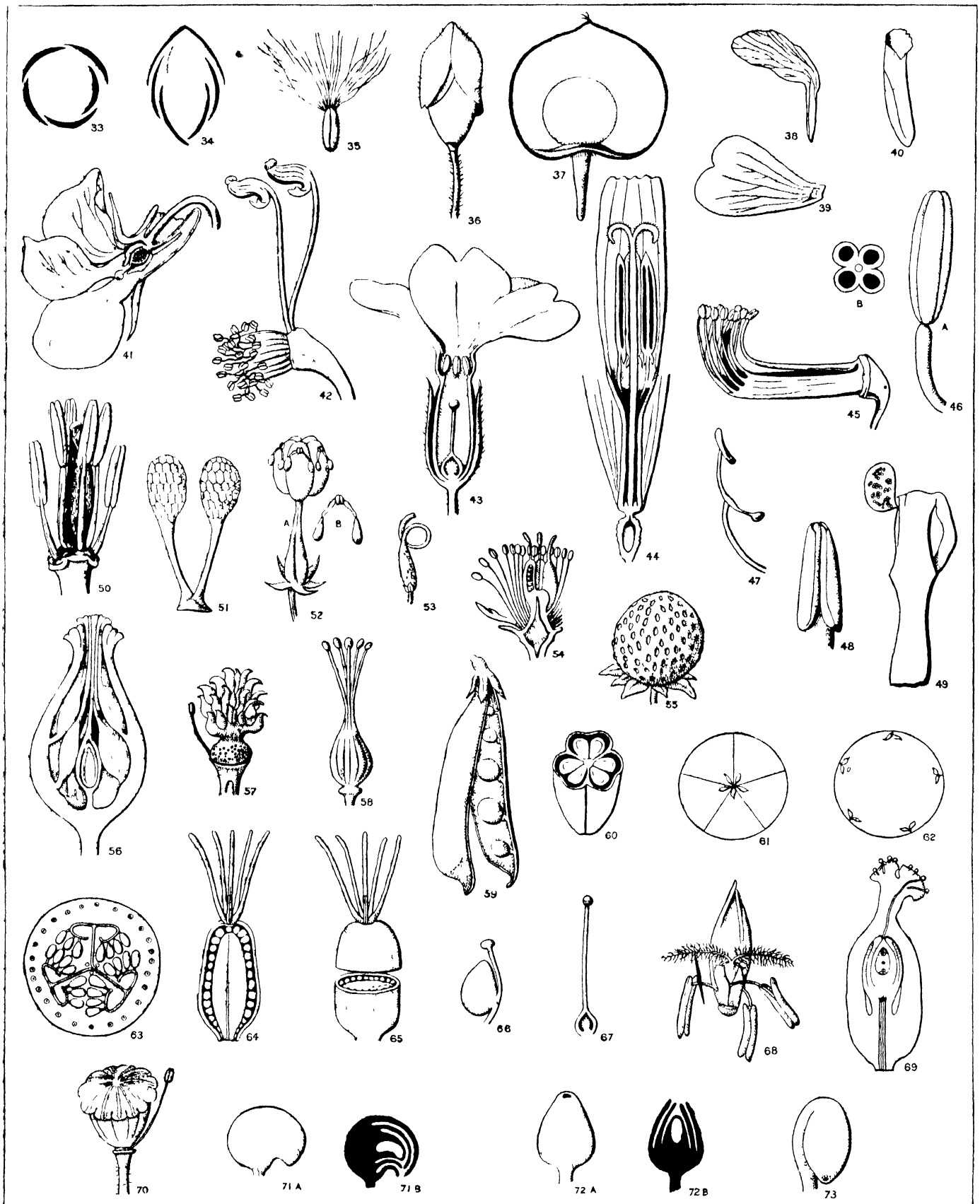
Calyx.—The sepals are sometimes *free* or separate from each other, at other times united to a greater or less extent, in the former case, the calyx is *polysepalous*, in the latter *gamosepalous* or *monosepalous* The divisions of the calyx are usually entire, but occasionally are cut (rose), rarely they are stalked Sepals are generally more or less oval, elliptical or oblong, with blunt or acute apices They may be erect or reflexed, spreading downwards (*divergent* or *patulous*) or arched inwards (*connivent*) They are usually greenish (*herbaceous*) but sometimes they are coloured (*petaloid*) The vascular bundles sometimes form a prominent mid-rib, at other times, several ribs The venation is useful as pointing out the number of leaves in a gamosepalous calyx A polysepalous calyx with three sepals is *trisepalous*, with five, *pentasepalous*, etc. The sepals are occasionally of different forms and sizes The number of members in a gamosepalous calyx is usually marked by divisions at the apex, which may be simple projections or may extend down as fissures, the calyx being *trifid* (three-cleft), *quinquefid* (five-cleft), etc ; or they may reach nearly to the base, the calyx being *tripartite*, *quinquepartite*, etc The union of the parts may be complete and the calyx entire or *truncate* The cohesion is sometimes irregular, thus a two-lipped or *labiate calyx* arises. Occasionally certain parts of the sepals are enlarged to form a spur as in *Tropaeolum*, *Viola* and *Pelargonium* Degeneration may take place so that the calyx becomes dry and scaly (Juncaceae), or hairy (Compositae), or a mere rim (madder), when it is *obsolete* or *marginate* In Compositae, the calyx is attached to the pistil and its limb is developed into hairs (*pappus*) The calyx sometimes falls off before the flower opens, as in poppies (*caducous*, fig 36), or with the corolla, as in *Ranunculus* (*deciduous*), or it remains after flowering (*persistent*) as in Labiatae, or its base only is persistent (*operculate*) The receptacle bearing the calyx is sometimes united to the pistil and enlarges to form part of the fruit (apple), in which case the withered calyx is seen at the apex Sometimes a persistent calyx encloses the fruit without being incorporated with it (*accrescent*); or it may become *inflated* or *vesicular* (*Lychnis*)

Corolla.—The corolla is the coloured attractive inner floral envelope, usually the most conspicuous whorl As a rule the petals are highly coloured, the colouring matter being contained in the cell-sap (blue and red flowers) or in *plastids* (*chromoplasts*) as in yellow flowers, or in both (orange flowers) Petals are generally glabrous, but in some instances hairs are produced They often close the way to the honey-secreting part of the flower to small insects whose visits would be useless for pollination Coloured hairs occur on the perianth of *Iris* Normally thin and delicate petals occasionally become thick and fleshy (*Rafflesia*), dry (heaths), or hard and stiff (*Xylopia*) Each petal often consists of two parts, a lower narrow *unguis* or *claw*, and an upper, broad *lamina* or *limb* (fig 38) The claw is often wanting (fig 39) and the petals are then *sessile* The limb may be flat, concave or hollowed In hellebore the petals become tubular (fig 40); in aconite (fig 42), some resemble a hollow-curved horn, supported on a grooved stalk, while in columbine and violet (fig 41) one or all are prolonged as a spur. In *Antirrhinum*, the spur is short and the petal is *gibbous* or *saccate* These spurs, tubes and sacs serve as receptacles for nectar

A corolla is *dipetalous*, *tripetalous*, etc , according as it has two, three, etc , separate petals, the general name *polypetalous* is given to corollas with separate petals, while those in which the petals are united are *monopetalous*, *gamopetalous* or *sympetalous* This union generally takes place at the base and extends towards the apex In the vine, the petals are separate at the base, adherent at the apex In a sympetalous corolla the lower portion usually forms a tube, the upper parts a common limb, the point of union being the *throat* The number of parts is determined by the divisions (teeth, fissures, etc), or when, as rarely, the corolla is entire, by the venation The union may be equal, or some parts may unite more than others

Amongst regular polypetalous corollas may be noticed the *rosaceous* corolla; the *caryophyllaceous* corolla, in which there are five clawed petals, the *cruciform*, having four petals in the form of a cross, as in the wallflower. Of irregular polypetalous corollas, the most marked is the *papilionaceous* (fig 28–29), in which there are five petals—one superior next to the axis, usually larger than the rest, and the *vexillum* or *standards*, two lateral, the *alae* or wings, two inferior, often united slightly to form a single keel or carina, which embraces the essential organs.

Regular sympetalous corollas may be *campanulate* or *bell-shaped* (*Campanula*), *hypocrateriform* or *salver-shaped* (*Primula*, fig 43) *tubular* (comfrey); *rotate* or *wheel-shaped* (forget-me-not), *urceolate* or *urn-shaped* (bell-heath) Some of these forms may become irregular in consequence of certain parts being more developed than others; thus in the foxglove there is a slightly irregular campanulate corolla Other irregular sympetalous corollas include the *labiate* or *lipped*, having two divisions of the limb, the upper usually of two, the lower of three, united petals, separated by a gap When the upper lip is much arched, and the gap is distinct, the corolla is *ringent;* when the gap is reduced



33. Imbricated aestivation; 34 Papilionaceous flower; 35 Groundsel fruit with pappus; 36 Poppy calyx; 37 Fruit of Physalis Alkekengi; 38. Unguiculate petal of Wallflower, 39 Crowfoot petal; 40 Hellebore petal; 41. Pansy; 42. Part of Aconite flower; 43. Primrose flower; 44. Dandelion flower; 45. Stamens of Garden Pea; 46. Anther of Rush; 47. Salvia officinalis anther; 48 Nightshade stamen; 49. Barberry stamen; 50. Flower of Wallflower; 51 Pollinia; 52. Asclepias pistil; 53 Broom pistil, 54 Section of Black Hellebore flower; 55 Strawberry, 56 Section of Dog Rose fruit; 57. Ranunculus pistils; 58. Flax pistil; 59 Garden Pea fruit, 60 Ovary of Lily; 61 Quinqueloocular ovary; 62 Five-carpellary ovary; 63 Melon fruit; 64 Cerastium hirsutum pistil; 65 Same cut horizontally; 66 Carpel of Lady's mantle, 67 Primrose pistil; 68. Grass flower with glumes removed, 69 Polygonum Convolvulus ovary; 70 Gynaecium and stamen of Poppy; 71. Ovules; 72. Ovules; 73. Ovule

to a chink, as in snapdragon, *personate*. In *Calceolaria* the lips become much hollowed out When a tubular corolla is split to form a strap-like process on one side, it is *ligulate* or *strap shaped* (fig 41), as in many Compositae

Petals are sometimes suppressed and at times the whole corolla is absent. In *Amorpha* there is only a single petal In the Ranunculaceae some genera (*e g*, *Ranunculus*) have both calyx and corolla, while others (*e g*, *Anemone*) have only a coloured calyx

The term *nectary* includes those parts of a flower which secrete a honey-like substance, as the glandular depression on the petal of *Ranunculus* (fig 39) The honey attracts insects, which convey pollen to the stigma The horn-like nectaries under the galeate sepal of *Aconitum* (fig 42) are modified petals, as are the tubular nectaries of hellebore (fig 54)

Petals are attached to the axis usually by a narrow base When this attachment is by an articulation, the petals fall off either immediately after expansion (*caducous*) or after fertilisation (*deciduous*) A corolla continuous with axis, as in *Campanula*, may remain in a withered state while the fruit is ripening A sympetalous corolla falls off in one piece

ESSENTIAL ORGANS

As a stamen represents a leaf developed to bear pollen or microspores, it is spoken of in comparative morphology as a microsporophyll, similarly the carpels which make up the pistil are the megasporophylls (*see* ANGIOSPERMS) In plants with hermaphrodite flowers, self-fertilisation is often provided against by the structure of the parts or by the period of ripening of the organs For instance, in *Primula* (fig 43), some flowers (thrum-eyed) have long stamens and a short styled pistil, others (pin-eyed) short stamens and a long-styled pistil; these are *dimorphic* In some plants the stamens are perfected before the pistil (*protanderous*), more rarely, the pistil is perfected first (*protogynous*) Plants in which protandry or protogyny occur are *dichogamous* When the same plant bears unisexual flowers of both sexes it is *monoecious* (hazel), when the male and female flowers are on separate plants, the plant is *dioecious* (hemp), when there are male, female and hermaphrodite flowers, it is *polygamous*

Stamens.—The stamens arise from the receptacle within the petals, with which they generally alternate, forming one or more whorls, collectively constituting the androecium Their normal position is below the pistil (*inferior*), but they may be above (*superior*) or, as in Saxifragaceae, *half inferior* or *half superior* Sometimes they adhere to the petals (*epitalous*), or to the pistil, so as to form a column (*gynandrous*) These arrangements are important in classification Stamens vary in number from one to many, even hundreds In acyclic flowers there is often a gradual transition from petals to stamens, as in the white water lily (fig 21) When there is only one whorl the stamens are usually equal in number to the sepals or petals The additional rows of stamens may be developed in centripetal order or interposed between the pre-existing ones or placed outside them, *i e*, be developed centrifugally (geranium) When the stamens are fewer than 20, they are *definite;* when more, *indefinite*, represented by the symbol ∞. A flower with one stamen is *monandrous*, with two, *diandrous*, with many, *polyandrous*, etc

The function of the stamen is the development and distribution of the pollen, which is contained in the anther If the latter is absent, the stamen cannot perform its functions The anther is developed before the filament, which may be absent (*e.g*, mistletoe), when the anther is *sessile*

The Filament—The filament is usually thread-like and cylindrical, or slightly tapering towards its summit It may, however, be thickened and flattened in various ways The length sometimes bears a relation to that of the pistil, and to the position of the flower. Though usually of sufficient solidarity to support the anther in an erect position, the filament is sometimes (*e g*, grasses) delicate and hair-like, so that the anther is pendulous (fig. 68). It is generally continuous, but sometimes is bent or jointed (*geniculate*), or spiral (*e g*, pellitory) In *Fuchsia* it is red, in *Adamia*, blue; in *Ranunculus acris*, yellow The filament is usually articulated to the receptacle and the stamen falls off after fertilisation, but in *Campanula*, the stamens remain in a withered state. The filaments may cohere to a greater or lesser extent, the anthers remaining free Thus, all the filaments may unite to form a tube round the pistil (*e g*, mallow), the stamens being *monadelphous*, or they may be arranged in two bundles (*diadelphous*), as in the pea, where nine out of ten unite, the posterior one being free (fig 45) In this case the stamens, originally free, cohere, but in most cases each bundle arises from the branching of a single stamen

The Anther—The anther consists of lobes containing the minute pollen grains, which, when mature, are discharged by an opening There is a double covering to the anther—the outer *exothecium* resembling the epidermis and often bearing stomata; the inner *endothecium* formed by a layer or layers of cellular tissue, the cells of which have thickened walls The endothecium generally becomes thinner towards the part where the anther opens out, and there disappears The anther appears first as a simple papilla of meristem, upon which indications of two lobes soon appear Upon these projections rudiments of the pollen-sacs, usually four, two on each lobe, are seen In each differentiation takes place in the layers beneath the epidermis, by which an outer small-celled layer surrounds an inner one of larger cells These central cells are the pollen mother-cells, the outer cells forming the endothecium while the exothecium arises from the epidermis

When all four pollen-sacs remain permanently the anther is *quadrilocular* (fig 46) Sometimes, however, the sacs in each lobe unite to give a *bilocular* anther Further fusion of the lobes or the abortion of one of them (*e g*, hollyhock) leads to a *unilocular* anther Occasionally there are numerous cavities in the anther (*e g*, mistletoe) The lobes are generally more or less oval or elliptical The division between them is marked on the face of the anther by a *furrow*, and there is usually a suture indicating the line of dehiscence Stamens may cohere by their anthers becoming *syngenesious* (*e g*, Compositae)

The Connective—The anther-lobes are united by the *connective* which is either continuous with the filament or articulated with it When the filament is continuous and prolonged so that the lobes appear to be united throughout their length, the anther is *adnate* or *adherent* When the filament ends at the base of the anther, the latter is *innate* or *erect* In these cases the anther is fixed When, however, the attachment is narrow and an articulation exists, the anthers are movable (*versatile*) as in grasses (fig 68) The connective is sometimes extended backwards and downwards (*e g*, violet) to form a nectar-secreting spur

Anther Dehiscence—The opening or dehiscence of the anthers to discharge their content takes place by clefts, valves or pores When the anther-lobes are erect, the cleft is likewise along the line of suture—*longitudinal dehiscence* (fig 16) In other instances the opening is confined to the base or apex, each loculus opening by a single pore (*e g*, Solanum, fig 48), in the mistletoe there are numerous pores In the barberry (fig 49) each lobe opens by a valve on the outer side of the suture (*valvular*) Anthers dehisce at different periods during the process of flowering, sometimes in the bud but more commonly when the flower is expanded They may dehisce simultaneously or in succession. These variations are connected with the arrangements for the transference of pollen *Introrse* anthers dehisce by the surface next the centre of the flower, *extrorse* anthers by the outer surface; when by the sides (e g, *Iris*) they are *laterally* dehiscent

Stamens occasionally become sterile by non-development of the anthers and are then called *staminodes* Some stamens are enclosed within the tube of the flower (*included*) others are *exserted, i e*, extend beyond the flower (*e g*, *Plantago*); sometimes they are exserted in early growth, but become included later (e g, *Geranium striatum*) When there is more than one whorl, the stamens on the outside are often longest (*e g*, many Rosaceae), but sometimes the reverse is the case When the stamens are in two rows, those opposite the petals are usually the shorter. In some flowers the stamens are *didynamous*, only four out of five

being developed and the upper pair longer than the lateral (*e g*, Labiatae, Scrophulariaceae) When there are six stamens, four may be long and two short (*tetradynamous*), alternating with the pairs of long ones (*e g*, Cruciferae, fig 50)

Pollen—The pollen-grains consist of small cells, developed from the large, thick-walled mother-cells in the interior of the pollen-sacs A division takes place to form four cells in each mother-cell and these are the pollen grains, which increase in size and acquire a cell-wall, differentiated into an outer cuticular *extine* and an inner *intine* Then the walls of the mother-cells are absorbed and the grains float freely in the fluid of the pollen-sacs The fluid gradually disappears and the mature grains form a powdery mass In most Orchidaceae the pollen-grains are united into masses (pollinia, figs 51, 52) by viscid matter Each of these has a stalk (*caudicle*) which adheres to a prolongation at the base of the anther (*rostellum*) by a viscid gland (*retinaculum*) *Gynandrum* is sometimes applied to the part of the column in orchids where the stamens are situated The number of pollinia varies

The extine is a firm membrane which defines the contour of the pollen-grain and gives it colour (generally yellow) The extine is either smooth or covered with projections and is often covered with viscid or oily matter The intine is uniform, thin, transparent and extensible In some aquatics (e g, *Zostera*) only one covering exists

Pollen-grains vary in diameter from $\frac{1}{300}$ to $\frac{1}{700}$ in or less They are most commonly ellipsoidal, but may be spherical, cylindrical and curved, polyhedral (Compositae) or nearly triangular in section There are rounded pores varying from one to fifty, and through one or more of these the pollen-tube is extruded in germination In monocotyledons there is usually only one, in dicotyledons, where they may form a circle round the equatorial surface, they number from three upwards Within the pollen-grain is granular protoplasm with oily particles and occasionally starch Before leaving the pollen-sac, the grain divides into a vegetative cell or cells, from which the pollen-tube arises, and a generative cell, forming the male cells (*see* ANGIOSPERMS, GYMNOSPERMS)

Pollination—When the pollen-sacs are ripe, the anther dehisces and the pollen is shed In order that fertilization may be effected, the pollen must be conveyed to the stigma of the pistil This *pollination* (*q v*) is promoted in various ways, the whole form and structure of the flower being adapted to the process In some plants (*e g*, pellitory) the mere elasticity of the filament is sufficient, in others (*anemophilous*) pollination is effected by the wind (*e g*, grasses) and in such cases enormous quantities of pollen are produced, but the common agents of pollination are insects To attract them to the flower the odoriferous secretions and gay colours are produced, and the position and complicated structure of the parts of the flower are adapted to the perfect performance of the process It is comparatively rare in hermaphrodite flowers for self-fertilization to occur and the various forms of dichogamy, dimorphism and trimorphism prevent this

Disk.—Under the term disk is included every structure intervening between the stamens and the pistil It presents great varieties of form, such as a ring, scales, glands, hairs, petaloid appendages, etc, and often contains nectar The disk frequently arises by degeneration or transformation of the staminal row In cruciferae, it consists of tooth-like scales at the base of the stamens The enlarged receptacle covering the ovary in *Nymphaea* may be regarded as a disk

The Pistil.—The pistil or gynoecium occupies the centre or apex of the flower and is surrounded by the stamens and floral envelopes when these are present It constitutes the innermost whorl, which after flowering is changed into the fruit and contains the seeds The ovary contains the ovules attached to the *placenta* The pistil consists of one or more modified leaves, the *carpels* (megasporophylls) When a pistil consists of a single carpel, it is *simple* or *monocarpellary* (fig 53), when composed of several carpels, it is *compound* or *polycarpellary* (fig 54) Each carpel has its own ovary, style (when present) and stigma and may be regarded as formed by a folded leaf, the upper surface of which is turned inwards, towards the axis, the lower outwards, while the ovules develop from the margins A pistil is usually formed by more than one carpel These may be arranged at the same height in a whorl, or at different heights in a spiral When they remain separate and distinct (*e g*, hellebore, fig 54) the pistil is *apocarpous*, when they unite (*e g* pear) it is *syncarpous* A flower with a simple pistil is *monogynous;* with two carpels, *digynous,* with three, *trigynous,* etc

The union in a syncarpous pistil is not always complete, it may take place by the ovaries alone (fig 58), when the organ becomes a compound ovary, or by ovaries and styles, or by stigmas and the summits of these styles Various intermediate states exist, the union is usually most complete at the base

The Placenta—The ovules are attached to the placenta, through which the fibrovascular bundles pass The placenta is usually formed on the edges of the carpellary leaf (*marginal placentation*) But often the placentas arise from the axis (*axile placentation*) and are not connected with the carpellary leaves In marginal placentation, the placenta is borne on the *inner* or *ventral suture*, corresponding to the margin of the carpellary leaf, the *outer* or *dorsal suture* corresponding to the mid-rib As the placenta is formed on each margin of the carpel, it is essentially double When the pistil is simple, the inner margins unite and usually form a common placenta When the pistil is apocarpous, there are generally separate placentas at each margin In a syncarpous pistil, however, the carpels are so united that the edges of each of the contiguous ones, by their union, form a *septum* or *dissepiment,* and the number of these septa consequently indicates the number of carpels in the pistil When the septa extend to the axis, the ovary is divided into cells, being *bilocular, trilocular,* etc, according to the number, each cell corresponding to a single carpel In these cases, the marginal placentas meet in the axis and unite to form a single *central* one When the carpels of a syncarpous pistil do not fold inwards, the ovary is *unilocular* and the placentas are *parietal* (e g *Viola*) Often the margins of the carpels which fold in to the centre split there into two lamellae, each of which is curved outwards and projects into the loculament, dilating at the end into a placenta (*e g*, Cucurbitaceae, fig 63) Cases occur, however, in which the placentas are not connected with the walls of the ovary (*free central placentation,* figs 64, 65), this may be due to the separation of the carpellary leaves from the axis, as in Caryophyllaceae, in which there are often traces of the septa at the base of the ovary, or to the placenta being an axile formation produced by the elongation of the axis (*e g* Primulaceae)

Occasionally divisions take place in ovaries which are not formed by the edges of contiguous carpels These *spurious dissepiments* are often horizontal, only developed after fertilization In Cruciferae, however, they are vertical and arise from the prolongation of the placentas

The ovary is usually spherical or curved, sometimes smooth on its surface, at other times hairy and grooved The grooves usually indicate the divisions between the carpels When the ovary is on the centre of the receptacle, free from the outer whorls, so that its base is above the insertion of the stamens, it is *superior* (e g *Primula*, figs 43, 67) When the margin of the receptacle is prolonged upwards, carrying with it the floral envelopes and staminal leaves, the basal portion of the ovary being formed by the receptacle and the carpellary leaves alone closing the apex, the ovary is inferior (e g, *Fuchsia*) In many Saxifragaceae these are intermediate forms (*half-inferior*)

The Style—The style proceeds from the summit of the carpel (fig 67) and is traversed by a narrow canal, a continuation of the placenta, constituting conducting tissue, which ends in the stigma In some cases, owing to more rapid growth of the dorsal side of the ovary, the style becomes lateral (fig 66), this may be accentuated so that the style appears to arise from the base (*basilar*), but it still indicates the organic though not the apparent, apex of the ovary Several basilar styles may unite (*e g*, Boraginaceae) to form a single *gynobasic* style The style is usually cylindrical, filiform and simple; sometimes it is grooved on one side, or flat, thick, angular, compressed or even petaloid

(e g *Iris*). It may bear hairs, which aid in the application of pollen to the stigma (collecting hairs, e g. *Campanula*). The styles of a syncarpous pistil, when separate, alternate with the septa; when united, the style is *simple* (fig 67) The style of a single carpel may be divided The length of the style depends upon the relation which should subsist between the position of the stigma and that of the anthers to allow proper application of pollen

The Stigma—The stigma is the termination of the conducting tissue of the style and is usually in direct communication with the placenta It consists of loose cellular tissue and secretes a viscid matter which detains the pollen and causes it to germinate The stigmas alternate with the septa of a syncarpous pistil, *i e* corresponds to the back of the loculi, but in some cases half the stigma of one carpel unites with half that of the next, the stigmas being thus opposite the septa (*e g* poppy) The divisions of the stigma usually mark the number of carpels in the pistil, but sometimes (*e g* Gramineae) the stigma of a single carpel divides It may be terminal or lateral and may present sensitive laminae which close when touched (e g *Mimulus*) It may be globular, umbrella-like, ovoid (e g *Fuchsia*), radiating, as in the poppy, where the true stigmatic rays are attached to a shield-like (*peltate*) body The lobes of the stigma may be flat and pointed, fleshy and blunt, smooth, granular or feathery (*e g* many grasses, fig 68) In Orchidaceae, the stigma is on the anterior surface of the column beneath the anthers

The Ovule—The ovule is usually produced on the margin of the carpellary leaf, but sometimes ovules arise all over the surface of the leaf, or from the floral axis, terminally (*e g* Polygonaceae) or laterally (*e g* Primulaceae) The ovule is usually contained in an ovary and is *angiospermous;* but in the Coniferae and Cycadaceae it has no proper ovarian covering and is *naked* or *gymnospermous* It is attached to the placenta either directly (*sessile*) or by a *funicle* (figs 71, 72, 73), this cord may become much elongated after fertilization The ovule is attached to the placenta or funicle by its *base* or *hilum,* the opposite end being its *apex*

The ovule first appears as a small projection from the placenta The cells multiply and assume an enlarged ovate form constituting the *nucellus* This nucellus may remain naked and alone form the ovule, as in some parasitic families, but in most plants it becomes surrounded by integuments, which appear first as rings at the base of the nucellus, which gradually spread over its surface In some cases (*e g*, Compositae), only one covering is formed, but usually another is developed subsequently, covering the first completely except at the apex, where neither integument invests the nucellus, but leaves an opening, the *micropyle* A single cell of the nucellus enlarges to form the *embryo-sac* or *megaspore,* which gradually supplants the tissue of the nucellus until only a thin layer is left, and at the apex it may extend beyond it, or pass into the micropyle In gymnosperms it usually remains deep in the nucellus For further development, *see* ANGIOSPERMS, GYMNOSPERMS

The point where the integuments are united to the base of the nucellus is the *chalaza,* which is often coloured, is denser than the surrounding tissue and is traversed by vascular bundles from the placenta When the chalaza is at the hilum and the micropyle is opposite, there being a short funicle, the ovum is *orthotropous* (fig 72) When by more rapid growth on one side than on the other, the nucellus and integuments are curved on themselves so that the micropyle approaches the hilum, the ovule is campylotropous (*e g.,* Cruciferae, fig 71) In an *inverted* or *anatropous* ovule (fig 73) the commonest form in angiosperms, the apex with the micropyle is turned towards the point of attachment of the funicle to the placenta and the funicle coalesces with the ovule to form the *raphe* The ovule thus curves from the point of origin of the integuments and if a second integument is formed, it does not extend to the side adherent to the raphe Forms intermediate between these types occur When there is a single ovule with its axis vertical, it may be attached to the placenta at the base of the ovary (*basal placenta*), when it is erect (*e g*, Compositae); or it may be inserted a little above the base on a parietal placenta (ascending), or it may hang from an apical placenta at the summit of the ovary, its apex being directed downwards (*inverted* or *pendulous*), or from a parietal placenta near the summit (*suspended, e g*, Euphorbiaceae) Sometimes a long funicle arises from a basal placenta, reaches the summit of the ovary and there, bending over, suspends the ovule (*e g*, sea-pink), at other times the hilum appears to be in the middle and the ovule is *horizontal* When there are two ovules in the same cell they may be side by side (*collateral*), or one erect and the other inverted, or one above the other, as is the case in ovaries containing a moderate number of ovules When the ovules are *definite* (*i e*, uniform and can be counted) their attachment usually forms a good character for classification. When very numerous (indefinite) and the placenta little developed, their position shows great variation and their form is altered by pressure into various polyhedral shapes

Fertilization—When the pistil has reached a certain stage in growth, it becomes ready for fertilization The pollen-grain having reached the stigma in angiosperms, or the summit of the nucellus in gymnosperms, it is detained there, and the viscid secretion from the glands of the stigma or from the nucellus induce the protrusion of a pollen-tube through the pores of the grain The pollen-tube (or tubes) passes down the canal (fig 69), through the conducting tissue of the style, when present, and thence to the micropyle of the ovule, one pollen-tube going to each ovule Frequently the tube has to pass some distance into the ovary, to reach the micropyle, being guided by hairs, grooves, etc In gymnosperms the pollen-grain resting on the apex of the nucellus sends off its pollen-tubes which at once penetrate the nucellus (fig 69) Ultimately the apex of the tube perforates the tip of the embryo-sac, the male cells are transmitted to the sac and fertilization is effected Consequent upon this, after a longer or shorter period, those changes begin in the embryo-sac which result in the formation of the embryo plant, the ovule being converted into the seed, the ovary enlarging to form the fruit, often incorporated with which are other parts of the flower (receptacle, calyx, etc) In gymnosperms the pollen-tubes, having penetrated a certain distance down the tissue of the nucellus, are arrested in growth for a period, sometimes nearly a year *See* ANGIOSPERMS *Flower,* FRUIT, SEED

FLOWER ARRANGING in Japan is an old art of composing natural flowers, foliage or fruit-bearing branches in a vessel for the decoration of a room Its important position in the home was established in the middle of the 15th century, when the tea-ceremony (*q v*) became a fashion, and so popular did it grow that it soon became independent of the tea-room to be taught by flower-masters By the 17th century there arose many schools or styles which held competitive exhibitions of their art Such exhibitions are still being held and there are more than 100 styles, the number still increasing Private lessons are given by numerous flower-masters and a course on flower arranging, or to use the Japanese term, *ikebana,* is included in the curriculum of nearly all the girls' schools in Japan

Common to practically all the styles is the principle guiding the fundamentals There is to be a tall spray representing the "leading principle," Heaven Another branch should be kept low down to denote the "subordinate principle," Earth And there is to be another branch between the two which stands for the "reconciling principle," Man Thus an effort is made, besides aiming at a beautiful form, to indicate man's relation to the universe There should always be these three prominent features, however many other branches of minor significance may be added, the joining of these principal points forming a triangle However, the *rikka* (standing flowers), a special art of the Ikenobo school, may be considered an exception it denotes the universe with actual suggestions of landscapes by the branches and flowers In each style the highest artistic value of a vase of flowers is brought out in its relation to the season, the occasion, and the other objects of ornament, chief among which is the *kakemono,* the hanging picture As the arranged flowers are to be placed on the *tokonoma* (an alcove in the guest room) they are so composed as to be best seen from the front Now that there are so many foreign styled rooms in the Japanese houses, it has become neces-

sary to have flowers so arranged as to be appreciated from all sides, and there is a tendency to develop a style to meet this requirement.

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FLOWER FARMING. Flower growing for the wholesale market has become a great industry in many countries with the development of wealthy urban populations of cultured taste England, the United States, France and Holland have important flower outputs

Flower Farming in England.—In 1925 the Ministry of Agriculture estimated that the area devoted to flower production in England in the open fields was about 5,250 acres Daffodils and narcissi accounted for about 1,400ac, tulips 300ac, violets 150ac, and other flowers 3,400 acres The value of flowers grown in the open was estimated at about £400,000

In addition, flowers are produced in glasshouses, the source of the very choicest and early forced blooms Daffodils, tulips, iris, lilies, etc are forced in advance of the outdoor crop, roses and carnations are kept cropping both winter and summer, while choice chrysanthemums are produced long after the outdoor varieties have been cut down by frost The value of the glasshouse blooms far exceeds those from the fields In 1925 the outputs of glasshouse grown chrysanthemums, roses and carnations were valued at £250,000, £250,000 and £85,000 respectively Cut flowers and flowering plants in pots produced in glasshouses were valued at £1,350,000 Thus the output of flowers from open fields and from glasshouses was in all £1,750,000

Flower Growing in France.—In various parts of France, and notably around Paris, there are glasshouses devoted to roses and cut flowers Nevertheless the greater part of the industry is carried on in the open fields of the Riviera district During rough or cold weather some kinds are protected with rush mats or glass lights, but in the main the French flower production is that of the open field The flower area extends from Toulon beyond the border into the Italian Riviera Toulon is important for narcissi, Hyères for violets, Cannes for mimosa, and Nice for carnations and roses Ranunculus, anemones, alliums and Spanish iris are also grown

Flower Growing in the Netherlands.—Flower culture in Holland is mainly devoted to the ends of the bulb industry In the spring the fields of narcissi, daffodils, tulips and hyacinths give a blaze of colour not seen anywhere else in the world These fields are the main source of the world's bulbs, and large quantities are exported annually to all parts The area of cultivation is estimated to be about 15,000ac and lies mainly between Amsterdam and Leyden, tulips predominate at Haarlem, hyacinths at Lisse and daffodils and narcissi at Sassenheim, though much general planting of all kinds occurs at each centre Bulbs are also forced in glasshouses to produce cut flowers, and with the flowers gathered from the open fields the cut flower industry is considerable, large quantities, especially of tulips, being exported to England, Germany and France

The American Flower Industry.—Floriculture has made great progress in the United States and to a lesser extent in Canada, and, beginning in the large centre round Boston, New York, Philadelphia, etc, has spread on some scale everywhere American floriculture is carried on in specially built glasshouses, some of which are of a scale bigger than any yet built elsewhere In 1900, the industry was said to occupy 9,307ac, in 1910 18,248ac., and in 1928 it is more than twice as large as in 1910. The principal flowers grown in their order of importance are roses, carnations, violets, chrysanthemums, sweet peas, lilies of the valley, bulb-flowers and orchids Sweet peas are becoming very popular and in importance will soon rank before violets, if they have not yet done so Whilst glasshouses of great size are built for mass production, good culture has not been sacrificed, and American roses are not surpassed elsewhere.

Spring Flowers.—While flowers such as mimosa, lilac, freezia, daffodils, narcissi, snowdrops, anemones, violets and iris come to herald the spring, and are usually spoken of as spring flowers, even before Christmas European markets are supplied with violets and mimosa from the French Riviera and with the white narcissi (Paper white or Mediterranean white) from Toulon. These are followed early in January by daffodils and narcissi from the Scilly isles. By Easter time supplies are general in all countries The Scilly isles function as a spring flower garden for Great Britain. The flowers are grown mostly on the islands of St Mary's and Tresco. Pickings commence in the open fields with daffodils (Henry Irving, Emperor, Golden Spur), and with narcissi (Soleil d'or) soon after Christmas For the first bunches prices rule high, but quickly fall as the daily supplies increase

All these spring flowers are also grown in England near Penzance, in Middlesex and in Lincolnshire The Lincolnshire area which is situated around Spalding follows closely the Dutch methods of culture, emigrants from the Netherlands having settled in Lincolnshire and done much to stimulate flower farming there. Here also are grown in the open fields the vast majority of tulips produced in England

Forcing Bulbs into Flower.—Forcing is done in the Scilly isles, Cornwall, Lincolnshire and Guernsey, the largest forcers are centred about Uxbridge, Cheshunt, Hampton and other districts near London When bulbs have grown in the open field to a large size they are suitable for forcing, and large quantities of these "forcers" are sold each autumn Golden Spur, Emperor, Empress, Ornatus and Horace are popular daffodils for this purpose Of tulips a good many varieties are used, Duc van Hols, Diana, King of the Yellows, for Christmas flowers, Salvator Rosa, Thomas Moore, Prince of Austria and Ionricesall Flamingo, Wm. Pitt and Wm Copeland for January use, and Franz Hals, King Harold, Himese for February

Forcing tulips requires much care, the bulbs must be in the boxes by August or early September, the soil must be light virgin loam containing much bone meal The boxes covered with earth should stand in a cool and shady spot for a time for root development, before being taken to forcing rooms maintained at 60° F.

Violets.—The violets of the florist's shop are the product of special culture in selected places, one very suitable spot is the French Riviera, especially in the region of Hyères, in which region very large quantities are produced every winter In England violets are grown in open field culture in the Scilly isles, Cornwall, Devon, Dorset, Hants, Sussex and Kent Violets grow exceedingly well in the south-west of Ireland, where in county Cork important commercial violet farms exist In America violets are grown in specially constructed glasshouses

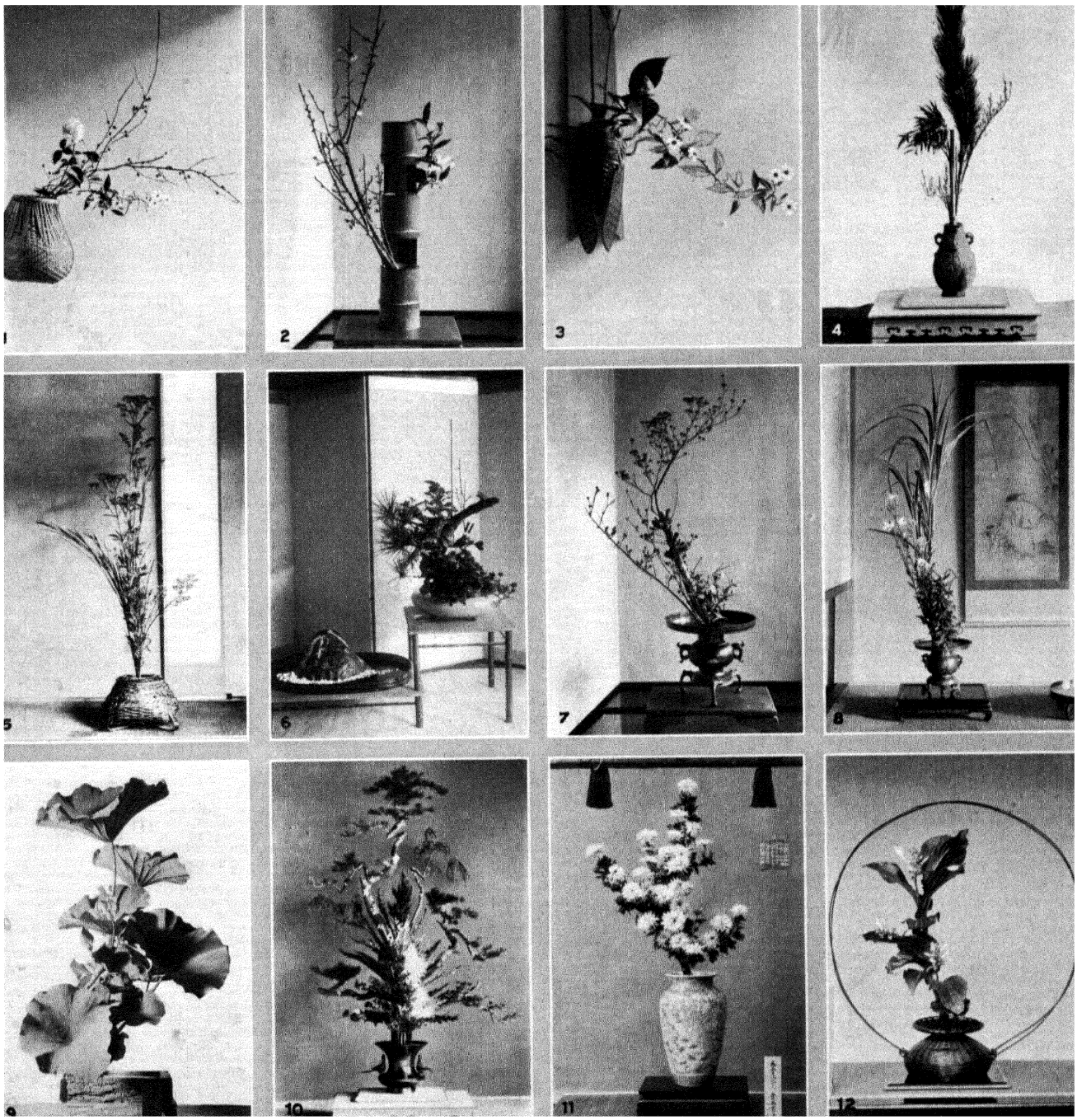
The violet is a sensitive plant, very exacting in its requirements It needs much sunshine but will not tolerate heat or dryness, it must be sheltered from winds and in some instances protected from frost Clay lands are too cold and wet, whilst sandy soils become too hot and dry

There are a large number of varieties in cultivation, but nearly 90% of the shop blooms are of the variety Princess of Wales, which yields best under commercial conditions The plants of this variety should commence flowering in October and continue to give crops till March; Baroness Rothschild and California are blue of a similar type with long stems. Double violets are grown in smaller quantities, the best being Marie Louise (mauve) and Comte de Brazza (double white). These are the "Parma" violets of the shops

In open field culture the plants are grown in beds 9ft. wide to take 10 plants 12in apart with 14in between the rows, thus giving about 30,000 plants to the acre An acre of good plants should produce not less than 45,000 bunches and the selling price varies from 2s 6d per dozen bunches in the early part of the season to 9d. per dozen later when blooms are plentiful.

Sweet Peas.—These lovely flowers are much grown In districts which are favourable, sowing should begin during the autumn on well cultivated land richly manured with rotten dung. The seeds must be sown very thinly, so that the plants are at least 3in. apart. In districts where autumn sowing is not safe, the seeds should be sown during October in small pots—two or three seeds in size 60 pots—and these should be kept in a house or frame

FLOWER ARRANGING



BY COURTESY OF JIRO HARADA

JAPANESE STYLES OF FLOWER ARRANGING

1 Flowers arranged in Seizan-Ryu style The Seizan-Ryu school is an outgrowth of the Ikenobu cult (*see* figs 4 and 5)

2 Flowers arranged in Tozanko-Seiryu style (*see* figs 7 and 8) The triangular grouping, characteristic of all Japanese flower-arrangement, symbolizes Heaven, Earth and Man

3 Another arrangement of flowers in Seizan-Ryu style (*see* fig 1)

4 Pine, plum and bamboo arranged for a happy occasion, in Ikenobu style. The first Ikenobu was a pupil of Soami (*see* fig 9)

5 Autumnal flowers arranged in Ikenobu style, in combination with a kakemono (hanging picture), suggesting the singing of autumn insects

6 Arrangement in Mori-bana style

7 and 8 Further examples of Tozanko-Seiryu style (*see* fig 2) The grouping with all the stems together at the base is typically Japanese

9 Lotus arranged according to Soami style Soami (15th century) is reputed to have been the originator of the three-element style

10 Rikka, or standing flowers, grouped to suggest a landscape, a style peculiar to the Ikenobu school

11 Flowers arranged in Tensho-Koryu style As in all Japanese arrangements, an effect of even symmetry is avoided

12 Flower arrangement according to Shogetsudo-Koryu style, originated by Myogi-Shomix in 1171–1231

free from frost during the winter, though no forcing must be attempted If little heat is used and the plants are given plenty of ventilation, good sturdy plants should be ready by April, when they may be planted out during good weather to bloom in June.

Sweet peas also are grown under glass for early blooms, and these crops yield the choicest blooms The seeds are autumn grown in pots and planted out about March into beds specially prepared in the houses and kept growing, so that by April they are two to three feet high. All tendrils and side growths are removed and the plant kept upright by being twisted around string hung from the roof. Ventilation must be given at all times, and plenty of tepid water. In May, when the flower spikes are showing, feeding with liquid manure may commence

The English sweet pea industry is expanding, but is still very much smaller than that of the United States, where sweet peas are grown in immense quantities.

Carnations.—The area of carnation houses has greatly increased; supplies of the flowers have more than trebled in recent years; yet there seems to be a market for all and especially for the best grown blooms. Formerly glasshouses of small size were used, but some of the new houses are 100yd long and hold as many as 15,000 plants

The carnation plants are grown in prepared beds of soil, a good loam enriched with well rotted manure and some bone meal, four to six inches deep, preferably raised to provide good drainage and aeration Regular water and fortnightly feeding is necessary! A high temperature in the house is harmful, one of 46° F to 50° F during dry weather is sufficient for the growth, and this is best attained by running hot water pipes above the plants rather than low down as in tomato houses

The following list gives a selection of the best varieties of each colour.—

Pink. Mayday, Mrs Walter Hemis, Enchantress Supreme. *Salmon Pink* Lady Northcliffe, Bona, Cupid, Laddie *Scarlet.* Aviator, Tarzan, Beacon, Edward Alwood *Crimson* Triumph, Nigger. *White* White Wonder, Wivelsfield White, White Mayday. *Cerise.* Peerless *Mauve* Mikado, Eastern Maid, Wivelsfield Claret. *Yellow.* Saffron, Sunshine

Rose Culture Under Glass.—Rose culture under glass is essentially different from that of the open gardens, for by special pruning and manuring the indoor rose plant is made to give blooms almost continuously Few varieties are grown, Richmond (red-scarlet), Ophelia (salmon), Madame Butterfly (salmon to rose), and Lady Hillingdon (orange yellow) being the chief kinds Three-year bushes budded on manetti stock are planted in beds of loam, heavily manured with dung and fertilizers. The plants are kept cut hard back and the rich soil forces out new strong growths which develop blooms on the tips If the bloom commences before the stem is of sufficient length, the bud must be picked out and the shoot allowed to make further growth before flowering, for long straight stems are essential. Roses are grown in this way in Holland, North America and England. The English roses are all needed at home The Dutch roses are mainly exported to England and Germany. Rose growing under glass has attained its greatest measure of development in the United States; the plants seem to appreciate the bright American sunshine, for the roses are exceedingly fine and have very long stems.

Lily of the Valley.—There are now many thousands of acres of land in the United States, England, Holland and Germany devoted to the production, not of the flowers but of the crowns (roots) of this flower. In October these crowns are packed an inch apart into boxes with the crown flush with top and covered with any light sandy soil. The boxes are well watered and covered with moss or coconut fibre to a depth of three or four inches. When placed in houses heated to 80°–95° F growth soon commences, and when the shoots are two to three inches long the moss is removed and light gradually admitted. Heavy daily watering must be made until the blossoms appear Boxes of crowns placed in refrigerated chambers having a temperature of 28° to 30° F remain dormant. These may be taken out at any required time and forced into flower in greenhouses.

Lilies.—In all countries the chief lily of the market gardener is the White Trumpet—(*Lilium longiflorum*)—the bulbs of which are raised in Japan and Bermuda By forcing some bulbs, growing others in natural heat, and retarding the growth of yet others by keeping the bulbs in refrigerated chambers, the grower produces these tall White Lilies at all seasons of the year, though the greatest demand comes at Easter and Christmas Fine bulbs are put into a 6-in pot provided with much drainage, and covered with good medium loamy soil, leaf mould or rotten manure The flowers are cut with long stems in the bud stage, packed firmly in very long shallow boxes and despatched to the markets

Lilium speciosum also is much used in making wreaths and bouquets It is smaller and of a different shape The colours vary from deep red and rose spots on white to white without spots. The culture is similar to that described for *longiflorum.*

Chrysanthemums.—Some few varieties of chrysanthemums flower very early and yield their market crop before the frost comes Varieties which do this are grown out of doors in beds 12ft by 4ft 6in in rows 18in apart and with 18in from plant to plant The following are the most desirable kinds for growing —Framfield Early Primrose (white): Holicot Yellow (yellow); Golden Almirante (orange yellow); Mrs. Jack Pearson, Bronze Goacher (bronze); Almirante (chestnut), Normandie (pink); Lighfield Purple (purple).

In indoor culture, cuttings are placed in pots in November; when rooted the plants should be potted on and receive no check from the commencement until they have flowered The indoor plants need training, *i e*, the stems are stopped by pinching out the tops, so that the plant "breaks" into fresh growths and the cultivator is able to flower as many of these as he desires. Those who aim at large choice blooms must thin off all except the terminal bud; energy is concentrated into a few stems and the flowers grow to a large size. Grown naturally, chrysanthemums would develop into a bush, producing flowers in sprays, and although "Spray Chrysanthemums" are sold in the market the price paid is often low The greenhouse during the winter months should have just sufficient heat to keep out frost, but any attempt at forcing should be avoided for chrysanthemums do not respond well to such treatment Periodic spraying with nicotine and soft soap (1 oz. nicotine, 1 lb. soft soap and 12gal rain water) should be practised to kill aphis

Holicot (yellow), Alcaldo (bronze) and Debutante (white) are early blooms, Norman (single yellow), Ada Brookes, Chieftains, Mary Morris, Mrs. N. C. Cotlow, Mrs J Bassell, Pioneer, Balcomb Beauty, K C. Pulling and Majestic are popular varieties. Each grower has his own particular fancy, which matters little, for in the market the flowers are sold as whites, yellows, bronze, etc

Flowering Plants in Pots.—At special seasons of the year flowering plants in pots are much in demand. At Christmas time, and in America also at Easter time, the flower markets and shops are full of flowering hyacinths in bowls and pots of azaleas, cyclamens, spireas, hydrangeas and heaths, which are readily sold at good prices.

The Belgian growers have specialized in azaleas, and their special culture in pots of small bushy plants full of flowers may be had about Christmas time. Large quantities are exported from Belgium during the autumn, and these are forced into bloom by Christmas. They need a good deal of water. After flowering, the plants should be pruned and allowed to make new growths which should be ripened off by standing the plants out of doors during July and August

The market grower raises his cyclamen corms from seed These are grown in shallow pans of leaf mould and sand in July or August. The seeds take some time to germinate and come up very irregularly. When large enough to handle, each seedling should be potted to rich loam and leaf mould and grown in houses at 60° F to 65° F. As the plants grow they are shifted into larger pots, finally being placed into those of size 48 in about 12 months' time from the date of sowing the seed. The plants may now receive bone meal, Guano liquid manure and then go into a house heated to about 50° F, where they develop their blooms. These pots of cyclamen in full bloom find a ready sale during December and January.

Popularity of Cut Flowers.—The public to-day appreciates flowers so much that those in the industry are surprised at the great expansion of the cut-flower trade The volume of trade has grown enormously together with an increased variety of flowers A grower may now send to market any kind of choice flowers and secure a sale Dahlias, delphiniums, zinneas, gladioli, etc , are welcome and find buyers no less than the sorts which have been mentioned above The public taste is for large well grown blooms of bright colours, sweet scented, if possible; but there is little demand for poorly grown specimens, and indifferently developed blooms are almost unsaleable Flower growing, to be successful, must be the work of a specialist (H V T.)

United States.—So far as flowers are concerned there appears to be little difference between the kinds of plants grown in the United States, in England and on the Continent Since the enforcement of Quarantine No 37 which prohibits the introduction into the United States, except by special permit, of all plants with soil on the roots and certain bulbs, there has been less interchange of plants between Europe and America than in the earlier days The United States is now dependent on its own nurserymen for its supply of azaleas, araucarias, bay trees and many other species formerly imported in large numbers from European countries Greenhouse establishments in America are considerably more numerous than in England and variations in climatic conditions make it necessary to pay considerably more attention to heating problems Steam is more generally used for heating than hot water

Roses are without doubt the most important cut-flower crop produced in America Extensive areas of glass are devoted exclusively to their culture in the eastern and central States. Within recent years there has been a decided change in the varieties grown Bud variations and seedlings of American, German, French, Irish, Dutch and English varieties are widely grown; such varieties as Briarcliff, Mme Butterfly, Rapture, Premier, Rose Hill, Mrs F R Pierson and the offsprings of Souvenir de Claudius Pernet, Fontanelle, Gaiety and others, have replaced, in the American trade, Killarney, Ophelia and other European varieties White Killarney, however, still continues as the best white rose in the American market Carnations are now less generally grown in America and the large numbers of other species, such as calendulas, snapdragons, lupines, delphiniums, stocks and many annual plants which are now being grown for winter cut-flowers under glass have taken the place of carnations to a considerable degree Orchids are rapidly becoming an important commercial cut-flower crop Among potted plants semi-tuberous begonias, cyclamen, primroses, cinerarias, calceolarias and many other species are grown In America there is also a considerable trade in outdoor flowers such as sweet peas, asters, dahlias, gladioli and others Many seedling palms are now being propagated and grown, especially in California, to supply the American trade (E A W)

FLOWERLESS PLANTS: *see* PTERIDOPHYTA, BRYOPHYTA, ALGAE, FUNGI

FLOWER PAINTING. Broadly speaking, flower painting may be divided into two big classes that of the East, and that of the West In the East, flower painting very early attained to a high state and became an individual, extremely beautiful art in China between the 7th and 17th centuries Japanese painters, adopting many of the traditions of Chinese art, created a phase of flower painting which rose to superb heights in the 16th and 17th centuries In the West, flower painting proceeded slowly from Egyptian, Grecian and Roman days, on through the Italian Renaissance, until, mainly in the north of Europe, again in the 16th and 17th centuries, almost with one bound, it reached a distinctive and highly developed form of painting in the Netherlands, and from there spread to nearly every country of Europe The two schools grew under conditions so separated that each remained until recent times quite untempered by the other.

Flower painting of modern times is something of a heritage of both these divisions, but mainly of the Western group, to which has been added a richer and fuller sense of colour, finer and more subtle effects of light and atmosphere resulting from the greater development of visual perception and the delving into the realms of science, as developed by the French impressionists. The manner of painting flowers has followed the changes that have taken place in painting generally, whether of the East or of the West In method, in the West, the early form was fresco, then oil; now water-colour and pastel are employed in addition With the Chinese and Japanese, except in wall painting, it has always been a phase of water-colour painting, and their marvelous use of the brush on silk or paper has given a character found nowhere else in the world of art. In the Western world, flowers have been associated for the most part with man They have appealed to his finer feelings; they have graced his life. He has used them as symbols, decorations, adornments, offerings and as enrichments to his home and his surroundings, while in the East they have always been thought of as a beautiful part of the great order of things in the universe, a part of nature of which man himself is likewise but a part Flower painting, therefore, has developed along a far different line in the East from what it has in the West In the East it has always been approached from a contemplative, philosophic and poetic point of view, while in the West it has been, for the most part from an objective one In the West, we find flowers used in the early days only as accessories in the art of painting At first they are painted as symbolical and decorative adjuncts. Later they assume a realistic phase in their conjunction with the religious and mythological subjects But not until about the 16th century do they appear as subjects for paintings for their own beauty In the East, however, they have formed a very distinct branch of painting for over a thousand years The Chinese divided their paintings into four general subjects landscape, man and objects, flowers and birds, plants and insects Three of these main divisions deal directly in the broad field of nature, the third and fourth divisions are closely related, and being based on much the same conceptions as their landscape painting, follow it as a natural development

THE ART IN CHINA AND JAPAN

The close observation and contemplation of nature by the artists of the East has produced in their work a rare character and charm Their flower paintings vibrate with life and force, they are beautifully rhythmic Their lilies nod and sway on delicate stems; lotus flowers vigorously grow from earth and water into light and sunshine Their vines hang and sway in the breeze, their peonies unfold, their plum blossoms spread their petals and gently float away in the breeze almost as they open Flowers in their paintings are associated with the passing of the seasons and the moods of nature Generally they are painted with the birds of the seasons naturally associated with them at the time of flowering, in their natural habitat, and always with a great understanding of their life and growth The Chinese artists ever communed with nature It is said of Chao Ch'ang, of the early 11th century, that "every morning he would walk round the gardens and examine some flower carefully, turning it over and over in his hand Then he would paint" Of I Yuan-chi, it is said that "he laid out a garden, planted it with bamboos and rushes, and kept there a variety of water fowl, so as to be able to watch them in movement and repose." Kuo Hsi writes about this same time· "Those who study flower painting take a single stalk and put it into a deep hole and then examine it from above, thus seeing it from all points of view Those who study bamboo painting take a stalk of bamboo, and on a moonlight night project its shadow on to a piece of white silk on a wall"

Of the early Chinese flower paintings few remain to the present day, but of those known, the earliest are of the T'ang dynasty (A D. 600–900) and show an art that must have been highly developed through many earlier centuries Pien Luan, of the late 8th century, was noted for his paintings of birds and flowers. Hsiao Yüeh of the same century painted the bamboo exclusively. Hsü Hsi, of the early 10th century, was famous for his painting of flowers "Peonies in the Wind" and "Ducks in a Lotus Pond" are typical titles In his time he was considered an artist of the front rank, and has been called "the father of bird and flower painting" He was famous for his paintings of the lotus flowers

FLOWER PAINTING

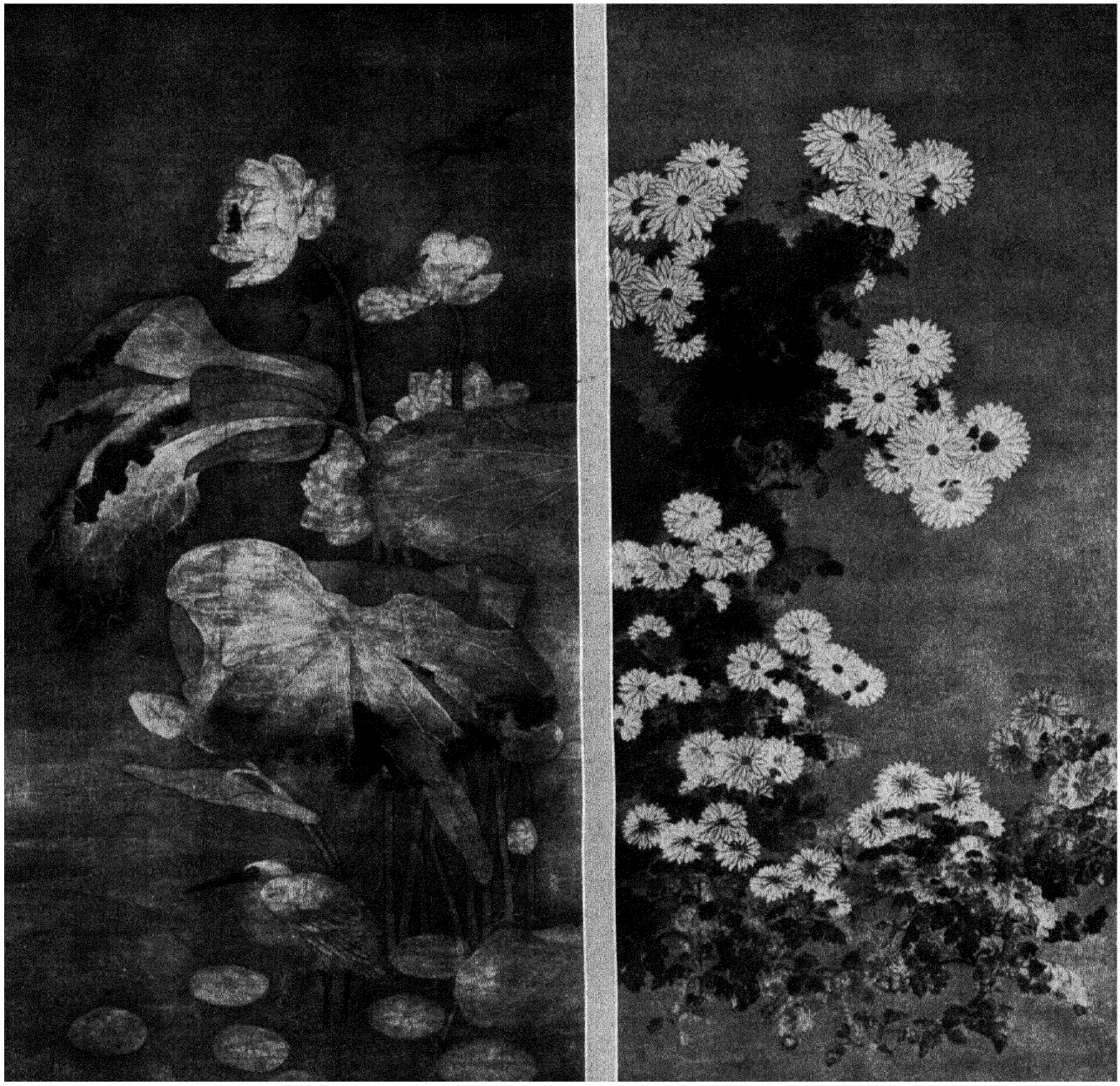
PLATE I

COURTESY OF THE MUSEUM OF FINE ARTS, BOSTON, (2) COPR H BONNAIRE, (3) THE LEFEVRE GALLERIES, COPR H BONNAIRE, (4) C W KRAUSHAAR ART GALLERIES

EUROPEAN FLOWER PAINTINGS

1 Vase of Flowers, by Jan van Huysum, Holland (1682–1749) 2 Roses au Chevrefeuilles, by Auguste Renoir, France (1836–94) 3 Vase de Fleurs, by Charles Dufresne, France. 4. Roses, by Henri Fantin-Latour, France (1836–1904. 5. Les Lauriers Roses, by Vincent van Gogh, Holland (1853–90)

FLOWER PAINTING



BY COURTESY OF THE TRUSTEES OF THE BRITISH MUSEUM

JAPANESE AND CHINESE FLOWER PAINTING

1. "Lotus, White Heron and Kingfishers" by an unknown Chinese painter of the Sung dynasty (960–1268), an example of the work of the period when flower painting advanced to a great art in China
2. "Chrysanthemums" by Tawarayo Sotatsu, an outstanding figure of the Tokugawa period in Japanese art He worked between 1624–1643 and was the first to use gold as a pigment, mixing it with ink and colours

which were the inspiration for many painters in later times both in China and Japan Huang Ch'uan and his son Huang Chu-ts'ai were noted painters of flowers of this same century Two pictures, "Fowls" and "Peonies," in the British Museum are attributed to the father, while there is record of a large number of paintings of birds and flowers by the son

The three centuries of the Sung dynasty (960–1260) saw flower painting advanced to a great art It was a period of intense nature study, a period where a passion for flowers was common, a period when flowers were associated with nature and with every mood of nature. Many flower painters flourished, and their paintings are filled with an elusive poetic quality, combined with accurate form and rhythmic beauty of growth In this phase of Chinese art, the Sung artists are pre-eminent Hsu Ch'ung-ssŭ was a painter of flowers and insects, and is accredited with being the first to paint directly without first sketching the subject Chao Ch'ang, who followed something of his methods, attained great fame. It is said of him that he "not only produces an accurate resemblance, but hands over to you the very soul of the flower" also Ch'êng T'ang was famous for his paintings of bamboo, as was Chou Shun Li-Ti excelled as a flower painter, Chao-Mêng-Chien delighted in painting the plum and narcissus, while Cheng Ssŭ-hsao devoted himself to the painting of orchids

In the Yuan period, 1260–1368, there are few outstanding flower painters Ch'ien Hsuan, born in the earlier dynasty, was noted, and Li K'an achieved great fame as a painter of the bamboo In the Ming dynasty, 1368–1644, though a decline had set in, much of the tradition of the golden age of the Sung period was carried on, and a number of flower painters are found Mr Fenollosa claims for Lin Liang first place of all Ming artists Lu Chi painted his flowers and birds with a landscape background. Sun K'an specialized in the painting of the chrysanthemum Other flower painters of this time were Ch'ên Shun, Kao Ku, Sun K'o-hung, whose paintings were noted for beauty of movement in flowers, and Chou Chih-mien, also noted for the rhythm and spirit he attained In the Ch'ing or Manchu dynasty, 17th to the 20th century, though no new vigour has been added, and marked signs of decadence are seen, many of the traditions in flower painting of the earlier Sung and Ming periods were maintained with vitality, at least to the beginning of the 18th century

In Japan, flower painting, inspired greatly by the Chinese masters of the T'ang, Sung and Ming periods, possess many of their characteristics, grafted often on to the traditions of their own Japanese native schools of painting

The most impressive periods were the Ashikaga period (1335–1573) and the Tokugawa, from about 1600 into the 19th century The first strongly upheld traditions of the Sung painters The native Japanese tradition slumbered, and a sort of Chinese renaissance in Japan took place The gorgeous coloured scrolls, which had been typical, were replaced by bold simple ink paintings of birds and flowers and landscape It was the philosophic, contemplative art of earlier Chinese painters So far as flower painting was concerned, it was the interpretation of the life and growth of the flowers and their association with nature. Sesshiu and Kano Masanobu, the first of the great Kano school, both of whom had great influence and many followers, painted flowers in the classic Chinese style. Utanosuke, son of Kano Masanobu, achieved a great reputation for his distinguished painting of flowers and birds. He died in 1575. About 1600 began the Tokugawa period of Japanese art. Chinese ideals were developed along with the Japanese tradition for rich colour and sumptuous decorative effects. Artists with great skill and understanding vied with each other in producing a phase of flower painting, combining all the beauty of the growing flower with superb design and gorgeous colour, that remains unique in the entire field of painting The three outstanding masters of flower painting of this period are Koyetsu (1557–1637), the leader in this movement, Sotatsu, considered by Japanese critics as the greatest of flower painters after Utanosuke, and Korin (1661–1716) who "is perhaps the most Japanese of all the artists of Japan." Their influence carried forward to recent times, but there are few, if any artists since who have inherited their skill or genius.

OCCIDENTAL FLOWER PAINTING

In the West, as has been said, the earliest painted flowers are only to be found as symbols or as decoration The blue water-lily of the Nile, symbolizing a full harvest, is constantly found in the painted decoration of the Egyptians Flowers repeatedly appear in the religious paintings of the Renaissance. The lily, emblem of purity, is painted in almost every picture of the Annunciation and of the Madonna. In Roman times garlands and festoons of flowers were painted as decorations. Fine examples, in excellent preservation, are those painted in fresco on the walls of the house of Livia on the Palatine Crivelli and Mantegna continually in their pictures echo much of this festive decorative floral and fruit painting of the Romans Flowers form a part in many of the pictures by Botticelli, and though generally introduced for their symbolism, or decoration, they show close observation of growing flowers and a delight in painting flowers for their own beauty, and are rapidly assuming an objective, or realistic character They slightly suggest those found in some of the paintings of the late Ming period in China Botticelli died in 1515, and this century witnessed an unprecedented interest in flowers and gardens The Italians and Dutch both developed the making of gardens to a fine art. Merchants brought new and beautiful flowers from every corner of the earth to enrich them In Holland this collecting of rare flowers became the fashion, and collectors of both Italy and Holland employed artists to paint them

From 1550 to 1650 numerous painters in Italy, Spain and the Netherlands painted flower pictures for the beauty of the flowers themselves Many of them attained great reputations, and a few were great masters They exercised an influence that was immediately felt throughout Europe, and which has continued even to the present day Jan Breughel (1568–1625) is generally acclaimed as one of the first to develop this manner of painting to a fine art, and, since he introduced flowers as decorative elements in religious painting something in the manner of the early painters of the Italian Renaissance, and later painted flower pictures, he may be considered as the most important link in the chain which leads to the highest point of flower painting in the West Caravaggio (1569–1609), an Italian, as a young man made many paintings of flowers and fruit while in Rome He did much to advance solidity and light and shade in painting, and his influence was felt both in Spanish and Dutch painting. From then on this feeling for light and shade and third-dimension was a markedly noticeable addition to painting This phase, observed with greatest understanding, was almost scientifically accurate, and showed direct observation and study from nature. Daniel Seghers (1590–1661) painted in something of the same manner as Breughel, whose pupil he was He, too, used flowers in conjunction with religious subjects, but they seem rather to be painted as offerings to the Madonna and saints than as garlands of enrichment. As paintings of flowers, they are very beautiful, with much of the charm of their form, looseness and grace of growth, and delicacy of texture Individual flowers are masterpieces of close observation and painted with feeling for and knowledge of the flowers themselves.

The painting of garlands and festoons as accompanying decorations to other subject matter led in turn to separate flower paintings Jan D van Heem (1606–1684) developed this phase of flower painting to an amazing degree His technique was masterly His composition, colours, arrangements, lighting and feeling for the forms of flowers, which he generally painted against a simple dark background, produced a most finished and unified result. As an objective painter, he advanced flower painting to a point far in advance of what had gone before. He has seldom been surpassed He achieved a great and deserved reputation, and is one of the real masters of this art. His influence was unmistakable, not only among the Dutch and Flemish painters, but throughout Europe Almost simultaneously, we find groups of artists painting flower pictures in various countries, much in the manner of de Heem. In Italy, there were many, the most noted among which were: Giovanni Battista Ruoppoli (1600–59); Mario Nuzi da Fiori (1603–73) (a pupil of Cavaliere Tommaso Salini's [1570–

1625], who was a contemporary of the Italian Caravaggio and the Flemish painter Jan Breughel, and who is claimed by Lanzi to have been "the first that composed vases and flowers accompanying them, with beautiful groups of foliage"); and the Roman, Michelangelo de Campidoglio (1610–70) In Spain, various members of the Arellano family painted in the van Heem and Caravaggio manner, the most famous being Juan de Arellano (1614–1672) whose flower paintings, generally painted in pairs, are greatly prized throughout Spain.

Later a German, Abraham Mignon (1639–1697), pupil of de Heem's, who worked in Holland, made for himself a reputation second only to his master He, in addition to painting grouped flowers and fruit, painted growing flowers but with little of their rhythmic beauty of growth and no sense of their envelopment by air and light Andrea Belvedere (1646–1732), a Neapolitan, is another painter, of this later time, with something of the Dutch tradition, much of Ruoppoli and something of Juan de Arellano's Like him his flower paintings are often in pairs His pictures are crowded but there is much, as in Arellano's, of the easy free growth of the flowers The crowning point of this kind of flower painting was reached by Jan Van Huysum (1682–1749), who painted well into the 18th century His flowers are masterly in the drawing of their exquisite and beautiful forms, superb in their third-dimensional quality, and in their delicate and gracious contours His combinations of colour, his contrasting of light flowers against dark and his design of the wealth of blossoms portrayed, produced gorgeous decorative effects and place him without question as one of the greatest masters of flower painting Yet his paintings lack a feeling for the living flower and do not possess that quality of growth so superbly grasped by the artists of the East They lack, too, the beauty of transmitted light and translucent colour that gives so much of the ethereal quality to flowers These qualities were to come later in the painting of the French school of the 19th century. However, in his time his pictures were unequalled for exquisiteness and grace of form, and were masterpieces of faultless finish Rachel Ruysch (1664–1750) painted in a similar manner and is by some critics considered his equal. Van Huysun's influence was considerable, and flower pictures in his manner continued to be painted on into the 19th century They are not as sumptuous, have not the same perfected finish and have not usually the same beauty of form. Often they have an increased harshness

In France there is an evidence of greater concern for the living character of the flower, a sense of its lightness and delicacy, or, its heaviness, on its stem—a sense for the frailness of flowers that makes Huysum's seem almost moulded from thin metal Such a painter as Laurent Melaine (1745–1809) gives evidence of this, as does Francois Pret, of whom there seems to be no existing biography or even dates, but, whose robust and richly painted flowerpiece in the Prado, places him as a master, and moves the art of flower painting a step forward It is in France, in the second part of the 19th century that flower painting reveals a new and glowing character. The changes brought about in painting by the French painters of this time are well known. The naturalistic trend of Courbet, Manet's aesthetic interest in colour and his admiration of Japanese art, tending to rich vivid masses of pure colour, Monet's interest in light, and colour in light—all these had their influence on flower painting.

France produced, adding these new phases to those of the Dutch school, a group of flower painters that is unsurpassed In the decade between 1830 and 1840 were born Edouard Manet (1832–83), Antoine Vollon (1833–1900), Fantin-Latour (1836–1904) and Claude Monet (1840–1926). Manet and Monet were the real influences for added characteristics of painting, but Fantin-Latour was the great painter of flowers In Manet's flower painting rich arrangement of colour in a bright and surrounding light gives a sumptuous quality. His flowers are painted with great gusto, freshness and luminosity. His influence is perhaps stronger on the painters of flowers of to-day than that of any other painter; but Monet's influence has been of an unmeasurable quantity also. He made the world see colour in light, pure colour of a vibrating, iridescent quality. In his pictures he has perhaps painted flowers rather more as a medium by which to express this feeling for pure colour in light and in space than because of the beauty of the flowers in themselves Latour, on the other hand, understood flowers, their delicacy of form, growth and colour, and painted them for their own great beauty, but, in doing so, combined the qualities of his two great contemporaries His pictures are beautiful arrangements of form and colour with all the living vibrating, if passing, qualities of the flower, placed in full light with atmosphere surrounding them, and they mark to the present time the high spot of Western flower painting

Between the realistic Dutch period and the French impressionistic, William Henry Hunt (1790–1864) in England, painting in a method quite his own, produced flower pictures in water colour that, ungracious as they generally are, had much of the exactness of floral structure with a suggestion in colour, that was slightly related to what the French later developed to such a supreme degree. Later still, Francis E James (1849–1920) developed in water-colour a crisp delightful phase of flower painting Contemporary with the great French impressionists, John La Farge (1835–1910) in America was a true flower painter, and the forerunner of a number of flower painters in this country. Abbott Thayer, Wilton Lockwood, Maria Oakley Dewing, Charles Demuth and Laura Hills are artists who have found, in flowers, subjects for their paintings, and each has added something to the art (*See* also PAINTING; WATER-COLOUR) (G W. D)

FLOWER-PECKER, the name given to the members of a family (*Dicaeidae*) of small Old World birds which usually build hanging nests. *Dicaeum erythrorhynchus,* the smallest bird in the Old World, weighing some 7 or 8 grams, is included in this family

FLOWERS, ARTIFICIAL. Imitations of natural flowers are sometimes made for scientific purposes (as the collection of glass flowers at Harvard university, which illustrates the flora of the United States), but more often as articles of decoration. A large variety of materials have been used in their manufacture by different peoples at different times—painted linen and shavings of stained horn by the Egyptians, gold and silver by the Romans, rice-paper by the Chinese, silkworm cocoons in Italy, the plumage of highly coloured birds in South America, wax, small tinted shells, etc. At the beginning of the 18th century the French, who originally learnt the art from the Italians, made great advances in the accuracy of their reproductions, and towards the end of that century the Paris manufacturers enjoyed a world-wide reputation. About the same time the art was introduced into England by French refugees and soon afterwards it spread also to America

The industry is now a highly specialized one and comprises a large number of operations performed by separate hands. Four main processes may be distinguished. The first consists of cutting up the various fabrics and materials into shapes suitable for forming the leaves, petals, etc. This may be done by scissors, but more often stamps are employed which will cut through a dozen or more thicknesses at one blow The veins of the leaves are next impressed by means of a die, and the petals are given their natural rounded forms by goffering irons of various shapes. The next step is to assemble the petals and other parts of the flower, which is built up from the centre outwards; and the fourth is to mount the flower on a stalk formed of brass or iron wire wrapped round with suitably coloured material, and to fasten on the leaves required to complete the spray.

FLOYD, JOHN (1572–1649), English Jesuit, was born in Cambridgeshire. When at Rome in 1592 he joined the Jesuits, and by 1606 was a missionary priest in England. He had considerable fame as a preacher and teacher, and was frequently arrested. His last years were spent at St. Omer where he died on Sept. 15, 1649. His works are listed in Fellow's *Bibl. Dict. Eng. Caths.* (1885).

FLOYD, JOHN BUCHANAN (1807–1863), American politician, was born at Blacksburg, Va., on June 1, 1807. He was the son of John Floyd (1770–1837), governor of Virginia, 1830–34. In 1826 he graduated from South Carolina college, after which he practised law in Virginia and in Helena, Ark. He was a representative in the Virginia legislature, 1847–49, and governor of Virginia, 1849–52; afterwards he was again returned to the

FLOWER PAINTING



BY COURTESY OF (5) THE METROPOLITAN MUSEUM OF ART, NEW YORK PHOTOGRAPHS (1 2 3 4 6 7 8) BY VERRALL

FLOWER PAINTINGS OF THE FRENCH, DUTCH, AND SPANISH SCHOOLS; 17TH–18TH CENTURIES

1 Flowers by François Pret, French In the Prado

2 Flowers by Daniel Seghers, Flemish (1590–1661) Like his teacher, Jan Breughel, Seghers frequently painted flowers in conjunction with religious subjects In the Prado

3 Roses, tulips and other flowers in a wicker-basket, by Juan de Arellano, Spanish (1614–76) In the Prado

4. Flowers by Andrea Belvedere (1642–1732), Neapolitan school In his paintings of flowers, fruits and birds the light is often reflected from mirrors or fountains In the Prado

5. Vase of flowers (1716) by Margareta Haverman, Dutch (18th century), pupil of Jan van Huysum. In the Metropolitan Museum of Art

6. A garland of flowers by Jan Breughel, Flemish (1568–1625) He frequently painted garlands of flowers around portraits or pictures of the Madonna by Rubens and others In the Prado

7. Another painting of flowers by Jan Breughel, often called *Breughel de velours* In the Prado

8 Garland of flowers by Daniel Seghers (*see* also fig 2), a pupil of Jan Breughel In the Prado

FLOWER PAINTING



BY COURTESY OF (1, 3) THE MUSEUM OF FINE ARTS, BOSTON

MODERN AMERICAN FLOWER PAINTINGS

1 Larkspur, Canterbury bells and peonies, pastel by Laura Coombs Hills (1859–), painter of flowers in pastel and miniatures

2 Mountain rhododendrons, by George Walter Dawson (1870–), flower and landscape painter; owned by Harold Hill Blossom

3 Peonies, by Wilton Robert Lockwood (1861–1914), painter of flowers and portraits

4. Water-lily among reeds, by George Walter Dawson (1870–), flower and landscape painter, owned by George B Garrett

State legislature. In 1857 President Buchanan appointed him secretary of war.

When Maj Anderson on Dec 26, 1860, transferred his forces in Charleston harbour from Ft Moultrie to Ft Sumter, the move that resulted in the outbreak of hostilities in the Civil War, Floyd claimed that the act was contrary to his orders. When the president and a majority of his cabinet upheld and defended Anderson's move Floyd resigned and returned to his Virginia home, becoming a secessionist in his sympathies A few days previous to his resignation President Buchanan had requested a resignation because of certain financial irregularities in Floyd's department due to extremely careless administration Whether the request had reached Floyd at the time he resigned and the Ft Sumter incident merely furnished him with a pretext for a more honourable exit is not known Charges made later that he had made use of his office to furnish arms to the South in anticipation of war were disproved by an investigating committee of the House of Representatives in Jan 1861 Floyd was commissioned a brigadier-general in the Confederate service and employed first in operations in western Virginia In Feb 1862, he became commander of the Confederate forces at Ft Donaldson When resistance seemed useless he escaped with part of his forces, leaving Gen S B Buckner to surrender to Grant For this President Davis relieved him of his command He died at Abingdon, Va , on Aug 26, 1863

See P G Auchampaugh, *James Buchanan and his Cabinet on the Eve of Secession* (1926), J F Rhodes, *History of the United States, 1850–77*, vol III , R M Hughes, "Floyd's Resignation from Buchanan's Cabinet," *Tyler's Quarterly*, vol. V (1923).

FLOYER, SIR JOHN (1649–1734), English physician and author, was born at Hinters in Staffordshire, and was educated at Oxford He practised in Lichfield, and it was by his advice that Dr Johnson, when a child, was taken by his mother to be touched by Queen Anne for the king's evil He died on Feb 1, 1734 Floyer was an advocate of cold bathing, introduced the practice of counting the rate of the pulse-beats, and gave an early account of the pathological changes in the lungs associated with emphysema

His numerous writings include —*Φαρμακο-Βάσανος: or the Touchstone of Medicines* . . . (1687), *A Treatise of the Asthma* (1st ed , 1698), *The ancient Ψυχρολουσία revived, or an Essay to prove cold Bathing both safe and useful* (London, 1702, several editions, abridged, Manchester, 1844).

FLUDD or **FLUD, ROBERT** [ROBERTUS DE FLUCTIBUS] (1574–1637), English physician and mystical philosopher, son of Sir Thomas Fludd, treasurer of war to Queen Elizabeth in France and the Low Countries, was born at Milgate, Kent After studying at St. John's College, Oxford, he travelled in Europe and read the works of Paracelsus He subsequently returned to Oxford, and taking his medical degrees, practised in London Following Paracelsus, he maintained that the universe proceeds from and will return to God. The act of creation is the separation of the active principle (light) from the passive (darkness) in the bosom of the divine unity (God). The universe consists of three worlds: the archetypal (God), the macrocosm (the world), the microcosm (man). Man is the world in miniature, all the parts of both sympathetically correspond and act upon each other. Fludd's pantheistic materialism was refuted by Kepler and Gassendi Fludd was a man of varied attainments, interested in scientific experiments, and defending the Rosicrucians De Quincey considers him to have been the immediate, as J. V. Andrea was the remote, father of freemasonry. Fludd died in London on Sept. 8, 1637.

See J. B. Craven, *Robert Fludd, the English Rosicrucian* (1902), where a list of his works is given; A. E Waite, *History of the Rosicrucians* (1887); De Quincey, *The Rosicrucians and Freemasons;* J Hunt, *Religious Thought in England* (1870) His works were published in 6 vols., Oppenheim and Gouda, 1638.

FLÜGEL, GUSTAV LEBERECHT (1802–1870), German orientalist, was born at Bautzen on Feb 18, 1802, and died at Dresden on July 5, 1870. Flügel's chief work is an edition of the bibliographical and encyclopaedic lexicon of Haji Khalfa, with Latin translation (7 vols., London and Leipzig, 1835–58) His works include also an edition of the Koran (Leipzig, 1834 and again 1893); *Concordantiae Corani arabicae* (Leipzig, 1842 and again 1898); *Mani, seine Lehren und seine Schriften* (Leipzig, 1862); *Die grammatischen Schulen der Araber* (Leipzig, 1862); and *Ibn Kutlûbugas Krone der Lebensbeschreibungen* (1862).

FLÜGEL, OTTO (1842–1921), German philosopher, was born on June 16, 1842, at Lützen, and educated at Schulpforta and Halle He became pastor at Wansleben, near Halle. While in his theological speculations Flugel finds a place for revelation, in his philosophy he is a strong Herbartian and opponent of monism With Allihn, he edited for a time the *Zeitsch fur exacte Phil im Sinne des neueren philosophischen Realismus,* and later edited Herbart's collected works He died on July 9, 1921, at Dolau His chief publications are: *Der Materialismus* (1865); *Das Wunder und die Erkennbarkeit Gottes* (1869); *Die Probleme der Philosophie und ihre Lösungen* (1876; 4th ed , 1906); *Die Seelenfrage* (1878; 3rd ed , 1902), *Die spekulative Theologie der Gegenwart* (1881, 2nd ed , 1888), *Das Ich und die sittliche Idee im Leben der Volker* (1885; 5th ed., 1912), *Das Seelenleben der Tiere* (3rd ed , 1897), *F Herbart als Philosopher* (1905); *Monismus und Theologie* (1908)

FLUKE, a name given to several kinds of fish, flat in shape, especially to the common flounder, also to a trematode worm, resembling a flounder in shape, which, as a parasite, infects the liver and neighbouring organs of certain animals, especially sheep, and causes liver-rot The most common is *Fasciola hepatica* (*see* TREMATODES) The name is given to a species of kidney potato, to the holding plates, triangular in shape, at the end of the arms of an anchor, and to the triangular extremities of the tail of a whale The use of the word as a slang expression for a lucky accident appears to have been first applied in billiards to an unintentional scoring shot

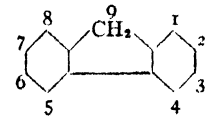
FLUME, a word formerly used for a stream, and particularly for the tail of a mill-race It is used in America for a very narrow gorge between precipitous rocks, with a stream at the bottom, but more frequently is applied to an artificial channel of wood or other material for the diversion of a stream of water from a river for purposes of irrigation, for running a sawmill, or for various processes in the hydraulic method of gold mining (*see* AQUEDUCT).

FLUMINIMAGGIORE, a town of the province of Cagliari, Sardinia, 10 m by road N of Iglesias, and 5 m from the W coast Pop (1921) town 3,569, commune 5,918 It is the centre of a considerable lead and zinc mining district Three miles to the south are the ruins of a temple erected probably in the time of Commodus They seem to mark the site of Metalla (mines), a station on the coast road from Sulci to Tharros, and the centre of the mining district in Roman times

FLUORANTHENE, known also as idryl, a solid hydrocarbon occurring with phenanthrene, pyrene, diphenyl, chrysene and other substances in "Stupp" fat (obtained in working up the mercury ores in Idria), and also in the higher boiling fractions of the coal tar distillate Fluoranthene, $C_{16}H_{10}$, was discovered by R. Fittig in 1878, who, with F Gebhardt and H Liepmann, elucidated its constitution From the tar distillate the chrysene can be fractionally precipitated, and the fluoranthene can be separated from most of the pyrene by fractional distillation in a partial vacuum. The two latter hydrocarbons are finally separated by fractional crystallization of their picrates Fluoranthene crystallizes in large slender needles or monoclinic tables, melting at 109–110° C and boiling at 250–251° C (60mm) On oxidation with chromic acid it forms a quinone, $C_{15}H_8O_2$, and an α-diphenyleneketocarboxylic acid

See A. E Everest, *The Higher Coal Tar Hydrocarbons* (1927).

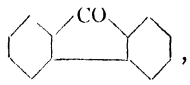
FLUORENE (ortho-diphenylene methane),



is a hydrocarbon, $C_{13}H_{10}$, obtained from coal tar, where it was first discovered by M Berthelot in 1867. The "carbolic oil" fraction,

after removal of naphthalene and anthracene, is distilled, the greater portion of the fluorene coming over between 295° and 310° C Separation from other constituents may be effected through its solid potassium compound by fusion with caustic potash at 280° C Addition of water regenerates the fluorene, which is further purified through its picrate or by crystallization, when it forms white, lustrous laminae, melting point 115° C, boiling point 295° C

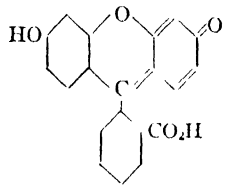
Oxidation with chromic acid yields fluorenone (diphenylene ketone)



yellow prisms, melting at 84°C, but with potassium permanganate as oxidizing agent the molecule is broken down, giving phthalic acid (*q v*) The positions taken up in fluorene by entering substituents are controlled by the influence of the phenylene nuclei one upon the other, and not at all by the methylene group (contrast carbazole, *q v*) Thus on dinitration the nitro-groups replace the hydrogen atoms ortho and para to the single bond which directly unites the two nuclei, to give 2 5- and 2 7-dinitrofluorene 2 7-Diaminofluorene has been used in the preparation of azo-dyes which, like those from benzidine, possess affinity for unmordanted cotton, but they have not yet found commercial application When fluorene is reduced with hydriodic acid, decahydrofluorene, $C_{13}H_{20}$, is produced, other hydrogenated fluorenes are also known

(H A Ha)

FLUORESCEIN, so called from the fact that its dark-red solutions in caustic alkalis, in which it dissolves readily, show a brilliant green fluorescence, especially when they are largely diluted with water It is a yellow amorphous powder when precipitated from water, in which it is insoluble, from alcohol it crystallizes in small dark-red nodules It was first made in 1876 by A v Baeyer by the condensation of phthalic anhydride with resorcinol at 195–200° C The two reacting substances are either heated alone or with zinc chloride, and the melt obtained is boiled out with water, washed by dilute alcohol, extracted by means of sodium hydroxide, the solution acidified and the precipitate well washed with water By repeating this process fluorescein may be obtained in a very pure condition It is resorcin phthalein, $C_{20}H_{12}O_5$, with the structure shown below



By brominating fluorescein in glacial acetic acid solution, *eosin* (tetrabromofluorescein) is obtained, which crystallizes from alcohol in yellowish red needles and dyes silk, wool and mordanted cotton a fine pink colour The corresponding iodo-compound is known as *erythrosin* Other dyestuffs of this series are safrosine or eosin scarlet (dibromodinitrofluorescein) and rose Bengal (tetraiodotetrachlorofluorescein) With zinc dust and caustic soda, fluorescein is reduced to the leuco-compound fluorescein For the coloured and colourless dimethyl ethers of fluorescein *see* O Fischer and E Hepp (1893–95) These ethers correspond with the quinonoid and benzenoid (non-quinonoid) modifications of fluorescein (*See* Dyes, Synthetic)

FLUORESCENCE AND PHOSPHORESCENCE, terms applied to the cases of emission of light, by illuminated substances, in which the emitted light is made up of colours not present in the illuminating radiation The term phosphorescence is often used in general sense to denote the emission of light by living organisms, such as glow-worms, fire-flies, jelly fishes and deep sea fishes, and bacteria present in decaying matter In these cases the phenomenon is the result of biochemical reactions, often, in the case of the higher organisms, under the control of the creature We are not here concerned with phosphorescence in this sense (*see* Phosphorescence, Animal), but solely with the emission of light by bodies in which no chemical changes take place, and where illumination is a necessary preliminary Substances which do not exhibit fluorescence or phosphorescence merely reflect or diffuse the light which falls upon them, coloured substances extracting certain constituents of the light by absorption and reflecting the residue, the absorbed radiations being transformed into heat We may regard white light as made up of a mixture of all possible colours, as this view, although perhaps not the most modern one, answers the purposes of the present case A green pigment absorbs the red, orange, yellow, blue and violet constituents of the white light and diffuses the green rays If illuminated by red or violet light, it appears black, as all of the light is absorbed In the case of fluorescence and phosphorescence the absorbed rays, instead of being changed into heat, are transformed into light of a different colour, which is emitted by the substance in addition to rays reflected or diffused in the usual manner The substance may be regarded as a light "transformer," changing the wave-length of the rays, as the electrical transformer alters the voltage Practically all substances exhibit the phenomenon to a greater or less degree, though it is usually masked by the faintness of the fluorescent or phosphorescent light in comparison with the light reflected or diffused If only ultra-violet light, which the eye does not perceive directly, is used in a darkened room for the illumination, the phenomenon is at once apparent, practically everything in the room becoming immediately more or less luminous

The term *fluorescence* has been applied to the cases in which the emission of the light created, so to speak, within the substance continues only as long as the exciting rays fall upon it, while the term *phosphorescence* is used for cases in which the luminosity persists for a longer or shorter time, after the light has been shut off Modern researches have shown, however, that this classification is unfortunate, for we can cause a fluorescent substance to become phosphorescent by altering the medium in which it is dissolved, *e g*, by dissolving it in a gelatine solution and allowing the gelatine to dry Moreover, many fluorescent substances, if examined by refined methods, are found to glow for a very brief interval of time, say $\frac{1}{10,000}$ sec after the illuminating light has been cut off This circumstance has resulted in a tendency on the part of some writers to regard the two phenomena as identical This, however, is not the case, for it has been fairly well established that fluorescence is a phenomenon which occurs wholly within the molecule, the re-emission of the light sometimes being delayed for a very brief interval, while true phosphorescence, which is in general of much longer duration, results from the expulsion of an electron from the molecule, the phosphorescent light resulting from its return These matters will be fully discussed later on

History.—The phenomenon of phosphorescence was made the subject of scientific enquiry some 50 years before fluorescence was seriously investigated The chapter opens with the discovery in 1602, by a cobbler of Bologna, Vincenzo Cascariolo, of a substance which shone brightly in the dark after exposure to a strong light This shoemaker practised alchemy in his leisure moments, and having found on Mt Pesara some fragments of a very heavy mineral which sparkled brilliantly in the sunlight, he took them home and heated them in his furnace in the hope of obtaining precious metals The mineral was "heavy-spar," a natural sulphide of barium, and the result of his experiment was the birth of the celebrated "Bologna stone," the first of a series of so-called natural phosphors, the investigation of which at once became the fashion These substances were usually porous in structure, and it was at first supposed that they soaked up light as a sponge soaks up water, but in 1652 Zecchi illuminated his phosphors with light of different colours and found that the colour of the phosphorescent light was the same in each case, thus proving that phosphorescence was not a re-emission of light stored up in the substance. This observation was confirmed and put on record by other observers, one of whom used coloured rays obtained from a prism for exciting the phosphorescence This is of interest, as it was not until 200 years later that the discovery was made by Sir George Stokes that fluorescent bodies behaved in the same way

The study of fluorescence commenced about half a century after the discovery of the Bologna stone, though allusions to the phenomenon can be found as far back as the year 1570, when a Spanish physician, Niccolo Monardes, mentioned the blue-colour exhibited by a tincture of a certain wood (lignum nephriticum) Grimaldi in 1665 investigated the optical properties of this tincture, illuminating it in a darkened room with a beam of light concentrated by a lens, and described the blue luminosity of the cone of rays within the liquid In 1704 Newton investigated the phenomenon, illuminating the solution with light of various colours, and attributing the effects observed to an internal reflection of the light Nose in 1780 discovered the fluorescence of tincture of sandal wood and quassia In 1792 an advance was made by Wunsch, who employed more or less homogeneous light obtained by a prism for the illumination He described the effects observed, but was unable to explain them

In a paper communicated to the Royal Society of Edinburgh in 1833, Sir David Brewster described what he believed to be a new phenomenon to which he gave the name of "internal dispersion" By condensing sunlight with a lens on a bottle filled with a solution of chlorophyl, the green colouring matter of leaves, he observed that the path of the rays through the green liquid was marked by a cone of a blood red colour He subsequently observed the same phenomenon in other liquids, and in some solids, notably fluor-spar, and named it "internal dispersion," being of the opinion that it was due to coloured particles held in suspension Several years after Brewster's observations, Sir John Herschel discovered independently that a colourless solution of sulphate of quinine, when held in a strong light, showed a shimmer of blue at the surface at which the light entered The illuminating beam, after its passage through the solution, was unable to provoke the blue colour in a second bottle of the liquid, though it was apparently unchanged either in colour or intensity Herschel considered that the light had been modified in some new and mysterious manner at the surface of the liquid, and introduced the term "epipolized" (ἐπιπολή, surface) to designate it He concluded that light which had once been epipolized, could not be epipolized a second time

None of these early investigators had a glimmering of an idea that the phenomenon was an emission of a new set of radiations excited by the absorption of violet and ultra-violet rays Newton and Wunsch were on the right track in their investigations with coloured light, and it is hard to see how they failed to find the key to the mystery The latter investigator must have missed it by a very narrow margin, for the same method, in the hands of Sir G. G Stokes, established the true nature of the phenomenon His first paper "On the Change of Refrangibility of Light" was published in 1852 This brief title is a complete statement of the true nature of fluorescence Extending the experiments of his predecessors he soon came to the conclusion that he was dealing with a wholly new phenomenon, the scattered beam of light differing in refrangibility (colour) from the rays which excited it He at first spoke of it as "true internal dispersion" to distinguish it from the scattering of light by cloudy solutions which he called "false internal dispersion" He afterwards abandoned this term as misleading, substituting for it the term *fluorescence* (derived from fluor-spar, a mineral which exhibits the phenomenon), a term which does not presuppose any theory

In one of Stokes's experiments a vertical spectrum was projected on the flat side of a glass tank filled with the solution, the fluorescence being observed through the side Rays for which the absorption was slight penetrated the liquid to the opposite wall, and excited feeble fluorescence along their entire path More powerfully absorbed rays penetrated to lesser and lesser distances, and excited fluorescence of increasing intensity, the gradual retreat of the fluorescence to the front wall being marked by a curved line This line shows objectively the actual form of the absorption curve. The photograph (Plate I, fig 1) was made with a solution of rhodamine, the absorption band of which has two maxima as is clearly indicated The position and colour of the exciting rays are indicated by arrows, and the absorption curve by dots.

Stokes's Law.—On exciting the fluorescence with monochromatic light, by restricting the excitation to a very narrow region of the spectrum passed through a fine slit, Stokes observed that the spectrum of the fluorescent light covered a fairly wide range in the blue region, which showed that light of many different shades of colour was produced by illumination with a single pure colour Stokes was of the opinion that the fluorescent radiations were always of less refrangibility (longer wave-length) than the exciting rays, a condition governed by what has been known as Stokes's law, the validity of which was first called into question by Lommel

Many experimenters busied themselves with this question, and a controversy commenced which lasted for 20 years, Hagenbach and Lommel being the principal disputants, the former claiming that the law of Stokes was never violated, and that all of Lommel's results were due to the impurity of the light used for exciting the fluorescence Lommel, however, excited the fluorescence of a solution of naphthalene red with the light of a sodium flame (which emits a nearly monochromatic yellow radiation) and observed that the fluorescence spectrum extended from the red to the yellow-green region In answer to objections by Hagenbach, he further showed that it was the yellow sodium light that was responsible for the green rays in the fluorescence, as the bunsen flame without the sodium caused no fluorescence at all The more recent experiments of Nichols and Merritt, who measured with a photometer the intensity of the light at different points of the fluorescence spectrum, when excited by light of different colours, showed that Lommel was right and that Stokes's law did not hold in a number of cases They found that the intensity curve of the fluorescent spectrum, by which we indicate the relative intensities of the different colours, was independent of the colour of the exciting light, though the total intensity varied over a wide range as the exciting wave-length was altered They found, moreover, that the absorption band overlapped the fluorescent band in the case of all substances which showed violation of Stokes's law

To show the failure of the law it is not necessary to resort to laborious measurements with the photometer The spectrum photographs (Plate I, fig 2) bring out the effect most conspicuously They were made by directing the spectroscope at a small bottle filled with a dilute solution of fluorescein, which was illuminated with an intense beam of monochromatic light emerging from a second spectroscope, the eye piece of which had been replaced by a narrow slit By turning the prism of this instrument, the colour of the exciting beam could be changed gradually from blue to green, and finally yellow A suspension of fine particles in the fluorescein solution scattered a small amount of the exciting light, causing it to register its position in the spectrum with respect to the fluorescent spectrum It appears in the photographs as a rather broad, hazy line, either immersed in the fluorescent band, or well outside of it, according to its colour In the upper picture, the exciting light is entirely outside of the fluorescent range in the blue region, in the next two it has entered it, and in the fourth it has advanced so far towards the yellow that fluorescence is no longer produced It is apparent from the two middle pictures that the broad fluorescence band is fully developed on both sides of the exciting line The colour of the fluorescence is yellow-green The faint line to the right of the fluorescence band is the D line of sodium, which was impressed on each plate to facilitate bringing them into coincidence

Fluorescence of Gases and Vapours.—In spite of the very large amount of experimental work which had been done on fluorescence up to 1928, there was at that time no very satisfactory theory of the phenomenon in the case of liquids and solids. In the case of gases and vapours, however, where the molecules are not under the influence of their neighbours, the mechanism of the transformation of the radiations was beginning to be elucidated The simplest case of all, involving no change of wave-length or colour, is that in which the vapour absorbs one or more definite radiations and re-emits them without altering their frequency. This is the phenomenon of *resonance radiation,* observed for the first time in the case of sodium vapour by R W Wood in

1905 (*Phil Mag*, vol xx), and several years later in the case of mercury vapour Though it is not strictly fluorescence, a brief consideration of the process involved will serve as a useful foundation upon which to build a discussion of the more complicated types If a little metallic sodium is heated in a highly exhausted glass bulb to a temperature of 140° C, and the yellow light from a small sodium flame is focussed at the centre of the bulb with a large condensing lens, the path of the rays through the vapour is marked by a cone of yellow light, the appearance being as if the bulb were filled with a light smoke or fog (Plate I., fig 3 gives a good idea of the phenomenon, though it shows the fluorescence of iodine instead of sodium vapour) If, however, we substitute a source of light of any other colour for the sodium flame, we see nothing at all The vapour is totally unable to scatter light unless its wave-length is precisely the wave-length of the so-called D lines of the solar spectrum, or the yellow light of the sodium flame

The process involved was formerly supposed to be analogous to what takes place when sound-waves from one tuning fork impinge on a second fork of the same pitch, the latter absorbing some of the sound from the air, and being thrown into vibration itself in the process, so that if we quench the first fork with the fingers we hear the singing of the second The modern theory, which we owe to Niels Bohr, is not quite so simple. By the absorption of the radiation the sodium atom is brought from its normal state, in which the electron revolves about the nucleus in an inner orbit, to an excited state in which the electron moves in an orbit more remote from the nucleus, the resonance radiation being emitted when the electron returns to its original orbit. (*See* ATOM) This makes the processes of absorption and re-emission successive instead of simultaneous as on the older theory In the case of mercury vapour the same thing happens, except that it is an invisible radiation in the ultra-violet which is absorbed, and the mercury vapour is contained in an exhausted bulb of fused quartz, which requires no heating as the density of the vapour is great enough at room temperature to show the phenomenon at its best The bulb is illuminated by the ultra-violet ray of wave-length 2536 Å U from a quartz mercury arc This ray is separated from the others by a prism and focussed at the centre of the bulb by a quartz lens A photograph made with a camera provided with a quartz lens shows the cone of resonance radiation stretching right across the bulb. If the bulb is heated slightly, the resonance radiation retreats to the wall at the point where the radiation enters it, as the rays are no longer able to penetrate more than a very minute depth of the vapour If the bulb is cooled it is found that the resonance radiation of the vapour can be detected at a temperature of −50° C, that is, 10° below the freezing point of mercury This showed that even the solid metal gave off sufficient vapour to absorb and re-emit the light Bulbs rendered luminous in this way have been named "resonance lamps," and have proved of use in various investigations as they give off radiations even more homogeneous, or monochromatic, than the lamps which excite them

The next step in the development which we must consider is the observation made in 1915 by R J Strutt (now Lord Rayleigh) that sodium vapour, illuminated by the ultra-violet light of a zinc spark (which emits a radiation of the same wave-length as one of the sodium ultra-violet lines), emits a yellow light of the same wave-length as when excited to resonance radiation by the yellow light of a sodium flame This is the simplest and most elementary case of fluorescence which we have, and its explanation is clear from the viewpoint of Bohr's theory. By the absorption of the ultra-violet light the electron is raised to a higher orbit than that in which it originally revolved The return to the normal state may now take place in either of two ways It may return directly, in which case ultra-violet resonance radiation occurs, or it may be shaken out of this orbit into a lower one by collisions with other atoms, and from here return to the inner orbit with the emission of the yellow light. In this case Stokes's law is obeyed, for it has not yet been found possible to get the ultra-violet line by excitation with yellow light

Slightly more complicated is the case observed by Fuchtbauer, who found that mercury vapour *in vacuo* in a tube of fused quartz glowed with a green light when illuminated by the total radiation of a quartz mercury arc, and the spectroscope showed that practically all of the spectrum lines of the mercury arc were being emitted by the vapour. These other rays are not emitted as resonance radiation, however, for if a glass plate, which cuts off the ultra-violet but not the visible rays, is interposed between the arc and the tube containing the vapour, the luminosity vanishes, although the vapour is still powerfully illuminated. For these other rays to be produced it is necessary that the vapour be illuminated by the ultra-violet ray $\lambda 2536$, and the glass plate absorbs this The processes involved in this case are completely in accord with Bohr's theory of absorption and re-emission Mercury vapour in the normal state absorbs only ultra-violet light, by which it is brought into the excited condition (electrons in higher orbits), and while in this condition it can absorb some, but not all, of the visible radiations By the absorption of the violet ray $\lambda 4046$, the electron is carried to an orbit still further removed, and it may return to any one of three inner orbits, the green line being emitted in one case We are here dealing also with a very simple case of fluorescence, namely the emission of green light resulting from the absorption of blue Fuchtbauer's observations have been extended by R W Wood, who illuminated the vapour by various combinations of rays from the lamp and studied the orbital transitions of the electrons which resulted One of the most striking and interesting results of the study was the discovery that emitted light, which resulted from two successive absorption processes, increased as the square of the intensity of the exciting light, while certain other spectrum lines, the emission of which required three successive absorptions, increased as the cube, a circumstance perfectly in accord with theory

Resonance radiation and the simple types of fluorescence exhibited by sodium and mercury vapour, which have just been described, are phenomena of the atom, the vapours of sodium and mercury at low pressure being monatomic When these vapours are formed at higher pressure by raising the temperature of the bulbs, some of the atoms combine to form diatomic molecules, and a new type of absorption and fluorescence manifests itself. If white light is passed through the dense sodium vapour and examined with a spectroscope, a very complicated absorption spectrum consisting of fluted bands is seen, and a similar spectrum can be seen with the vapour of iodine at room temperature These bands we now believe to be the result of three different disturbances produced in the molecule, an orbital displacement of the electrons in the atoms, a vibration of the two atoms along the line joining them, and a rotation of the molecule as a whole (*See* BAND SPECTRUM.) If sun or arc light is concentrated upon the vapour, it glows with a greenish light, the spectrum of which consists of bands similar in their general appearance to the absorption bands A photograph of the fluorescence of iodine vapour at room temperature in a large glass bulb is shown (Plate I, fig 3) The path of the illuminating beam from the arc to the bulb was made visible by blowing a little smoke into the region between them The bulb is highly exhausted, and contains a small crystal of iodine If air is admitted to the bulb, even in a minute quantity, the fluorescence disappears This is true fluorescence, for if we illuminate with monochromatic light, we find many other wave-lengths or colours in the emitted light, the vapours giving out light which the spectroscope shows as double lines spaced at sensibly equal intervals along the spectrum (R W Wood, *Phil. Mag*, 1912). These spectra have been fully accounted for theoretically by Lenz, and have proved useful in the analysis of the very complicated band spectra, which are made up of fine lines to the number of some 50,000 or 60,000 in the case of iodine Stokes's law is violated conspicuously in the case of these resonance spectra, for lines frequently appear on the short wave-length side of the line which excites the vapour If helium or some other chemically inert gas is mixed with the iodine vapour, and illuminated say with the green line of the mercury arc, the widely spaced double lines fade away and the band spectrum appears in its place This forms the stepping-stone between the vapour fluorescence, and the fluorescence of a liquid or solution,

for by the introduction of the helium we note the effects of the collisions of the molecules on the emission spectrum, and in a solution we have this same effect to an enhanced degree It appears that the effect of the collisions, in the case of iodine, is to change the rotational energy of the molecules by different amounts, with the result that, during their return to the normal state, each one emits a radiation of a definite frequency depending upon the change in its rotational energy produced by the collision In general, the effect of an impact with another molecule is to decrease the internal energy of an excited molecule, which will result in the emission of a radiation of lower frequency than that of the exciting light, the excess energy being spent in increasing the velocity of the rebounding molecules, *i e.*, in raising the temperature of the vapour It may happen in some cases that some of the kinetic energy of the colliding molecules is spent in raising the energy of vibration or rotation, and this gained energy is given off again when the molecule returns to its normal state It is in this way that we may have the higher frequencies radiated contrary to Stokes's law, without violating the energy relations of the quantum theory

The case of benzene is of especial interest as it exhibits fluorescence in the vapour, fluid and solid state, and also when in solution in another liquid The behaviour of the vapour under optical excitation resembles that of iodine in some respects, and a study of the substance in its several states has shown that it may possibly be regarded as a connecting link between the phenomena exhibited by sodium and iodine vapours, which are comparatively well understood, and those presented by aniline dyes and other complicated organic compounds, in regard to which we have no very complete or satisfactory theory

Efficiency Factor.—By this we mean the ratio of the absorbed energy to that which is re-emitted as fluorescence. If we illuminate a solution of fluorescein with monochromatic light obtained from a spectroscope, we find that the intensity of the fluorescence varies greatly as we alter the colour of the exciting light As we have seen, the complete fluorescence spectrum is radiated regardless of the wave-length of the exciting light, if it is capable of exciting any fluorescence at all, and it is this circumstance that causes Stokes's law to break down in cases when the absorption band and fluorescence band overlap It was shown by Nichols and Merritt that all wave-lengths are equally efficient in exciting fluorescence if we compare the fluorescence with the amount of light actually absorbed Now in the case of resonance radiation of a metal vapour in a high vacuum it has been found that all of the energy extracted from the exciting beam of light is re-emitted, there being no true absorption, but if some other gas is present, true absorption at once appears and the intensity of the resonance radiation is diminished. In the case of fluorescence the efficiency was determined for a number of substances by Wawilow (*Zeit fur Physik*, 1924), who measured the amount of the absorbed light with a photometer and compared it with the fluorescent light scattered by the solution, and by a diffusing screen of magnesium oxide. The highest efficiency was found for fluorescein which showed an efficiency of 75%, while some dyes showed values as low as 2% or less An efficiency of 75% means that three-quarters of the energy of the absorbed light is re-emitted as fluorescent light. It is this high efficiency which makes possible the Cooper-Hewitt "light transformer" which is described under *Applications of Fluorescence.*

The intensity of the fluorescent light in the case of most solutions varies enormously with the concentration, and falls to zero if the concentration becomes too great. This can be well shown with fluorescein, which exhibits its most brilliant effect only in extremely dilute solutions, and becomes non-luminous if the concentration is increased beyond a certain point. We are quite in the dark in regard to the cause of this effect. All that can be said is that the close proximity of the fluorescent molecules prevents the re-emission of radiation, the mystery being why a fluorescein molecule interferes with the functioning of its neighbours any more than the water molecules A similar behaviour in the case of benzene has already been mentioned.

Fluorescence of Uranium Compounds.—Though there are countless organic compounds which show fluorescence, very few inorganic substances exhibit the phenomenon, though many of them have absorption bands of the same general character as those of the fluorescent organic compounds Until we can explain why a solution of potassium permanganate, with its beautiful absorption bands in the green region of the spectrum, shows no trace of fluorescence, while a solution of rhodamin which has similar absorption bands and colour, glows vividly under illumination, we cannot claim to have a very definite view of the underlying causes. It seems probable that in fluorescent bodies, such as benzene and other aromatic compounds, and certain salts of uranium, the electron system of the atom which causes absorption and fluorescence is shielded in some way from the disturbing influence of neighbouring atoms The salts of uranium and the platino-cyanides are among the few inorganic compounds which show conspicuous fluorescence, and it is only the uranyl salts that show the phenomenon, the uranous compounds exhibiting no trace of luminosity

Various compounds of uranium were studied by Stokes, who found that some of them exhibited fluorescence in solution as well as in the crystalline state He found that the spectrum consisted of well-defined bands arranged at regular intervals, and that the absorption spectrum in the blue and violet region exhibited a series of bands of similar appearance. An exhaustive study of the subject was undertaken in 1872 by E Becquerel, who discovered that the fluorescent crystals of the uranyl salts were also phosphorescent, that is they continued to glow for several thousandths of a second after the illuminating rays had been cut off He found also that the fluorescent and phosphorescent spectra were identical in structure, from which he concluded that the two phenomena were not really distinct According to our present views, however, we should not call this phosphorescence, but fluorescence of long duration In more recent times a very comprehensive study of these salts has been made by Nichols and Merritt In 1903 the very important observation was made by J. Becquerel and Kammerlingh Onnes, working with uranyl salts in the cryogenic laboratory of the latter at Leyden, that at the temperature of liquid air (−185° C) each band of the fluorescent spectrum broke up into a number of narrower bands At the temperature of liquid hydrogen the components of the band became almost as narrow as the lines of a spark spectrum

The chief point of interest in connection with the fluorescence of the uranyl salts is the similarity of their behaviour to that of benzene The broad bands at room temperature, the breaking up of these bands into narrower bands at low temperature, the overlapping of the region of absorption and fluorescence are common to both substances While the fluorescence of the crystals of the uranium salts is very bright, that of their solutions in water is in general very feeble. Francis Perrin has found that solutions in sulphuric acid fluoresce much more powerfully, and that the fluorescence is of long enough duration to be seen with the phosphoroscope, an instrument which will be described presently. This is the first case recorded of a "phosphorescent" liquid It is probable that the UrO_2 molecules in this case are in an environment similar to that obtaining in the case of uranium (or "canary") glass, which also exhibits a fluorescence of long duration in the phosphoroscope

The platino-cyanides of barium, magnesium, potassium and other metals form another group of fluorescent crystals These compounds differ from the uranium salts in that they show no trace of luminosity in solution, and their solutions are as clear and free from colour as pure water, though the salts are highly coloured. In some respects they resemble the true phosphorescent compounds, which we shall now consider.

Phosphorescence.—This term, as formerly applied, would cover all cases in which the emission of light persisted, even if only for a minute fraction of a second, after the exciting light had been cut off As has been said, if we adopt this definition, no sharp line can be drawn between fluorescence and phosphorescence. The term, as now used, applies to a class of bodies in which very minute traces of metallic impurities in crystalline substances give them the power of emitting light for a longer or shorter time after

exposure to a strong illumination Such substances are termed "phosphors"

Many of the substances studied by A C Becquerel, in his pioneer investigations, we should now class as fluorescent He devised an instrument which he named the phosphoroscope, in which the substance was contained in a dark box between two wheels perforated by slots which were arranged out-of-step, these wheels were mounted on a common axle, and could be rotated at high speed by a system of gears The illuminating beam reached the substance through the slots of one of the wheels, while the observations were made through the perforations of the other This enabled the viewing of the substance in the dark in the very brief intervals between the flashes of light which illuminated it With this instrument Becquerel discovered the phosphorescence of an enormous number of substances, and measured the duration of the phenomenon, as affected by the temperature, colour of the exciting light and other factors

Crystals of uranium nitrate, fluor spar, gems and many other minerals glow with brilliant colours in this instrument The foundations of our knowledge regarding the nature of the true phosphorescent bodies, as distinguished from fluorescent bodies showing a slight persistence of luminosity, was laid by the researches of P Lenard and his collaborators They found that the phosphorescent properties of the metallic sulphides were due to very minute traces of other metals by which they were rendered active The maximum intensity of the phosphorescence is obtained with a certain definite proportion of the impurity, an excess decreasing it In some cases phosphorescence is produced by as little as $\frac{1}{10,000}\%$ of the impurity

The earlier work on phosphorescence was hampered by the imperfect methods of purification of the chemicals employed in the preparation of "phosphors" It was found difficult to duplicate results, and the production of a satisfactory phosphor by following a recommended specification was often a matter of luck The researches of Becquerel, Verneuil, Boisbaudrans and Wiedemann gave evidence of the part played by impurities, but Lenard was the first to examine the conditions systematically, preparing his phosphors from carefully weighed amounts of the purest materials obtainable He employed metallic sulphides, oxides and selenides as the foundation material, adding minute traces of other metals as the activating substance, the mixture being heated, usually with a flux of sodium chloride or sulphate, to a high temperature in a furnace Phosphors can also be prepared by crystallization from solutions, and this method was the one usually employed by Wiedemann These, however, do not exhibit as brilliant a phosphorescence as those obtained by the furnace method Cadmium sulphate, recently studied by Waggoner, is a good example of phosphors of this class The purest salt obtainable commercially, phosphoresces when illuminated by ultra-violet light, but if further purified by repeated fractional crystallization, shows no trace of luminosity The addition of 0 1% of zinc sulphate causes the appearance of an intense blue phosphorescence, magnesium or sodium salts added as impurities cause yellow or green phosphorescence

The present view is that all of these phosphorescent bodies are crystalline, the molecules of the impurity deforming the crystal lattice This, while contrary to the former views of Lenard, who considered his phosphors amorphous, has been confirmed by X-ray photographs made by the method of Debye and Scherrer An interesting case is that of calcium tungstate, the material used in the preparation of X-ray fluorescent screens Obtained as an amorphous or non-crystalline precipitate from solution, and even if activated by impurities, it shows no trace of phosphorescence On allowing it to stand for some time it changes gradually into the crystalline modification, as shown by X-ray photographs, in which state it exhibits phosphorescence. The change can be accomplished more rapidly by heating the amorphous powder, but the temperature must not exceed 1,000° C.

Quenching of Phosphorescence by Red and Infra-red Rays.—Seebeck discovered that orange or red light falling upon a phosphorescent substance, excited to luminosity by violet or blue light, destroyed the phosphorescence completely This discovery, though recorded in Goethe's *Farbenlehre,* remained comparatively unknown, and the phenomenon was rediscovered many years later by E Becquerel, who investigated it more fully and found that the quenching of the phosphorescence by orange or red light was preceded by a momentary increase in the intensity of the luminosity followed by complete darkness It appeared as if the red rays squeezed out all of the stored light in a few moments, and he attributed the effect to the heating action of the rays, for he had found that the same thing could be accomplished by warming the substance He found further that the infra-red rays acted in the same manner and his son, H Becquerel, continued the investigation, and in 1883 studied the invisible region of the solar spectrum, beyond the red as far as 1 5μ (wave-length double that of the extreme visible red), by projecting the spectrum on a luminous screen excited to phosphorescence, and observing the darkening produced by the invisible rays J W Draper improved the process by laying the partially darkened phosphorescent screen upon a photographic plate thus obtaining a permanent record This method of phosphoro-photography of the infra-red was subsequently employed by Lommel, Dahms and others, but nothing of much importance has been accomplished by it

Dahms in 1904 made the interesting observation that the luminosity of the zinc sulphide phosphors is quenched by red and infra-red radiations without any momentary increase, which shows that there are two distinct types of quenching Balmain's luminous paint is an example of the first type Under infra-red illumination, the phosphorescing material suddenly gives out a greenish light, quite different in colour from the violet glow which it emitted before the infra-red rays played upon it If warmed slightly with a heated glass rod there is also an increase in luminosity, but in this case the colour is unaltered This proves that the action of the infra-red rays is not merely a heating effect The zinc-sulphide phosphors, which are now extensively used for stage effects, are examples of the second type of quenching They rapidly darken under the action of infra-red rays without any preliminary increase of luminosity

Lenard discovered that the absorption spectrum of an excited (*i e*, luminous) phosphor was different from that of the unexcited. The absorption bands in the ultra-violet disappeared under powerful illumination, and were replaced by new bands in the longer wave-length region It is from absorption by these new bands that the quenching results This change in the molecular state also manifests itself in other ways The magnetic and dielectric properties of the phosphors are found to be different before and after illumination Elster and Geitel found that both natural and artificial phosphors exhibited the photo-electric effect, *i e*, they gave off electrons when illuminated, and Lenard, following the matter up, found that the photo-electric emission and the phosphorescence were caused by absorption of radiation of the same wave-lengths His theory of phosphorescence supposed that the absorption of light resulted in the ejection of an electron from an atom, and its capture by a neighbouring atom, the phosphorescence resulting from the gradual return of the captured electrons to their former places, the energy set free in this process being communicated to another electron and eventually radiated as light of longer wave-length

The modern theory of the phenomenon rests chiefly on the recent work of Gudden and Pohl, who found that many non-phosphorescent (*i e*, "pure") crystals conducted electricity when illuminated by light This may be called an "internal photo-electric effect," the electrons set free by the light, travelling through the crystal lattice to the anode, under the influence of the applied electro-motive force. It is only in a crystal, the space lattice of which is distorted by foreign atoms (impurities), that the return of the electrons ejected by the light causes an emission of radiation. Experiments on the electrical conductivity of these crystals have shown that the electrons do not traverse the distorted lattice freely, as in "pure" crystals, but that many are captured on their way to the anode by atoms It has recently been found by Rupp that the electric current, which flows in a phosphorescent crystal (under an applied electric force) during its illumination, and ceases as soon as the illuminating rays are cut off, starts up



SPECTROSCOPIC COLOURS REFRACTED FROM FLUORESCENT ELEMENTS

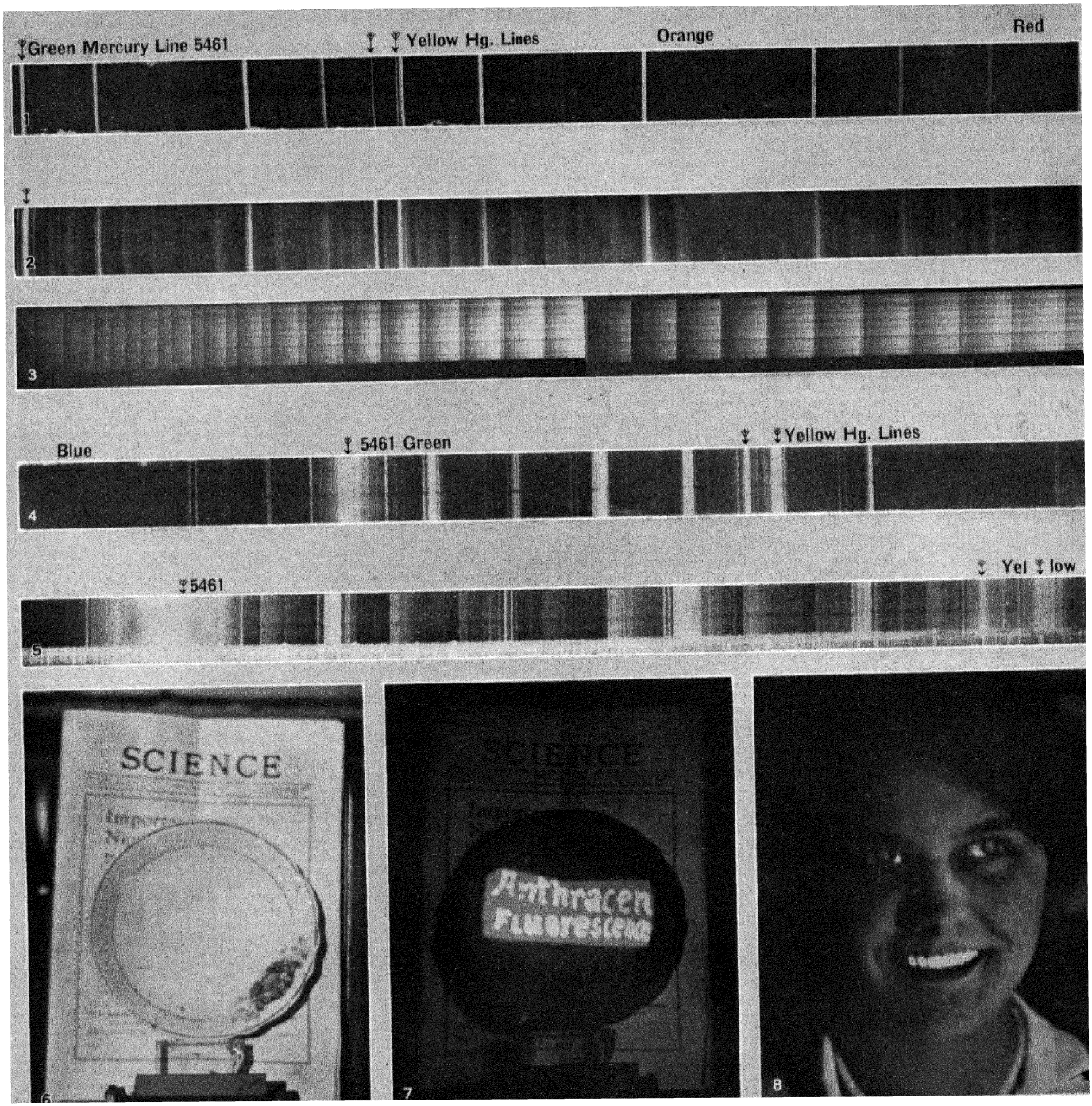
1 Stokes' experiment A vertical spectrum projected on solution of rhodamine producing band of colours (1a) having two maxima

2 Four photographs of fluorescein solution illuminated by intense beam of monochromatic light emerging from a second spectroscope

3 Resonance radiation, showing fluorescence of iodine vapour in a bulb illuminated by sodium flame, producing cone of yellow light

4. Fluorescence of uranium, showing bands at regular intervals. The absorption spectrum, also phosphorescent, has a similar appearance

FLUORESCENCE AND PHOSPHORESCENCE



SPECTRUM AND OBJECT PHOTOGRAPHS MADE THROUGH MERCURY VAPOUR AND ULTRA VIOLET RAYS

1, 2, 3, 4, 5 Spectrum photographs made through mercury vapour, showing colour lines produced by fluorescence Width of bands is determined by opening or slit in the aperture of the photographic spectroscope 6, 7, 8 Photographs made under mercury arc lamp giving intense ultra violet radiations Lamp is contained in a quartz tube and light is filtered through glass coloured black with oxide of nickel. 6. China plate photographed in white light using scientific journal for background 7 The same objects photographed under ultra violet light Writing on paper attached to plate is made with solution of anthracene 8 Photograph showing fluorescence of lens of the human eye The skin appears quite dark while teeth are brightly reflected

again if the crystal is warmed or illuminated by infra-red rays, and that the amount of electricity transported is proportional to the amount of light emitted

If a "pure" crystal is illuminated in the absence of an electric field the electrons ejected from atoms by the light move about freely in the lattice, and the local fields, which result from the ejections, recapture them as soon as the illumination ceases, and no current will flow under an applied electric force when the crystal is warmed In the distorted lattice of a phosphorescent crystal, on the contrary, the ejected electrons are captured by other atoms, and if such a crystal is illuminated for a definite time, and the photo-electric current, which flows during the illumination is measured, an equal amount of electricity will flow, on cutting off the illumination and warming the crystal.

Applications of Fluorescence and Phosphorescence.— Fluorescence can be utilized for illustrating or studying the passage of rays of light through liquids. The curved rays of light forming focal points in a non-homogeneous medium (*see* R W. Wood, *Physical Optics*) were made in this way, a small amount of sulphate of quinine having been added to the solution The ultra-violet portion of the spectrum can be rendered visible, and a small pocket spectroscope has recently appeared provided with a fluorescent screen for examining the spectra of sources of light rich in ultra-violet rays The fluorescence of mineral oils is made use of in a process for the photography of the extreme ultra-violet in investigations with the vacuum spectrograph Ordinary plates are insensitive to these rays as the gelatine film, in which the sensitive silver salts are embedded, is opaque to the light, but if a thin film of oil is smeared over the film, it becomes fluorescent when the spectrum lines are focussed on it, and this fluorescent light records itself on the plate

Fluorescence has even been utilized for purposes of general illumination The mercury arc, one of the cheapest artificial sources of light, suffers from the disadvantage that it gives out little or no red light, with the result that under its illumination, few objects appear in their proper colours, and the human face takes on a ghastly greenish hue, spotted with blue The idea occurred to Cooper-Hewitt, the inventor of the commercial form of the lamp, to make use of the fluorescence of rhodamine to supply the missing red rays He devised a white reflector coated with a film of celluloid stained with the dye, which, when mounted above the arc, glowed with a bright vermilion colour, adding its rays to those of the lamp, and producing an illumination not very different from daylight This reflector he called a "light transformer" The efficiency of such a screen is much greater if the fluorescent film is formed on white paper or card than if it is deposited on a silver or tin reflector, in which case the fluorescence is surprisingly feeble The cause of this was investigated (R W Wood, *Phil. Mag*, 1913) and found to result from the circumstance that the fluorescent light was imprisoned by total reflection in the case of the metal backing, whereas it was at once released by the diffusing surface of the paper

Both fluorescence and phosphorescence have been utilized in recent years for the production of spectacular effects on a darkened stage illuminated by the powerful ultra-violet lamps, developed during the war by R. W. Wood and described in the *Journal de Physique* (1919). The lamp consists of a mercury arc (in a quartz tube), the light from which is filtered through glass coloured black with a carefully chosen amount of oxide of nickel The ultra-violet radiations given out by such a lamp are so intense that the entire company in a large auditorium can be rendered fluorescent, fabrics shining with unusual colours, teeth and eyes glowing with a brilliant bluish light (false-teeth appear coal black) and practically everything in the room giving off light of a greater or less intensity The lens of the eye is also fluorescent under the illumination, and this light falls upon the entire surface of the retina, producing a curious illusion, the room appears to be filled with a bluish haze or smoke, which vanishes the instant the hand is held between the eye and the lamp These lamps have had a wide application in other fields, such as the diagnosis of certain diseases in which the fluorescence of the tissues are examined in the dark by the ultra-violet radiations, the detection of adulterants in drugs and chemicals, the differentiation of cotton from silk in fabrics, the comparison of old paintings with recent copies, and so on

Photographs showing some of these curious effects are reproduced (Plate II , figs 6, 7 and 8) Fig 6 is a photograph of a white china plate in front of a journal A slip of white writing paper, on which invisible writing has been printed with a solution of anthracene, is pasted across the plate The fluorescence of these objects under ultra-violet illumination is shown by fig 7 The white plate appears coal black, while the white paper is quite luminous, though not nearly as bright as the letters in anthracene. Fig 8 is a photograph of a young woman, and shows the fluorescence of the lens (pupil) of the eye The skin appears as dark as that of a mulatto, while the teeth are very brilliant

The excitation of fluorescence or phosphorescence by the X-rays is utilized in the screens or fluoroscopes used for visual observations of the internal organs or bones One very early application of phosphorescence was in the preparation of a paint which glowed in the dark, this so-called Balmain's luminous paint had a considerable vogue during the latter half of the 19th century It was a calcium sulphide containing certain impurities on which its phosphorescence depended, and after exposure to a strong light remained luminous in the dark for some time It was used for painting key-holes, gas and electric fixtures, and other objects which had to be located in the dark It has been supplanted by the modern phosphorescent paints used on watch and clock dials, the luminosity of which is continually excited by a small content of radium "Canary" glass, coloured by oxide of uranium, is used in the arts and owes its peculiar green luminosity to fluorescence, its colour by transmitted light being a pale yellow The powerful fluorescence of extremely dilute solutions of an alkaline salt of fluorescein (uranine) has resulted in its employment for tracing possible seepage from drainage systems to springs or wells, a small quantity of the substance thrown into the drain causing the water in the well to show a green fluorescence if seepage occurs

See R W Wood, *Physical Optics* (2nd ed , 1911), E. C. C. Baly, *Spectroscopy* (4th ed , 1927), P Pringsheim, *Fluoreszenz und Phosphoreszenz* (1928) (R. W. W.)

FLUORINE, a gaseous chemical element of the halogen group having a greenish-yellow colour and a choking smell (symbol F, atomic number 9, atomic weight 19 00) It is never found in the uncombined condition, but in combination with calcium as fluorspar CaF_2 it is widely distributed, it is also found in cryolite Na_3AlF_6, in fluor-apatite, $CaF_2\,3Ca_3P_2O_8$, and in minute traces in sea-water, in some mineral springs, and as a constituent of the enamel of the teeth It was first isolated by H Moissan in 1886 by the electrolysis of pure anhydrous hydrofluoric acid containing dissolved potassium fluoride. The U-shaped electrolytic vessel and the electrodes are made of an alloy of platinum-iridium, the limbs of the tube being closed by stoppers made of fluorspar, and fitted with two lateral exit tubes for carrying off the gases evolved. Whilst the electrolysis is proceeding, the apparatus is kept at a constant temperature of $-23°C$ by means of liquid methyl chloride The fluorine, which is liberated as a gas at the anode, is passed through a well-cooled platinum vessel in order to free it from any acid fumes that may be carried over, and finally through two platinum tubes containing sodium fluoride to remove the last traces of hydrofluoric acid, it is then collected in a platinum tube closed with fluorspar plates. Fluorine possesses a specific gravity of 1·265 (H. Moissan); it has been liquefied, the liquid also being of a yellow colour and boiling at $-187°C$. It is the most active of all the chemical elements; in contact with hydrogen, combination takes place between the two gases with explosive violence, even in the dark, and at as low a temperature as $-253°C$.; finely divided carbon burns in the gas, forming carbon tetrafluoride; water is decomposed even at ordinary temperatures, with the formation of hydrofluoric acid and "ozonized" oxygen; iodine, sulphur and phosphorus melt and then inflame in the gas; from chlorides it liberates chlorine, with which it does not combine, but it combines with most metals instantaneously to form fluorides. Organic compounds are rapidly

attacked by the gas

Only one compound of hydrogen and fluorine is known, namely *hydrogen fluoride* or *hydrofluoric acid,* HF or H_2F_2, which was first obtained by C. Scheele in 1771 by decomposing fluorspar with concentrated sulphuric acid, a method still used for the commercial preparation of the aqueous solution of the acid, the mixture being distilled from leaden retorts and the acid stored in leaden or gutta-percha bottles The perfectly anhydrous acid is a very volatile colourless liquid and is best obtained, according to G Gore, by decomposing the double fluoride of hydrogen and potassium at a red heat in a platinum retort fitted with a platinum condenser surrounded by a freezing mixture, and having a platinum receiver luted on It can also be prepared in the anhydrous condition by passing a current of hydrogen over dry silver fluoride The pure acid thus obtained is a most dangerous substance to handle, its vapour, even when highly diluted with air, having an exceedingly injurious action on the respiratory organs, whilst inhalation of the pure vapour is followed by death The anhydrous acid boils at 19 5°C. (H Moissan) and melts at −92 3°C (K Olszewski) It is a non-conductor of electricity (*see* ACIDS) Potassium and sodium readily dissolve in the anhydrous acid with evolution of hydrogen and formation of fluorides The aqueous solution is strongly acid to litmus and dissolves most metals directly, it is a conductor of electricity, but inferior to hydrochloric acid in this respect Its most important property is that it rapidly attacks glass, reacting with the silica of the glass to form gaseous silicon fluoride, and consequently it is used for etching T E Thorpe determined the vapour density of hydrofluoric acid at different temperatures, and showed that there is no approach to a definite value below about 88°C, where it reaches the value 10 29 corresponding to the molecular formula HF, at temperatures below 88°C the value increases rapidly, showing that the molecule is more complex in its structure. The probable existence of H_2F_2 is cited by T M Lowry as an example of the co-ordination of hydrogen, thus $(HF_2)H$ The aqueous solution behaves on concentration similarly to the other halogen acids, E Deussen found the solution of constant boiling point to contain 43 2% HF and to boil at 110° (750 mm)

Fluorine oxide (oxygen fluoride), F_2O, according to P Lebeau and A Damiens (1927), results as a by-product when fluorine is prepared by the electrolysis of acid potassium fluoride, as in Moissan's method (above) It is less reactive than fluorine and is stable in the presence of water or glass even at high temperatures, it liberates iodine from potassium iodide, and is only sparingly soluble in water, but fairly soluble in alkalis

The salts of hydrofluoric acid are known as *fluorides* and are easily obtained by the action of the acid on metals or their oxides, hydroxides or carbonates The fluorides of the alkali metals, of silver, and of most of the heavy metals are soluble in water; those of the alkaline earths are insoluble In many of these solubility relationships fluorides differ from chlorides, bromides and iodides A characteristic property of the alkaline fluorides is their power of combining with a molecule of hydrofluoric acid and with the fluorides of the more electro-negative elements to form double fluorides, a behaviour not shown by other metallic halides Fluorides can be readily detected by their power of etching glass when warmed with sulphuric acid; or by warming them in a glass tube with concentrated sulphuric acid and holding a moistened glass rod in the mouth of the tube, the water apparently gelatinizes owing to the decomposition of the silicon fluoride formed The atomic weight of fluorine according to Moissan is 19 05, and E Moles and T Batuecas, from the vapour density of methyl fluoride, give 19 00 For the introduction of fluorine into the benzene nucleus, *see* DIAZO-COMPOUNDS

See H Moissan, *Le Fluor et ses composés* (1900)

FLUORSPAR derives its name from its use in metallurgical operations as a flux (*cf* Lat *fluere,* to flow, and its Ger name *Fluss-spat*) It is the native fluoride of calcium, also called fluorite or fluor, CaF_2 One of the most interesting characters of fluorspar is its colour Specimens have been found of all the colours met with in the mineral kingdom The colours may be divided roughly into the following groups: white to honey yellow; pale leek green to emerald green, sky blue; green blue to dark violet; light to carmine red. The colour of a given specimen often varies with the way in which light falls on it. Thus many green-blue specimens are green by transmitted light and blue by reflected. This is the phenomenon of fluorescence to which fluorspar gives its name

Certain coloured varieties of fluorspar when irradiated with white or ultra-violet light glow with a vivid light, which when examined spectroscopically is seen to consist in general of a number of very fine lines. The character of the light emitted depends to a large extent on the particular specimen of fluorspar and to some extent on the quality of the light which is incident on it A very interesting series of experiments have shown that the lines occurring in this fluorescent spectrum are due to impurities in the crystal consisting chiefly of manganese and the rare-earths Urbain was able to prepare an artificial fluorspar containing these impurities in proportions such that the fluorescent spectrum of the product was exactly the same as for one of the common natural varieties He also found that perfectly pure artificial fluorspar did not fluoresce and it seems likely that the same is true of the natural product since many colourless specimens give no fluorescence Whilst it is fairly clear that the colour of fluorspar is in many cases due to the presence of impurities like the rare-earth metals, which give a well marked fluorescence spectrum, yet there are others which partly owe their colour to the action of radioactive radiations of the β- and γ-type These radiations are able to cause a great many fluorspars to acquire a green-blue tint, though they hardly ever produce the other colours so common in this mineral The presence of radioactive material in some fluorspars may be shown directly by the action a crystal will produce on a photographic plate; in other cases the radiations have recorded their presence in the fluorspar by pleochroic haloes surrounding the minute inclusions It seems certain that the colour of such specimens is largely due to the radioactive radiations

A theory has been put forward by Doelter that the impurities which give rise to the fluorescence, *i e*, the rare-earths, manganese, etc , are present in a highly dispersed condition resembling that of a colloid This would account for the disappearance of colour on heating in the case of most fluorspars and the change of colour on irradiation with β- and γ-rays, if we may assume the same phenomena to occur in a crystal as occur in colloidal solutions It has also been suggested that the colouring is due to an organic pigment, as hydrocarbons have been found in many specimens Carbon monoxide and dioxide, hydrogen, nitrogen and a little oxygen are sometimes also present

The known facts relating to the colour of fluorspar indicate that it is in all cases due to impurities which may, like the rare earths, give a colour determined by the fluorescence spectra, or produce a colour by scattering action resulting from the fine state of their division

Fluorescent Light, emitted in the visible spectrum, ceases instantly on cutting off the exciting light but an emission of light in the ultra-violet continues for a long time This emission has been detected by means of a photographic plate over a period of the order of a month Associated with this phenomenon is another remarkable property of fluorspar When heated in the dark, after being exposed to the light, it emits a bright light of colour varying with the specimen and the temperature. The crystals begin to glow at temperatures ranging between 40°–80° C and continue for some hours if not heated too strongly After they have ceased glowing they do not on cooling emit any more ultra-violet light There is no adequate theory to account for these phenomena, which are probably also due to impurities since they do not occur with all specimens

The crystal habit of fluorspar is generally cubic: in addition the forms (111), (110), (311), (211), (210), (310), (421) are often found The habit appears to depend very much on the mode of origin fluorspar formed hydrothermally is generally simple cubic, but when formed more rapidly in pneumatolytic processes it is frequently octahedral and rich in faces. Twin crystals are not uncommon, two cubes interpenetrating so that

they are symmetrically arranged about a face of the octahedron Fluorspar has a hardness of 4, so that it is scratched by a knife though not so readily as calcite Its specific gravity is about 3·2 The structure consists of two interpenetrating cubic lattices one of calcium and one of fluorine The former is face-centred with the unit cell of length 5·45 Å U. The simple-cubic lattice of fluorine atoms has a unit cell of half this length and is placed so that each fluorine atom is at the centre of a tetrahedron formed of calcium atoms

Fluorspar is widely used in metallurgy as a flux and an electrolyte On account of its high melting-point it is usually mixed with other fluorides and chlorides, when it is a good solvent for aluminium oxide and metallic silicates These properties render it particularly suitable for the extraction of aluminium since the impurities in the ore consist largely of silicates It is also used extensively in the steel industry for the production of ferro-silicon, ferro-manganese and ferro-vanadium, and in lead-smelting Considerable quantities of the mineral are used in the production of enamel and opal glass and very perfect crystals are employed in the manufacture of apochromatic lenses It is used as a source of hydrofluoric acid, which it evolves when heated with sulphuric acid The coloured variety known as Blue John is much worked as an ornamental stone By impregnation with resin the otherwise brittle spar may be worked on a lathe and very beautiful and delicate work has been done in this way

The mineral is of very wide distribution Some of the finest crystals occur in the lead-veins of the Carboniferous limestone series in the north of England, especially at Weardale, Allendale and Alston Moor It is also found in Aberdeenshire, Cornwall and south Devon Fine yellow fluorspar occurs in some of the Saxon mines and beautiful rose-red octahedra are found in the Alps near Göschenen Many localities in the United States yield fluorspar and it is worked commercially in Colorado, Illinois, Kentucky, New Mexico, British Columbia and Guipuzcoa (Spain)

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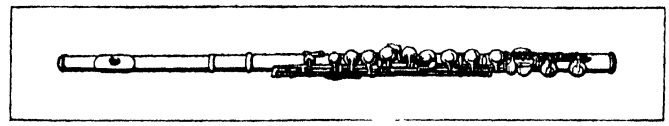
FLUSHING (Dutch *Vlissingen*), in the province of Zeeland, Holland, on the south side of the island of Walcheren, at the mouth of the estuary of the western Scheldt, 4 m S by W. of Middelburg, with which it is also connected by tramway and canal Pop (1927) 21,742 An important naval station and fortress up to 1867, Flushing has since become a packet station In 1872 the railway was opened which, in conjunction with the boat service to England (Queenborough and Harwich), forms one of the main routes between England and the Continent In 1873 the harbour, docks and canal works were completed Yet the navigation of the port remains far behind that of Rotterdam or Antwerp As a summer resort Flushing has acquired considerable popularity It possesses a town hall, containing a collection of local antiquities, a theatre, an exchange, an academy of sciences and a school of navigation. The Jakobskerk, founded in 1328, contains monuments to de Ruyter (1607–76) and Jacob Bellamy (1757–86) The chief industries of the town are connected with the shipbuilding yards and packet service The chief imports are colonial produce and wine, wood and coal. The exports include agricultural produce, shrimps and meat

FLUSHING, formerly a township and a village of Queens county, N.Y., U S A, on Long Island, at the head of Flushing bay, since 1898 a part of the borough of Queens, New York city It was settled in 1644 by a company of English nonconformists who had probably been living at Flushing in Holland, from which the new place took its name Subsequently a large number of Quakers settled here, and in 1672 George Fox spent some time in the township. Before the Revolutionary War Flushing was the country seat of many rich New Yorkers and colonial officials.

FLUTE, in music, is a general term applied to wood-wind instruments consisting of a pipe pierced with lateral holes and blown directly through the mouthpiece without the intervention of a reed.

The flute family is classified according to the type of mouthpiece used, *ie*, (1) those with the simple lateral mouth-hole or embouchure which necessitates holding the instrument in a transverse position; (2) those with the whistle or fipple mouthpiece which allows the performer to hold the instrument vertically in front of him; (3) those having no mouthpiece of any sort, in which the column of air is set in vibration by blowing obliquely across the open end of the pipe, as in the ancient Egyptian nay, and the pan-pipe or syrinx (*q v*)

Of these the transverse flute has now entirely superseded, not only the obsolete third class, but also the whistle flute, which has



BY COURTESY OF CARL FISCHER, INC

THE BOEHM FLUTE, MODELLED BY THEOBALD BOEHM

survived only in the so-called penny whistle, in the "flute-work" of the organ (*q v*), and in the French flageolet

The *Transverse Flute* or *German Flute* includes the *concert flute,* known both as flute in C and as flute in D, the piccolo (*q v*) or octave flute, and the fife (*q v*), and consists of a tube open at one end and nominally closed at the other by means of a plug or cork stopper Virtually, however, the tube is an open one giving the consecutive harmonic series of the open pipe or of a stretched string

The compass of the modern flute is three octaves with chromatic semitones from middle C upwards The sound is produced by holding the flute transversely with the embouchure turned slightly outwards, the lower lip resting on the nearer edge of the embouchure, and blowing obliquely across, not into, the orifice The flat stream of air from the lips, known as the air-reed, breaks against the sharp outer edge of the embouchure The current of air, thus set in a flutter, produces in the stationary column of air within the tube a series of pulsations or vibrations caused by the alternate compression and rarefaction of the air and generating sounds of a pitch proportional to the length of the stationary column, which is practically somewhat longer than the length of the tube The length of this column is varied by opening the lateral finger-holes

The bore of the early flute with six finger-holes was invariably cylindrical throughout, but towards the end of the 17th century a modification took place, the head joint alone remaining cylindrical while the rest of the bore assumed the form of a cone having its smallest diameter at the open end of the tube The conical bore greatly improved the quality of tone and the production of the higher harmonics of the third octave Once the conical bore had been adopted, the term flute was exclusively applied to the new instruments, the smaller flutes, then cylindrical, used in the army being designated fifes (*q v*). At the present day in England, France and America, the favourite mode of construction is that introduced by Theobald Boehm, and known as the "cylinder flute with the parabolic head," though the conical type is still usually employed in military bands

The quality of tone depends somewhat on the material of which the flute is made. Silver and gold produce a liquid tone of exquisite delicacy suitable for solo music, cocus-wood and ebonite, a rich mellow tone of considerable power suitable for orchestral music. The tone differs further in the three registers, the lowest being slightly rough, the medium sweet and elegiac, and the third bird-like and brilliant The proportions, position and form of the stopper, and of the air chamber situated between it and the embouchure are mainly influential in giving the flute its peculiar slightly hollow timbre, due to the paucity of the upper partials of which, according to Helmholtz, only the octave and twelfth are heard.

The technical capabilities of the flute are practically unlimited to a good player who can obtain sustained notes diminuendo and crescendo, diatonic and chromatic scales and arpeggios both legato and staccato, leaps, turn, shakes, etc, with the greatest facility

Instruments of the flute type appear to be of very ancient origin. The Hindus, Chinese and Japanese all claim to have had

them from time immemorial, the like applying to the Egyptians, and also to the Greeks and Romans

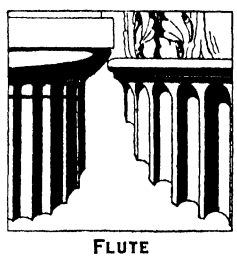
The first essentially western European trace of the transverse flute occurs in a German ms of the 12th century, the celebrated *Hortus deliciarum* of the abbess Herrad von Landsperg, in which Fol 221 shows a syren playing upon an instrument of this type, which Herrad explains in a legend as a *tibia*

According to Quantz, it was in France, and about the middle of the 17th century, that the first modern modifications were introduced in the manufacture of the flute, including the abandonment of the cylindrical bore in favour of a conical one, and the introduction of keys But no maker had as yet devoted his attention to the rational division of the column of air by means of the lateral holes, and it was left for Theobald Boehm, a Bavarian maker, to embody this and many other improvements in the completely remodelled instruments which he brought out in 1832 and in 1846

The old English *fipple flute* or *flute à bec* is described under the headings RECORDER and FLAGEOLET (X)

In architecture flute describes vertical channels or curved sinkages used in a series for decorative purposes, especially when employed upon the shafts of columns Flutes may be separated from each other by a sharp edge or ridge known as an arris, or by a small, vertical flat surface known as a fillet The earliest known flutes occur in Egyptian columns, where they are obviously the result of the attempt to decorate simply the piers of a rockcut tomb If the corners are cut off a square pier, an octagonal pier results, if its corners are in turn cut off, one of 16 sides Such piers are common in the tombs at Beni Hassan (12th dynasty) In many, the sides are made slightly concave in order to emphasize the vertical lines at the corners The result is a fluted pier In the temple at Karnak (*c.* 1400 B C), and that of Queen Hatshepsut, at Deir-el-Bahri (*c* 1500 B C), similar fluted supports appear Such piers are sometimes known as Proto-Doric

Whether borrowed from the Egyptians or developed independently, flutes became universal in Greek Doric building In early examples they are segmental in plan, but later a section approximating an elliptical curve, or one formed with three centres, was the most common type as such a curve gave greater emphasis to the line of the arris, without too great depth in the flute itself In columns of the Ionic and Corinthian orders the flutes are separated by fillets and here, more than ever, an elliptical section is necessary, in order to bring the edges of the flute as nearly parallel to a column radius as possible In general, flutes separated by fillets are deeper than flutes separated by arrises, varying from one quarter of the width, as in the Ionic columns in the cella of the temple at Bassae (*c* 450 B C), to one half the width, as in the Erectheum The number of flutes varies from 16 to 24 in Doric examples, with 20 as the most common number In Ionic and Corinthian columns, the number of flutes is usually greater, averaging 24, but in the archaic temple of Artemis at Ephesus (*c.* 500 B C) there are 52 Similarly in the Persian palace columns of Susa and Persepolis, obviously influenced by Greek work, the number of flutes is great, varying from 30 to 52 Roman columns mostly followed Greek precedent, but with less refinement and a general substitution of semicircular and segmented flutes in place of the refined Greek ellipses In some of the smaller Roman examples, particularly in domestic work, the lower portions of the flutes are filled either with a convex moulding known as reeding or by merely filling them to a flat surface in an effort to preserve the arrises and fillets from damage Twisted, helical or spiral flutes are found occasionally in Roman work, are frequent in mediaeval Italy and were spasmodically used during the high Renaissance and Baroque, as in Sammichele's Bevilacqua palace at Verona (1530) Except where there was direct imitation of Roman work, as in much of the Romanesque of Burgundy and Provence, fluting was not used in mediaeval work outside of Italy



FLUTE

Flutes are frequently used to decorate horizontal bands, especially the coronas, or flat projecting portions of the Corinthian cornice, and also in friezes, as in much English and American late Georgian work Fountain basins and sarcophagi are also often fluted, in many cases with flutes not vertical, but taking an S curve. Fluting occurs in mediaeval work only in styles where there was much imitation of Roman work, as the Romanesque of Burgundy and Provence. (T. F. H)

FLUX, in metallurgy, a substance introduced in the smelting of ores to promote fluidity, and to remove objectionable impurities in the form of a slag The substances in commonest use are.—lime or limestone, to slag off silica and silicates, fluorspar for lead, calcium and barium sulphates and calcium phosphate, and silica for removing basic substances such as limestone Other substances are also used, but more commonly in assaying than in metallurgy Sodium and potassium carbonates are valuable for fluxing off silica, mixed with potassium nitrate, sodium carbonate forms a valuable oxidizing fusion mixture, "black flux" is a reducing flux composed of finely divided carbon and potassium carbonate, and formed by deflagrating a mixture of argol with quarter to half its weight of nitre Borax is very frequently employed, it melts to a clear liquid and dissolves silica and many metallic oxides. Potassium bisulphate is useful in the preliminary treatment of refractory aluminous ores Litharge and red lead are used in silver and gold assays, acting as solvents for silica and any metallic oxides present The word is derived from Lat *fluxus,* a flowing, and retains this meaning in medicine, etc.

FLUXIONS, a form of the calculus (*q v*) developed by Sir Isaac Newton (*q v*), beginning in 1665. The word *fluxion,* as used by him, denoted the rate at which a variable (flowing quantity, fluent) increases or decreases at a given instant of time If x and y were taken to be the flowing quantities (fluents) $y=x^3$, then it could be shown that $\dot{y}=3x^2\dot{x}$ In the alternative differential notation we should have $dy=3x^2dx$ (*See* CALCULUS)

FLY, a name given to the winged stage of many insects such as butterfly (*see* LEPIDOPTERA), dragon-fly (*q v*), may-fly (*q v*), caddis-fly (*q v*), etc , also specially used by entomologists to mean any species of two-winged flies or DIPTERA (*q v*) In ordinary parlance *fly* is often used in the sense of the house-fly (*q v*), and by colonists and sportsmen in Africa with reference to the tsetse-fly (*q v*)

Out of doors the flies that most commonly come under notice are the daddy-long-legs or crane-fly (*Tipula*), the wasp-like or bee-like hover-flies (fam *Syrphidae*), the horse-flies and their allies (fam *Tabanidae*), and various others Apart from the house-fly proper (*Musca domestica*), several species are commonly found in houses, *e g , Stomoxys calcitrans,* the biting house-fly or stable-fly, *Pollenia rudis* or cluster-fly, blue-bottles or blow-flies of the genus *Calliphora, Lucilia* or green-bottles, *Sarcophaga carnaria* or flesh-fly, and several others.

FLYCATCHER, the name for birds of the family *Muscicapidae,* the best known of which is the spotted flycatcher (*Muscicapa grisola*), a summer visitor to most of Europe It is a small grey bird, fond of perching on railings or posts, whence, ever and anon, it darts to snap up some passing insects The call note is plaintive It builds a neat nest among the twigs which sprout from the bole of a tree, in a hole in a wall and similar places It lays four to six pale greenish-blue eggs, freckled with rust-colour.

The pied flycatcher (*M atricapilla*) is more of a woodland bird and is less common It has an agreeable song, and the plumage of the cock is black and white Other species of this genus occur in Europe, Asia and Africa.

The paradise flycatchers (*Tchitrea*) are distinguished by the long tail-feathers and, usually, white plumage of the male. They are found in the forests of Africa and tropical Asia The fantailed flycatchers (*Rhipidura*) are Australian; they have the curious habit of turning over in the air, like a tumbler pigeon Several other genera inhabit Africa and Australia.

The name "flycatcher" is also used for other insectivorous birds; *e.g ,* certain of the *Tyrannidae* (*see* KINGBIRD)

FLYGARE-CARLÉN, EMILIE (1807–1892), Swedish novelist, was born in Strömstad on Aug 8, 1807. Her father, Rutger Smith, was a retired sea-captain, and she often accompa-

nied him on the voyages he made along the coast She married in 1827 a doctor named Axel Flygare, and went with him to live in the province of Småland. After his death in 1833 she returned to her old home and published in 1838 her first novel, *Waldemar Klein* In the next year she removed to Stockholm, and married, in 1841, the jurist and poet, Johan Gabriel Carlén (1814–75) The most famous of her 31 volumes of tales are *Rosen på Tistelon* (1842, Eng trans *The Rose of Tistelon*, 1842), *Enslingen på Johannesskaret* (1846, Eng trans *The Hermit*, 4 vols, 1853); and *Ett Kopemanshus i skargården* (1859; *The Merchant's House on the Cliffs*) Fru Carlén published in 1878 *Minnen af svenskt forfattarlif 1840–1860*, and in 1887–88 three volumes of *Efterskord från en 80– årings forfattarbana*, containing her last tales Her home was a meeting place for Swedish men of letters She died at Stockholm on Feb 5, 1892

FLYING, COMMERCIAL: *see* AVIATION, CIVIL, TRANSPORT BY AIR, AERONAUTICS

FLYING BRIDGE, a type of ferryboat propelled by the resistance of a rope or chain attached to a fixed buoy acting against the forces of the stream The rudder is fixed obliquely which causes the boat to move at right angles towards the buoy *See* also FERRYBOAT

FLYING BUTTRESS, in architecture, a term given to an arched strut which transmits the thrust of an arch or vault across an open space, such as a side aisle or chapel, to an independent, vertical buttress built in the line of the outer wall of the space Certain late Roman buttresses, as in the Baths of Diocletian (305) are pierced by arches and are, therefore, in essence, flying buttresses It was, however, only towards the middle of the 12th century that the structural and aesthetic possibilities of the flying buttresses were understood, their development from then on became one of the important features of Gothic architecture (*q v*) The typical Gothic flying buttress consists of a half arch abutting, at its apex, against the nave wall and at the outer end against the vertical mass of the buttress proper, which was frequently weighted by a heavy pinnacle Where the nave wall was of great height, two, or even three, half arches, one over the other, form the flying buttress

FLYING CORPS: *see* AIR FORCES

"FLYING DUTCHMAN," a spectre-ship popularly believed to haunt the waters around the Cape of Good Hope Its appearance is considered by sailors as ominous of disaster The commonest legend declares that the captain of the vessel, Vanderdecken, was condemned for his blasphemy to sail round the cape for ever, unable to "make" a port The legend was used by Wagner in his opera *Der fliegende Hollander*

The German legend makes one Herr von Falkenberg the hero and alleges that he is condemned to sail for ever round the North Sea, in a ship without helm or steersman, playing at dice for his soul with the devil

FLYING FISH, the name generally given to fishes of the genus *Exocoetus,* in which the pectoral fins are greatly enlarged The lower lobe of the caudal fin is very long and, with strong strokes of the tail, these fishes emerge rapidly from the water and, with the pectoral fins outspread, sail through the air at a great speed, for distances up to 200 yards It is probable that the flight is an effort to escape from large piscivorous fishes, such as bonitos There are numerous species of *Exocoetus,* all from warm seas

The so-called flying gurnards (*Dactylopterus*) are not related to the flying fishes They have relatively larger pectoral fins than *Exocoetus,* but appear to be less efficient fliers, perhaps because the caudal fin lacks the long lower lobe There are three or four species from tropical seas

Pantodon, a little African fresh-water fish, has large pectoral fins and is said to fly, but perhaps the most interesting flier is *Gastropelecus,* a Characin of the rivers of South America, a deep-bodied fish with a large rounded, sharp-edged ventral keel, formed by the greatly expanded coracoid bones, which serve for the attachment of the enormous muscles of the pectoral fins. This fish has been seen by Eigenmann to progress by rapid beats of the strong pectoral fins, with the keel just cutting the surface of the water, and finally to emerge in a true, but not prolonged, flight.

The Catalina flying fish (*Cypsilurus californicus*) of southern California waters, sometimes 18 in long, one of the largest known species, is a strong flier, with enlarged ventral as well as dorsal fins

FLYING-FOX or **FOX-BAT,** the name applied to the fruit-eating bats of the genus *Pteropus,* which contains more than half the family *Pteropidae* This genus is confined to the tropical regions of the eastern hemisphere and Australia. It comprises numerous species, a considerable proportion of which occur in the islands of the Malay Archipelago The flying-foxes are the largest of the bats, the kalong of Java (*Pteropus edulis*) measuring about a foot in length, and the wings measuring 5ft across Flying-foxes are gregarious, nocturnal bats, suspending themselves during the day head-downwards from the branches of trees with their wings wrapped about them They are very good eating, something like hare Towards evening these bats fly off in companies to the village plantations, where they feed on all kinds of fruit, doing much damage The flying-fox of India (*P. medius*) is a smaller species, but is found in great numbers wherever fruit is to be had in the Indian peninsula

FLYING LEMUR: *see* GALEOPITHECUS.

FLYING-SQUIRREL, the name applied to two very different groups of rodents, in both of which a parachute-like expansion of the skin of the flanks enables them to take long flying leaps from tree to tree

The first group, allied to the true squirrels, comprises three genera *Pteromys,* characterized by the extension of the parachute to the interfemoral position, includes the Indian flying squirrel, *P oral,* a beautifully coloured animal with a loud, screaming voice *Sciuropteras* has one species extending into E Europe and another in N America, otherwise, like the last genus, it is confined to Indo-Malaya, it is distinguished from *Pteromys* by the slight development of the interfemoral membrane and the broad, flat tail *Eupetaurus* represented by the large *Eu cinereus* from N W Kashmir, is recognized by its tall-crowned molars and long tail, which is twice as long as the body

The second group is African and consists of certain members of the family *Anomaluridae,* some of which, however, have no parachute The flying species differ from those of the last group in that the membrane is supported by a bone at the elbow joint instead of by a cartilage at the wrist There are two flying genera, *Anomalurus* and *Idiurnus,* the latter containing a single small species (*Izenkeri*). They are all similar in habits to the previous group and, like them, are very squirrel-like in appearance

The term "flying-squirrel" is also applied to certain marsupials but these are more usually called flying-pralangers. (*See* MARSUPIALIA and GALEOPITHECUS)

FLY RIVER, a large stream in southern New Guinea, the largest in Papua (British New Guinea) It rises in the Victor Emanuel mountains near the centre of the island and flows first south and then southeast into the Gulf of Papua It is about 800 m in length and is navigable with a steam launch for a distance of 535 m from its mouth For approximately 100 m it forms the boundary between British and Dutch New Guinea The Fly river enters the Gulf of Papua in a great estuary nearly 50 m across which is filled with a series of low shifting mud islands. The largest, Kiwai, lies in the centre of the estuary and is inhabited. The effect of the tide is felt for a distance of 150 m. up the river, and at the point where it ceases the stream is 600 yd wide and averages 39 ft in depth About 300 m from its mouth the Strickland river, a tributary as large, and perhaps larger, than the Fly, enters from the north, having its source also in the Victor Emanuel mountains About 500 m from the mouth another large tributary, the Alice comes in from the right Perhaps 550 m from the mouth the Fly river divides into two nearly equal branches, the one from the left, named the Palmer, being regarded as the tributary There are no white settlements in the whole vast extent of territory drained by the Fly river, and for the last 400 m of its course the land is too low and unhealthy for white occupation, though the natives are fairly numerous The low country is inundated annually. The first hills are found about 480 m up the river, and from here on nights are cool and the climate healthier Despite its great navigable length the river is commercially unimportant.

The mouth of the Fly river was discovered by Capt Blackwood in 1842 and named after one of his ships It was first explored by Macfarlane and D'Albertis in 1875–76, and in 1877 by D'Albertis alone, who ascended to the entrance of the Alice river In 1885 Capt Everill discovered and ascended the Strickland river which D'Albertis had missed The Alice was not explored until in 1913 by Murray and in 1922 by Austen In 1927 Champion first made his way to the headwaters of the Palmer river, and Karius crossed to and descended the Strickland river

See L M D'Albertis, *New Guinea* (1880); J H P Murray, *Papua* (1912), W N Beaver, *Unexplored New Guinea* (1920) and The *Annual Reports* of the Governor-general of Papua

FLYSCH, the term long used in geology to denote a peculiar formation occurring specially in the northern Alpine zone In the Swiss-German dialect it means "slippery earth", it is applied typically to very thick, light grey shales with intercalations of small beds of ferruginous sandstone and calcareous nodules When modified by the predominance of calcareous or sandy elements it is usual to refer to "calcareous flysch," "sandy flysch," etc The flysch extends from south-west Switzerland eastward along the northern Alpine zone to the Vienna basin, whence it may be followed round the northern flanks of the Carpathians into the Balkan peninsula It is represented in the Pyrenees, the Apennines, the Caucasus and extends into Asia, similar flysch-like deposits are related to the Himalayas as the European formations are to the Alps The deposits were laid down along the fringes of the great geosynclinal basin (the Tethys) which persisted from Jurassic until late Tertiary times The flysch is not therefore of the same age throughout, the oldest portions, such as those in the Carpathians, are lower Cretaceous but the greatest development was in upper Eocene (Priabonian or Bartonian) times and lower Oligocene The absence of fossils from enormous thicknesses of flysch makes the correlation with other formations difficult. Local phases of the flysch have everywhere received special names—such as the Vienna or Carpathian sandstone Large exotic blocks of granite, gneiss and other crystalline rocks in coarse conglomerates have been variously regarded as indications of glaciation or of coastal conditions (L D S)

FLYWHEEL. The heavy rim of a flywheel stores up energy and is necessary for two main purposes (1) to prevent irregular

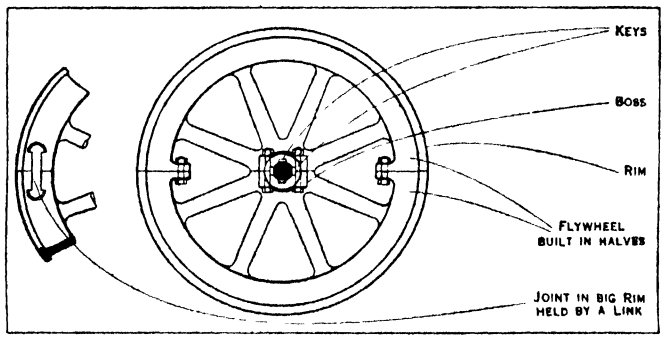


DIAGRAM OF FLYWHEEL BUILT IN HALVES, WITH LINK JOINT IN RIM
The momentum a flywheel generates ensures the steady running of engines and other machines requiring a sudden reserve of power

running of an engine, (2) to give off a reserve of force with which to overcome sudden resistance Steam, gas, oil and petrol engines, air-compressors, pumps and some water turbines are concerned with the first-named requirement, and presses, shearing and punching and slotting machines, forging machines, crushers and rolling mills with the second In engines the pressures transmitted to the crankpins vary, and the flywheel absorbs excess energy, and gives it out again when the pressure is insufficient to meet demands In explosion types of engines the cyclic variations are very marked, and heavy wheels are necessary to ensure steady running For single-cylinder internal-combustion engines a specially heavy flywheel is used when driving an electric generator.

The mass of a large flywheel constitutes a potential danger, for if the velocity of the rim exceeds the safe tensile strength of the cast-iron, the wheel will burst and scatter death and destruction to a considerable distance. The governing device must therefore be infallible, to prevent over-speeding, or "running away." Safety in manufacture is often sought by casting the arms curved instead of straight; as the rim and boss cool in the mould the arms are thus able to accommodate themselves to any pull, nor are they put into a state of stress when all is cold. Large wheels are built up in pieces, for safety and convenience of making and transport; often the rim is cast in several pieces, united with links put in hot, in the recesses, and forming a powerful hold by the act of shrinking. Each arm is separate in the biggest wheels, which are of an enormous weight

What is termed a *high-speed* flywheel is made of forged steel instead of cast-iron, and goes on a fast-running shaft to give the same result as a much heavier wheel on a slow-speed shaft

Large wheels are provided with barring gear, consisting either of a lever which is pushed against teeth in the wheel and so starts up the engine, enables it to be moved round for repairs, etc, or of a sort of hand winch, steam barring engine or electric motor, which serves for large wheels A flywheel often serves a dual purpose, when its rim takes a driving belt, or when it is grooved for a set of driving ropes A clutch also may be incorporated, as in automobile practice or in some stamping presses

FOA, EUGENIE RODRIGUES-GRADIS (1798–1853), French author, was born at Bordeaux in 1798 Separated from her husband while still very young, she earned her living by writing, and became especially noted for her graceful stories for children published largely in the *Journal des enfants* and the *Journal des demoiselles* Toward the end of her life she became blind Among her chief romantic writings were *La Juive, histoire du temps de la Regence* (1835); *Les Memoires d'un polichinelle* (1837), *Le Petit Robinson de Paris* (1840), *Le Vieux Paris, Contes historiques* (1840) She died in Paris in 1853

FOÀ, EDOUARD (1862–1901), French explorer, was born at Marseilles on Dec 17, 1862 He visited the French colony of Dahomey in 1885, and between 1891 and 1897 made two extended trips into central Africa On the latter he traversed the continent from the mouth of the Zambesi river on the east coast, through lakes Nyassa and Tanganyika to the Congo valley, ending at Libreville in the French colony of Gabon on the Atlantic Coast. He published *Le Dahomeh* (1895), *Chasses aux grands fauves dans l'afrique centrale* (1899, Eng. trans by F Lees), and *Traversee de l'Afrique, zu Zambieze au Congo francais* (1900)

See *Resultats scientifiques de voyages en Afrique d'Edouard Foà* (1908)

FOAKES-JACKSON, JOHN FREDERICK (1855–), British church historian, was born at Ipswich on Aug 10, 1855, and educated at Trinity college, Cambridge (B A, 1879, M A, 1882, B D, 1903). He was ordained by the Bishop of Winchester (1880) and became a lecturer at Jesus College, Cambridge, 1882–1916 He was dean from 1895 to 1916. He was examining chaplain to the Bishop of Peterborough, 1897–1910, Hulsean lecturer in 1902, and Lowell lecturer at Boston, U S A, in 1916 After 1916 he was professor of christian institutions at Union Theological Seminary in New York city His chief publications were *History of the Christian Church to A D 337* (1891; 7th ed to A D 461, 1923), *A Biblical History of the Hebrews* (1903; 5th ed, 1924); *Christian Difficulties, a Study of Marcion* (1903), *Biblical History for Schools Old Testament* (2nd ed, 1927); *Biblical History for Schools: New Testament* (with B T D Smith, 1923); *Introduction to Church History, 590–1314* (1921), *Studies in the Life of the Early Church* (1924); *Principles of Anglicanism* (1924), *Origins of Christianity* (with Kirsopp Lake, 2 vols); Volume II of *Outlines of Christianity* (1926); *St. Paul, the Man and the Apostle* (1926).

F.O.B., a contraction for "free on board," an expression used in commerce to denote that a price quoted is inclusive of all costs of carriage and delivering the goods on board the ship or other medium which is to take them to their destination.

FOCA, a town of Bosnia, Yugoslavia. Pop. (1921) 3,459. It is famous for its silver filigree work and inlaid weapons. The soil produces excellent walnuts, but poor tobacco. Lying close

to the frontiers of Novipazar and Montenegro, Foca (*Chocha*) was the scene of almost incessant border warfare during the middle ages. No monuments of this period are left, except the Bogomil cemeteries and the beautiful mosques, which are the most ancient in Bosnia. Foca was a trading station of the Ragusans in the 14th century, if not earlier In the 16th century it was the residence of the governor of Hercegovina. It was captured by the Montenegrins in the World War.

FOCAL INFECTION, a localized area or pocket in the tissues which affords favourable conditions for germs to grow and produce their poisons and from which these germs and poisons may be absorbed into the blood stream and thence carried to different parts of the body The most common situations for foci of infection to develop are the tonsils, teeth, the bony cavities of the head or sinuses connecting with the nasal passages, certain of the reproductive organs and less often the intestinal tract, appendix, gall bladder and kidneys

While germs are the direct cause of focal infections, the development, continuation and especially the harm which comes from their source are often attributable to mechanical factors This being the case, mechanical treatment or surgery, often becomes necessary to effect a cure Thus, healing of pockets or abscesses in tonsils is often prevented and bacteria and their products forced into the blood or lymph stream because the narrowed openings of dilated crypts become plugged with the products of infection and the walls are held apart by scar tissue, the result of previous attacks of tonsillitis Mechanical removal of tonsils such as these, is therefore the only rational procedure Local antiseptic applications or other forms of treatment can be of little value Strain or repeated injury from mastication on teeth that are out of proper alinement may be the inciting cause of pyorrhea or infection of the enveloping membrane about the teeth Since the infection in this condition may extend deep into the tissues along the teeth and form pockets plugged with concretions, cure can best be effected by correcting the contributing mechanical causes.

A properly functioning intestinal tract is rarely a source of infection If, however, kinks or adhesions develop from localized infection or injury, absorption of bacteria and their poisons is prone to occur Chronic infections of the appendix and gall bladder which may give rise to disease in distant organs are often directly attributable to kinks, a narrowed lumen from scar tissue or faecal concretions and gall stones Here again, mechanical or surgical treatment may become necessary

It has long been recognized that localized infections which are severe and associated with pain, fever and other symptoms, are liable to give rise to disease in remote parts of the body, but that this is also likely to occur from trivial, often symptomless, foci of infection such as occur so commonly in tonsils and in and around teeth, has only recently become apparent There is still difference of opinion among medical men regarding the relative importance of mild or symptomless focal infections as a cause of diseases in remote parts of the body, but those who have studied the question most thoroughly regard this mode of origin as of common occurrence. Recovery from chronic "rheumatism" even in cases that have perhaps resisted for years the repeated local application of liniments, ointments and other cures is a common occurrence, following the removal of responsible foci. Recurring attacks of arthritis, iritis or other diseases of the eye, appendicitis, ulcer of the stomach, kidney stones and other more vague affections such as slight afternoon rise of temperature. lack of endurance and nervousness, may disappear following the extraction of infected teeth, removal of tonsils, drainage of a sinus or elimination of other responsible focal infection. This new method of treatment is not, however, to be taken as a cure-all. Many conditions be too firmly established to be materially benefited; others are not due to focal infection; or the responsible focus may be hard to locate and may easily be missed.

Foci of infection, besides being directly responsible for many diseases, are prone to have deleterious effects in other ways. They interfere with the cure of diseases not attributable to focal infection, such as syphilis or tuberculosis. They tend to lower the resistance to intercurrent infections and predispose to complications in acute diseases such as scarlet fever and influenza

The part played by septic foci in the economy of the human organism has been difficult to ascertain The germs that lurk in focal infections in persons having widely different diseases are often similar and hence were not considered as possible causes of diseases that were so different in their manifestations The blood of patients does not usually react in a characteristic way with the bacteria isolated from the diseased tissues or organs The usual injections in animals are without apparent effect The germs, when grown on artificial mediums, rapidly lose their peculiar infecting powers It was not until freshly isolated cultures were injected into the blood stream of animals and the animals, usually seemingly well after injection, were anaesthetized and examined for lesions, that the significance of the germs in foci of infection in their relation to diseases in remote parts of the body, became clearly apparent These germs, so much alike in appearance, may nevertheless have widely different disease-producing power Thus, those obtained from foci of infection and the lesions of patients having ulcers of the stomach, produced ulcers of the stomach in the injected animals, or of patients with rheumatism, lesions in the joints, muscles and heart, or if the patient was suffering from certain diseases of the eye, diseases of the eye were prone to occur Diseases of the heart valves, appendicitis, shingles, inflammation of the gall bladder and gall-stones, diseases of the kidney and of the nervous system, infection of the roots of nails, were produced in large part, with germs from infected teeth or tonsils

In this field, more than in others, the maxim "An ounce of prevention is worth a pound of cure" holds good In order, therefore, that the greatest benefits may be derived from this new principle, periodic examinations to learn the state of one's health and the presence or absence of focal infections which may lead to serious disease are strongly indicated (E C R)

Dental Infection.—The bacteria of the mouth usually produce no perceptible effect elsewhere in the body until they have penetrated within the vascular structures of the teeth and jaw. They reach these structures by invasion of the tooth pulp (erroneously called nerve) through the medium of deep cavities, or by invasion of the gum tissue by pyorrhea.

Pulp infection follows the vascular channels through the root end and sets up an infection in the bone of that region (root abscess) Root abscesses are either acute or chronic The chronic root-end infection or abscess leads to serious systemic disease It is usually painless, and the tooth on which it is located may be entirely comfortable and firm when used for mastication, and may show no inflammation of the overlying gum This fact was responsible for the failure of dentists and medical practitioners to recognize its existence, before the X-ray was adapted to dental use Then, it was found that teeth infected through cavities and even teeth from which pulps were removed under supposedly aseptic conditions often developed root infections This led to a sweeping statement by some dental and medical observers that all pulpless teeth eventually become infected, and that all such teeth should be extracted. These propagandists were soon opposed by others, chiefly dentists, and at the present time the dental profession does not condemn the pulpless tooth as such The question as to whether a given pulpless tooth is infected or not is determined by diagnostic aids, of which the X-ray is the one most widely used, though interpretation of dental radiographs is not always dependable in the absence of local examination

Foci of infection may also develop around the roots of teeth subject to pyorrhea In its later stages this infection invades the soft tissue and bone around the roots of the teeth, producing "pus pockets" from which a certain amount of toxic material is absorbed into the circulation. Infectious foci in the jaws may also occur in other ways, *e g.*, as a result of leaving broken roots in the bone at the time of extraction; again, root abscesses do not always disappear with the extraction of infected teeth, leaving "residual infections" in the jaw; or they may result from third molars (wisdom teeth) which have failed to erupt

Foci of infection may also occur in the tonsils and in bony

chambers (sinuses) connected with the nose

A less common, but important, site of focal infection in which pyogenic micro-organisms are concerned, is the appendix (*See* DENTISTRY, BACTERIA AND DISEASE) (J O McC)

FOCH, FERDINAND (1851–1929), French marshal, was born at Tarbes on Oct 2, 1851 His father's family had long been settled in the south of France, leaving the district of Ariège in the 17th century to establish themselves as woollen manufacturers in the small town of Valentine where they took a prominent part in municipal affairs On his mother's side, Marshal Foch came of a race of soldiers, his maternal grandfather having been a gallant officer of the Grand Army His father was a lawyer at Tarbes (Hautes-Pyrénées) who later became a revenue official; and he was frequently transferred from place to place, taking his son with him The future marshal thus received his education successively at the Lycées at Tarbes and Rodez, the seminary at Polignan and the Jesuit college at St Étienne

It was not long before his teachers were struck with his "geometrical mind," and it was decided that he should enter the École Polytechnique, to prepare for which he was sent to St Clement's College at Metz After a few months there, however, the war of 1870 interrupted his studies He enlisted in the infantry but the armistice came before he saw any fighting, and he returned to Metz to finish preparing for his examination One of his fellow-students has described how, in the midst of a lesson, they learned, on March 11, 1871, by the booming of the German guns, that the treaty of peace had made Metz a city of the German empire None could foresee that the young student was destined, as marshal, to restore the city to France

He sat for his examinations at Nancy, which was still occupied by Manteuffel's troops, and was admitted to the École Polytechnique, where he made his mark In 1873 he was commissioned, and served successively at Fontainebleau, Tarbes and Rennes He then passed into the École Supérieure de Guerre where, after a tour of duty on the general staff, he was appointed a professor on Oct 31, 1894 His lectures soon made a sensation, both by the evident soundness of the matter and the originality of the form Even thus soon his pupils bore witness to the excellent qualities of their professor, who presently became one of the leaders in military doctrine The lessons given between 1894 and 1900, collected in volumes, constitute the chapters of Foch's great works *De la conduite de la guerre* and *Des principes de la guerre,* which appeared in 1897 and 1899

In teaching six batches of staff college students Foch fortified his own military science as well, his years at Paris were, in fact, of capital importance in the higher development of his intellect When he vacated his post no one doubted that he would return ere long in another capacity After holding two regimental commands of artillery and spending a year on the staff of the 5th Corps, he was, so to say, imposed on the Government by the opinion of the whole army as the fittest selection for the command of the École de Guerre that he had made famous It was Clemenceau—at that time prime minister—who made the appointment, giving him the rank of general, and from that day began the cordial relations between the great statesman and the great soldier which were to be revived later under memorable conditions

The general held his post as head of the École for four years, during which time he threw himself with untiring zeal into the work of this famous centre for military study, giving it a permanent stamp and forming a whole new generation of picked officers When, in 1911, he was nominated to the command of the 13th Div at Chaumont, Foch was one of the very few outstanding figures of the army and it was not surprising that, after a brief period in command of the 8th Corps, the wish of everyone acquainted with the higher military personnel brought him to the head of the splendid 20th Corps, stationed about Nancy, which was accounted one of the best elements of the "couverture" Thus, in 1913, he entered, to the sound of trumpets, the town where he had passed his examinations to the tune of the German army fifes and whence, before long, he was to march out for the War.

General Foch, who had married Mlle Julie Bienvenue, had at that time three children—two married daughters and a young son who was destined to be one of the first to fall in the war Although still attached to his Pyrenean home, the general spent his holidays on a small estate that he had acquired at Trofeunteniou in Brittany In the summer of 1914 France was so far removed from any idea of attacking Germany that Foch had left Nancy to spend a month in far-away Brittany A week later events led to his recall and he went into harness

The Outbreak of War.—He was then a man of 63, but his rare moral, intellectual and physical vigour kept him singularly young Foch was a man of thought and also, above all, a man of action Gifted with an intelligence which was never allowed to be idle, ever widening the scope of his knowledge, reflective and delighting—to use his own striking phrase—to "phosphoresce," the great soldier was even stronger in will than in intellect "Victory = *Will* . Victory goes always to those who deserve it by the greater force of *will* A battle won is a battle in which one *will* not acknowledge oneself beaten"—these are but a few of the maxims found in his books, in which the word *will* occurs on every page And in truth, although his grey eyes sparkled with intelligence, the forehead and, even more, the mouth revealed that will which he was able to communicate to all those who came in contact with him in the course of war It was this will which gave such solidity to his character and protected it from all weaknesses What is more, it stimulated both conscience and intelligence He spoke of "these natures, hungry for responsibility, which alone turn out great men," and his own was one of these natures, that no sentimental considerations could either divert or check For the rest, his clarity of mind translated itself by a realist and somewhat ironic common sense "What is it about?" was a favourite phrase of his in all circumstances, for he believed in clear vision before direct action

The 20th Corps formed part of the 2nd Army and Foch was therefore one of the commanders of Castelnau's army, which, on Aug 19, 1914, was thrown into annexed Lorraine It will be remembered that this army, after some successes, came up against a formidable resistance in the region of Morhange and failed with heavy losses Foch had had no part in forming the plan, which met with so cruel a check, he was but one of the executants He had thrown his army corps resolutely at Morhange and, when repulsed, was still able to organize with perfect coolness its retreat on the solid positions of the Couronne de Nancy Not content to await the enemy there, he resumed the offensive and, on Aug 20, threw himself on the German regiments which were waiting to attack in the "gap of Charmes," and in overthrowing them prepared the victory in Lorraine He was preparing to take his part there when he was called to the Grand Quartier Général, where Joffre entrusted him with the command of an army

At that time the French were retiring in good order from Belgium and the Ardennes towards the region of the Marne As a gap tended to open between the 4th and 5th Armies, Joffre gave Foch the mission of forming a new army (the 9th) between them, co-ordinating his action with theirs He was on the ground before the corps entrusted to him had arrived In a few days he forged out of them a solid and supple little army which was already well in hand when the celebrated order of Sept 4 arrested the retreat and prescribed the battle which was to lead to the victory of the Marne.

Foch, after passing the marshes of St Gond, established himself on the heights which dominate the Petit Morin and of which Fère Champenoise marks the crest It was thought that his rôle would be limited to supporting Franchet d'Esperey's army on his left But when the German armies, which, instead of turning the left of the French armies as they had expected, were themselves turned on the right, they tried to penetrate the allied centre precisely in this region of Fère Champenoise and Foch had therefore suddenly to support the main strain of the battle, and that with troops inferior in number The heights were for a moment carried by the Germans from Mondemont to Fère Champenoise It was then that, by a clever manoeuvre, Foch rapidly trans-

ferred the 42nd Div from his left to his centre and thus was able to gain the upper hand and force the enemy back. The extreme fatigue of his troops prevented him from pushing his successes, but he hung on to the retreating Germans and entered Chalons-sur-Marne behind them His part in the victory of the Marne was capital and it was recognized by a glorious citation in general orders (*See* MARNE, 1ST BATTLE OF)

His reputation was so increased after this great crisis that Joffre immediately entrusted him with a new mission—this time one without parallel Scarcely had the operations of the Marne terminated when, the two armies mutually trying to outflank one another, the "race to the sea" set in from the Oise to the Flemish coast which was only to be closed by the arrival of the Belgian Army and the formation of a continuous front right to Nieuport The British corps, for their part, had been moved into the region of Ypres, while Joffre detached from the now stable front between the Oise and the Vosges all the forces that he could spare to meet a great attack between the Oise and the sea

To co-ordinate the action of the heterogeneous troops hurriedly thrown into these regions, a leader of great authority was wanted at once to take the higher direction of the operations of the French armies and to co-operate harmoniously with the Allied armies so as to assure the co-ordination necessary to victory On Oct 4, Foch was sent to the Nord to fulfil this mission with the title of "deputy to the commander-in-chief"

He did not limit himself to giving the French armies, from Picardy to Flanders, the most energetic orders but put himself in close and cordial relations with Field-Marshal Sir John French and King Albert I., and established the essential liaison between the Allied armies Ceaselessly finding the necessary reinforcements and dispatching them to the aid of the hard-pressed British and Belgian corps, he was able by his friendly and generous activity to impose his own resolute ideas and so make himself the soul of the battle of Flanders that, after the fierce fighting of the Yser and of Ypres, ended in mid-November by the definite check of the German invasion for the year 1914 In all this Foch had not merely confirmed his prestige as a strategist, but had won for himself the friendly admiration of his Allies so completely that, even then, it could be foreseen that if, one day, circumstances required unity of command there could be no better choice for it than Foch Did not Lloyd George say "He could not have done more for us had he been one of our own generals"

Foch was left therefore in contact with the British and Belgian corps in the capacity of general commanding the Group of Armies of the North He held the post for two years and thus presided over the two Artois offensives of May and Sept 1915 and the battle of the Somme (*q.v.*) in the summer of 1916 which the German attack on Verdun prevented from assuming the amplitude and decisive character that had been intended

After brilliant initial successes the Somme battle seemed to sink in the autumn mud The disappointment that it caused led to a movement of dissatisfaction with the higher leaders who had presided over it Joffre having been relieved of his command, Foch was deprived of his also and relegated to Senlis for a mission of inspection The story was that he was fatigued This was hardly the case, but he accepted this semi-disgrace with resignation and his valuable advice was always at the disposal of Gen Lyautey, who had become minister of war

When, in May 1917, Gen Pétain was called to the chief command, he himself suggested to the Government that Foch could be usefully employed in the post of chief of the general staff Having been sent into Italy on the morrow of Caporetto to establish a much-needed understanding with Gen Cadorna's headquarters, and having remained in constant and cordial relations with Field-Marshal Haig, there was little doubt that when the time came Foch would appear as the single commander that so many people desired by the end of 1917 When, in March 1918, the Germans launched their first grand offensive and the Allied line threatened to break, the necessity of this command became obvious to everybody It was at Doullens that Foch, on March 29, received from the representatives of the French and British Governments that mission of higher co-ordination that on April 14 became more precise in the form of the chief command of all the Allied armies fighting in France. Already he had grasped this command with a firm hand Thanks to the close co-operation of the Allies he stopped the Germans at the gates of Amiens, and thereby brought about the final failure of their attempt to break the Anglo-French front and penetrate to the Channel

Henceforward his whole energies were directed towards assuring this fruitful co-operation Thus he brought strong French reinforcements to help the British armies, attacked in March and April, and engaged British and American divisions in the battle of the Aisne in May, thus twice checking German offensives that, for a moment, were triumphant And when the Germans came to a standstill in the pockets that they had driven into our front, he prepared the counter-offensives which, when the hour struck, were to shake and crumple the German front

The counter-offensive was on the point of being launched against the flanks of these pockets, from the Aisne to the Marne, when, on July 15, a new German offensive took place (*see* MARNE, 2ND BATTLE OF) This met with a partial check which, as we know, had the effect of deepening the pocket in which Foch intended to grip the enemy The victorious attack of July 18 on the enemy's flanks forced him to retire and gave the signal for the grand Allied offensives

Foch was now determined to halt no more He realized that the German armies were beginning to be exhausted but that if they were to be overthrown, the blows must fall thick and fast The great offensive of Aug 8 in the region of the Somme which, as it gradually spread and became more violent, forced the Germans to retire on to the Hindenburg Line, was almost immediately followed by the new offensive against that strong position where French and English vied with each other in valour Once the line had been forced, Foch launched his famous "directive" of Sept 3 which was in fact the programme of the general attack The stages of this semi-concentric attack are well known It stretched from the Meuse into Flanders and was designed to draw the enemy from all parts back on to the region of the Ardennes where Foch hoped to pin them and grasp them The "directives," which issued from the headquarters of Bombon (and later, Senlis) are clear, resolute and pitiless At this point Pétain, Haig and Pershing worked in closest harmony with their French colleague The directives of Oct 10 and 19 were followed by successes—hard won and unequal, it is true, but which on Nov 5 culminated in the general retreat of the beaten and exhausted German armies

Foch, following them closely, had already prepared an operation on a large scale to make an end of them While the Germans were to be thrown back into the difficult Ardennes region, a huge group of armies under the orders of Castelnau with Mangin as principal executant, were to attack on the Moselle and the Sarre and, reaching the Rhine, were to bar the line of retreat from the encircled Germans It was at this point that the Germans asked for the Armistice On Nov 8 Foch, who had been engaged in drawing up the conditions for three weeks past, received the German plenipotentiaries at Rethondes and, by his masterful attitude, brought them to accept all conditions on Nov 11, obtaining with the occupation of the left bank of the Rhine the results which he had expected to gain from the supreme battle

The career of Foch was not at an end Europe acclaimed him as the leader who had secured the victory Marshal of France since Aug 7, he now became a British field-marshal and later a marshal of Poland He was elected a member of the *Académie française*, which body, emulating the *Académie des sciences*, gave him a wonderful reception, and at Paris, on July 14, 1919, he passed under the *Arc de triomphe de l'Étoile* at the head of the victorious troops From New York to London and from Brussels to Warsaw he passed from triumph to triumph He was not, however, content with a parade rôle, and, as president of the Inter-Allied military commission, he was repeatedly called upon to take measures in support of the action of the Allied Governments In Jan 1929 the Marshal was taken ill and after a long wasting illness, he died suddenly on March 20 He lay in state beside the grave of the Unknown Poilu at the Arc de Triomphe,

and was then laid to rest at the Invalides near the tomb of Napoleon. (*See* WORLD WAR) (L. M.)

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FOCHABERS, burgh of barony and village, Moray, Scotland. Pop. (1921) 1,020. It is delightfully situated on the Spey about 9 m. E. by S. of Elgin, the terminus of a branch of the L.M.S.R. connecting at Orbliston Junction with the main line from Elgin to Keith. The town was rebuilt in its present situation at the end of the 18th century, when its earlier site was required for alterations in the grounds of Gordon castle, in which the old town cross still stands. Adjoining the town stands Gordon castle, chief seat of the duke of Richmond and Gordon, built in the 18th century, but including the tower of the older building.

FOCŞANI, a town of Rumania, capital of the department of Putna; on the river Milcov, which formed the ancient frontier between Moldavia and Walachia. Pop. (1928) 28,000, of whom 6,000 were Jews. The chief buildings are the prefecture, schools, synagogues, and many churches, including those of the Armenians and Protestants. Focşani is a commercial centre of some importance, the chief industries being oil and soap manufacture and tannery. A large wine trade is also carried on, and corn is shipped in lighters to Galatz. The annual fair is held on April 29. The vicinity is rich in iron, copper, coal and petroleum. Near Focşani the Turks suffered a severe defeat from the Austrians and Russians in 1789.

FOCUS (Latin for "hearth" or "fireplace"), a point at which converging rays meet, toward which they are directed, or from which diverging rays are directed, in the latter case it is called the virtual focus (*see* MICROSCOPE, TELESCOPE, LENS). In geometry the word is used to denote certain points, such as the foci of an ellipse or the focus of a parabola (*See* ANALYTIC GEOMETRY, CONIC SECTIONS, ELLIPSE, PARABOLA, HYPERBOLA, and PERSPECTIVE.)

FODDER: *see* FEEDING STUFFS.

FOERSTER, JOSEF BOHUSLAV (1859–), Czech composer, was born on Dec. 30, 1859, at Dětenice, Bohemia. His father, Josef Foerster (1833–1907), was organist at Prague cathedral from 1887 onwards, and did much for the reformation of Church music in Bohemia. The son held various musical posts in Prague, and married an opera singer, Berta Lanterer. They went to Hamburg in 1893 and Foerster became a professor at the Hamburg conservatorium. At Hamburg the Foersters formed a close friendship with Gustav Mahler, who engaged Frau Foerster for the Imperial Opera in Vienna in 1903. Foerster taught at the Vienna conservatoire, and, after the revolution of 1918, at Prague. From 1922–23 he was director. Foerster has written music in many forms, some of his most important works being those for mixed chorus and orchestra, of which *Mortuis Fratribus* (1918) is one of the best known. His operas, *Deborah* (1891), *Eve* (1897), *Jessica* (1904), *The Unconquered* (1906), and *The Heart* (1922), are distinguished in turn by psychological depth and much subtle expressiveness. Many of Foerster's works have been directly inspired by episodes in his own life, and as time has passed his music has become more and more spiritual and philosophical in content.

See Zd. Nejedly, *J. B. Foerster* (Prague, 1909), and J. Bartoš, *J. B. Foerster* (Prague, 1922), both written in Czech.

FOG, defined by Shaw as a "cloud, devoid of structure, formed on land in the layers of air which, though nearly stationary, really move slowly over the ground." (*See* CLOUD.) The same kind of surface cloud may be found at sea accompanied by light breezes or even by wind of fairly considerable force. In its more intense forms it occasions considerable delays and is sometimes so thick as to paralyse traffic completely. Viewed from a distance, fog has a definite boundary which is absent in some other forms of obscurity.

Fog, mist and haze are somewhat indiscriminately used in ordinary literature. Mist consists of a surface cloud of minute drops of water suspended in the air, *e.g.*, Scotch mist or Dartmoor mizzle, haze should be reserved for smoke or dust obscuration of the lower atmosphere when the air is dry (*See* HARMATTAN.) This distinction is often disregarded in practice, and formerly even the Beaufort weather notation had no separate letter for haze (now indicated by *z*), though fog (*f*) and mist (*m*) had separate letters.

The popular distinction between fog and mist is based rather on obscurity effects than on their meteorological character. The phrase "in a fog" has become proverbial, while the usual compounds for traffic aids are "fog-bell," "fog-horn," when vessels are "fog bound", *cf.* "fog-signal" (railway), the word "mist" is seldom used in similar connection. Sailors normally restrict the term to an obscurity of the atmosphere in comparatively calm weather, if the obscurity is produced by strong winds and driving rain the terms employed are "thick" weather or "very thick weather." In the latter case, if passing ships are not sufficiently visible for safe navigation some form of fog-warning becomes a duty.

The *Seaman's Handbook of Meteorology* (Met. Office, No. 215, 1914) contains a series of plates based on over 50,000 observations taking during the 30 years ending 1908, which show the average distribution of a fog and mist in the vicinity of the British Isles. Another set of observations taken at St. Mary's, Scilly Isles (30 years period), gives the relation between wind force and the occurrence of fog and mist.

Wind force (Beaufort scale, *q.v.*)	0 and 1	2	3	4	5	6	7–12
Number of occasions of fog (47) per 1,000 observations	8	7	9	14	6	3	<1
Number of occasions of mist (84) per 1,000 observations	5	6	11	22	20	12	8

The Meteorological Office, the Admiralty and the Trinity House have adopted a scale of "fog" intensity for the use of observers in estimating and recording grades of obscurity caused by fog or mist.

Scale of Fog Intensity

Name and symbol	On sea	On river
Slight fog or mist (*f* 1)	Horizon invisible, but lights and landmarks visible at working distances	Objects indistinct but navigation unimpeded
Moderate fog (*f* 2 and *f* 3)	Lights, passing vessels and landmarks generally indistinct under a mile. Fog signals are sounded.	Navigation impeded. Additional caution required
Thick fog (*f* 4 and *f* 5)	Ships' lights and vessels invisible at ¼ mile or less	Navigation suspended

On land during *f* 1 although objects are indistinct, road and rail traffic is unaffected; *f* 2 demands additional caution for rail traffic, *f* 3 and *f* 4 cause road and rail traffic to be impeded; and *f*.5 results in total disorganization of traffic. Related to this scale is a *scale of visibility* in which 0 stands for dense fog, objects not visible at 50 metres, 1, thick fog, objects invisible at 200 metres; 2, fog, objects invisible at 500 metres; and so on up to 9, excellent visibility, objects visible beyond 50,000 metres. At sea or in the country a fog, as a rule, is white and consists of minute water globules forming a cloud of no great vertical thickness which, though it disperses the sunlight, is fully translucent. In large towns the cloud is intensified by smoke, and some dark fogs may be regarded as entirely the result of smoke. The term "high fog" used to describe the blanket of opaque cloud which results in

almost complete darkness during daytime in certain large towns, though the streets are clear of obscurity, is a convenient though inaccurate use of the word "fog"

The physical processes which produce fogs are complicated The usual process of cloud formation, namely, the cooling of air consequent on the reduction of pressure during ascent, cannot be applied to these surface-clouds The only other process hitherto recognized as producing clouds in the atmosphere is the mixing of masses of moist air of different temperatures The mixing results from a slow motion of the air masses, and this motion is essential to the phenomenon.

Over the sea, fog is usually caused by the cooling of a surface layer of air by contact with the underlying colder water *See* Shaw, *Life History of Surface Air Currents* (M O Publication 174, 1906, p 72).

The cooling of the air surface in contact with the sea would, on account of convection, affect only a thin layer, but in addition a churning motion is set up by which the cooling is gradually extended upwards. (*See* G I Taylor, *Scientific Results of the Voyage of the Scotia*, 1913)

Sea fogs are most prevalent in spring and summer when the air is warming rapidly Many thousands of observations taken over a period of 15 years (1891–1905) in the English channel give June as the most "foggy" month, followed by April, with November the least "foggy" The observations for mists give June as the highest, followed by May, and with November again as the least misty Sea fogs of the type described above demand that the movement of the air mass shall be slow and that the mixing shall neither be too violent nor too widespread in order that the whole mass producing the fog shall be cooled below the dew point (*q v*) From the conditions of its formation sea fog is likely to be less dense at the mast-head than it is on deck

Shaw suggests that a sea fog is sometimes formed by the slow passage of cold air over relatively warm water, giving a "steaming-pot" type of fog In this, the layer in contact with the warm water would be clear and the fog would form aloft where the mixing is more complete Such "steaming-pot" fogs are, however, rare, for if the existence of a cold current over warm water were a sufficient cause of fog in the same manner that the opposite conditions appear to be, then the distribution of fog in place and time would be much more extensive than it is at present.

The formation of land fog seems to involve even more complicated processes A certain amount of mistiness may arise from the replacement of cold surface air by a warm current, but this would hardly produce large detached banks of fog The ordinary autumn evening valley fog results from a combination of the cooling of the surface layer of air during a calm cloudless evening by earth radiation, the slow natural gravitational trickle of the cooled air towards lower levels; a certain amount of eddy motion to promote mixing, and the supply of water vapour from warm, moist soil or from a relatively warm water surface In this way wreaths and banks collect in the lowest parts, until extensive and deep valleys become filled with fog (For a minute description of a Lake District fog *see* J B. Cohen [*Q. J. Roy. Met. Soc*, vol xxx, p. 211, 1904])

Hence the circumstances favouring fog formation are (1) a site near the bottom level of a drainage area, (2) cold surface air but no wind, (3) a period of vigorous radiation, (4) warm but moist surface soil.

The persistence of these fog banks is remarkable considering that even the smallest particles of a fog cloud must be continually sinking, and consequently should reach the earth or water and lead to the disappearance of the fog-cloud In sheltered valleys the constant downward drainage of fresh and colder fog-laden material may displace the lower layers which were clearing, but there are occasions when the extent and persistence of land fog seems too great to be accounted for by such means, *e.g*, Dec 1904 when the whole of England south of the Humber was covered with fog for several days.

The very presence of fog, of course, tends to its own preservation for much of the solar heat which would otherwise reach the ground and set up convection from below is reflected from the upper surface of the fog screen Again, during thick fog there is a reversal of the normal temperature distribution of the lower layers and the surface air may be much cooler than the air immediately above This reversal of the normal lapse-rate for temperature confers a special stability on the lower layers, convection is impossible and the lower layers are practically shut off from the other layers of the atmosphere; in addition, in large towns the stagnant air becomes further polluted by dust and smoke and this intensifies the fog.

A typical case of inversion of temperatures was noted during the persistent fog of March 6, 1902, when the minimum temperature recorded on the Victoria Tower (400 ft high) of the Houses of Parliament was $7\frac{1}{2}^\circ$ F higher than the minimum measured in a thermometer screen 4 ft above the ground The lowest layers, in such circumstances, may attain very low temperatures A remarkable example occurred in London on Jan 28, 1909 The city was under fog all day and the maximum temperature only reached 31° F, whereas Warlingham (Surrey), outside the fog zone, had a temperature of 46° F It is thus evident that while fog arrests surface cooling by radiation, yet it does not provide a protection for plants against frost (*See* DEW)

The somewhat capricious drifting of fog banks over the sea still awaits satisfactory explanation Shaw suggests that it may be connected with the electrification of particles, as observations at Kew show high electrical potential during fog, but whether this potential is a cause or a result of the fog has not yet been proved. Shaw has also experimentally demonstrated that if a mass of fog-bearing air could be enclosed and kept still for but a short time then the fog would settle, hence as one essential condition of fog formation is the process of mixing, then the apparently capricious behaviour of fog banks may mean that mixing is still going on in the persistent ones, but is completed in the disappearing ones.

Statistics on the geographical distribution of fog are usually not very satisfactory on account of the uncertainty of the distinction between fog and mist Nevertheless, certain areas have been well mapped, *e g*, the north Atlantic ocean and its various coasts as shown in the monthly meteorological charts of the north Atlantic issued by the Meteorological Office, and in the pilot charts of the north Atlantic of the United States Hydrographic Office. These charts show that ocean fog is most extensive in the spring and summer. By June the fog area has extended from the Great Banks over the ocean to the British Isles, in July it is most intense and by August it has notably diminished, while in November, proverbially a foggy month on land, hardly any ocean fog remains

The various meteorological aspects of fog and its incidence in certain areas are set out in numerous papers As far back as 1889 the titles referring to fog, mist and haze in the *Bibliography of Meteorology* (Pt. 2. U S. Signal Office) numbered 306, and there have been very numerous additions The fogs of London in particular have long been the subject of inquiry, and reports were prepared by A Carpenter and R. G K Lempfert, based upon observations made between 1901 and 1903, in order to examine the possibility of more precise forecasts of fog. (See *Met. Office Publication*, No. 160)

The study of the properties of fog is especially important for large towns in consequence of the resultant economic and hygienic effects, but it is difficult to get trustworthy statistics in consequence of the vagueness in the classification of fog For large towns there is great advantage in using a fog intensity scale such as that given above.

Assuming that the term fog means an obscurity amounting to *f*2 or more on the scale, it then becomes possible to determine comparative frequencies between places or for the same place at different periods. From such a comparison Brodie suggests (*Q.S.R. Met Soc*, vol xxxi p 15) that in recent years there has been a marked diminution of fog frequency as indicated by the following total number of days of fog for the separate years 1871 to 1908

1871–1880 42, 35, 75, 53, 49, 40, 46, 63, 69, 74.
1881–1890 59, 69, 61, 53, 69, 86, 83, 62, 75, 65.
1891–1900 69, 68, 31, 51, 48, 43, 48, 47, 56, 13
1901–1908. 45, 42, 26, 44, 19, 16, 37, 19.

But neither the above statistics, nor later figures, nor common

experience suggests that the atmosphere of London is approaching that of the rural districts as regards transparency Autographic records still show that the atmosphere in many parts of the metropolis is almost opaque to sunshine strong enough to burn the card of the recorder during the winter months, and any substantial reduction of the obscuring pall will only follow a serious handling of the smoke abatement problem (*See* Sir Napier Shaw and J S Owens, *The Smoke Problem of Great Cities*, 1925) In this connection it is interesting to note that there was a marked diminution of the smoke layer over Britain during the fuel shortage which accompanied the labour disputes of 1926

FOGAZZARO, ANTONIO (1842–1911), Italian novelist and poet, was born at Vicenza on March 25, 1842 He was a pupil of the Abate Zanella, one of the best of the modern Italian poets, whose tender, thoughtful and deeply religious spirit continued to animate his literary productions He began his literary career with *Miranda*, a poetical romance (1874), followed in 1876 by *Valsolda*, which, republished in 1886 with considerable additions, is perhaps his best poem To the classic grandeur of Carducci and D'Annunzio's impetuous torrent of melody Fogazzaro opposes a Wordsworthian simplicity and pathos His novels, *Malombra* (1882), the hero of which, Corrado Silli, is said to reflect his own personality, *Daniele Cortis* (1887), *Mistero del Poeta* (1888), did not gain universal popularity until they were discovered and taken up by French critics in 1896 The demand then became prodigious and a new work, *Piccolo Mondo antico* (1896), which critics far from friendly to Fogazzaro's religious and philosophical ideas pronounced the best Italian novel since *I Promessi Sposi*, went through many editions, it is a tale of the liberation of Lombardy and Venetia Even greater sensation was caused by his novel *Il Santo* (*The Saint*, 1906), on account of its being treated as unorthodox by the Vatican, and Fogazzaro's sympathy with the Liberal Catholic movement—his own Catholicism being well known—made this novel a centre of discussion in the Roman Catholic world He is also concerned with ethical and religious problems in the volumes of stories *Fedele, ed altri racconti* (1887) and *Idilli spezzati* (1901), and in his essays *Discorsi* (1898) and *Ascensioni umane* (1899) He died at Vicenza on March 7, 1911 Many of his works have been translated, but, as their beauty depends so much on atmosphere, they lose in the process

See E Donadoni, *Antonio Fogazzaro* (1913), L Gennari, *Fogazzaro* (1918) and *Ritratto di un poeta, Antonio Fogazzaro* (Bergamo, 1921), F Crispolti, *Antonio Fogazzaro, Discorso Commemorativo* (1911), Gallarati-Scotti, *The Life of Antonio Fogazzaro* (1922)

FOG BOW, a white rainbow, about 40° in radius It has a reddish outer margin and an inner margin of bluish tinge, but the whole of the middle of the band is uncoloured It occasionally accompanies fogs (*q v*) and its origin resembles that of the normal rainbow, but the smallness of the water drops (under $\frac{1}{40}$ mm) causes the colours to be mixed and the resulting band to be nearly white (*See* Halo)

FOGELBERG, BENEDICT (or Bengt) **ERLAND** (1786–1854), Swedish sculptor, was born at Gothenburg on Aug 8, 1786 His father sent him in 1801 to Stockholm, where he studied at the school of art He then studied in Paris, first under Pierre Guérin, and afterwards under the sculptor Bosio, for the technical practice of sculpture In 1820 Fogelberg went to Rome, where the greater part of his remaining years were spent He died at Trieste on Dec 22, 1854 The subjects of Fogelberg's earlier works are mostly taken from classic mythology. Of these, "Cupid and Psyche," "A Bather" (1838), "Venus and Cupid" (1839) and "Psyche" (1854) may be mentioned His "Odin" (1831), "Thor" (1842), and "Balder" (1842), though influenced by Greek art, are of greater interest His portraits and historical figures, as those of Gustavus Adolphus (1849), of Charles XII (1851), of Charles XIII. (1852), and of Birger Jarl, the founder of Stockholm (1853), are faithful and dignified works

See Casimir Leconte, *L'Oeuvre de Fogelberg* (1856)

FOGGIA, a town and episcopal see of Apulia, Italy, capital of the province of Foggia, 243 ft above sea level, in the centre of the great Apulian plain 201 m by rail S E of Ancona and 123 67,314 The name is perhaps derived from the pits or cellars under the pavement slabs of the open spaces (*foveae*) in which the grain of the neighbourhood is stored The town is the mediaeval successor of the ancient Arpi, 3 m. to the N., the Normans, after conquering the district from the Eastern empire, gave it its first importance The date of the erection of the cathedral is 1172, it retains some fine Norman architecture but was much altered after the earthquake of 1731 Only one single gateway of the palace of the emperor Frederick II. (1223, by Bartolommeo da Foggia) is preserved Here died his third wife, Isabella, daughter of King John of England Charles of Anjou died here in 1285 After his son's death, it was a prey to internal dissensions and finally came under Alfonso I of Aragon, who converted the pastures of the Apulian plain into a royal domain in 1445, and made Foggia the place at which the tax on the sheep was to be paid and the wool to be sold It is still a great wool market, and the centre of an association (the Ovile Nazionale) for improving the breed of sheep Foggia is a railway centre, on the main line from Bologna to Brindisi, where this is joined by the line from Benevento and Caserta There are also branches to Rocchetta S Antonio (and thence to either Avellino, Potenza, or Gioia del Colle), to Manfredonia and to Lucera

See R Caggese, *Foggia e la Capitanata* (Bergamo, Arti Grafiche, 1910) well illustrated, A Haseloff, *Bauten der Hohenstaufen in Unteritalien*, 1 (Leipzig, 1914), 67 *sqq*

FOG-SIGNALS are employed for the purpose of guidance or warning when visual marks or signals are obscured by fog or their visibility is materially reduced by atmospheric conditions Permanent fog-signals intended for the guidance of the mariner are usually established in conjunction with coast and harbour lighthouses and lightships For warning signals made during fog by vessels under weigh or at anchor *see* Navigation Fog-signals are used in railway working to warn engine drivers when the ordinary signals are obscured by fog, these commonly consist of detonators, fixed on the rail, which are exploded as the leading wheel of the engine passes over them (*see* Railway Signalling)

Coast fog-signals are of three kinds (a) *Aerial-acoustic*, (b) *Submarine-acoustic*, including submarine bells and oscillators, which are usually established on light-vessels as an auxiliary to an aerial-acoustic signal, and (c) *Wireless* or *Radio-fog-signals* Aerial-acoustic signals may be divided into three classes, first, those sounded by compressed air, such as sirens, diaphones and reed-horns, secondly, explosive signals, including nitrated-gun-cotton charges, guns and rockets, the two last now seldom used, and thirdly, bells and gongs The use of wireless-fog-signals has been largely extended since 1921, when the first permanent coast-signal of this description was established, and they are of great importance to aerial as well as to marine navigation Aerial-acoustic signals are audible at greatly varying distances and, under certain atmospheric conditions, may be heard at a considerable distance though at the same time wholly inaudible in intervening areas Wireless and submarine signals, on the other hand, are unaffected by the atmospheric conditions which impair the audibility of aerial sound-signals (*See* Lighthouses)

(N. G. G)

FÖHN, a warm, relaxing wind experienced on the northern side of the Alpine range most frequently in winter and early spring Similar local winds occur elsewhere, *e g*, Norway, Greenland and North America In the last case it is known as the *Chinook* and descends the Rocky mountains to the western prairies, as a warm, dry wind which evaporates a great deal of the winter snow. The fohn approaches the ridge from the south, is cooled during its ascent, and moisture may be condensed from it, giving rain or snow It descends the northern slope by some process still obscure, during which it becomes warmed and dried, and has important local effects with reference to human activities.

See Hann, *Lehrbuch der Meteorologie*, p 594; and von Ficker, *Innsbrucker Fohn-Studien* (Wien, 1905).

FÖHR, a German island in the North Sea, belonging to the province of Schleswig-Holstein, and situated off its coast. It comprises an area of 32 sq m Fohr, the most fertile of the

well wooded The inhabitants are mainly engaged in the fishing industry, and are known as excellent sailors It is also a summer resort and the chief town, Wyk, has a population of 2,784

FOIL. 1 A leaf (from Lat. *folium*), so used in heraldry and in plant names, *e g*, the "trefoil" clover, and hence applied to anything resembling a leaf. In architecture, the word appears for the small leaf-like spaces formed by the cusps of tracery in windows or panels, and known, according to the number of such spaces, as "quatrefoil," "cinquefoil," etc The word is also found in "counterfoil," a leaf of a receipt or cheque book, containing memoranda or a duplicate of the receipt or draft kept by the receiver or drawer as a "counter" or check "Foil" is particularly used of thin plates of metal, resembling a leaf, not in shape as much as in thinness In thickness foil comes between "leaf" and "sheet" metal In jewellery, a foil of silvered sheet copper sometimes known as Dutch foil, is used as a backing for paste gems, or stones of inferior lustre or colour This is coated with a mixture of isinglass and translucent colour, varying with the stones to be backed, or, if only brilliancy is required, left uncoloured, but highly polished From this use of "foil," the word comes to mean, in a figurative sense, something which by contrast, or by its own brightness, served to heighten the attractive qualities of something else placed in juxtaposition The commonest "foil" is that generally known as "tinfoil" The ordinary commercial "tinfoil" usually consists chiefly of lead, and is used for the wrapping of sweetmeats, tobacco or cigarettes A Japanese variegated foil gives the effect of "damaskeening" Many thin plates of various metals, gold, silver, copper, together with alloys of different metals are soldered together in a particular order, a pattern is hammered into the soldered edges, and the whole is hammered or rolled into a single thin plate, the pattern then appearing in the order in which the various metals were placed

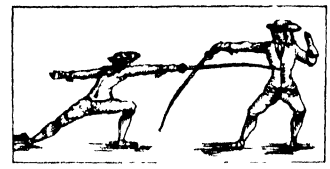
2 An old hunting term, used of the running back of an animal over its own tracks, to confuse the scent and baffle the hounds (from O Fr *foler*, to tread) It is also used in wrestling, of a "throw" Thus comes the common use of the word, in a figurative sense, with reference to both these meanings, of baffling or defeating an adversary, or of parrying an attack

3 As the name of the weapon used in fencing the word is of doubtful origin

FOIL-FENCING, the art of attack and defence with the fencing foil, is essentially a conventional art, its characteristic limitation lying in the rule that no hits except those on the body shall be considered good, and not even those unless delivered in strict accordance with certain standard precepts It requires for its perfect display a combination of artificial circumstances, such as even floors, featherweight weapons, and an unconditional acceptance of a number of traditional conventions In duelling much of the foil-fencer's special achievement and brilliancy has to be sacrificed in the presence of the brutal fact that thrusts on the face or below the waist *do* count, insomuch as they may kill, that accidental hits in the arm or leg cannot be disregarded, for they may, and generally do, put a stop to the duel The fact, however, that in these earnest encounters, all conventions that determine a hit vanish, does not in any way justify the notion, prevalent among many, that a successful hit justifies any method of planting the same, and that the mere discarding of all convention in practical sword-play is sufficient to convert a bad fencer into a dangerous duellist

Whether in foil-fencing or in the simpler and more cautious operation of the practised duellist the one golden rule remains, that one so quaintly expressed by M Jourdain's *maître d'armes* in Molière's comedy *"Tout le secret des armes ne consiste qu'en deux choses, à donner et à ne point recevoir."* The modern motto is *"Toucher et ne pas l'être"* This is the true reason for the conventionalities of foil-play, the idea of "giving without receiving" In courteous bouts a hit has no real value when it is actually cancelled by a counter or when it is delivered in such a way as to admit of a counter. The experience of ages and the careful consideration of probabilities have given birth to the various make-believes and restrictions that go to make sound foil-play These restrictions are destined to act in the same direction as the warning presence of a sharp point instead of a button, and thus as far as possible to prevent those mutual hits (*le coup des deux veuves*) which mar the greater number of assaults

With reference to actual duelling, it is recognized that it would be foolish to attempt the complex attacks, and the neat but somewhat weak parries of the foil and this had led some to assert that, for its ultimate practical purpose (which logically is that of duelling) the refined art of the foil is next to useless Some even maintain that a few weeks' special work in that very restricted play which alone can be considered safe on the field of honour will produce as good a practical swordsman as any who have walked the schools for years Nothing can be further from the truth The foil-fencer of standing, who can perform with ease and accuracy all the intricate movements of the assault, and has trained his hand and eye to the lightning speed of the well handled foil must logically prove more than a match for the more purely practical but less trained devotees of the épée de combat All argument aside, foil-fencing is considered the basis, so far as practice is concerned, of all sword play, whether with foil, épée or sabre



FROM CASTLE, "SCHOOLS AND MASTERS OF FENCE"

THRUST IN LOW QUARTE (QUINTE) PARRIED BY THE CIRCLE (SEPTIME)

There are two recognized schools of foil-fencing, the French and the Italian The French method, which is now generally adopted everywhere except in Italy, is described in this article, reference being made to the important differences between the two schools

The Foil.—The foil, called in French *"fleuret"* and in Italian *"fioretto"* from the button on its point, consists of the "blade" and the "handle" The blade, which is of steel and has a quadrangular section, consists of two parts. the blade proper, extending from the guard to the button, and the "tongue," which runs through the handle and is joined to the pommel The blade proper is divided into the "forte," or thicker half (next the handle), and the "foible" or thinner half Some authorities divide the blade proper into three parts, the "forte," "middle" and "foible" The handle is comprised of the "guard," the "grip" and the "pommel" The guard is a light piece of metal shaped like the figure 8 (Fr *lunettes*, spectacles) and backed with a piece of stiff leather of the same shape The grip, which is grasped by the hand, is a hollow piece of wood, usually wound with twine, through which the tongue of the blade passes The pommel is a piece of metal, usually pear-shaped, to which the end of the tongue is joined and which forms the extremity of the handle The blade from guard to button is about 33in long (No 5), though a somewhat shorter and lighter blade is generally used by ladies The handle is about 8in long and slightly curved downwards

The Italian foil differs from the French in having the blade a trifle longer and more whippy, and in the form of the handle, which consists of a thin, solid, bell-shaped guard from 4 to 5in in diameter, a straight grip and a light metal bar joining the grip with the guard, beyond the edge of which it extends slightly on each side Of late years many Italian masters use French blades and even discard the cross-bar, retaining, however, the bell-guard

In holding the foil, the thumb is placed on the top or convex surface of the grip (the sides of which are a trifle narrower than the top and bottom), while the palm and fingers grasp the other three sides This is the position of "supination," or thumb-up "Pronation" is the reverse position, with the knuckles up The French lay stress upon holding the foil lightly, the necessary pressure being exerted mostly by the thumb and forefinger, the other fingers being used more to guide the direction of the executed movements This is in order to give free scope to the *doigté* (fingering), or the faculty of directing the point of the foil by the action of the fingers alone, and includes the possibility of changing the position of the hand on the grip Thus, in parrying, the end of the thumb is placed within half an inch, or even less, of the guard, while in making a lunge, the foil is held as near the pommel as possible, in order to gain additional length. It

will be seen that *doigté* is impossible with the Italian foil, in holding which the forefinger is firmly interlaced with the cross-bar, preventing any movement of the hand The lightness of grasp inculcated by the French is illustrated by the rule of the celebrated master Lafaugère "Hold your sword as if you had a little bird in your hand, firmly enough to prevent its escape, yet not so firmly as to crush it" This lightness has for a consequence that a disarmament is not considered of any value in the French school

Strangely enough, when masks began to be generally worn, and the "fleuret" or foil was invented, fencing practice became gradually even more conventional than before No one seems to have realized that with masks all conventions could be safely laid aside, and sword-practice might assume all the semblance of reality Nevertheless it should be clearly recognized that the basis of modern foil-fencing was laid with the small sword alone, in and before the days of Angelo, of Danet and the famous chevalier de St George who were among the first to adopt the fleuret also All the illustrious French professors who came after them such as La Boissiere the younger, Lafaugère, Jean Louis, Cordelois, Grisier, Bertrand and Robert, were foil players pure and simple, whose reputations were gained before the modern épée-play had any recognized status

Foil-fencing in England.—Under such masters the foil, both prior to the advent of the new school of épée play in the last quarter of the 19th century, and side by side with it afterwards, always enjoyed great popularity on the European continent In England, by the middle of that century fencing with both foil and sabre had fallen into neglect In the last twenty years of the century a gradual revival set in but it was at that time an esoteric art Its devotees were mainly men of leisure imbued with the traditions of the sword, who in their travels across Europe met the leading continental swordsmen and at home crossed blades with one another in the privacy of the fencing room: first at Angelo's, later at the old rooms of the London Fencing Club, whose membership was confined to those who had been presented at Court, or at Bertrand's famous rooms in Warwick Street Curiously enough it was the introduction of the épée into England in 1900 that sowed the seeds of that popularity for fencing which has become so marked in recent years, a popularity which embraces all weapons, so that the foil may be said to owe a considerable debt of gratitude to its rival The foundation of the Amateur Fencing Association in December 1901, with eighteen affiliated Clubs, was not only the sign, but, after its inception, the mainspring of this popular revival Three years before this, however, in 1898, an event had occurred pregnant with consequences, welcomed by some but deplored by others, to the future of foil-fencing This was the institution of the Amateur Foil Championship for which the Amateur Gymnastic and Fencing Association, the forerunner of the Amateur Fencing Association, was responsible *The foil was hereby recognised as a competitive weapon* The argument as to whether so delicate an art as foil-fencing should be purely academic or should lend itself to competition is too long for an article of this nature A bout with the foils has aptly been compared to a conversation, the attack, parry, riposte, counter-riposte etc, representing arguments advanced and refuted one after the other When discussion becomes heated the niceties of dialectics take flight, and when fencers fight rather than fence with the foil, the play loses much of its charm Many lovers of the foil regarded the institution of the championship with much disfavour For them the manner of the hit mattered just as much as the hit itself, and they feared that the true art of foil play would be lost in the fierce heat of competition These fears have to some extent been justified Composed attacks which best exhibit the beauties of the foil are now rare in competitive assaults In these days it is the hit that counts and the manner of it not at all It is upon the sudden lunge, with a simple double or disengage—or at the best a one-two—that the competitor relies for success There was a time when the Association sought to encourage correct foil-fencing by awarding points for style in the championship competitions, but the rule was difficult to apply and was finally abandoned In some of the later championships foot work has played quite as important a part as hand, a fact most distressing to some of the older school of foilists who were taught the art standing upon tea-trays from which the feet were not allowed to stray, and were blindfolded in their earlier lessons, the better to learn the feel of the opponent's blade.

Amateur British foil champions since 1910 have been:—

	Men	*Women*
1910	R. Montgomerie	Miss J. Johnstone
1911	E M Amphlett	Miss G Daniell
1912	P. G Doyne	Miss G. Daniell
1913	G. R. Alexander	Miss A. B Walker
1914	R. M P Willoughby	Miss A B Walker
1915–1919	No Competition	
1920	P G Doyne	Miss C A Walker
1921	R Sutton	Miss G Daniell
1922	R Sutton	Miss Millicent Hall
1923	Major Stenson Cooke	Miss G Davis
1924	Flight-Lieut F G Sherriff	Miss G Daniell
1925	Flight-Lieut F G Sherriff	Miss G Davis
1926	S R. Bonsfield	Miss G Davis
1927	Major A. D. Pearce	Mrs Freeman

(E Br., A. R H)

FOIX, COUNTS OF. The counts of Foix were a distinguished French family which flourished from the 11th to the 15th century, and during the 13th and 14th centuries were among the most powerful of the French feudal nobles Living on the borders of France, having constant intercourse with Navarre, and in frequent communication with England, they were in a position peculiarly favourable to an assertion of independence.

The title of count of Foix was first assumed by Roger, grandson of Roger I, count of Carcassonne (d 1012), when he inherited the town of Foix and the adjoining lands, which had hitherto formed part of the county of Carcassonne Dying about 1064, Roger was succeeded by his brother Peter, who died six years later, and was succeeded by his son, Roger II This count took part in the crusade of 1095, and was afterwards excommunicated by Pope Paschal II for seizing ecclesiastical property, but subsequently he appeased the anger of the Church by rich donations, and when he died in 1125 he was succeeded in turn by his son, Roger III, and grandson Roger Bernard I The latter's only son, Raymond Roger, accompanied the French king, Philip Augustus, to Palestine in 1190 and distinguished himself at the capture of Acre He was afterwards engaged in the wars of the Albigenses, and on being accused of heresy his lands were given to Simon IV, count of Montfort Raymond Roger, who came to terms with the Church and recovered his estates before his death in 1223, was a patron of the Provençal poets, and counted himself among their number He was succeeded by his son, Roger Bernard II, called the Great, who assisted Raymond VII, count of Toulouse, and the Albigenses in their resistance to the French kings, was excommunicated on two occasions and died in 1241 His son, Roger IV, who followed, died in 1265, and was succeeded by his son, Roger Bernard III, who, more famous as a poet than as a warrior, was taken prisoner both by Philip III of France and by Peter III of Aragon This count married Marguerite, daughter and heiress of Gaston VII, viscount of Béarn (d 1290), and this union led to the outbreak of a long feud between the houses of Foix and Armagnac, which was continued by Roger Bernard's son and successor, Gaston I, who became count in 1302, inheriting both Foix and Béarn Becoming embroiled with the French king, Philip IV, Gaston was imprisoned in Paris, but quickly regaining his freedom he accompanied King Louis X. on an expedition into Flanders in 1315, and died on his return to France in the same year His eldest son, Gaston II, became reconciled with the house of Armagnac, and died at Seville in 1343, when he was succeeded by his son, Gaston III (1331–91), surnamed Phoebus on account of his beauty, the most famous member of the family Like his father he assisted France in her struggle against England, being entrusted with the defence of the frontiers of Gascony, but when the French king, John II., showed a marked preference for the count of Armagnac, Gaston left his service and went to fight against the heathen in Prussia. Returning to France about 1357 he delivered some noble ladies from the attacks of the adherents of the *Jacquerie* at Meaux, and was soon at war with the count of Armagnac In 1362 the latter was

defeated and compelled to pay a ransom; and peace was made in 1377 Early in 1380 the count was appointed governor of Languedoc, but when Charles VI became king later in the same year this appointment was cancelled Refusing, however, to heed the royal command, and supported by the communes of Languedoc, Gaston fought for about two years against John, duke of Berry, who had been chosen as his successor, until, worsted in the combat, he abandoned the struggle and retired to his estates, remaining neutral and independent Left without legitimate sons, Gaston was easily persuaded to bequeath his lands to King Charles VI, who thus obtained Foix and Béarn when the count died at Orthes in 1391 Gaston was very fond of hunting, but was not without a taste for art and literature Several beautiful manuscripts are in existence which were executed by his orders, and he himself wrote *Déduits de la chasse des bestes sauvaiges et des oiseaulx de proye* Froissart, who gives a graphic description of his court and his manner of life, speaks enthusiastically of Gaston, saying "I never saw none like him of personage, nor of so fair form, nor so well made," and again, "in everything he was so perfect that he cannot be praised too much"

Almost immediately after Gaston's death King Charles VI granted the county of Foix to Matthew, viscount of Castelbon, a descendant of Count Gaston I Dying without issue in 1398, Matthew's lands were seized by Archambault, count of Grailly and captal de Buch, the husband of his sister Isabella (d 1426), who became count of Foix in 1401 Archambault's eldest son, John (*c* 1382–1436), who succeeded to his father's lands and titles in 1412, and married Jeanne, daughter of Charles III, king of Navarre, played an important part in the wars of his time, supporting at different periods the kings of Aragon, France and England The next count was John's son, Gaston IV, who married Leonora (d 1479), a daughter of John, king of Aragon and Navarre In 1447 he bought the viscounty of Narbonne, and having assisted King Charles VII in Guienne, he was made a peer of France in 1458 In 1455 his father-in-law designated him as his successor in Navarre, and Louis XI of France gave him the counties of Rousillon and Cerdagne, and made him his representative in Languedoc and Guienne, but these marks of favour did not prevent him from joining a league against Louis in 1471 His eldest son, Gaston, the husband of Madeleine, a daughter of Charles VII of France, died in 1470, and when Gaston IV died two years later, his lands descended to his grandson, Francis Phoebus (d 1483), who became king of Navarre in 1479, and was succeeded by his sister Catherine (d 1517), the wife of Jean d'Albret (d 1516) Thus the house of Foix-Grailly was merged in that of Albret and subsequently in that of Bourbon; and when Henry of Navarre became king of France in 1589 the lands of the counts of Foix-Grailly became part of the French royal domain

See Le Père Anselme, *Histoire généalogique*, tome III (1726–33), H Castillon, *Histoire du comté de Foix* (Toulouse, 1852), J M de Madaune, *Gaston Phoebus, comte de Foix et souverain de Béarn* (Pau, 1865), Froissart's *Chroniques*, ed S Luce and G Raynaud (1869–97), D. J. Vaissète, *Histoire générale de Languedoc*, tome IV. (1876); and L Flourac, *Jean Ier, comte de Foix, Vicomte Souverain de Béarn* (1884).

FOIX, PAUL DE (1528–1584), French prelate and diplomatist, was ambassador to England from 1561 to 1565 He was then sent to Venice, and returned a short time afterwards to England to negotiate a marriage between Queen Elizabeth and the duke of Anjou He fulfilled several important missions during the reign of Henry III of France. In 1577 he was made archbishop of Toulouse, and in 1579 was appointed ambassador to Rome, where he died on May 15, 1584.

There is some doubt as to the authenticity of *Les Lettres de Messire de Paul de Foix* . (1628). See *Gallia Christiana* (1715 *seq*), "Lettres de Catherine de Médicis," edited by Hector de la Ferrière (Paris, 1880 *seq.*) in the *Collection de documents inédits sur l'histoire de France.*

FOIX, a town of south-western France, in the middle ages capital of the counts of Foix, and now capital of the department of Ariège, 51 m S of Toulouse, on the Southern railway from that city to Ax. Pop. (1926), 4,455. It stands at the confluence of the Arget with the Ariège Foix probably owes its origin to an oratory founded by Charlemagne, which later became an abbey, in which were laid the remains of St. Volusien, archbishop of Tours in the 5th cent. The county of Foix included roughly the eastern part of the modern department of Ariège, *i e*, the basin of the Ariège During the later middle ages it consisted of a number of small lordships subordinate to the counts of Foix, with a share in the government of the district Protestantism early entered the county, and severe religious struggles ensued The *états* of the county can be traced back to the 14th century The old town is dominated by an isolated rock crowned by the castle (12th, 14th and 15th centuries) St Volusien is a Gothic church (14th cent) The town is the seat of a prefecture, a court of assizes and a tribunal of first instance, and has a chamber of commerce Iron-working is carried on

FOKKER, ANTHONY HERMAN GERARD (1890–), Dutch aeronaut and aeroplane constructor, was born on April 6, 1890, at Kediri, Java He obtained his international pilot certificate in 1911 and in the following year he established an aeroplane factory at Johannesthal, near Berlin. In 1913 he founded another factory at Schwerin in Mecklenburg and during the World War supplied the German Army with flying material, notably the Fokker bi- and tri-planes After the War he returned to Holland and established the Fokker Aircraft Works in that country In 1924 the Atlantic Aircraft Corporation was founded in the United States, Mr Fokker being a director, and a factory was started at Hasbrouck Heights, New Jersey Meanwhile he had set up a plant in Madrid, which was already producing machines for the Spanish Government He devoted much of his time to researches in the field of commercial aircraft development, concentrating especially on monoplanes

FOLARD, JEAN CHARLES, CHEVALIER DE (1669–1752), French soldier and military author, was born at Avignon on Feb 13, 1669 His military ardour was first awakened by reading Caesar's *Commentaries*, and he ran away from home and joined the army He was almost continuously on active service, in Italy, in Flanders, and in 1714 under Charles XII of Sweden. Charles XII he regarded as the first captain of all time, and it was at Stockholm that Folard began to formulate his tactical ideas in a commentary on Polybius On his way back to France he was shipwrecked and lost all his papers, but he set to work at once to write his essays afresh, and in 1724 appeared his *Nouvelles Découvertes sur la guerre dans une dissertation de Polybe*, followed (1727–30) by *Histoire de Polybe traduite par . . de Thuillier avec un commentaire de M de Folard, Chevalier de l'Ordre de St Louis* Folard spent the remainder of his life in answering the criticisms provoked by the novelty of his theories. He died friendless and in obscurity at Avignon in 1752

Folard's military writings contain a great number of independent ideas, sometimes valuable and suggestive The central point of his tactics was his proposed column formation for infantry Struck by the apparent weakness of the thin line of battle of the time, and arguing from the ἔμβολον or *cuneus* of ancient warfare, he desired to substitute the shock of a deep mass of troops for former methods of attack, and further considered that in defence a solid column gave an unshakable stability to the line of battle Controversy at once centred itself upon the column Whilst some famous commanders, such as Marshal Saxe and Guido Starhemberg, approved it and put it in practice, the weight of military opinion throughout Europe was opposed to it, and eventually history justified this opposition Amongst the most discriminating of his critics was Frederick the Great, who caused a *précis* of his work to be made by Colonel von Seers, and wrote a preface expressing his views. The work (like others by Frederick) fell into unauthorized hands, and, on its publication (Paris, 1760) under the title *Esprit du Chev Folard*, created a great impression Frederick saw that "Folard had buried diamonds in a rubbish heap"

See *Mémoires pour servir à l'histoire de M le Chevalier de Folard* (Paris and Regensburg, 1753), and for a detailed account of Folard's works and those of his critics and supporters, Max Jahns, *Geschichte der Kriegswissenschaften*, vol II pp. 1478–93 (Munich and Leipzig, 1890); *see* also C de Coynart, *Le Chevalier de Folard, 1669–1752* (1914).

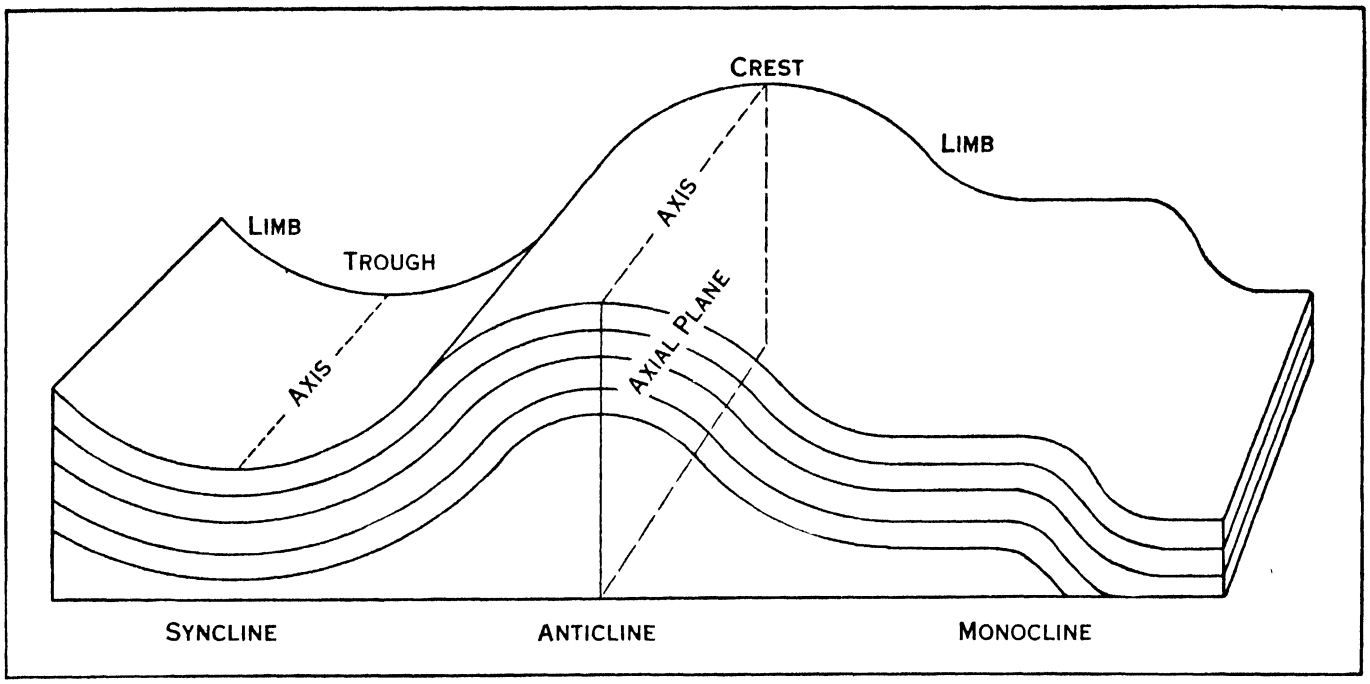


FIG 1.—DIAGRAM ILLUSTRATING THREE FORMS OF FOLDS, WITH GENERAL DESCRIPTIVE TERMS

FOLD, a pleat or bend in a flexible material The termination "-fold" added to numbers, as hundredfold, is of the same origin (O Eng *fealdan*), but fold in the sense of an enclosure for animals and hence applied to a community of worshippers has another root, apparently meaning a planked or boarded enclosure (O Eng *faloed*).

Folds in Geology.—Fold is the general geological term for a curvature of any degree in the stratified rocks of the earth's crust The French equivalents are *pli, plissement, videment,* the German, *Falte, Faltung, Sattelung*

With but a few exceptions all sedimentary rocks have been formed from the deposition of material, carried down from land masses, in horizontal or very nearly horizontal sheets Since the earth's crust has always been in a state of movement in one region or another, the stresses set up are relieved in various ways such as fracture (*see* FAULT), sagging down, buckling up and crumpling Except then, in comparatively recent strata, one rarely finds the stratified rocks lying in the position in which they were laid down The sheets are folded and fractured to any degree, from a condition when they show a hardly perceptible inclination to the horizontal to one when they have been contorted and folded over upon themselves so as to give rise to extremely complicated attitudes Such curved and folded strata are rarely seen except on a small scale in cliff sections from any one particular view-point *pari passu* with folding on a large scale denudation has been at work to plane down the land masses formed by such arching of the strata, so that what one observes are more or less highly inclined beds outcropping at the surface in different parts of the folded region, these beds being the truncated limbs of the folds

In describing folds certain terms are used Fig 1 shows diagrammatically a simple system of folding, strata curved upwards into an arch, giving rise to a simple *anticlinal fold* or *anticline,* and curved downwards into a trough, a simple *synclinal fold* or *syncline* The axis of folding is an imaginary line along the crest or the trough and defines the direction of folding The axial plane divides the fold symmetrically along its axis, in a simple symmetrical fold it will be vertical, but in an asymmetrical fold it

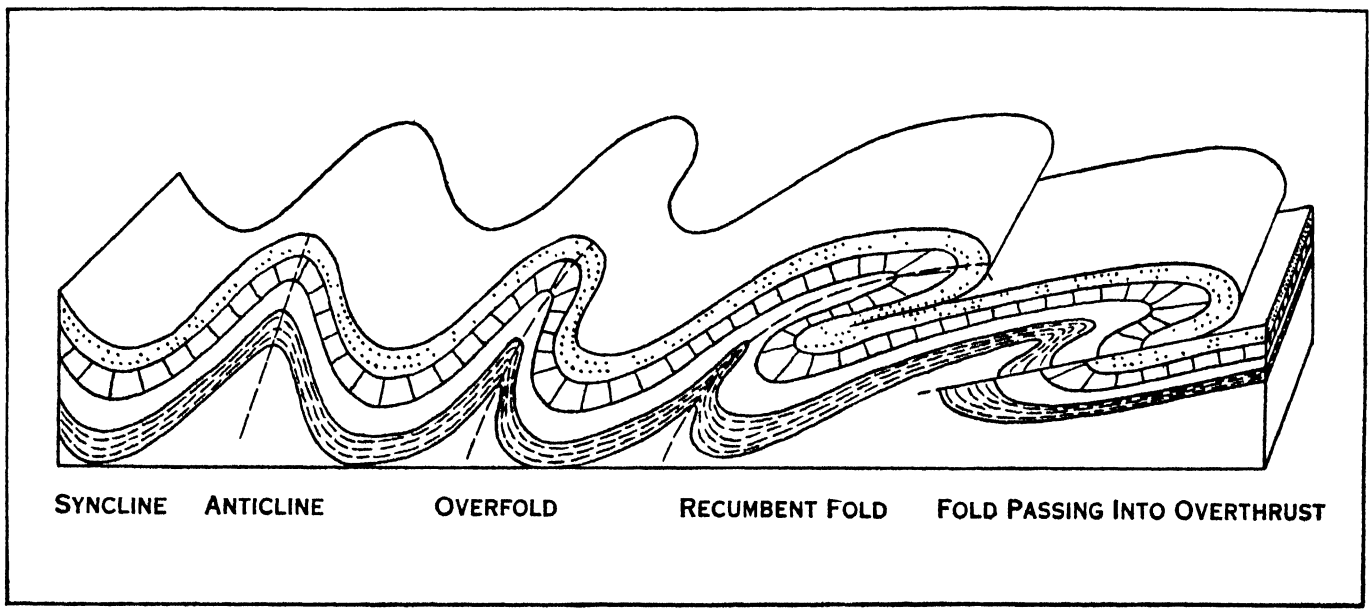


FIG 2.—ASYMMETRICAL FORMS

vill be inclined and may cease to be a plane, becoming a curved urface On either side of the fold the inclined strata form the *lanks, limbs* or *slopes.* The innermost strata or rock mass form he *core.* No fold can have an axis of indefinite length, so that t is found that folds die away longitudinally somewhat after the nanner of the rumpling which can be produced with the hand in small area of a table cloth, though the stresses which give rise

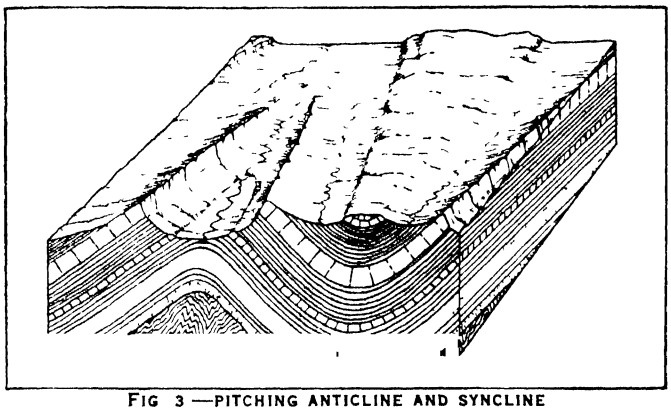


FIG 3 —PITCHING ANTICLINE AND SYNCLINE

o folding in stratified rocks may find relief in some other fashion han folding beyond the margin of these rocks, and hence a fold nay terminate differently Most folds are therefore somewhat ke an inverted feeding trough with tapering ends, and the axis, ollowing the crest, will plunge downwards The anticline is here aid to *pitch* or dip in a certain direction, and the angle of inclina- ion to the horizon of the axis at any point is called the *pitch* Folds may assume many forms, simple and complex, sym- netrical and asymmetrical There is the simple anticline (and yncline) where the axial plane is vertical, the asymmetrical orm where the axial "plane" is inclined or a curved surface A *'ome* is a special case of the symmetrical anticline here there is o axis and folding appears to have taken place round a point 'he dip of the strata around this point is said to be *quaquaversal* r *periclinal* The converse of this structure, basin shaped, is alled a *centro-clinal* fold Both these forms are somewhat rare A *monocline* is a fold with only one limb it passes generally into fault The axial plane may be inclined at any angle, from the ase where the asymmetry is hardly perceptible to the case where

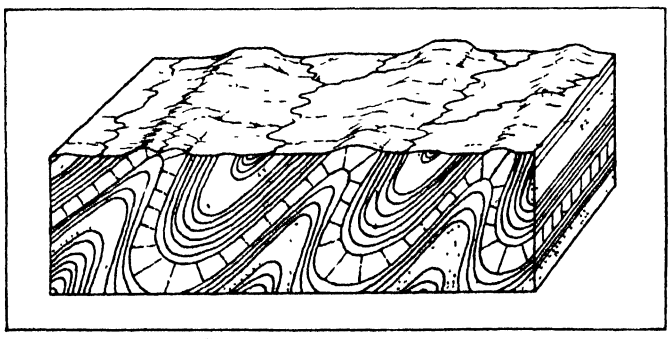


FIG 4 —ISOCLINAL FOLDING

. curves into a horizontal position if the axial plane is inclined t such an angle that the strata of one limb are reversed, the tructure is called an *overfold,* and when one limb is horizontal, a *ecumbent* fold. In regions of severe folding, a number of axial lanes inclined in the same direction give rise to *isoclinal* folding)n a large scale, the earth's crust may be arched up into a broad nticlinal fold, a *geanticline,* and if numerous subordinate flexures re present this is called an *anticlinorium.* The converse, resulting rom depression, is a *geosyncline* and a *synclinorium* A *fan tructure* is a great anticline flanked by one or more asymmetrical olds whose axial planes incline inwards Over wide areas, but on smaller individual scale, strata are frequently found to be folded n such a complex and irregular manner that they are said to be *ontorted* Great compression has caused the beds to behave as f they were plastic, since they thin out in the limbs and swell out in the arches Not only is this seen in large cliff sections but the same occurs in hand specimens and even in rock slices under the microscope. Constituents of rocks, like pebbles in conglomerates are drawn into lenticular shapes and fossils are distorted

Origin of Folds.—Folding, implying need for the earth's crust to adjust itself to a diminishing surface, is evidently the result of compression. The most obvious cause of this need is the differential shrinkage of the whole mass of the earth, the hotter interior contracting, in cooling, at a greater rate than the crust which is at a low temperature However, it is still undecided whether there may not be other agencies of even greater impor-

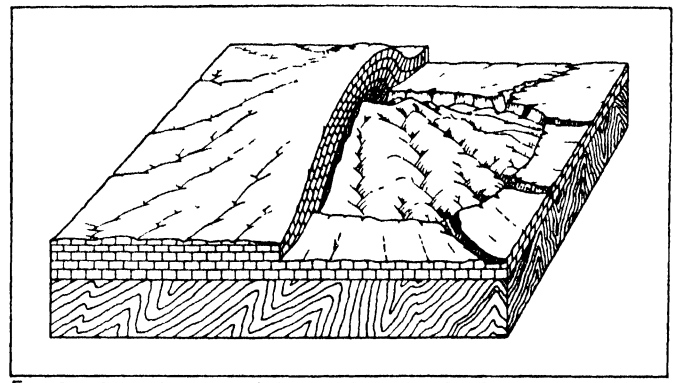


FIG 5 —QUAQUAVERSAL FOLD, OR DOME UPLIFT THE RIGHT FAULT IS IN PROCESS OF DENUDATION

tance to account for the contraction of the crust Though gently folded and little disturbed strata cover very large areas of the earth's surface, highly folded and contorted rocks are generally found in belts Thus the later mountain ranges, such as the Alps, the Andes and the Himalayas, are formed of highly folded rocks, and probably represent lines of weakness where crustal stresses have found relief the more easily (C B B)

FOLENGO, TEOFILO (1491–1544), otherwise known as Marlino Coccajo or Cocajo, one of the principal Italian macaronic poets, was born of noble parentage at Cipada near Mantua on Nov 8, 1491 At sixteen he entered the monastery of Monte Casino near Brescia, and eighteen months afterwards he became a professed member of the Benedictine order About 1516 he forsook the monastic life for the society of a well-born young woman named Girolama Dieda, with whom he wandered about Italy, supporting himself by his talent for versification. His first work was the *Merlini Cocai macaronicon,* telling the adventures of a fictitious hero named Baldus The coarse buffoonery of this work is often relieved by touches of genuine poetry, as well as by graphic descriptions and acute criticisms of men and manners His next work was the *Orlandino* (1526) an Italian poem of eight cantos, written in rhymed octaves It bore on the title-page the pseudonym of Limerno Pitocco (Merlin the Beggar) da Mantova In the same year Folengo returned to his ecclesiastical obedience, and shortly afterwards wrote his *Chaos del tri per uno,* in which, partly in prose, partly in verse, sometimes in Latin, sometimes in Italian, and sometimes in macaronic, he gives a veiled account of the vicissitudes of his life. About 1533 he wrote in rhymed octaves a life of Christ entitled *L'Umanità del Figliuolo di Dio;* and he is known to have composed, still later, another religious poem upon the creation, fall and restoration of man, and some tragedies In 1543 he retired to Santa Croce di Campesio, near Bassano; and there he died on Dec 9, 1544. Folengo is frequently quoted and still more frequently copied by Rabelais The earlier editions of his *Opus macaronicum* are rare The edition of 1530 exhibits the text as revised by the author

See E. Fabbrovich, *Merlin Cocai, Studio critico con annessa antologia dei maccheroni* (Turin, 1923).

FOLEY, JOHN HENRY (1818–1874), Irish sculptor, was born at Dublin on May 24, 1818 He studied at the schools of the Royal Dublin Society and the Royal Academy, London He began to exhibit at the Academy in 1840, and in 1844 was commissioned to do the statues of John Hampden and Selden for the Houses of Parliament He became A R A in 1849, and R A.

in 1858 He executed many commissions in London and Dublin, and for India He was responsible for the symbolical group "Asia," as well as the statue of the prince himself, for the Albert Memorial in Hyde Park, and "Stonewall Jackson," in Richmond, Va The statue of Sir James Outram at Calcutta is probably his masterpiece He died at Hampstead on Aug 27, 1874

See W Cosmo Monkhouse, *The Works of J. H Foley* (1875)

FOLEY, SIR THOMAS (1757–1833), British admiral, entered the navy in 1770, and served under Admiral (afterwards Viscount) Keppel and Sir Charles Hardy in the Channel, and with Rodney's squadron was present at the defeat of De Lángara off Cape St Vincent in 1780, and at the relief of Gibraltar Still under Rodney's command, he went out to the West Indies, and took his part in the operations which culminated in the victory of April 12, 1782 In the Revolutionary War he was engaged from the first As flag-captain to Admiral John Gell, and afterwards to Sir Hyde Parker, Foley took part in the siege of Toulon in 1793, the action of Golfe Jouan in 1794, and the two fights off Toulon on April 13 and July 13, 1795 At St Vincent he was flag-captain to the second in command, and in the following year was sent out in command of the "Goliath" (74), to reinforce Nelson's fleet in the Mediterranean In the battle of the Nile the "Goliath" led the squadron round the French van, and this manoeuvre contributed not a little to the result of the day Whether this was done by Foley's own initiative, or intended by Nelson, has been a matter of controversy (see *Journal of the Royal United Service Institution,* 1885, p 916) His next important service was with Nelson in the Baltic The "Elephant" carried Nelson's flag at the battle of Copenhagen, and her captain acted as his chief-of-staff From 1808 to 1815 he commanded in the Downs Sir Thomas Foley, who rose to be full admiral and G C B , died while commanding in chief at Portsmouth in 1833

See J B Herbert, *Life and Services of Sir Thomas Foley* (Cardiff, 1884).

FOLGORE DA SAN GEMINIANO, a 13th century Italian poet, of whose life nothing is known Some of his anti-Ghibelline political sonnets, and a few of his sonnets on the pleasures of the months and the days of the week, have been translated by D G Rossetti and by J A Symonds

See Navone, *Le Rime di Folgore* (Bologna, 1880).

FOLIGNO, a town and episcopal see of Umbria, Italy (anc *Fulginiae, q v*), 771 ft above sea-level, province of Perugia, from which it is 25 m S E by rail Pop (1921) 12,188 (town), 32,777 (commune). It lies in a fertile plain, on the Topino, a tributary of the Tiber, it is almost square in shape and is surrounded by walls Several churches contain paintings by Umbrian masters, notably works by Nicolò di Liberatore (or Nicolò Alunno) (1430–1502), a native of the place, and among them his chief work, a large altar-piece (the predella of which is in the Louvre) in S Nicolò The cathedral has a Romanesque south façade of 1133 In the same piazza as the south façade is the Palazzo Trinci, erected in 1395–1407, which has a chapel with frescoes by Ottaviano Nelli of Gubbio (1424) The Trinci also erected the fine castle of S Eraclio, 2 m S of Foligno. Raphael's "Madonna di Foligno," now in the Vatican, was originally painted for the church of S Anna The Palazzo Orfini and the Palazzo Deli are two good Renaissance buildings The abbey of Sassovivo, with its fine Romanesque cloisters (1229) lies 2 m to the E

Foligno changed hands often during the 13th century, and was destroyed by Perugia in 1281. From 1305 to 1439 it was governed by the Trinci family as deputies of the Holy See, until owing to the defection of one of them, Corrado II , Pope Eugene IV sent a force against Foligno, to which the inhabitants opened their gates, and Corrado was beheaded Until 1860 Foligno belonged to the states of the church It suffered from a severe earthquake in 1832 Foligno is a station on the main line from Rome (via Orte) to Ancona, and is the junction for Perugia. Wool, flannel and felt are among the manufactures

Paper is said to have been made at the village of Pale, 3 m. N E of Foligno, as early as at Fabriano (*q v*) The first edition of the *Divina Commedia* was printed here in 1472.

See M. Faloci Pulignani, *Foligno* (Bergamo, Arti Grafiche, 1907).

FOLIO, a term in bibliography and printing, with reference either to the size of paper employed, or of the book, or to the pagination In the phrase "in folio" it means a sheet of paper folded once, and thus a book bound up in sheets so folded is a book of the largest size and is known as a "folio" (*see* BIBLIOGRAPHY) Similarly, "folio" is one of the sizes of paper adapted to be thus folded (*see* PAPER) In book-keeping the word is used for a page in a ledger on which the credit and debtor account is written; in law-writing, for a fixed number of words in a legal document, used for measurement of the length and for the addition of costs In Great Britain a "folio" is taken to contain 72 words, except in parliamentary and chancery documents, when the number is 90 In the United States 100 words form a "folio "

FOLIUM: *see* CURVES, SPECIAL.

FOLK-DANCING. The term folk-dance is of modern origin Its existence implies a certain complexity of development in the social order, and a distinction based, more or less roughly, on this complexity In a primitive community the whole body of persons composing it is the "folk," and in the widest sense of the word it might equally be applied to the whole population of a civilized state In its common application, however, to civilizations of the western type (in such compounds as folk-lore, folk-music, etc) it is narrowed down to include only those who are mainly outside the currents of urban culture and systematic education, the unlettered or little-lettered inhabitants of village and countryside

In a community of the lower culture all dancing is of the folk, the need for distinction arises when with social progress art-forms split away, develop a self-conscious technique and become the province of a profession and of the cultured In a developed civilization we may say that folk-dancing is that dancing which has evolved among the peasantry and is maintained by them in a fluid tradition without the aid of the professional dancer, teacher or artist and is not, at least in the particular form observed, practised in towns, on the stage, or in the ball-room

Folk-dances may be ranged in two categories (*a*) social, danced by all who choose, for their own amusement, at any time, (*b*) ceremonial and spectacular, danced in connection with seasonal festivals, by special, but not in the ordinary sense professional, performers, and having apparently a magico-religious function

The precise relation between the social dance and the ceremonial dance is hardly to be decided To assign, as is sometimes done, a ceremonial or religious origin to social dancing as a whole seems in the state of the evidence dangerous Though the folk-lorist is well aware that the serious ceremony of one stage of development may become the adult amusement of the next, and the children's game of the phase following that, and though there is evidence of borrowing from ceremonial sources for social purposes, it would be incautious in the case of the social dance to forget that the impulse to mere amusement is general and early, and to read symbolism into obvious actions of the body, the natural formations into which a number of dancers may fall, or the patterns they trace

Seasonal and ceremonial dances may have become little more than a periodic diversion and show, but they bear their own marks, and inferences about origin and function may be drawn by examination of the festivals and concurrent ceremonies with which they are linked, features of the dances themselves, and the attitude towards them persisting, however much meanings may have been forgotten, in the performers and the communities in which they survive.

Though in Europe the folk-dance is rapidly dying, no European nation seems as yet to have lost it entirely. From such records as there are, it would appear that with differences of spirit and detail the folk-dances of the several nations present strong analogies and are parallel in origin and function, but close and accurate investigation has in most cases not been undertaken, and the materials for a detailed survey are not yet available. The folk-dances of England, so far the most thoroughly sifted, may be taken as in some degree illustrative. In England the work of collecting was carried out with great completeness by Cecil J. Sharp, to whom is due the fact that more is known about English

olk-dances in detail, both for dancer and folk-lorist, than about hose of any other nation The English Folk Dance Society, which moved under his direction from its foundation until his leath, carries on his work of restoring to the people the fine relics of a nearly dying art which he preserved

The social dance of England is the country-dance; and it is n this that the distinction between folk-dance and art- or ball-oom dance tends to be obscured. Country-dances are danced by country-folk at the present day, but by far the greater number, ind the most varied forms come to us in the 17 editions (1650–728) of Playford's "English Dancing Master," and smaller dance nanuals. That the country-dance, as presented by Playford, is of folk origin there is no reasonable doubt, but for Playford it vas already a ball-room dance fashionable enough to be worth publisher's attention, and it continued to be so, until its demise, or fashionable assemblies in the 19th century. Nor do we seem o have any certain evidence to show whether the country-dance of the modern countryman is a direct folk-tradition or a surviving back-flow of fashionable forms from town ball-rooms The latter s a view sometimes maintained, notably by Thomas Hardy But he country-dance as a type is undoubtedly of folk-growth and has preserved characteristics of its original form, nor is the tech-nique of the countryman in dancing it a ball-room technique

The French *contredanse* appears, by the evidence available, to be in name if not altogether in substance, derived from the Eng-ish country-dance

The ceremonial and spectacular dances are three. the sword-lance, the morris-dance and the procession The sword-dance is lanced at or near Christmas by teams consisting of men only t is frequently connected with a play, of which an essential part s a mimic beheadal and resuscitation, the beheadal being present ven when the play is absent or has lapsed It is commonly ex-plained as a ceremonial of imitative magic representing the winter leath, and subsequent revival of a vegetation-daemon At a leeper level there may be an underlying phallic symbolism, but he point needs further investigation for proof or disproof Sword-lances observed in Germany, France and elsewhere resemble those of England

Both morris and procession are danced in the spring, the mor-is by men only and most frequently at Whitsuntide Both are probably developments of a single type of ceremony They may be explained with some likelihood as acts of apotropaeic magic, he perambulation of parish or district for the expulsion of evils nd diseases The use of sticks and bells, together with the former ractice of dancing with blackened faces (to which the name norris, *i e*, Moorish, "nigger," seems to be due) would be appro-riate to a ceremony of this kind (E P. B)

FOLKESTONE, a municipal borough, seaport and watering-lace of Kent, England, within the parliamentary borough of Hythe, 71 m S E by E of London on the Southern railway Pop. (1921) 37,535 Folkestone is an important port of the Con-inental passenger service to Boulogne (30 m). The older part of the town lies in a small valley which opens steeply to the hore. To the north the town is sheltered by hills of 400 to 500 t, on several of which, such as Sugarloaf and Castle hills, are ncient earthworks. Along the cliff west of the old town a broad promenade called the Leas, commanding a notable view of the hannel, extends westward to Tandgate and is connected by foot-aths and lifts with the shore road and gardens below, where here is also a promenade pier. On this cliff stands the old parish hurch of St. Mary and St Eanswith, mainly Early English; the riginal church, attached to a priory, was founded on the site of convent established by Eanswith, daughter of Eadbald, king of Kent in 630, the monastery being destroyed at the Dissolution Folkestone harbour has a deep water pier, which, before the World War, had been lengthened to 1,480 ft., and has berths for ight steamers, with a railway platform and a lighthouse The rea of the inner and outer harbours is a little over 12 ac The sheries are important, and in addition to the passenger traffic, a arge general trade is carried on. Among institutions may be nentioned the grammar school, founded in 1674, the public ibrary and museum, the corporation technical school and a num-ber of hospitals and sanatoria, including the Royal Victoria hos-pital, built in 1889–90 and several times enlarged William Har-vey, discoverer of the circulation of the blood, was a native of Folkestone and is commemorated by a tercentenary memorial on the Leas Folkestone is a member of the Cinque Port of Dover It is governed by a mayor, seven aldermen and 24 councillors, and has its own court of Quarter Sessions and police Shorncliffe military camp and the populous suburb of Cheriton lie to the west of Folkestone There is a branch railway from Folkestone to Canterbury (Elham valley), while the line to Dover (7 m) passes through a series of cuttings and tunnels in the chalk cliffs, by way of the Warren (on the east of the town overlooking East Wear bay) and Abbot's and Shakespeare's cliffs In 1915 a serious landslip in the Warren closed the railway for four years In 1920 the earl of Radnor presented the Warren and East cliff to the town The remains of a large Roman villa were excavated near the East cliff in 1924 and the corporation undertook the roofing of a portion of the site

Folkestone (Folcestan) was among the possessions of Earl God-wine when he was exiled from England; at the time of the Domes-day Survey it belonged to Odo, bishop of Bayeux From early times it was a member of the Cinque Port of Dover, and had to find one out of the 21 ships furnished by that port for the royal service It shared the privileges of the Cinque Ports, whose liber-ties were exemplified at the request of the "barons" or freemen of Folkestone by Edward III in 1330 The corporation, which was prescriptive, was entitled the mayor, jurats and commonalty of Folkestone In 1629 the inhabitants obtained license to erect a port By the end of the 18th century the town had become prosperous by the increase of its fishing and shipping trades, and by the middle of the 19th century one of the chief health and pleasure resorts of the south coast Folkestone was an important embarkation point during the World War and one of the ports permitted to civilians It is estimated that over 100,000 Belgian refugees passed through the port between Sept 1914 and March 1915. There were later large numbers of Canadian and American troops stationed at Shorncliffe camp On May 25, 1917, during an air raid, a bomb fell in a crowded street, killing 33 people

FOLKLAND (*folcland*) This term occurs three times in Anglo-Saxon documents In a law of Edward the Elder (c 1 2) it is contrasted with bookland in a way which shows that these two kinds of tenure formed the two main subdivisions of land-ownership: no one is to deny right to another in respect of folk-land or bookland. By a charter of 863, King Aethelbert ex-changes five hides of folkland for five hides of bookland which had formerly belonged to a thane, granting the latter for the newly-acquired estates exemption from all fiscal exactions except the threefold public obligation of attending the fyrd and joining in the repair of fortresses and bridges. Evidently folkland was not free from the payment of *gafol* (land tax) and providing quarters for the king's men In Ealdorman Alfred's will the tes-tator disposes freely of his bookland estates in favour of his sons and his daughter, but to a son who is not considered as legitimate five hides of folkland are left, provided the king consents It is probable that folkland is meant in two or three cases when Latin documents speak of *terra rei publicae iure possessa.*

Two principal explanations have been given to this term Allen thought that folkland was the common property of the nation (*folc*), out of which the king could carve dependent tenures for his followers more or less after the fashion of continental *bene-ficia.* These estates remained subject to the superior ownership of the folk and of the king they could eventually be taken back by the latter and, in any case, the heir of a holder of folkland had to be confirmed in possession by the king Kemble and Stubbs, among others, followed Allen's lead

Another theory was started by Professor Vinogradoff in 1893 It considers folkland as landownership by folkright—at common law, as might be said in modern legal speech. In opposition to it bookland appears as landownership derived from royal privileges The incidents recorded in the charters characterize folkland as subject to ordinary fiscal burdens and to limitations in respect of testamentary succession Conversely, "bookland," land held

under a royal charter, was normally free from fiscal dues and could be bequeathed at its holder's will This view of the matter has been accepted by the chief modern authorities

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FOLKLORE. The word was coined by W. J Thoms in 1846 to denote the traditions, customs and superstitions of the uncultured classes in civilized nations The meaning of words, however, is prescribed not by definition but by usage, and to-day the scope of folklore includes what was deliberately excluded in the early definition, popular arts and crafts, *i e*, the material as well as the intellectual culture of the peasantry Mainly as the result of the work of the English anthropologists, Tylor, Frazer, and others, who directed attention to the use of the analogies presented by the practices and beliefs of the lower culture to illustrate and explain the superstitions and traditional customs of the European peasantry, no sharp boundary is drawn by English practice between the field of folklore and that of social anthropology But although it is true that their content overlaps and that one can hardly be explored without assistance from the other, the general implication of usage is towards restricting the province of folklore to the culture of the backward elements in *civilized* societies The use of the word folktales is less circumscribed and the branch of folklore which is concerned with popular stories, will therefore be considered in a section by itself.

The Study of Folklore.—Interest in the traditions, ballads, stories and superstitions of the common folk is no novelty of recent date One has only to think of the Caroline antiquaries like John Aubrey whose ms notes upon the *Remaines of Gentilisme and Judaisme* were written in 1687, though first printed in their entirety in 1881, or of the renewed interest in popular poetry in the 18th century as evinced by such works as Bishop Percy's *Reliques of Ancient English Poetry*, an interest which reached its literary zenith under the influence of Sir Walter Scott in the early part of the 19th century The customs of the folk no less than their songs attracted the attention of the 18th century antiquary John Brand's *Observations on the Popular Antiquities of the British Isles* was first published in 1777, in the early 19th century Hone's *Everyday Book* (1826) and *Year Book* (1829) deserve mention. But the work of the German brothers Grimm, whose *Kinder- und Hausmärchen* was published in 1812 and *Deutsche Mythologie* in 1835, laid the foundations for a study of folktales and popular superstitions upon a more scientific basis and envisaged its problems from a wider point of view than that of the local antiquarian or literary romantic

The collections of material from different parts of Europe, which were the fortunate consequence of the example set by the Grimms, revealed that, as Aubrey had already noticed, there were many popular beliefs and practices to which parallels could be found in the records of classical antiquity, and that there was a large stock of tales, customs and beliefs, which was common to all European countries For a time speculation, which was led astray by a mistaken philological theory and by a belief, now proved erroneous, that the *Vedas* represented a very primitive stage of "Aryan" culture, attempted to derive this common stock from the original ancestors from whom the various peoples who now speak languages belonging to the Indo-European family were thought all to have been descended. A prominent feature of the theories of this school, of which Max Muller was the protagonist, was the view that mythology and folktales were vestigial relics of an allegorical religious literature connected with the worship of natural phenomena But the work of E. B. Tylor, followed by that of Sir James Frazer, whose *Golden Bough* extended to the lower culture the results of Mannhardt's researches into the agricultural customs of the peasantry of Europe, and made popularly effective by the adroit pen of Andrew Lang, demolished these theories by demonstrating that analogies to these supposed survivals of "Aryan" religion among the European peasantry were to be found also among primitive peoples in all parts of the world Popular superstitions in Europe, it was now suggested, were not debased remnants of an elaborate archaic religious system, but vestiges of the stages of culture which the higher strata of civilized society had passed through but had outgrown The world-wide distribution of similar or identical customs was explained by the hypothesis that the normal reactions of the human mind at similar stages of its development to similar conditions of environment will everywhere produce similar results.

This reasonable view has maintained its position upon the whole, though from time to time challenged by theories of varying plausibility advanced by advocates of varying knowledge and intelligence, that these world-wide similarities are due rather to the diffusion of culture from some single civilization Some have sought this universal source in a lost continent, *Atlantis;* others look to the VIth Dynasty of Egypt, about the details of whose civilization and its history almost equally little is known for certain

Of the trend of the study of folklore in recent years two features may be noticed Firstly its materials have been greatly enriched by the systematic collection and recording of data, particularly in the smaller countries of Europe, where circumstances have been peculiarly favourable Here the recent very strong revival of national sentiment among the smaller nationalities has supplied an effective stimulus, and the opportunities for collection have been exceptionally rich where the conditions of European civilization have been but recently introduced into what were previously peasant societies Secondly with greater knowledge the complexity of the material is more adequately appreciated, and a more cautious and more historical approach to its problems is general The acceptance of Tylor's doctrine of survivals led for a time to an exaggerated emphasis upon similarities, which were sometimes superficial, to the neglect of differences, which were often fundamental Survivals, it was held, could not be dated, it might therefore be assumed that they belonged uniformly to an infinitely remote antiquity, and since no individual originator could be traced or named, some held that all popular songs, ballads and stories were "collective creations of the folk" How a ballad, or indeed any work of art, could actually be evolved by this committee process was never satisfactorily explained, but the view, which possessed a certain sentimental attraction, received some support from the works of the French school of sociologists, Durkheim and his pupils, who endeavored to interpret the data of folklore and social anthropology in terms of contemporary theories about the psychology of crowds

The present tendency is to recognize that the survivals of which the material of folklore consists, are not all of equal antiquity Difficult though it undoubtedly is, the main task of the student is that of analysis and stratification Many of the general ideas which find expression in popular customs and superstitions are doubtless the product of simple psychological reactions to environment, which are common to human nature in all parts of the world, but an examination of the detailed forms in which they have been given expression, often reveals substantial differences The distribution and, where possible, the chronological development of these specific forms demand the most careful attention Only thus can the data be disentangled For, if much is very old, much is relatively recent Culture is affected by foreign contacts of all kinds, whether peaceful or warlike, and within a single society, the learning of one generation has a way of becoming the folklore of another Much that is handed down eventually by oral tradition, perhaps in a debased and distorted form, has its origin in literature The satisfactory analysis, therefore, of folklore material demands the use of every available instrument, historical, literary and philological, as well as that of comparative analogy. What is quite certain is that in this, as in other fields of scientific enquiry, there is no master key which will unlock all secrets with a single simple formula.

Folk Tales and Popular Stories.—The fields of folklore and social anthropology are not rigidly separated. Thus it is not at all uncommon to find in a scientific monograph upon the social and religious customs of some primitive people, a chapter devoted

› their "folklore" This will usually be found in practice to ›ntain legends, stories, riddles and proverbs. Neither the story-lling faculty nor the ability to give forcible expression to moral ıd social truths or prejudices in picturesque apothegms are nited to any section of the human race Though in particular ses a proverb may have been borrowed by one people from an-her, the generic similarity of many proverbs which have a wide stribution (*e g*, "one swallow does not make the summer") ay well be due to the coincidence of independent invention

The problem of stories is more complicated Popular stories ll into three main categories, myths, legends and stories which e told primarily to provide entertainment As distinct from these st, myths have a purpose They are essentially aetiological, or, Mr Kipling would say, *"Just-So Stories"* Their object is to plain (1) cosmic phenomena (*e g*, how the earth and sky came be separated), (2) peculiarities of natural history (*e g*, why in follows the cries or activities of certain birds), (3) the igins of human civilization (*e g*, through the beneficent action a culture-hero like Prometheus), or (4) the origin of social religious custom or the nature and history of objects of wor-ip It will be obvious that myths which fall into the first three tegories are likely to present resemblances which may be ex-ained as coincidences, identical questions having provoked nilar replies, whereas the myths of our fourth class are likely differ as widely as the particular customs or local deities which ey seek to explain

Legend may be said to be distorted history It contains a icleus of historical fact the memories of which have been elabo-ted or distorted by accretions derived from myths or from ories of our third kind In so far as they are historical the simi-rities between the legends of different peoples must be due to incidences of real circumstance, in so far as they are fiction, e similarities will be of the same kind as those of myths or ıry stories from which they have really been borrowed

The majority of the recorded stories of primitive peoples, with e possible exception of the animal tales to which the African ces are peculiarly addicted, fall into the categories of myth legend, perhaps because disinterested or unmotived flights of e inventive imagination and fancy, which are rare or rudimentary ıong savage peoples, are essentially products of a relatively vanced civilization But the problems presented by stories, ich are neither myths nor legends, cannot be restricted to ırope, for there is a large stock both of incidents and of plots ich is common to all countries between Iceland and India Is is to be accounted for by the coincidence of independent in-ntion or by diffusion? Theodore Benfey, whose *Pantschatantra* is published in 1859, maintained that India had provided the eat reservoir of stories from which European folktales were rived In Germany the work of Kohler and in England the ıtings of Clouston helped to elucidate the debt of Western ırope to oriental story-books, and in France the late Emmanuel ›squin devoted great learning to the maintenance of the extreme ew that all European folktales had their prototypes in India.

If we are unable to accept the Indianist position, we may be ateful for definite gains which these scholars achieved Firstly, ey established the fact that certain kinds of similarity can ly be accounted for by diffusion While it is conceivable and ten probable that a general idea or an isolated incident may ve occurred independently to story-tellers in different countries, is to ask too much of coincidence to suppose that the same plot, ., an identical series of incidents arranged in the same logical der of interest, could be independently invented more than ce Secondly, they proved that an undoubted influence had been erted upon the folktales of Europe by the big literary collections Indian stories, which passed through Persian and Arabic trans-ions to the West Factors in promoting this influence were e pilgrimage to Jerusalem, the crusades and the mediaeval con-cts between eastern and western civilization which were occa-ned by the material and intellectual expansion of Islam In ›diaeval Europe translations of oriental story-books like the *story of the Seven Wise Masters* provided entertaining litera-re for the cultured, and eastern tales were collected in preachers' handbooks of *exempla*, as they were called, in order to enliven and adorn popular sermons Popular satire, again, as represented by the *fabliaux* of France and Germany adapted this material to its purpose It was later used again by the writers of *novelle* who presented it in some cases but little altered (*e g*, Straparola and Basile) or in others (*e g*, Boccaccio) transmuted by genius into the gold of literature

Thus from the middle ages onwards there has been constant interchange of stories over the whole area, and there are some, though fewer, instances of a common property which goes back to classical times and even to the 5th century B C But it is difficult to believe that Indians have had a monopoly of invention, or that stories have not been spread mainly by exchange The arguments which postulate a necessarily Indian origin for stories which are recorded only in modern oral tradition in India, are unsound For there is no guarantee of their antiquity upon Indian soil, and indeed there are other reasons to suppose that many of them have entered India with Islam Further there exist particular plots, the distribution of the variants of which suggests that they have travelled from West to East, and not from East to West (*See* also AMERIND FOLK-LORE and NEGRO FOLK-LORE IN AMERICA)

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For the British Isles *see* the journal *Folk-Lore* and the volumes of *County Folklore* published by the *Folklore Society* The same society has in preparation an elaborate edition of Brand's *Observations on the Popular Antiquities of the British Isles*

For Germany a very complete bibliography will be found in Paul's *Grundriss der Germanische Philologie* *See* also the notes in the excellent brief sketch of the subject, Fehrle, *Deutsche Feste und Volksbrauche*, 3rd ed (1927) For France *see* the uncompleted work of Sebillot, *Le Folklore de France*, and for Italy and Sicily the works of Giuseppe Pitre Of the smaller countries Finland has been notably active, and a number of important monographs have been published under the title of *F F Communications* by the Academy of Helsingfors The modern Greek material is exceptionally rich Besides the important journal *Laographia* there are the unfinished but monumental works of the late N Politis on Traditions (Παραδόσεις) and Proverbs (Παροιμίαι) entitled Μελέται ἐπὶ τοῦ βίου τοῦ Ἑλληνικου Λαοῦ, and the very useful collection of his more important papers published in two volumes Λαογρατικὰ Σύμμεικα, Athens Among the fairly numerous collections of modern Greek songs the standard book remains Passow, Τραγούδια Ῥωμαικά, *popularia carmina Graeciae recentioris* (Leipzig, 1860)

As regards folktales, the great dictionary of variants Bolte and Polivka, *Anmerkungen zu den Kinder- und Hausmarchen der Bruder Grim* is indispensable. Of this the third volume contains a full bibliography

America —The folklore of the North American Indian is dealt with by the Bureau of Ethnology, the Smithsonian Institution and the *American Anthropologist* The *Journal of American Folklore* and the memoirs of the American Folklore Society cover popular literature legends but not material culture The works of Marius Barbeau on French Canada and of Elsie Crews on the Bahamas deserve special note In South America much activity is being displayed and the work of the Société des Américanistes—and in particular of G Rivet is of prominence (W R H)

FOLK-SONG. Any art if it is to have life must be able to trace its origin to a fundamental human need Such needs must prompt expression among people even in their most primitive and uncultivated state To this rule the art of music is no exception, Parry has pointed out that the universal law of evolution demands that we should be able to trace even the most elaborate compositions of Beethoven or Wagner back to some primitive germ This primitive, spontaneous music has been called "Folk-song," a rather awkward translation of the German word "Volkslied," but nevertheless a word which stands for a very definite fact in the realm of music It has been said that if we did not know by experience of the existence of folk-song we should have to presuppose it theoretically to account for the art of music

Fortunately theory is borne out by practice We find that unlettered and untravelled people have both the desire and the power to express themselves musically and these attempts at musical ex-

pression are not mere clownish nonsense, nor are they, as we are sometimes told, degraded reminiscences of "cultured" music, but are something *sui generis*, moreover, among these spontaneous expressions are to be found melodies which are the most treasured possessions of our art—such melodies as "Searching for Lambs" (England), "Ca' the Yowes" (Scotland), "The Londonderry Air" (Ireland), "Innsbruck Ich musz dich lassen" (Germany), "Magali" (Provence), are ample proof of this, and these are only a few examples out of hundreds

Moreover, as we have already seen, the folk-song must of necessity bear within it the seed of all the future developments of the art Such a tune as "The Lady in the Dark," from Playford's *Dancing Master*, exhibits in miniature the same ground plan as many a movement from a Beethoven Symphony Indeed this tune has been described as a "Symphony eight bars long"

Folk-music has, of course, its limitations To start with, folk-music like all primitive art is an applied art, the vehicle for the declamation of a ballad or the stepping of a dance, and it is, therefore, bounded by the structure of the stanza or the dance-figure Secondly, folk-music (at all events that of the Teutonic and Latin races) is non-harmonic, there is nothing but the melodic line

But these limitations have their compensating advantages A tune which is only eight bars long, and which has to be repeated as often as 20 times to accompany a ballad or a dance, must have certain peculiar qualities if it is not to become wearisome; and we find that the best folk tunes only show their true quality after several repetitions

Again, the purely melodic character of traditional song gives it a wide range of outline, impossible to melodies which are bound by the progressions of underlying harmonies Melodies of an harmonic nature are almost always in the major or minor modes, but in folk-song other modes, chiefly the Dorian or Mixolydian, are frequent

The fact that these modes are also to be found in another great body of purely melodic music, namely the plain-song of the Roman Church, has led to the assumption that "modal" folk-songs must be "ancient," or even derived from mediaeval church music On the propriety of dubbing a folk-song "ancient" or "modern" more will be said later, as to the supposed derivation from plain-song, surely the simple explanation is that folk-song and plain-song, being purely melodic, are based on the same principles, surely no similarity except that of mode can be traced between such tunes as "Seventeen come Sunday" and "Jesu dulcis memoria"

A further and very important limitation of folk-song must be mentioned, namely that it survives by purely oral tradition By our hypothesis the inventors and disseminators of folk-music are unlettered, and are therefore unable to stereotype their inventions by means of reading and writing It is on this that the whole nature of folk-song and all questions of its origin and development depend

It is sometimes held that the word "folk-song" should be used in what is called a "broad" sense so as to include not only genuinely traditional music, but all those songs of a popular character which are habitually sung by the people of a country But, in fact, the difference between these two classes of music is a real and scientific one, which is properly recognized by the Germans in their distinction between a "Volkslied" and a "Volksthumliches-lied" What common denominator can be found which will cover, on the one hand, such a song as "Tom Bowling" and, on the other, the "Lazarus" tune in *English County Songs?* In the one case we can judge the date and even guess at the composer, but who can date a folk-song? Indeed, a folk-song is neither new nor old, it is like a forest tree with its roots deeply buried in the past but which continually puts forth new branches, new leaves, new fruit

Collectors are often asked by would-be intelligent enquirers as to the age of some folk-song, as if the question of age were either important or relevant Others (sceptics) suggest that the traditional singer "made it up himself." The answer to this, of course, is that quite possibly he did to some extent "make it up himself," although this in no way adds to, or takes away from, its scientific or artistic value It is not the question of age or authorship that is important in a folk-song but that of spontaneity and beauty When a collector nowadays hears a song sung by a traditional singer he may be pretty sure that, if the singer is a true artist, he will have unconsciously added something of his own to what he sings A folk-song then is always grafting the new on to the old This is the answer to the question "How old is that folk-song?" A folk-song is neither new nor old because it is continually taking on new life, it is an individual flowering on a common stem

This brings us to the vexed question of the "communal growth" of folk-song, and here it may be pointed out that much useless derision has been wasted over a supposed theory of "communal origin" No one has ever laid it down as an indisputable proposition that folk-song has a communal origin, though even this is not so impossible an idea as some people suppose No one insists that some individual must have invented every word of our language Who invented "father" or "plough" or "sun" or any other of the words that belong to primitive life? If we admit communal authorship in our language, is it not even more probable in such an intangible matter as music?

However, it is not necessary to prove the communal origin of folk-song in order to argue in favour of its communal growth It is well known that when a rumoured fact or story becomes spread about it soon is circulated in various altered forms and this in spite of the fact that everyone who repeats the story is anxious to repeat it correctly How much more then will a song become altered by oral repetition when each new singer is bound only by his artistic predilections? If he thinks he can improve the song, why should he not do so? If he finds it too difficult why should he not simplify it? Thus a folk-song evolves gradually as it passes through the minds of different men and different generations

Nor will this gradual change ever be a process of deterioration because those versions of the tune which are distasteful to others will die a natural death Here then is a clear case of the survival of the fittest A tune which has been handed down from father to son through many generations will represent the united imaginations of thousands of men and women through hundreds of years of evolution

This then is the much discussed "communal growth" theory and it is borne out by the facts Collectors know well that numerous variants of the same tune have been found in different parts of the country and, conversely, that tunes have been found which are quite distinct from each other, but at the same time have features that point to a common stock Thus Grimm's famous apophthegm "a folk-song composes itself" is not, after all a piece of misty emotionalism but represents the hard common-sense facts of the case (R V W)

Cowboy Songs.—The ballad spirit, common to all peoples and particularly active in European nations and their descendants survived until recent years and under exceptionally friendly conditions in the section of the United States lying west of the Mississippi river Here a fairly large group of men, almost all of Anglo-Saxon descent, were removed from easy contact not only with printed matter but with entertainment of any sort Each man spent many hours entirely alone when on night herd or when range riding, engaged frequently in work that absorbed only a part of his attention; and he and his small group, about the chuck wagon or in going up the trail, spent long terms with only such social amusements as they could provide for themselves Situated thus, the ballad-making instinct revived, with the result that there came into being a considerable body of folk-songs which have been preserved and perpetuated by oral tradition and have been designated loosely for present purposes *Cowboy Songs*.

These songs are interesting chiefly as human documents, for the light that they throw on the conditions of frontier life, and for their reflection of the old time cattle baron and his crew. The whole cycle of the cowboy's experience—its monotony, its fun, its heroes, its love affairs, its dangers, and the epics of the long drives overland from Texas to Montana—is set forth in the songs made and sung by the men themselves. Further, the

material offers to students of folk literature a picture of folk-songs in the process of manufacture and transmission. In a strict sense the songs of the cowboys are not ballads, yet, in the method of production, preservation and distribution, they show points of kinship to the accepted ballads of the Child collection For example, the refrain of the ballad form is often present, adapted at times to common cattle cries; there are occasional instances both of simple and incremental repetition; some songs are introduced by the stereotyped "Come all ye." Also, a majority of the songs are without known authorship; some of them bear indication of communal composition, probably around the evening camp fires or the larger gatherings of the general round-ups or in song contests, where the champion of one ranch "sang down" the champion of another ranch by the process of singing a greater number of songs Some are adaptations of songs already well known, changed to fit a new environment, all, of whatever origin, existed for a number of years in oral literature, each singer feeling the freedom of an author, introducing his personal experiences, amending the phrasing, and giving that breath of real life that is present in true folk-lore

During the time of their highest popularity these songs were not in print except in an occasional newspaper, but later a few small books, now out of print, appeared containing the words of some of the songs along with original verses by the local poet sponsoring them The best known of the real cowboy songs were widely distributed over the entire west of America 30 versions of the same song coming into the hands of a single collector from locations as far removed from each other as Idaho, California and Texas In all, some hundreds of genuine cowboy songs were current among the frontiersmen, springing up as naturally, as unobtrusively, as did the prairie grass, and destined, except for the interest of scholars, to perish as noiselessly and as completely As might be expected some of the cowboy's best poetic effort was expended on songs not suitable for publication

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FOLLEN, AUGUST (or, as he afterwards called himself, ADOLF) **LUDWIG** (1794–1855), German poet, was born at Giessen on Jan 21, 1794, the son of a district judge He studied at Giessen and Heidelberg, and after leaving the university edited the Elberfeld *Allgemeine Zeitung* Suspected of being connected with radical plots, he was imprisoned for two years in Berlin On his release in 1821 he went to Switzerland, where he lived till his death at Berne on Dec 26, 1855 Besides a number of minor poems he wrote *Harfengrusse aus Deutschland und der Schweiz* (1823) and *Malegys und Vivian* (1829), a knightly romance after the fashion of the romantic school The series of sonnets entitled *An die gottlosen Nichtswuteriche,* aimed at the liberal philosopher Arnold Ruge, started a violent literary quarrel Follen's best-known work is a collection of German poetry entitled *Bildersaal deutscher Dichtung* (1827)

FOLLEN, KARL (1795–1840), German poet and patriot, brother of A L. Follen, was born at Romrod, Hesse-Darmstadt, on Sept. 5, 1795 He studied at Giessen, and after a year's service in the army (1814) began the study of jurisprudence, and in 1818 established himself as *Privatdocent* of civil law at Giessen Suspected of political intrigues, he removed to Jena, and thence, after the assassination of Kotzebue, fled to France After the political murder of the duc de Berry (Jan 14, 1820), Follen was regarded as suspect, and took refuge in Switzerland; but the Prussian authorities imperatively demanding his surrender, he sought in 1824 the hospitality of the United States of America Here he taught German at Harvard in 1825, and in 1830 was appointed professor; but he forfeited his post in 1835 by his anti-slavery agitation, and became Unitarian minister at Lexington, Mass. (1836) He perished at sea on the night of Jan. 13–14, 1840. Follen was the author of several celebrated patriotic liberal songs. The best is perhaps *Horch auf, ihr Fursten! Du Volk, horch auf!* It was published in A L Follen's collection of patriotic songs, *Freie Stimmen frischer Jugend*

His wife Elisa Lee (1787–1860) published after his death his lectures and sermons, with a biography written by herself (5 vols, Boston, 1846).

FONBLANQUE, ALBANY WILLIAM (1793–1872), English journalist, was born of a French Huguenot family. His father was an Equity barrister and M P. for Camelford. Fonblanque began journalistic work in 1812, and attracted attention by the boldness of his opinions and the superiority of his style to the ordinary work of the day In 1830 he became editor of *The Examiner,* and remained in control till 1847. Fully maintaining the level of political independence set by the Hunts, he inspired the admiration even of his opponents by his wit, and *The Examiner* was the standard of literary merit in the journalistic world In 1847 he became statistical secretary to the Board of Trade, but continued to contribute to *The Examiner*

See the *Life and Labours of Albany Fonblanque,* edited by his nephew, Edward Barrington de Fonblanque (1874).

FOND DU LAC, a city of Wisconsin, U.S A, 60m N by W. of Milwaukee, at the south end of Lake Winnebago, the county seat of Fond du Lac county It is on Federal highways 41 and 151, and is served by the Chicago, Milwaukee, St Paul and Pacific, the Chicago and North Western, and the Soo Line railways, and by numerous motor bus lines and inter-urban trolley-cars The population was 23,427 in 1920, and was estimated locally at 28,000 in 1928 It is division headquarters of two of the railways, which have extensive shops just outside the city limits, employing 1,500 men There are varied and important manufactures, with an output in 1925 valued at $20,487,153 The city has a wide trade territory, and is the supply point for the many summer resorts around the lake At Calvary, a few miles east, is a monastery of the Capuchin order, established about 1870 Fond du Lac was settled about 1835, incorporated as a village in 1847, and chartered as a city in 1852

FONDI, a town of Lazio, Italy (anc *Fundi*), province of Rome, 12 m N W of Formia, and 69 m S of Rome by rail Pop (1911) 8,675 (town), 10,613 (commune) It lies 25 ft above sea-level, at the north end of a plain surrounded by mountains, which extend to the sea It occupies the site of the ancient Fundi, a Volscian town, belonging later to *Latium adjectum,* on the Via Appia, still represented by the modern high-road which passes through the centre of the town It is rectangular in plan, and portions of its walls are preserved The gate on the north-east still exists, and bears the inscription of three aediles who erected the gate, the towers and the wall In the neighbourhood are remains of ancient villas, and along the Via Appia still stands an ancient wall of *opus reticulatum,* with an inscription, in large letters, of one Varronianus, the letters being at intervals of 25 ft

The modern town is still enclosed by the ancient walls The castle on the south-east side has some 15th-century windows with beautiful tracery Close by is the Gothic church of S Pietro (formerly S Maria), the cathedral until the see was united with that of Gaeta (1818) In the Dominican monastery the cell which St Thomas Aquinas sometimes occupied is shown.

The ancient city of Fundi in 338 B C (or 332) received (with Formiae) limited, and in 188 B C full citizenship, because it had always secured the Romans safe passage through its territory This was strategically important for the Romans, as the military road definitely constructed by Appius Claudius in 312 B C, still easily traceable by its remains, and in part followed by the high-road, traversed a narrow pass, which could easily be blocked, between Fundi and Formiae The family of Livia, the consort of Augustus, belonged to Fundi During the Lombard invasions in 592 Fundi was temporarily abandoned, but it came under papal rule by 754 Pope John VIII ceded it with its territory to Docibile, duke of Gaeta, but sometimes it appears as an independent countship, though held by members of the Caetani family, who about 1297 returned to it In 1504 it was given to Prospero Colonna In 1534 Khair-ed-Din Barbarossa tried to carry off Giulia Gonzaga, countess of Fondi, and sacked the

city In 1721 it was sold to the Di Sangro family, in which it still remains Its position as a frontier town between the papal states and the kingdom of Naples, just in the territory of the latter—the Via Appia can easily be blocked either north-west at the actual frontier called Portella or south-east of it—affected it a good deal during the French Revolution and the events which led up to the unification of Italy

The Lago di Fondi, in the middle of the plain, and the marshes surrounding it, compelled the Via Appia to make a considerable détour. The lake was also known in classical times as *lacus Amyclanus,* from the town of Amyclae or Amunclae, founded, according to legend, by Spartan colonists, and probably destroyed by the Oscans in the 5th century B C , the bay was also known as *mare Amunclanum* The ancient Speluncae (mod *Sperlonga*) on the coast also belonged to the territory of Fundi Here was the imperial villa in which Sejanus saved the life of Tiberius, who was almost crushed by a fall of rock Considerable remains of it, and of the caves from which it took its name, still exist 1 m S E of the modern village Wine of the *ager Caecubus,* the coast plain round the Lago di Fundi, was praised by Horace The plain of Fondi is the northernmost point in Italy where the cultivation of oranges and lemons is regularly carried on in modern times

See T Ashby, in *English Historical Review,* xix (1904) 557 *seq* for a notice of Italian works on the subject (T A)

FONSAGRADA, a town of north-western Spain, in the province of Lugo, 38 m E N E of Lugo by road. Pop (1920) 17,750 Fonsagrada, over 3,000 ft above sea-level, is the market for the agricultural and dairy produce of the fertile valleys in the surrounding mountains, but its trade is mainly local, owing to the lack of communications beyond the Lugo-Rivadeo road which passes through the town

FONSECA, MANUEL DEODORO DA (1827–1892), soldier and first president of the United States of Brazil, was born in Alagoas, on Aug 5, 1827, the third son of a Brazilian army officer He received his education in the military school at Rio de Janeiro and his military experience at the siege of Montevideo (1864) and in the war against Solano López, dictator of Paraguay (1864–70) His courage gained him distinction, and in rapid succession he became colonel (1869), brigadier-general (1874) and general of division in 1884 Soon afterward he was appointed governor of the province of Rio Grande do Sul and turned his attention to politics, but was soon removed from his position because he used his authority to foster republican sentiments In 1887 (May 14), with General Pelotas, he signed a manifesto in defence of officers' political rights, which gained him the loyalty of the army and the opprobrium of the government In Dec 1888, he was assigned to the command of an army corps in the remote interior. When he returned to the capital in Sept 1889, conditions were ripe for a republican revolt, and he was prevailed upon to head an armed revolution against the government (Nov 15, 1889) The troops in the capital sided with the insurgents, and with scarcely any bloodshed the huge empire of Pedro II collapsed The army and navy rallied to the new cause, a republic was proclaimed, and on Nov 17 the emperor and his family were banished from the country The leaders of the coup d'état formed a provisional government with Fonseca at its head, declared martial law, and effectively stamped out any armed resistance In Jan 1891, a constitutional assembly convened, adopted a Federal constitution and on Feb 25, 1891 elected Fonseca constitutional president of the republic But he had not the political skill to control the situation He quarrelled with congress (May), dissolved it (Nov 4), declared martial law and assumed dictatorial powers He alienated his party by his arbitrary severity and by increasing issues of irredeemable paper money When a revolt broke out in Rio Grande do Sul, which spread to other provinces, the army and navy forsook him, and on Nov 23, 1891, he resigned his office and retired to private life He died at Rio de Janeiro on Aug. 23, 1892. An able soldier, he lacked the essential flexibility and decision of the politician, and consequently did not leave that mark on posterity, which his high qualities deserved (W B P)

FONSECA, BAY or **GULF OF,** an arm of the Pacific ocean extending into Central America and bounded on the south by Nicaragua, on the east and north-east by Honduras and on the north and north-west by Salvador. It is about 50m long and 30m wide, and forms one of the finest natural harbours in the world Surrounded by volcanic shores, with high sugar-loaf islands be speckling its surface, it suggests to the observer that it is itself the crater of a vast volcano, the surroundings and the island dotted surface of the bay forming a setting of unsurpassed natural beauty The islands are green and some of them cultivated, and the distant volcanoes include Conchagua (3,800ft) and Conseguina (3,000ft) at the entrance of the strait 18m in width which connects the bay with the Pacific ocean The islands at Conchaquita, Mianguiri and the rocky "Farellones" guard the entrance and help to protect the harbour from the winds and waves of the Pacific The largest islands in the bay itself are Sacate Grande 7x4m , and El Tigre, on which the Pacific port of Honduras Amapala (*q v*) is situated, and which rises to a height of 2,500ft in a volcanic cone The bay is bounded by a shore cut into innumerable inlets, some, on the south and east, with volcanic lava shores, but north and north-eastward with sloping plains leading to the mountains, some miles distant Fonseca bay was discovered in 1522 by Gil Gonzales de Avila and was named by him after his patron, that Archbishop Juan Fonseca who was the persecutor of Columbus The bay is also known, locally, as the Gulf of Amapala or the Bay of Conchagua Under the Bryan-Chamorro treaty of 1916, between the United States and Nicaragua, by the terms of which the United States acquired a perpetual option to the site of an interoceanic canal in Nicaraguan territory, Nicaragua also granted the United States the right to establish a naval base in Nicaraguan territory on Fonseca bay This provision brought a prompt protest from Salvador, whose government held that such a naval base would constitute a threat against her sovereignty and that the waters of Fonseca bay were not open sea but were the joint property of Salvador, Honduras and Nicaragua This protest, inspired, it is now certain, by President Carranza of Mexico as a part of his Latin American activities against the United States during the World War, was carried to the Central American Court of Justice at San José, Costa Rica, and was one of the causes which led to the dissolution of the court (*see* CENTRAL AMERICA) (W Tho)

FONT, the vessel used in churches to hold the water for Christian baptism In the apostolic period baptism was administered at rivers or natural springs, Lat *fons* (*cf* Acts viii 36), and no doubt the primitive form of the rite was by *immersion* in the water *Infusion*—pouring water on the head of the neophyte—was early introduced into the west and north of Europe on account of the inconvenience of immersion, as well as its occasional danger, this form has never been countenanced in the Oriental churches *Aspersion,* or sprinkling, was also admitted as valid but recorded early examples of its use are rare (*see* BAPTISM) These different modes of administering baptism have caused corresponding changes in the receptacles for the water After the cessation of persecution, when ritual and ornament began to develop openly, special buildings were erected for administering the rite of baptism This was obviously necessary, for a large *piscina* (basin or tank) in which candidates could be immersed would occupy too much space of the church floor itself These baptisteries consisted of tanks entered by steps (an ascent of three, and descent of four, to the water was the normal but not the invariable number) and covered with a domed chamber (*see* BAPTISTERY).

By the 9th century, however, the use of separate baptisteries had generally given place to that of fonts The material of which these were made was stone, often decorative marble; as early as 524, however, the council of Lerida enacted that if a stone font were not procurable the presbyter was to provide a suitable vessel, to be used for the sacrament exclusively, which might be of any material. In the Eastern Church the font never became an important decorative article of church furniture

Few if any fonts older than the 11th century survive These are all of stone, except a few of lead; much less common are fonts of

ast bronze (a fine example, dated 1112, exists at the Church of St Barthélemy, Liége) The most ancient are plain cylindrical bowls, with a circular—sometimes cruciform or quatrefoil—outline to the basin, either without support or with a single central pillar, occasionally there is more than one pillar The basins are usually lined with lead to prevent absorption by the stone The church of Efenechtyd, Denbigh, possesses an ancient font made of a single block of oak

Fonts early began to be decorated with sculpture and relief Arcading and interlacing work are common, so are symbol and pictorial representation A very remarkable leaden font is preserved at Strasbourg, bearing reliefs representing scenes in the life of Christ At Pont-à-Mousson on the Moselle are bas-reliefs of St. John the Baptist preaching, and baptizing Christ Caryatides sometimes take the place of the pillars, and sculptured animals and grotesques of strange design not infrequently form the base Most remarkable is the occasional persistence of pagan symbolism, an interesting example is the very ancient font from Ottrava, Sweden, which, among a series of Christian symbols and figures on its panels, bears a representation of Thor (*see* G Stephens' brochure, *Thunor the Thunderer*)

In the 13th century octagonal fonts became commoner, and in the 14th and succeeding centuries they became the rule In England no fonts can certainly be said to date before the Norman conquest, although it is possible that a few very rude examples, such as those of Washaway, Cornwall and Denton, Sussex, are actually of Saxon times, of course we cannot count as "Saxon fonts" those adapted from pre-Norman sculptured stones originally designed for other purposes, such as that at Dolton, Devonshire On the other hand, Norman fonts are very common, and are often the sole surviving relics of the Norman parish church They are circular or square, sometimes plain, but generally covered with carving of arcades, figures, foliage, etc Some of the best examples of "Norman" fonts in England (such as the notable specimens in Winchester cathedral) were probably imported from Belgium Fonts of the Perpendicular period are very common, and are generally raised upon steps and a lofty stem, which, together with the body of the font, are frequently richly ornamented with panelling It was also the custom during this period to ornament the font with shields and coats of arms and other heraldic signia, as at Herne, Kent

In 1236 it was ordered by Edmund, archbishop of Canterbury, that baptismal fonts should be kept under lock and key, as a precaution against sorcery. The ordinary position in the church was and is near the entrance, usually to the left of the south door

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FONTAINE, PIERRE FRANÇOIS LÉONARD (1762–1853), French architect, was born at Pontoise on Sept 20, 1762, and died in Paris on Oct 10, 1853 Several of his family were distinguished architects At the age of 16 he assisted the architect Bridré in hydraulic works at l'Isle-Adam, and was allowed to spy his designs In 1779 he went to Paris to study under Peyre the younger, and won the second prize at the Academy With the pension received therefrom he went to Rome in 1785 During the French Revolution he took refuge in England, but later was employed by Bonaparte to restore the palace of Malmaison and thereafter executed the principal architectural works in Paris for Napoleon I., Louis XVIII and Louis Philippe He was employed with his friend, Percier, on the arch of the Carrousel, the restoration of the Palais-Royal, the grand staircase of the Louvre and the project for the union of the Louvre and the Tuileries In 1812 he became a member of the Academy of Fine Arts and first architect to the emperor in 1813 With Percier he published the following works. *Palais, maisons, et autres édifices de Rome moderne* (1802), *Descriptions de cérémonies et de fêtes* (1807 and 1810); *Recueil de décorations intérieures* (1812); *Choix des plus célèbres maisons de plaisance de Rome et des environs* (1809–13); *Résidences des souverains, Parallèle* (1833) *L'histoire du Palais Royal* was published by Fontaine alone

See M Fouché, *Percier et Fontaine* (1905)

FONTAINEBLEAU, a town of northern France, capital of an arrondissement in the department of Seine-et-Marne, 37 m S E of Paris by rail Pop (1926) 12,180 It stands in the forest of Fontainebleau, nearly 2 m from the left bank of the Seine The Tambour mansion, and a portion of the cardinal of Ferrara's house, both of the 16th century, are still preserved Fontainebleau is the seat of a subprefect and has a tribunal of first instance It has quarries of sand and sandstone, saw-mills, and manufactories of porcelain and gloves It is a summer resort, and the president of the Republic frequently resides in the palace, one of the largest of the royal residences of France, situated to the south-east of the town. The exact origin of the palace and of its name (Lat *Fons Bleaudi*) are unknown, but the older château was used in the latter part of the 12th century by Louis VII Francis I caused most of the buildings of the Cour Ovale to be erected After Francis I, Fontainebleau owes most to Henry IV, Louis XIII, Napoleon I, Louis XVIII, Louis Philippe and Napoleon III The park covers about 200 acres and is traversed by a canal dating from the reign of Henry IV On the north it is bordered by a vinery producing white grapes

The forest of Fontainebleau is one of the most beautiful wooded tracts in France, and has been for generations the haunt of landscape painters It covers 42,200 ac, with a circumference of 56 m Nearly a quarter of this area is of a rocky nature, and the quarries of sandstone supplied a large part of the paving of Paris Oak, pine, beech, hornbeam and birch are the chief trees

See Pfnor, *Monographie de Fontainebleau,* with text by Champollion Figeac (1866), *Guide artistique et historique au palais de Fontainebleau* (1889), E Bourges, *Recherches sur Fontainebleau* (Fontainebleau, 1896), E Plouchart, Fontainebleau (1925)

FONTAN, LOUIS MARIE (1801–1839), French man of letters, was born at Lorient He wrote a number of plays, of which *Perkins Warbec* (1828), written in collaboration with MM Halévy and Drouineau, was the most successful He was repeatedly in trouble with the authorities under the Restoration, and spent some time in prison before the revolution of 1830 brought him release His *Jeanne la folle,* performed in the same year, gained a success due perhaps mainly to sympathy with the author's political principles A drama representing the trial of Marshal Ney, written in collaboration with Charles Dupenty, *Le Procès d'un maréchal de France* (printed 1831), was suppressed on the night of its production Fontan died in Paris on Oct 10, 1839

A sympathetic portrait of Fontan as a prisoner, and an analysis of his principal works, are to be found in Jules Janin's *Histoire de la littérature dramatique,* vol 1

FONTANA, DOMENICO (1543–1607), Italian architect and mechanician, was born at Mili on the Lake of Como in 1543, and died at Naples in 1607 After training in mathematics he went to Rome to study architecture, and entered the service of Cardinal Montalto (afterwards Sixtus V), for whom he erected a chapel in the church of Santa Maria Maggiore and the Villa Negroni On the election of Sixtus V, Fontana became his chief architect Among his works were the Laleian palace, the palace of Monte Cavallo (the Quirinal), the Vatican library, etc The undertaking which brought him the highest repute was the removal of the Egyptian obelisk (brought to Rome in the reign of Caligula) from the place where it lay in the Circus of the Vatican and its erection in front of St Peter's in 1586 After the death of Sixtus V, Fontana was accused of misappropriating public moneys, and was dismissed from his post in 1592 by Clement VIII He then became architect at Naples to the viceroy, the count of Miranda, and built the royal palace His projected new harbour and bridge was carried out after his death The account of the removal of the obelisk (Rome, 1590) is his only literary

work His son Giulio Cesare succeeded him as royal architect at Naples, the university there being his best-known building

FONTANA, LAVINIA (1552–1614), Italian portrait-painter, was the daughter of Prospero Fontana (*q v*) She was greatly employed by the ladies of Bologna, and, going thence to Rome, painted the likenesses of many illustrious personages She enjoyed the patronage of the family (Buoncampagni) of Pope Gregory XIII The Roman ladies, from the days of this pontiff to those of Paul V, elected in 1605, showed no less favour to Lavinia than their Bolognese sisters had done In her subject pictures she was not so successful Examples of her work are to be seen at Bologna, Rome, Florence, Venice, Milan, the "Virgin lifting a veil from the sleeping infant Christ," in the Escorial Madrid, and the "Queen of Sheba," a group of the Mantua courts, in the Dublin museum Two self-portraits are at the Pitti, Florence, and one in the Academy of St Luke, Rome Her husband, whose name is given as Paola Zappi Giovanni of Imola, belonged to a distinguished family He studied painting with Lavinia's father, and is said to have painted the draperies in many of Lavinia's pictures She was elected into the Academy of Rome, and died in that city in 1614

FONTANA, PROSPERO (1512–1597), Italian painter, was born in Bologna, and became a pupil of Innocenzo Francucci da Imola He afterwards worked for Vasari and Perino del Vaga in Genoa, Florence and Rome He has left a large quantity of work in Bologna where he lived after 1540 A representative work of his early period is the "Entombment" in the Bologna Pinacoteca, painted under the influence of his first master and comparatively careful in execution To his later period belongs the "St Alessis distributing Alms," in S Giacomo Maggiore at Bologna (1576), with many figures in architectural setting, in the mannered style of Vasari's pupils In portraiture he was outshone by his daughter and pupil, Lavinia He died in Bologna in 1597

FONTANE, THEODOR (1819–1898), German poet and novelist, was born at Neu-Ruppin on Dec 30, 1819 He made repeated visits to England, interesting himself in old English ballads, and as the first fruits of his tours published *Ein Sommer in London* (1854); *Aus England, Studien und Briefe* (1860) and *Jenseit des Tweed, Bilder und Briefe aus Schottland* (1860), and a volume of ballads *Manner und Helden* (1860). Fontane ranks with Uhland as one of the great ballad writers of the 19th century He drew his material from English, Scottish and above all Prussian sources; sometimes, as in *Die Bruck'am Tay* from contemporary events Among the most famous are *Archibald Douglas, Schloss Eger,* and one on "der alte Dessauer" Fontane was particularly attached to his native Mark of Brandenburg; the fascination which it had for him may be seen in his delightfully picturesque *Wanderungen durch die Mark Brandenburg* (1862–82, 4 vols) In 1870 he was for three months a prisoner of war at Vaucouleurs His fine historical romance *Vor dem Sturm* (1878) was followed by a series of novels of contemporary life *Irrungen, Wirrungen* (1888), *Stine* (1890); *Unwiederbringlich* (1891), *Effi Briest* (1895), *Der Stechlin* (1899) in which Fontane adapted the realistic methods and social criticism of contemporary French fiction to the conditions of Prussian life He died on Sept 20, 1898 at Berlin

Fontane's other works include *Kriegsgefangen, Erlebtes 1870* (1871), *Der Krieg gegen Frankreich 1870–71* (1874–76). Fontane's *Gesammelte Romane und Erzahlungen* were published in 12 vols (1890–91, 2nd ed, 1905) For his life *see* the autobiographical works *Meine Kinderjahre* (1894), and *Von Zwanzig bis Dreissig* (1898), also *Briefe an seine Familie* (1905). *See* also monographs by F Servaes (1900), Zillman (Stuttgart, 1919), Wandrey (Munich, 1919), and K. Hayens (London, 1920).

FONTANES, LOUIS, Marquis de (1757–1821), French poet and politician, was born at Niort (Deux Sèvres) on March 6, 1757. He wrote a number of poems, including a version of Pope's *Essay on Man* Fontanes drew up the protest of the citizens of Lyons against Collot d'Herbois, and was for some time in hiding On the fall of Robespierre he was made professor of literature in the *École Centrale des Quatre-Nations,* and he was one of the original members of the Institute. He was exiled by the Directory and made his way to London, where he was associated with Chateaubriand He soon returned to France, and his admiration for Napoleon, who commissioned him to write an *éloge* on Washington, secured his return to the Institute and his political promotion He was president of the legislative chamber from 1804 to 1810 Fontanes has been accused of servility to Napoleon, but he remonstrated with him on the judicial murder of the duc d'Enghien, and as grand master of the university of Paris (1808–1815) he supported monarchical principles He was made a marquis in 1817. He died on March 17, 1821, in Paris

See his *Oeuvres* (2 vols 1839), ed Sainte-Beuve.

FONTENAY-LE-COMTE, town of western France, capital of an arrondissement in the department of Vendée 30 m N E of La Rochelle by rail Pop (1926), town, 7,435, commune, 9,423

Fontenay existed in the time of the Gauls The affix of "comte" was added when it was given to the count of Poitou, under whom it became capital of Bas-Poitou Ceded to the English by the treaty of Brétigny in 1360 it was retaken in 1372 by Duguesclin It suffered repeated capture during the Religious Wars of the 16th century, was dismantled in 1621 and was occupied both by the republicans and the Vendeans in the war of 1793 From 1790 to 1806 it was capital of the department of Vendée Fontenay, a straggling town, is situated on both banks of the Vendée, at the head of navigation The church of Notre Dame (15th–18th cent) is rich in sculpture, and there are several old houses The Hôtel de Terre Neuve (1595–1600) contains collections of furniture and tapestry The Fontaine des Quatre-Tias given to the town by King Francis I, commemorates the birth of many prominent men Fontenay-Le-Comte is the seat of a subprefect and has a tribunal of first instance It manufactures felt hats, oil and soap, timber sawing, flour-milling and tanning are also carried on There is trade in grain, fruit, horses, mules, timber, etc

FONTENELLE, BERNARD LE BOVIER DE (1657–1757), French author, was born at Rouen, on Feb 11, 1657 He died in Paris, on Jan 9, 1757, having thus very nearly attained the age of 100 years His father was an advocate settled in Rouen, his mother a sister of the two Corneille He was educated at the college of the Jesuits in his native city, and then qualified as an advocate He visited Paris from time to time and established relations with the abbé de Saint Pierre, the abbé Vertot and the mathematician Pierre Varignon His tragedy *Aspar* (1680) was a complete failure His opera of *Thétis et Pélée* (1689) was highly praised by Voltaire, but none of his dramatic works kept the stage His *Poésies pastorales* (1688) show great purity of diction and occasional felicity of expression

Real success came with his collection of entertaining stories *Lettres galantes du chevalier d'Her* , published anonymously in 1685 In 1686 appeared his famous allegory of Rome and Geneva, slightly disguised as the rival princesses Mreo and Eenegu in the *Relation de l'île de Bornéo* His most famous works are *Nouveaux Dialogues des morts* (1683) and *Entretiens sur la pluralité des mondes* (1686) His object was to popularize among his countrymen the astronomical theories of Descartes, and he was a most ingenious and successful expositor

In 1687 Fontenelle removed to Paris; and in the same year he published his *Histoire des oracles,* consisting of two essays, the first of which was designed to prove that oracles were not given by the supernatural agency of demons, and the second that they did not cease with the birth of Christ In his *Digression sur les anciens et les modernes* (1688) he took the modern side in the controversy, his *Doutes sur le système physique des causes occasionnelles* (against Malebranche) appeared shortly afterwards

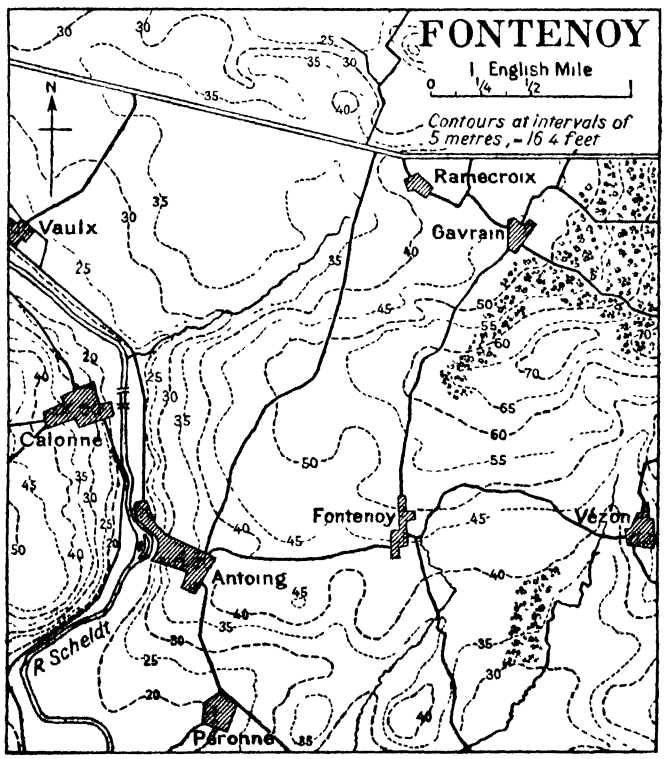
In 1691 he was received into the French Academy in spite of the determined efforts of the partisans of the ancients in this quarrel, especially of Racine and Boileau, who on four previous occasions had secured his rejection He consequently was admitted a member both of the Academy of Inscriptions and of the Academy of Sciences; and in 1697 he became perpetual secretary to the latter body This office he actually held for the long period of 42 years; and it was in this official capacity that he wrote the *Histoire du renouvellement de l'Académie des Sciences* (3 vols, 1708, 1717, 1722) containing extracts and analyses of the proceedings, and also the *éloges* of the members, written with great

simplicity and delicacy The other important works of Fontenelle are his *Eléments de la géometrie de l'infini* (1727), and his *Apologie des tourbillons* (1752)

There have been several collective editions of Fontenelle's works, the first being printed in 3 vols at the Hague in 1728–29 The best is that of Paris, 8 vols, 1790 Some of his separate works have been very frequently reprinted and also translated The *Pluralité des mondes* was translated into modern Greek in 1794 Sainte-Beuve has an interesting essay on Fontenelle, with several useful references, in the *Causeries du lundi*, vol. iii *See* also A. F Villemain, *Tableau de la littérature française au XVIIIe siècle* (1864), the abbé Trublet, *Mémoires pour servir à l'histoire de la vie et des ouvrages de M de Fontenelle* (1759), A Laborde-Milaà, *Fontenelle* (1905), in the "Grands écrivains français" series, and L. Maigron, *Fontenelle, l'homme, l'oeuvre, l'influence* (1906)

FONTENOY, a village of Belgium, in the province of Hennegau, about 4m S E of Tournai, famous as the scene of the battle of Fontenoy, in which on May 11, 1745, the French army under Marshal Saxe defeated the Anglo-Allied army under the duke of Cumberland The object of the French (*see* also AUSTRIAN SUCCESSION, WAR OF THE) was to cover the siege of the then important fortress of Tournai, that of the Allies, who slowly advanced from the east, to relieve it Informed of the impending attack, Louis XV, with the dauphin, came with all speed to witness the operations, and by his presence to give Saxe, who was in bad health and beset with private enemies, the support necessary to enable him to command effectively Under Cumberland served the Austrian field-marshal Konigsegg, and, at the head of the Dutch contingent, the prince of Waldeck

The right of the French position (*see* map) rested on the river at Antoing, which village was fortified and garrisoned, between Antoing and Fontenoy three square redoubts were constructed, and Fontenoy itself was put in a complete state of defence On



PLAN OF THE BATTLE OF FONTENOY, MAY 11TH, 1745

the left rear of this line, and separated from Fontenoy by some furlongs of open ground, another redoubt was made at the corner of the wood of Barry and a fifth towards Gavrain The infantry was arrayed in deployed lines behind the Antoing-Fontenoy redoubts and the low ridge between Fontenoy and the wood, behind them was the cavalry. Marshal Saxe himself, who was suffering from dropsy to such an extent that he was unable to mount his horse, slept in a wicker chariot in the midst of the troops At early dawn of May 11, the Anglo-Hanoverian army with the Austrian contingent formed up in front of Vézon, facing towards Fontenoy and the wood, while the Dutch on their left extended the general line to Péronne The total force was 46,000 against 52,000 whom Saxe could actually put into the line of battle

It was resolved that the Dutch should attack the front Antoing-Fontenoy, while Cumberland should deliver a flank attack against Fontenoy and all in rear of it, by way of the open ground between Fontenoy and the wood A great cavalry attack round the wood was projected but had to be given up, as in the late evening of the 10th the Allies' light cavalry drew fire from its southern edge Cumberland then ordered his cavalry commander to form a screen facing Fontenoy, so as to cover the formation of the infantry On the morning of the 11th another and most important modification had to be made The advance was beginning when the redoubt at the corner of the wood became visible Cumberland hastily told off Brigadier James Ingoldsby to storm this redoubt which, crossing its fire with that of Fontenoy, seemed absolutely to inhibit the development of the flank attack At 6 A M the brigade moved off, but it was irresolutely handled, and after waiting as long as possible, the British and Hanoverian cavalry rode forward and extended in the plain, becoming the target for a furious cannonade which drove them back Thereupon Sir John (Lord) Ligonier, whose deployment the squadrons were to have covered, let them pass to the rear, and pushed the British infantry forward through the lanes, each unit on reaching open ground covering the exit and deployment of the one in the rear, all under the French cannonade This went on for two hours, and save that it showed the magnificent discipline of the British and Hanoverian regiments, was a bad prelude to the real attack

It was now 9 A M, and while the guns from the wood redoubt battered the upright ranks of the Allies, Ingoldsby's brigade was huddled together, motionless, on the right Cumberland himself galloped thither, and under his reproaches Ingoldsby lost the last remnants of self-possession To Ligonier's aide-de-camp, who delivered soon afterwards a bitterly formal order to advance, Ingoldsby sullenly replied that the duke's orders were for him to advance in line with Ligonier's main body By now, too, the Dutch advance against Antoing-Fontenoy had collapsed

But on the right the cannonade and the blunders together had roused a stern and almost blind anger in the leaders and the men they led Ingoldsby was wounded, and his successor, the Hanoverian general Zastrow, gave up the right attack and brought his battalions into the main body Meantime the young duke and the old Austrian field-marshal had agreed to take all risks and to storm through between Fontenoy and the wood redoubt, and had launched the great attack, one of the most celebrated in the history of war The English infantry was in two lines The Hanoverians on their left, owing to want of space, were compelled to file into third line behind the redcoats, and on their outer flanks were the battalions that had been with Ingoldsby A few guns, man-drawn, accompanied the assaulting mass, and the cavalry followed The column may have numbered 14,000 infantry. All the infantry battalions closed on their centre, the normal three ranks becoming six (If the proper distances between lines were preserved, the mass must have formed an oblong about 500yd × 600yd)

The duke of Cumberland placed himself at the head of the front line and gave the signal to advance. Slowly and in parade order, drums beating and colours flying, the mass advanced, straight up the gentle slope, which was swept everywhere by the flanking artillery of the defence When the first line reached the low crest, the fire became a full enfilade from both sides, and at the same moment the enemy's horse and foot became visible beyond A brief pause ensued, and the front gradually contracted as regiments shouldered inwards to avoid the fire Then the French advanced, and the Guards Brigade and the Gardes Françaises met face to face. Captain Lord Charles Hay, lieutenant of the First (Grenadier) Guards, suddenly ran in front of the line, took off his hat to the enemy and drank to them from a pocket flask, shouting a taunt, "We hope you will stand till we come up to you, and not swim the river as you did at Dettingen," then, turning to his own men, he called for three cheers. The astonished French officers returned the salute and gave a ragged counter-cheer.

Whether or not the French, as legend states, were asked and refused to fire first, the whole British line fired one tremendous series of volleys by companies. Fifty officers and 760 men of the three foremost French regiments fell at once, and at so appalling a loss the remnant broke and fled. Three hundred paces farther on stood the second line of the French, and slowly the mass advanced, firing regular volleys. It was now well inside the French position, and no longer felt the enfilade fire that swept the crest it had passed over. Spasmodic counter-attacks on its flanks were repelled but these gained a few precious minutes for the French. It was the crisis of the battle. The king, though the court meditated flight, stood steady with the dauphin at his side—Fontenoy was the one great day of Louis XV.'s life—and Saxe, ill as he was, mounted his horse to collect his cavalry for a charge. The British and Hanoverians were now at a standstill. More and heavier counter-strokes were repulsed, but no progress was made, their cavalry was unable to get to the front, and Saxe was by now thinking of victory. Captain Isnard of the Touraine regiment suggested artillery to batter the face of the square, preparatory to a final charge. The nearest guns were planted in front of the assailants, and used with effect. The infantry led by Lowendahl, fastened itself on the sides of the square. On the front, waiting for the cannon to do its work, were the Maison du Roi, the Gendarmerie and all the light cavalry. The left wing of the Allies was still inactive, and French troops were brought up from Antoing and Fontenoy to support the final blow, about 2 P.M. In eight minutes the square was broken. As the infantry retired across the plain in small stubborn groups all attempts to close with them were repulsed by the terrible volleys, and they regained the broken ground about Vézon, whence they had come. Cumberland himself and all the senior generals remained with the rearguard.

The losses at Fontenoy were exceedingly severe in the units really engaged. Eight out of nineteen regiments of British infantry lost over 200 men, two of these more than 300. The Hanoverian regiments suffered as heavily in proportion. The total loss was about 7,500, that of the French 7,200.

Fontenoy was in the 18th century what the attack of the Prussian Guards at St Privat was in the next, a *locus classicus* for military theorists. But the technical features of the battle are completely overshadowed by its epic interest.

FONTEVRAULT or **FONTEVRAUD** (Lat. *Fons Ebraldi*), a town of western France, in the department of Maine-et-Loire, 10 m. S.E. of Saumur by road, near the confluence of the Loire and Vienne. Pop. (1926) 1,121. The interest of the place centres in its abbey, since 1804 utilized and abused as a convict prison. The church (12th century) has a beautiful nave formerly covered by four cupolas destroyed in 1816. There is a fifth cupola above the crossing. In a chapel in the south transept are the effigies of Henry II. of England, of his wife Eleanor of Guienne, of Richard I. of England and of Isabella of Angoulême, wife of John of England—Eleanor's being of oak and the rest of stone. Cloister, refectory and chapter-house date from the 16th century. The second court of the abbey contains the Tour d'Évrault (12th century), long called *chapelle funéraire*, but in reality the old kitchen. Details and diagrams will be found in Viollet-le-Duc's *Dictionnaire de l'architecture*. There are three stories, the whole being surmounted by a pyramidal structure.

The *Order of Fontevrault* was founded about 1100 by Robert of Arbrissel. The establishment was a double monastery, containing a nunnery of 300 nuns and a monastery of 200 monks, separated completely so that no communication was allowed except in the church, there were, moreover, a hospital for 120 lepers and other sick, and a penitentiary for fallen women, both worked by the nuns. The basis of the life was the Benedictine rule, the abbess ruled the monks as well as the nuns. At the beginning the order had a great vogue, and at the time of Robert's death, 1117, there were several monasteries and 3,000 nuns; afterwards the number of monasteries reached 57, all organized on the same plan. The institute never throve out of France; there were attempts to introduce it into Spain and England. In England there were three houses—at Ambresbury (Amesbury in Wiltshire), Nuneaton, and Westwood in Worcestershire. The nuns in England as in France were recruited from the highest families, and the abbess of Fontevrault, who was the superior-general of the whole order was usually of the royal family of France.

See P. Helyot, *Hist. des ordres religieuses* (1718), Max. Heimbuche *Orden und Kongregationen* (1907), the arts. "Fontevrauld" in Wetz and Welte, *Kirchenlexicon* (ed. 2), and in Herzog-Hauck, *Realenc klopadie* (ed. 3), Édouard, *Fontevrault et ses monuments* (1875); for the later history *see* art. by Edmund Bishop in *Downside Revie* (1886).

FOOCHOW, a treaty port of China and the capital of th province of Fukien. Its population, estimated at 625,000, rank it among the larger cities of China. The position of Foocho near the mouth of the Min river (26° 7′ N., 119° 20′ E.), whic gathers up the drainage of fully two-thirds of Fukien, marks out as the capital of a province which is separated from the re of China by high forested ridges and to some extent constitute an independent regional division of China. This remoteness fro other centres of population, and the separateness of the provinci life of Fukien, was the reason, for example, for the foundatio at Foochow in 1921 of the Fukien Christian university, one c the five Union universities of China. But although its commun cations are virtually limited on the landward side to the provinc Foochow lies on the sea route which was developed early fro the South China coast and by way of the Spice islands to Indi and ultimately to Europe. It was because of this position th Foochow was created one of the original five treaty ports by th Treaty of Nanking in 1842. Foochow does not seem to hav participated much in the earlier phases of this maritime com merce but with the development of the tea trade, especially i the early 19th century, it grew rapidly to be one of the for most Chinese tea ports.

At its most prosperous period it exported not only the teas c Fukien but also teas brought over difficult mountain tracks fro the interior provinces. Eventually these interior supplies wer cut off by the opening up of the Yangtze route to foreign trad and with the decline in the China tea trade as a whole Foocho suffered heavily. Much, too, of its camphor trade has been lo to Formosa. Foochow is therefore engaged in adjusting its trad to changed conditions. The bulk of its foreign trade now passe through one or other of the entrepôts of Hongkong or Shangha each with a vast hinterland behind it. Some compensation i being found in the increase of the coastwise trade which is con cerned with such articles as paper, canned foodstuffs, bambo shoots, soap and the like. The industries of the city are engage mainly in the production of these goods.

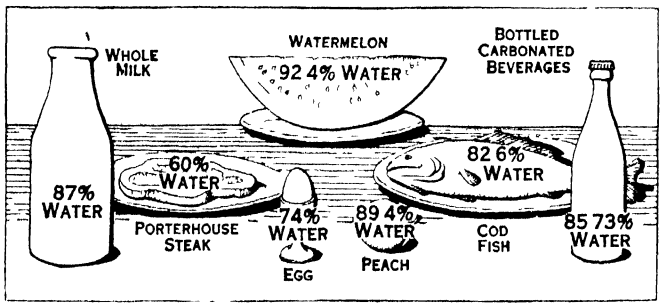
The total trade of the port in 1926 was Hk. Tls. 34,284,96 and it then stood 19th among Chinese ports. The navigation c the Min river is being improved (Foochow stands 35 miles fro its mouth) so that vessels drawing 17 ft. of water will be able t reach the city instead of, as hitherto, having to discharge at th Pagoda anchorage, ten miles downstream. But Foochow is no likely to regain the importance it possessed when the tea trad was at its height and its significance will lie in coastwise rathe than in international trade.

FOOD, the general term for what is eaten by man and othe creatures for the sustenance of life. The scientific aspect c human food is dealt with under NUTRITION; DIET and DIETETIC

Infancy.—The influence of a normal diet upon the health c man (we exclude here the question of diet in illness, which mus depend on the abnormal conditions existing) begins at the earlies stage of his life. No food has as yet been found so suitable fo the young of all animals as their mother's milk. This, howeve has not been from want of seeking. Baron Justus von Lieb as the result of his chemical researches, introduced a "food fo infants," which in more modern days has been followed by multiplication of patent foods. A close imitation of human mil may also be made by adding to fresh cow's milk half its bulk c soft water, in each pint of which has been mixed a heaped-u teaspoonful of powdered "sugar of milk" and a pinch of phosphat of lime. These artificial substitutes for the natural nutrimer have their value where for any reason it is not available. Th wholesomest food, however, for the first six months is certainl mother's milk alone. It is only when the teeth are on their wa

to the front, as shown by dribbling, that the parotid glands secrete an active saliva capable of digesting starchy foods Till then anything but milk must be given tentatively, and considered in the light of a means of education for its future mode of nutrition

The time for weaning should be fixed partly by the child's age, partly by the growth of the teeth The first group of teeth usually consists of the lower central front teeth, which may appear any



BY COURTESY OF SCIENCE SERVICE, WASHINGTON

PERCENTAGES OF WATER IN VARIOUS KINDS OF COMMON FOODS

time during the sixth and seventh month The mother may then begin to diminish the number of suckling times, and by a month she can have reduced them to twice a day, so as to be ready when the second group makes its way through the upper front gums, to cut off the supply altogether The third group, the lateral incisors and first grinders, usually after the first anniversary of birth, give notice that solid food can be chewed But it is prudent to let dairy milk form a considerable portion of the fare till the eye-teeth are cut, which seldom happens till the 18th or 20th month

Childhood and Youth.—At this stage the diet must be transitional from that of infancy to that of adult age The supply of nutriment need not be so continuous as before, but should be more frequent than for the adult Up to 14 or 15 years of age the rule should be four meals a day, varied, but nearly equal in nutritive power and in quantity Three full meals a day are generally sufficient after 14

Adults.—It is only necessary here to refer to the article on DIET AND DIETETICS (*see* also VEGETARIANISM) for the food of normal adults, and to such headings as DIETARY (for fixed allowances) or COOKERY Different staple articles of food are dealt with under their own headings For animals other than man see the respective articles on them

FOOD, MINISTRY OF: *see* WAR CONTROL OF FOOD

FOOD, PURE (*see* ADULTERATION) It is only within recent years that the transfer of the manufacture of food from the home to the factory, and the transportation of food for greater and greater distances, have made it necessary for governments to promote systematically and scientifically the purity and truthful labelling of food products The purity of foods, drugs and other commodities was everywhere adversely affected by the conditions prevailing during the World War There was a great increase in the practice of adulteration, and a marked falling off in the quality of manufactured foods The use of substitutes and inferior products in times of shortage is a necessity, the subsequent restoration of higher standards is slow Borax, formaldehyde and other food preservatives were tolerated to an almost unlimited extent in some European countries during the troubled period attending the War, and the users of these substances, after a few years of unmolested privilege, have been unwilling to give way

Scientific Developments.—One phase of the movement for pure food was a proposal by the newly organized International Union of Pure and Applied Chemistry to study the practice of conserving foods by chemical means—a subject extensively investigated in the United States between 1904 and 1912. A report upon the laws governing the use of chemical preservatives in foods was presented at the fourth meeting of the International Union of Pure and Applied Chemistry at Cambridge, England, in June 1923 (Comptes-rendus de la quatrième Conférence Internationale de la Chimie, p. 133–136) The trend of public and scientific opinion at the present time is toward the complete elimination of chemical preservatives from foods In addition to their own injurious action, food preservatives disguise the effects of putrefaction, and their use in many cases has put a premium upon the unsanitary handling of foods Certain advocates, notably Prof E Paterno of the University of Rome, have defended the use of preservatives It has been asserted that the extensive consumption of meats, preserved by boric acid or formaldehyde, as an exigency of war, produced no injurious effects The lack of cold-storage facilities, such as are everywhere provided in the United States, has been advanced in many countries as an argument for the use of chemicals in preserving perishable foods Legislation to exclude completely all foreign chemicals from foods has been held to be inconsistent so long as copper compounds, arsenates and other substances are permitted in agriculture as insecticides, fungicides and disinfectants, since traces of these nearly always occur in the fruits and vegetables so treated Nevertheless opinion among hygienists, manufacturers and the general public is decidedly adverse to the use of chemical preservatives It has been suggested that an important factor in the increase of certain diseases is the presence of chemical preservatives and metallic poisons in foods

British Committee on Preservatives.—In England the Minister of Health appointed on July 7, 1923, a Committee on the Use of Preservatives and Colouring Matters in Food In accordance with their recommendations the Minister of Health announced on Feb 17, 1925, a Draft of Rules and Orders that completely excludes from foods boric acid, salicylic acid, formaldehyde, fluorides and all other chemical preservatives except benzoic acid and sulphur dioxide, which are permitted in minimum amounts for preserving a limited number of foods and beverages According to these regulations a food preservative is defined as —

> any substance which is capable of inhibiting, retarding or arresting the process of fermentation, acidification, or other decomposition of food or of masking any of the evidences of any such process or of neutralising the acid generated by any such process, but does not include common salt (sodium chloride), saltpetre (sodium or potassium nitrate), sugars, acetic acid or vinegar, alcohol or potable spirits, spices, essential oils or any substance added to food by the process of curing known as smoking

It was objected that the new rules would operate to the detriment of both the trade and the general public on account of storage difficulties and of the increased price at which it would be necessary to sell food under the changed conditions The new British Public Health (Preservatives, etc, in Food) Regulations of 1925 came into operation on Jan 1, 1927, with slight extensions of this date in the case of butter, cream and a few other products

Standardisation.—A basic requirement in pure food control is the establishment of official standards of purity The differences of opinion which prevail with regard to what constitutes pure sausage, marmalade, chocolate, catsup, ice-cream and numerous other foods would make the task of the analyst an impossible one unless he had available certain recognized standards which are accepted as just by the trade and by regulatory officials In Germany, Great Britain and the British dominions much valuable pioneer work has been done by the public analysts toward establishing standards of composition for many articles of food In the United States a joint committee of nine experts selected equally from the U S Bureau of Chemistry, the Association of Official Agricultural Chemists and the Association of Dairy, Food and Drug Officials, by joint conferences with the trade, has established definitions and standards for a large variety of foods

FOOD CONTROLLER. In the World War, this name was given in Great Britain to the member of the Government who was made responsible for the food supplies of the British people The first food controller was Viscount Devonport, succeeded in turn by Lord Rhondda, J. R Clynes, G. H Roberts and C. A McCurdy *See* WAR CONTROL OF FOOD

FOOD COUNCIL. In Great Britain, after the winding up of the Ministry of Food in 1921, considerable popular feeling was excited by the continuation of high prices for foodstuffs. This led

to the appointment of a royal commission on food prices, which in its report of April 23, 1925 (Cmd paper 2390 of that year), recommended that the Government should set up a permanent official body charged with the supervision of food supplies and food prices Accordingly, on July 27, 1925, the prime minister appointed a "food council" consisting of 12 members, the chairman being Lord Bradbury of Winsford, G C B The members were chosen for their special knowledge of public affairs or of business, or for their acquaintance with some aspect or other of the food problem; the two women were chosen to represent the point of view of the housewife, all the appointments are unpaid The following is the official definition of the duties and functions of the council

"To investigate and from time to time report to the President of the Board of Trade on such questions as by reason of complaints from persons interested or otherwise appear to the council to require investigation in the interests of consumers or traders, or are referred to them by the President of the Board of Trade, relating to the supplying or price of articles of food of general consumption and in particular the following wheat, flour, bread, meat, bacon and ham, milk, butter, cheese, eggs, fish, fruit and vegetables, sugar, tea"

The powers of the food council are very limited, it does not possess any statutory right to demand information to control prices, nor has it any authority to trade in food Its functions indeed are strictly in accordance with the recommendation of the royal commission, upon whose report it was established, that report took the line that the publicity given to the council's work would mobilise public opinion and exercise a potent influence in persuading food traders to comply with the suggestions of the council It comes to this, that the council is to work upon public opinion by calling facts and stating opinions and that its expressed views are supposed to influence the minds of traders To this end the council conducts impartial enquiries into the food question and publicly reports its findings to the president of the Board of Trade

The council examines the complaints received from the public and, in the light of all information available, decides which foodstuff most urgently requires investigation Consideration is then given to the statistical position, the recent movements of prices and supplies, and information obtainable from trade journals and other sources Witnesses from the trade are invited to appear before the council and are questioned, but they cannot be compelled to produce evidence The results of the enquiries are embodied in reports presented to the Board of Trade, which authorizes their publication

The council began by an investigation into bread prices, and issued three reports on this subject in 1925 The third report, dated Nov 14, 1925, contains a table indicating what, in the council's opinion, should be the maximum price for the 4 lb loaf in relation to the price of flour The table was issued as a guide to the housewife

In one case the council's work led to legislation At the request of the Board of Trade, the council investigated the short weight and measure in the sale of foodstuffs, and its report formed the basis of the Sale of Food (Weights and Measures) Act of 1926 This act imposes penalties upon traders who do not give full weight or measure

Reports have also been published on wholesale tea prices, retail milk prices in 1926, the Smithfield list of retail meat prices, and fish prices. Similar enquiries were pursued in 1928.

The Food Council's endeavour is to maintain a continuing survey of the principal food trades, to ensure that no substantial rise in food prices occurs without adequate enquiry into its cause, and that reductions in wholesale prices are properly passed on to the consumer Further, the council acts as a court of enquiry which can be set in motion by any food producer, distributor, or consumer who considers that he is suffering from unfair treatment Its investigations also enable the council to make constructive suggestions to the food trade

FOOD POISONING. The term food poisoning as used by public-health workers and bacteriologists does not include the deliberate addition to food of poisonous substances with criminal intent, nor yet individual idiosyncrasy or sensitisation to certain proteins such as those contained in strawberries, eggs, milk or shellfish Food idiosyncrasy depends primarily on a peculiar condition of the human body rather than on any dangerous quality in the food itself The various "deficiency diseases," such as *beriberi, scurvy* and perhaps *pellagra* and *goitre* which are due to the lack of some essential element in the diet, are also not usually considered as types of food poisoning

The manifestations ordinarily grouped as food poisoning at the present time are those due to. (1) the presence of poisonous substances in healthy, untreated plant or animal tissues, (2) the introduction into food by accident, or design, of more or less familiar organic and inorganic poisons, (3) the presence in the food of living pathogenic bacteria or other parasites; (4) the presence in the food of poisonous substances elaborated by the growth of various micro-organisms

Poisons in Plants and Animals.—Certain normal plant and animal tissues contain substances poisonous to man, and when eaten may cause illness and death, such are poisonous mushrooms and certain fish found in tropical waters. Fatal cases of oxalic poisoning from eating the leaves of the common rhubarb have occurred Horses and cattle grazing free on the western ranges are frequently poisoned when forage is scanty and they resort to weeds and plants generally left untouched, such as the larkspur, the lupins, the water hemlock, and the death Camas Poisonous weeds eaten by cattle may indirectly produce poisoning in man The disease known to the pioneer settlers in parts of the United States as *milk sickness* was early recognized to be connected with the occurrence of *trembles* in milch cows, but its origin long remained obscure It is now believed that both *trembles* and *milk sickness* were due to a poisonous substance in the white snakeroot (*Eupatorium*) which was eaten by the cows when other pasturage failed

Mineral Poisons.—Occasionally mineral poisons like arsenic and lead find their way by accident into food in the process of manufacture, as in the famous outbreak of *peripheral neuritis* in several of the Midland counties in England in 1900, involving at least 6,000 persons and causing about 70 deaths (*see* ADULTERATION) More recently the cocoa sold by an English firm contained a small amount of arsenic derived from the potassium carbonate employed in its manufacture Long-continued action of food on containers may dissolve harmful metals such as lead, copper or tin Tin poisoning from canned foods, although theoretically possible, is so rare as to have little practical significance, doubtless partly because such tin as is dissolved is largely fixed in an insoluble form by the solid portions of the canned food and eliminated directly from the body Copper, although not a violent irritant, may have a highly injurious effect when absorbed during many years, as in the constant use of distilled liquors containing copper derived from the copper worm of the condenser, cirrhosis of the liver (*see* LIVER) may be caused in this way Lead, owing to its well-known cumulative effect on the human body, is an undesirable substance to come in contact with food or drink As long ago as 1767 the local malady of *Devonshire colic* was shown by Baker to be due to the action of cider on lead vessels Lead poisoning has also resulted from the frequent use of acid beverages in bottles with lead stoppers When lead was generally used in glazes and enamels for cooking vessels, recognized poisoning from these sources sometimes occurred, the enamelled ware at present in common use in England and the United States is lead free

Food Preservatives.—The use of food preservatives constitutes a very difficult and important phase of the problem of the addition of poisonous substances to food. Numerous substances have been added to food intentionally for the purpose of preventing the growth of micro-organisms and consequent spoiling. Some food preservatives once widely used are now known to be poisonous for man as well as antiseptic for microbes, and have been generally discarded or prohibited Such are formaldehyde and hydrofluoric acid and their derivatives. Regarding some other preservative substances there is great diversity of opinion among those who have given the matter most study. The use of boron

and salicylic acid compounds is generally, but not universally, disapproved Benzoic acid, sulphurous acid and sulphites are regarded by many hygienists as permissible in certain foods under controlled conditions The differences of opinion emphasise the insufficiency of our knowledge Until information commanding the respect of all competent experts is available, it is well to err on the side of caution and minimise the use of preservatives

The practice of adding poisonous substances to food merely for the sake of altering colour or appearance has nothing to recommend it. At the present time any danger of actual poisoning from colouring matter added to candy, pastries and the like is slight. In most countries the health authorities maintain a list of substances, such as certain coal-tar dyes, which are permitted, and prohibitory regulation is strictly enforced. In the United States no colours and no preservatives in foods are permitted unless they are deemed harmless (*See* FOOD, PURE, and ADULTERATION)

Bacterial Poisoning.—Food may serve as the vehicle for certain kinds of disease-producing bacteria and other parasites In some instances the bacteria are exclusively of human origin and occur in or upon the food as the result of contact with sewage-contaminated water or through handling by a *carrier* of disease germs, *e g*, the contamination of oysters with typhoid bacilli present in polluted water and the contamination of milk by a typhoid carrier on a dairy farm In other instances the bacteria present in the food are derived from an infection of the food animal. This second class of infections is especially important in any survey of food poisoning since the gastro-intestinal symptoms produced are often sudden and violent; many of the most typical and best known mass outbreaks of food poisoning belong to this group. The nausea, vomiting and diarrhoea that characterize these attacks usually attract attention to some article of food eaten shortly before An attack of this kind rarely terminates fatally, and the symptoms pass off within 24 to 48 hours, having little after effect. Such symptoms characterize acute toxic poisoning and though cooking may have killed the bacilli themselves it will in many instances have left unaltered the toxins to which they give rise Often a history of illness in the slaughtered animal can be secured. Some of the most extensive outbreaks of meat poisoning in European countries have been traced to the use of meat from an animal noticed to be ailing and promptly killed by the thrifty peasant as an emergency measure.

The bacteria that cause this typical form of food poisoning belong for the most part to the Salmonella group of *paratyphoid* bacilli, organisms closely related biologically to the typhoid bacillus, but distinguishable by laboratory tests Within this group are several different species (*e g*, *B enteritidis, B aertrycke, B suipestifer*) that primarily cause disease in various domestic animals, but secondarily and occasionally give rise to food poisoning in man Food poisoning from bacilli would probably be much more common than it is if foods were not usually cooked. These bacteria are killed by boiling, and the history of many attacks shows that, while parts of an animal eaten raw or partly cooked have given rise to illness, other portions cooked before being eaten have been quite innocuous Sausages made from uncooked meat or internal organs (liver sausage, blood sausage, etc) have been the cause of food poisoning in a disproportionately large number of cases. Unfortunately inspection of the meat before sale may fail to reveal any evidence of infection, so that protection against this form of food poisoning depends chiefly on (*a*) the selection of healthy animals for slaughter and (*b*) thorough cooking of all foods of animal origin

Foods may be also contaminated with the bacilli under discussion by rats and mice These rodents suffer from natural infections with these bacteria and can become carriers Rodent contamination must always be reckoned a possibility in investigating outbreaks of this type.

Certain of the higher animal parasites occasionally enter the human body in contaminated food The small roundworm (*Trichinella*) that causes trichinosis is one of the best known. Thorough cooking is an effective safeguard

Ergotism.—One of the earliest established instances of poisoning due to the products formed by the growth of micro-organisms in food substances is the disease of *ergotism* so prevalent in the middle ages. Ergot (*q.v*) is the poison formed by a fungus that grows on rye; in times of famine the enforced use of rye that would not otherwise have been eaten led to much suffering and many thousands of deaths

Ptomaines.—It was long believed that many instances of gastro-intestinal disturbance (the typical food poisoning of the layman) were due to the products of various micro-organisms found in partly spoiled or decomposed food Definite chemical substances—*ptomaines* were incriminated, and the expression *ptomaine poisoning* came for a time to play as large a part in popular self-diagnosis as "influenza" or "the grip " In point of fact ptomaine poisoning, if it occurs at all, must be exceedingly rare. Ptomaines appear in food substances in the later stages only of putrefaction—after about a week. Alleged instances of "ptomaine poisoning" when investigated by modern methods may almost always be traced with greater plausibility to some other form of food poisoning

The products of bacilli that have grown in food may in some instances be the cause of food poisoning, even when the bacteria themselves have been killed The determination of this question presents great technical difficulties and has not yet been settled

Botulism.—The most conspicuous and definite example of poisoning from a microbic product formed in food is *botulism*, a disease which is dealt with at length under that heading Here it may suffice to note therefore that, although so serious when experienced, botulism is fortunately, of very rare occurrence and, further, can be more or less completely guarded against by the adoption of simple precautionary measures Foremost among these are steps to ensure cleanliness in all foods subjected to preservative processes and, in the case of heat-preserved foods, to use so far as practicable temperatures high enough to destroy the most resistant spores of the infective germ The majority of canned foods proved to contain botulism toxin give sensible evidence of spoilage. The botulism toxin, unlike the organism that produces it, is readily destroyed by boiling The immediate rejection, without tasting, of any food showing signs of spoilage, and the re-cooking of canned foods before serving, constitute a second line of defence If these precautions are followed, botulism already rare should become practically unknown

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FOOD PRESERVATION. As food material in its natural state only keeps sound and edible for a comparatively short time, its preservation has engaged the attention of mankind from the very earliest times and has been practised from the dawn of civilization Pastoral man preserved milk in the form of butter or cheese, and grape juice in the form of wine, the hunter soon learned to dry or salt his game or fish. The ever increasing spread of man over different parts of the world, into widely differing climates, and still more the increase in the population of towns and large cities has rendered the development of adequate methods of preservation a matter of vital necessity in the maintenance of the food supply of the world For many centuries the art of preservation developed but slowly; it was purely empirical, drying, smoking or curing with salt being the principal methods Rapid advance follows when the underlying cause of a matter is understood. so, when the biological causes of the decomposition of food were realised, appropriate methods were soon developed for dealing with the causative agents

Very few substances decompose of their own accord, almost

always the changes associated with decomposition are due to the activity of living organisms, usually bacteria, yeasts or moulds. In the case of fruit and other vegetable substances, there may also be the activity of ferments or enzymes. The very fact that a substance is available as food for man pre-supposes that it is decomposable by living agency, either microbes or enzymes. If bacteria are completely excluded foodstuffs will keep indefinitely, so that the problem to be solved is how to destroy all living organisms in the food and prevent their subsequent access As an alternative we can so reduce the temperature that the activity of the bacteria or of any enzyme present is suspended Yeasts decompose sugary substances into alcohol and carbon dioxide, some bacteria produce acetic, lactic or other acids, others decompose the nitrogenous constituents of the food, giving rise to various gases which often have offensive smells Moulds attack the carbohydrates, thereby forming various compounds All these processes may be going on simultaneously if conditions are favourable The preliminary infection of the food may arise from the bacteria naturally present therein or from contamination from outside, since the air, water and soil are all normally infested with an almost infinite variety of organisms

Sterilization by Heat.—Of the various methods of preserving food to be considered, only one—sterilization by heat—aims at the complete destruction of all bacterial life The others merely reduce the numbers of organisms or produce such conditions that their development or activity is prevented, such methods include refrigeration, drying, salting, smoking, the addition of sugar or pickling with vinegar, salt or nitre, or the addition of a chemical antiseptic or preservative The efficacy of sterilization by heat was known for centuries before its theory was understood Cooking renders food temporarily sterile, so by repeated cooking it can be made to keep indefinitely, if adequate means are taken to prevent re-infection This fact is used by the housewife unwittingly when she covers the potted meat with a layer of hot fat, or the jam with paper soaked in brandy Few bacteria can long survive a temperature above 80° C (176° F) in the presence of moisture (those which can are termed thermophilic) with the exception of some which form spores needing temperatures as high as 140° C (284° F) for their destruction Sterilization proceeds more rapidly in an acid medium than in an alkaline one, and the fact is that, except for milk, all natural foods are slightly acid in reaction In the ordinary operations of cooking the temperature employed is above 100° C (the boiling point of water) so almost all bacteria are killed—but not their spores—with the important reservation that in the case of large masses the central portions may not actually reach 100° C (212° F) If conditions are favourable the surviving spores may develop into the vegetative form, hence it is needful either to repeat the cooking or to keep the food under such conditions that the spores do not develop The presence or absence of air is an important factor since bacteria and their spores are of two classes, aerobes and anaerobes, which respectively grow in the presence or absence of air, of these the aerobes are much the larger class and among its members are those organisms which are most frequently the cause of spoilage

The application of these principles to the canning of food dates back to the Napoleonic wars, although at that time they were little known François Appert, in 1810, was the first to preserve meat, he had but indifferent success Fish and fruit were preserved by about 1840, and in 1856 Borden patented the first process for the manufacture of condensed milk Since then the industry has advanced and extended greatly, and is now being placed on a surer and more scientific basis; cruder methods and those involving the use of chemicals suspected of being injurious to health are being replaced by processes beyond the reach of criticism Of prime importance in the canning of food is the vessel in which it is to be cooked, transported and sold. This must be unaffected by heat, or by contact with the food material in it; it must be light, cheap and strong Glass is sometimes employed, but the most usual material is tin-plate, this is thin sheet steel which has been cleaned and dipped into molten tin and subsequently rolled so as to leave a very thin layer of tin all over the surface of the iron It is not quite an ideal substance as, quite apart from mechanical defects, such as pinholes or an imperfect surface, it is to some extent attacked by all acidic foods so that a tiny quantity of tin is communicated to the food When this amount is only a fractional quantity, at the most not exceeding a grain or so per lb., it is not considered to be prejudicial to health, but as it may be avoided by the use of lacquered tins these are much to be preferred, especially for the more strongly acid foods such as tomatoes. Glass vessels are mainly used for potted meats, tongues and similar articles There are two principal types of tin-can, the "hole-and-cap" and the "sanitary," the former is the older, into it the foodstuff is filled, then the lid is put on, leaving a small hole which is filled in with a dab of solder after the processing or sterilization In the sanitary can the lid is put on in its entirety, before or after the cooking, by means of a special "crimping" machine; a gasket is usually inserted to ensure that the can is air tight This latter type is now the more common

The process of sterilization usually consists in heating the tins or pots in trays in a large autoclave or pressure chamber, by means of superheated steam, to a temperature in the neighbourhood of 120° C (248° F), but varying according to the nature of the foodstuff. The time also is variable, though it should be sufficient to ensure that the central parts of the tins reach at least 100° C (212° F), it therefore depends upon the size and distribution of the cans in the oven. After this cooking the tins are allowed to cool slowly in the oven with suitable adjustment of the pressure, it then remains only, if hole-and-cap cans have been used, to close up the holes with a drop of solder It is interesting to note that the development of the food canning industry has been to a large extent favoured by fortune, it was intended to sterilize the food in the tin but in fact this is rarely accomplished What does happen is that most of the bacteria are killed and those which survive, and any spores, are under such conditions that they cannot develop owing to the lack of air or suitable conditions of food Almost all the air has been excluded during the process and the proteins of the food have been so changed as to become unsuitable for the organisms which developed in it before cooking Of all kinds of canned foods not more than about 20% of the tins are sterile, and in the case of sweetened condensed milk a sterile tin is quite a rarity. (*See* also PRESERVING AND BOTTLING)

Refrigeration.—This is really the only method which affords a means of preserving food in its raw state for a reasonably long period, it is therefore the only process which is entirely unexceptionable Its introduction on a commercial scale has immensely influenced the food supply of the world and has affected all civilized countries. It would be no exaggeration to say that no scientific advance since the advent of railways and steamboats has so greatly altered the economic life of Europe and America Enormous quantities of food, meat, fish, fruit, butter and vegetables are exported, imported and stored, so that the abundance of supply in one country is made to serve the scarcity of another. The use of cold in this way depends upon a plentiful supply of ice, this is rendered possible and cheap by the ingenuity of the engineer (*see* article REFRIGERATING), and the use of this method is rapidly extending from the large-scale operations of the importer to the small scale of the household, which has its own ice-chest. The object in refrigeration is not to kill bacteria, since these microscopic forms of life can resist a very low temperature without injury; it is to reduce or to arrest completely their activity. All bacteria are rendered incapable of growth at the freezing point of water, so that at or below this temperature all biological change ceases and the only changes which may go on are physical ones, depending on the evaporation of water and volatile flavouring substances, or certain chemical oxidation changes Enzymes likewise are rendered inoperative by low temperatures Refrigeration includes both freezing and chilling, not merely because it involves much lower temperatures but because of its effects on the food itself. On cooling foods, particularly nitrogenous ones such as meat, two kinds of change take place, some reversible some irreversible, so that the food may or may not return to its natural condition when it is allowed to resume a normal temperature. A point of great practical importance also is the rate of cooling, since it is found that if the cells and tissues of food are frozen suffi-

ciently rapidly the changes are usually reversible, therefore, to obtain the best results, both the rate of cooling and the temperature must be regulated according to the nature of the particular foodstuff. The foods most usually preserved by freezing are meat, fish, poultry and butter, eggs present special difficulty and when once frozen do not return satisfactorily, they are therefore usually only chilled

Two methods are in general use for the freezing of flesh foods, (*i*) by cold air and (*ii*) by cold brine The former method is slower and occasions more loss of moisture but, as meat does not dry very rapidly, it is preferable, the air must be carefully filtered and purified to remove bacteria and moulds (which grow at low temperatures) or any contaminating odours Fish suffers much from desiccation and is best treated by the cold brine process This latter method has the advantage of being much more rapid, but the disadvantage that it communicates some salt to the tissue of the foodstuffs The more rapid the freezing, the less the penetration of salt, it is therefore the practice to use the lowest possible temperatures, with ordinary brine this is about −21° C (−6° F) Meat may be frozen by the air method, using a much lower temperature, not only because the time taken for the cooling of thick masses of flesh would otherwise be too long, but also to minimise the "drip" A temperature of −60° C (−76° F) or even −70° C (−94° F) is employed for the freezing, and is followed by storage at −6° C (+21° F) or −10° C (+14° F) in Europe, or often −20° C (−4° F) in America Recent research has shown that the freezing of flesh has no detrimental effect on its vitamin content or its nutritive value

Preservation by Drying.—Desiccation or drying is nature's method of preservation It will be found that all natural substances which will remain unchanged for long periods of time contain but small amounts of moisture, not exceeding say 10% For example, cereal seeds of all kinds and nuts will keep almost indefinitely, nature preserves them simply by removing water. The reason for this is that bacteria cannot grow on dry materials, so if any food is desiccated, or the water content reduced below 8% or 10%, it is immune from attack—except for a few innocent types of mould Meat is not now dried in the more civilized countries, though in the wilder parts of South America and in the Balkans the method is still in use, freezing is preferable Fish is still cured by drying, with or without salting or smoking Eggs, milk, fruit and vegetables also are dried in enormous quantities Different kinds of grapes dried in the sun produce raisins, sultanas and currants, plums, apples, pears, peaches, apricots and other fruits are evaporated by exposure on wooden or galvanized iron trays in a warm atmosphere, when galvanized trays have been used there is not unfrequently contamination by zinc which has been dissolved by the acid in the wet natural fruit Vegetables such as peas, carrots and onions are widely prepared in the dry state and sold in packets, and will keep almost indefinitely The flavour and colour of such vegetables is apt to be impaired, a fact which sometimes leads to the addition of artificial colouring matters and chemicals to improve the flavour

Although the desiccation of meat in the ordinary way is not now practised, mention may be made under this heading of the manufacture of meat extract since the keeping property of this depends largely upon a low water content, usually about 15 or 18% This process was discovered by Justus von Liebig and von Pettenkofer about a century ago. Lean meat, beef or mutton, is extracted with warm water, the fat is skimmed off and the extract heated to coagulate the albumen, which is then removed, salt is added and the broth is evaporated *in vacuo* to the required degree of dryness One pound of such extract is obtainable from about 25 lb of lean meat Yeast when similarly treated yields an extract almost indistinguishable in taste from beef extract, chemically it is recognisable by the absence of certain specific proteins A well-known preparation of yeast in this form is in common use and is a valuable source of vitamin B Closely allied to the desiccation method of preserving is the addition of sugar. Although dilute sugar solutions are peculiarly liable to fermentation and other decomposition, a solution containing less than about 25% or 30% of water does not undergo bacterial change, particularly in the presence of a small amount of acids such as those from fruit For this reason jam keeps well, it is only liable to a growth of mould on the surface if this is not adequately protected from such infection Various sweetmeats, jellies and fruits are preserved in this way.

Salt is one of the oldest preservative substances and is used for the preservation of all kinds of fish or flesh, sometimes saltpetre is added with it to give the meat a bright pink colour The method of application is simply to sprinkle salt on the layers of meat or fish, or in the case of large joints it may be dissolved in water and forcibly injected into the tissue Alternatively the flesh is soaked in strong brine Butter also is often salted, the amount added varying from 1% up to 10%, but with the improvement in refrigerating methods salt butter seems to be losing popular favour Salt is a poor preservative but a useful accessory in conjunction with drying methods, as it enables a larger percentage of moisture to be safely left in the foodstuff It suffers from the disadvantage of rendering the food less palatable, though much of it can often be washed out before consumption Smoking is a practice confined almost entirely to fish and ham, its efficacy depends partly upon the drying which accompanies it and partly upon the bactericidal action of the chemical compounds, such as phenols and aldehydes in the smoke Other classes of food are preserved in media which inhibit bacterial growth, a notable instance is pickling in vinegar or in brandy Vinegar is essentially the product of bacterial life, the vinegar bacillus with the aid of oxygen from the air converts alcohol into acetic acid, but when the strength of the acid reaches about 6% the bacillus can no longer grow and other types of bacilli may be killed For this reason vinegar, which is essentially a solution of acetic acid, inhibits the growth of bacteria in pickled vegetables or fruits or fish The preservative qualities of these products are strictly limited and it is necessary to minimise risk of infection by exposure to the air About 3% of acetic acid is necessary to keep pickled vegetables and in making such it must be borne in mind that the vegetables themselves contain about 80% or 85% of water so that the acid added will slowly be diluted to a corresponding extent by the process of diffusion as the water passes out of, and the acid passes into, the tissue of the fruit Strong alcohol acts in a similar way, for which reason wines of a sufficient alcoholic strength keep indefinitely if evaporation is prevented, and fruit may be preserved by immersion in spirits, as for example in cherry brandy

The preservation of eggs is worthy of special mention Several methods are in common use on a large or small domestic scale On the large scale, refrigeration is generally employed Millions of eggs arrive in Europe from South Africa and other parts after a voyage of a month or six weeks in perfectly good condition by reason of storage in a cold chamber at or just above the freezing point of water There is a critical temperature for eggs at about −6° C (+21° F), if in the chilling or storage the temperature falls below this point a non-reversible change takes place in the white or albumen, so that the egg cannot be restored to its normal transparent condition Egg is sometimes preserved in the frozen state for manufacturing purposes, in which case it is cooled to a temperature approximating to −20° C (−4° F), and becomes a solid mass which takes a considerable time to thaw and which, though fluid, never returns to its normal state On a domestic scale eggs are usually preserved by the simple expedient of preventing the access of air through the shells Scores of devices for effecting this have been patented, common methods include immersion in water-glass, or in bran or sawdust, coating with vaseline or even wrapping in oiled paper When eggs are immersed in sodium silicate solution (water-glass) or milk of lime the shell becomes impregnated with the silicate or lime and is then impervious to the atmosphere One minor defect in this very good method of preservation is that the eggs have a tendency to burst when boiled—this may be overcome by first pricking the shell with a needle. Also the yolk is apt to burst easily; this is because, when the egg is preserved, water tends to pass from the white to the yolk (which has normally a less percentage of water) and to distend the membrane surrounding the yolk

Chemical Preservatives.—A very large number of chemical substances, having real or supposed preservative properties, have at different times been added to foodstuffs, many of these are discussed in the article on ADULTERATION. Some are considered harmless and even necessary in certain articles and are permitted to be added in most countries Nevertheless it is generally agreed that chemical preservatives are not desirable and should be excluded wherever possible, they are as a class self-condemned, for it is obvious that if a chemical inhibits bacterial or enzyme action it must, at least to a small extent, retard digestion and assimilation The compounds, other than positively objectionable or toxic ones, best known as preservatives include boric acid and borax, sulphurous acid and its salts, salicylic acid and benzoic acid, and formaldehyde or formalin The last-named substance is now recognized as being injurious and is not tolerated in most civilized states Perhaps the most used compound is boric acid, at one time all margarine contained it, as did a large percentage of butters, and often cream, bacon and ham Its use became the more general as the public palate turned against salted foods, and for years it held almost universal sway, as about one-half per cent of boric acid serves to keep most foods sweet for a reasonable period Salicylic acid and its salts found favour in saccharine beverages, wines and preserves, as it is particularly useful in preventing the growth of moulds Benzoic acid is in nature similar to salicylic and serves a similar purpose but has the advantage of being less active pharmacologically Sulphurous acid, or sulphites, are specially useful in light wines where the alcoholic strength is insufficient to preserve them, and in beer and cider, it is also used as an adjunct in the drying of fruits such as sultanas, currants, apples, apricots, etc

Nearly all civilized countries have now legislated on the question of preservatives in food, all agree in prohibiting formalin and fluorides and any other substance of such definitely toxic properties Boric acid is tolerated in certain dairy products in Australia, New Zealand, Canada and Holland, but is prohibited in England, the United States and Sweden Salicylic acid is very rarely permitted, and then only in very small declared amounts in certain countries, it is prohibited in Britain and America Sulphurous acid is permitted in certain commodities in England up to small stated quantities, it is prohibited generally in meatstuffs but sometimes permitted in sausages and in wines, beer and dried fruits Benzoic acid is allowed in stated proportions in certain foods in England, Australia and Denmark and is generally permitted in small amounts in the United States Federal Law Japan and a few states in the United States are quite intolerant of any preservative of any kind in any food There can be no doubt that such a veto is the ideal to be aimed at, but its realization in many countries awaits the better development of refrigeration and other methods of food preservation *See* also CANNING, REFRIGERATION and ICE MANUFACTURE

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Concentrated Milks are among the most important preserved foods and are extensively used Some 720,000,000 lb entered international trade in 1925, according to the U S Department of Commerce Of a total world production of about 3,000,000,000 lb, approximately 60 per cent is manufactured in the United States, where 346,368,000 lb of condensed milk, 1,509,354,000 lb of evaporated milk, and 186,393,000 lb of dried milk were produced in 1927 Condensed milk denotes milk from which a considerable portion of the water has been removed, and to which sugar has been added Milk is rapidly heated to effect destruction of bacterial life; sucrose is added; and the milk is condensed in a vacuum until 2½ parts of whole milk are reduced to one part of sweetened condensed It is cooled and placed, usually, in small tin containers, although also distributed in bulk. Condensed skim milk is likewise manufactured Evaporated milk, or unsweetened condensed, is somewhat similarly made, but without sugar. Milk is forewarmed, condensed under vacuum, and before cooling, homogenized It is canned and then heated for a sufficient period to cause complete sterility

Dried or powdered milk was first made by Grimwade in England in 1855, but has been prepared commercially by several methods In the spray process pre-condensed pasteurized milk, under high pressure passes through fine nozzles into a steel chamber at 270° F The water evaporates and the resulting powder is removed from the bottom of the chamber In the roller process for drying milk pre-condensed milk is poured upon hot steel-drums or cylinders More *dried skim milk* is manufactured than is *dried whole milk* Malted milk, marketed since 1887, is a powdered product made from whole milk, whole wheat, and barley malt Evaporated milk is a sterile product, while condensed and dried milk are generally low in bacteria, although not sterile The sucrose in condensed milk, inhibits or destroys the growth of bacteria and molds Pathegenic bacteria which might be present in the whole milk are destroyed by the various manufacturing processes Except for vitamin C, heating for concentration does not appreciably affect the vitamins of the whole milk Vitamin C is not present in evaporated milk and is *apparently* somewhat reduced in condensed and dried, though there is evidence that spray process dried milk retains most of its content of this vitamin Other nutritive qualities are not appreciably affected The canned concentrated milks are stable and will keep for considerable periods of time, especially as methods of packing have become more efficient. (J A To)

FOOD SERVICE, the preparation and serving of food to large numbers of people over a continuous period, usually through a chain or a group organization with highly standardized methods Such quantity food service, since the World War, has been a factor of great importance in effecting changes in the restaurant business This article is intended to complement the articles in this volume describing the mass production and marketing of food supplies and deals with food distribution and consumption in mass For a study of restaurants of the typical English, continental or early American type *see* RESTAURANTS

Food service has undergone the most significant change in the United States where "mass feeding" has more than doubled since 1918 This branch of the food business sells about 15% of all meals served to the literate, white population of the United States. A recent survey shows one restaurant for each 750 persons residing in American cities In New York, Chicago and San Francisco from 25% to 35% of meals served are eaten in hotels and restaurants Population considered, this percentage is greater than that in any other nation Switzerland ranks second, closely followed by Canada, England, Sweden, Denmark, France, Germany, Italy and Spain Switzerland leads in food service in schools and hospitals There are also in Switzerland several excellent hotel and restaurant schools.

In the order of their importance the three main divisions of the food-serving industry are (1) large commercial establishments, (2) non-commercial or semi-commercial groups and (3) small commercial operatives

The commercial branch of food service business in the United States is made up of about 90,000 restaurants, 25,000 of which serve more than 500 meals a day each, and 20,000 hotels equipped for food sales, about 8,500 of which serve more than 500 meals a day each The groups serve a total of about 53,500,000 meals daily Owing to the fact that the terms "hotel" or "restaurant" do not in all countries always mean complete food service, it is impossible to make an accurate comparison of food service in the United States and the rest of the world It is estimated that outside of the United States there are approximately 500,000 food service units These include hotels, restaurants, pensions, schools, hospitals, railway diners and steamships The growth in food service has been constant ever since the close of the World War Tourists have materially increased the number of hotels and restaurants in Europe, Asia, South America and parts of North and South Africa, and steamships and railroads food service facilities have been greatly expanded. In Europe and parts of Asia, the

trend toward urban life has brought about an increase in commercial food service units Institutional food service subjects are being taught in colleges in most important countries of the world

The non-commercial or semi-commercial branches of food serving so termed because they sell food to the public or because they do not compete with other establishments, constitute all kinds of social, charitable, or non-profit institutions, dining cars, steamships, construction camps, circuses, army and navy headquarters This miscellany totals at least 50,000 units in the United States Small commercial establishments include boarding houses, street lunch carts and road-side stands Estimating conservatively, there are 150,000 such food outlets Thus there is a total of about 310,000 places in the United States serving food to persons outside their homes. The world total is approximately 800,000

Numerous factors have influenced the trend from individual to group food service. Some of these factors have been women in business, smaller families, shortage of servants, the general public's increased earning power, demand for more leisure, transport problems, automobiles, shorter working hours, the popularity of small apartments, improved catering facilities and in the United States, prohibition Before the World War, both factory and office employees carried home-made lunches In 1928 this was rarely done As a result thousands of restaurants serve only the midday meal, five days a week, merely to fill this need The unusually large turnover from 11 AM to 2 PM makes this profitable A very large percentage of modern schools and colleges have food-serving facilities The number of resort hotels, camps, clubs and road-side stands has materially increased due to greatly increased automobile travel, shorter business weeks and educational work to promote outdoor life Automobile travel in 1929 was so general that in America many commercial hotels claim that 75% of guests use motor cars Naturally the number of inns, wayside tea rooms and road-side stands has increased Most of these changes occurred between 1922 and 1927, and the men and women concerned in the business anticipated the development. Colleges added courses on quantity cooking dietetics, hotel, restaurant and institutional management Next came books and magazines on the same problems The chain or group grew until there were about 800 restaurant and hotel chains in the United States (*See* HOTELS)

Simultaneously the character of the food served underwent considerable change About 60% of the patrons of these group establishments in the United States are women—who are light eaters Even many American men eat relatively little heavy foods Therefore, with this consideration and the institution of prohibition, most old-fashioned steak and chop houses have closed their doors. There are sandwich, coffee shops, soda fountains and tea rooms instead The following table, compiled after interviewing the managers of about 2,000 hotel and restaurant establishments in the United States, indicates this tendency This covers changes since 1917 —

Decrease—Meat, for main dishes, 45%, pastry, 26%, white bread (table service), 29%, coffee, 12%, potatoes, 15%, tea, 7%, soup, 5%

Increase.—Sandwiches, 215%, salads, 110%, ice cream, 70%; milk (malted), 63%, milk (whole), 62%, ginger ale, 47%; fruit (fresh), 39%; whole wheat (bread, rolls, etc), 35%, vegetables (fresh), 35%; vegetables (canned), 30%, fruit (canned), 33%, fruit (dried), 12%; cereals (breakfast), 34%, cheese, 40%, fish, 33%; grape juice, 32%; gelatine desserts, 26%; poultry, 25%, spring water, 20%; coffee substitutes, 15%; eggs, 11%; pie, 5%.

The tremendous increase in the restaurant and hotel business created a demand for labour-saving machines This need was met and machines now prepare and sell more food at less cost, considering comparative prices of raw materials than was possible under pre-World War conditions. Seven kitchen and eight dining room workers can serve 185 persons thrice daily by the aid of machinery. A recent study by *Kitchen Management*, gives 40 labour savers used in most quantity kitchens. The figure after each group is the minimum of meals per day that must be served to justify the machines' expenses: dish-washer, food-mixer, butter-cutter, can-opener, scales, mop wringer, sink pumps, automatic refrigerator, meat grinder, coffee mill, automatic toaster, knife-cleaner, knife-sharpener, urns, mopping trucks, 25 meals per day; vegetable-slicer, fruit-juice extractor, French-fry cutter, pressure-cookers, 50; spice mill, egg-timer, potato-peeler, time clock, potato masher, bread-slicer, food chopper, cream-dispenser, soap-feeder, incinerator, steam kettles, steam tables, 100, meat slicer, silver washer, water-softener, fruit-corer, potato-cutter, electric ice-cream freezer, ice-cream machine, food or dish conveyor, ice cuber, apple-peeler, cherry-stoner, bread-crusher, cheese-grater, trucks, cake-filler, ice-breaker, paper baler, 200, dough dividers, 500.

Great Britain is using labour-saving equipment for food service in greater quantities each year and Germany, France and Switzerland are also adopting these devices However, the greatest progress made in this regard thus far is in America.

Chain organizations in the United States prepare much of the food in a central commissary and transport it in trucks containing heated containers Individual units seldom prepare more than coffee and salads on the premises Generally the ingredients come mixed, ready to be assembled and served. Many chain organizations prepare and wrap sandwiches for resale by drug stores, soda fountains and street carts Most hotels and the better restaurants however cook and bake the food they serve with the exception of bread and ice cream Most kitchens use gas, but the use of electricity has increased greatly since 1923 Specialty cooking equipment, such as electric automatic toasters, waffle irons, bacon fryers, steak grills and egg cookers, sells readily and is widely used In larger hotels and restaurants steam cooking is general A dozen 30 gal steam kettles in one kitchen is not unusual. The quantity kitchens of 1928 are factories where the assembling, the preparing and the serving of food is accomplished within a few hours Steam tables, electrically heated carts and boxes, keep food well conditioned until ready to be served as far as 20 m. away

In Great Britain chain restaurant organizations are superior to those in the United States or any other country in the world They are expensively furnished, fully equipped with the latest machines and staffed with highly trained personnel France, Germany and Switzerland have a limited number of chain hotel and restaurant companies but they do not compare in size with those of the United States. The European hotel chains are often associations, such as the "Uniti." Members agree to assist each other in advertising and financing, and, at times, have a plan for the exchange of employees

Manufacturing plants, supplying equipment to the food service industry, sell their products direct to users or, more generally, through kitchen supply houses or equipment jobbers A number of architects and engineers are engaged in planning kitchen equipment.

The adoption of large kitchens has necessitated an extensive study of food and preparation costs. Specialists are employed to plan the most efficient and economical service Many people are required to purchase, store, prepare, control and serve food Some design and construct buildings, manufacture equipment, sell, install, collect and serve it; other groups write advertisements, books and magazines. Finally, there are schools and colleges teaching quantity cooking, hotel, restaurant, soda fountain and kitchen management, institutional dietetics, kitchen management No accurate figures are available but it is estimated that in the United States alone 2,000,000 people devote their entire time to the quantity food service business, including only those actually engaged in the manufacture and sale of equipment and supplies, the building and furnishing of quantity kitchens and food service departments. At least 5,000,000 people are engaged in food service units in other parts of the world. This number does not include hundreds of thousands raising food products served from quantity kitchens, for those canning, packing or transporting such food products. Mass food preparation and service in the United States is growing five times faster than the rate of population increase. In America it is one of the leading businesses and it bids fair to rank second only to agriculture. In other civilized countries of the world it is growing steadily in importance. (*See* also RESTAURANT; CAFÉ AND CAFETERIA.) (J. O D)

FOODSTUFFS, a term applied to the products used for human food, as distinguished from "feeding stuffs" (*q v*), the term applied to products used for the food of animals in domestic cultivation For foodstuffs generally see the articles CEREALS, GRAIN, MEAT, DAIRY, OILS AND FATS, etc, and for specific information the articles under the various product headings, as BEEF, MUTTON, SUGAR, TEA, etc, as well as the articles FOOD and FOOD PRESERVATION, NUTRITION, DIET AND DIETETICS

FOOD SUPPLY OF THE WORLD. The population of the world is believed to be about 1,800,000,000 The land area (excluding the Arctic regions) is roughly 33,000,000,000ac, less than half of which is now regarded as arable Taking good and bad land together, it may be estimated that five acres are required, directly and indirectly, to sustain one human being Other things being equal, this would fix the limit of population of the globe at something like 6,000,000,000 The direct requirement of acreage per head of population will be reduced by improvements in agriculture and diminution in the number of domesticated animals Nevertheless, one may regard a population of 6,000,000,000 as the point of saturation for the globe But from this it is not to be inferred that such a population will ever be reached

The Law of Diminishing Returns.—Considering the relation of food resources to population, we face the so-called law of diminishing returns This proposition (it cannot be called a law, logically or scientifically) came into prominence over a century ago and is commonly associated with the names of Ricardo and Malthus Revised by John Stuart Mill, the modern formulation is stated by Alfred Marshall, as follows "Whatever may be the future development of the arts of agriculture, a continued increase in the application of capital and labour to land must ultimately result in a diminution of the extra produce which can be obtained by a given extra amount of capital and labour"

The law of diminishing returns proves too much when stated without qualification, when properly qualified it proves little Of course, some lands are richer and easier to cultivate than others The proposition can be applied either to extensive agriculture or to intensive agriculture and for both one may agree that *ultimately* the moment will come when the increment of extra produce will fall relatively below the extra amount of capital and labour involved If the hypothesis of diminishing returns be strictly defined as related to "secular diminishing returns," as has recently been done by Patton, the proposition becomes at once clarified and qualified

Historically considered, the proponents of the hypothesis of diminishing returns have over-emphasized the proposition, while underestimating the developments in agricultural practice Up to the present, the agriculture of the world seems to have exhibited secular increasing returns Statistical data are not complete enough to justify categorical statements, but the evidence lends support to the view that, considered by and large, the agriculture of the world has shown increasing rather than diminishing secular returns How far this may continue is another question, but the non-fulfilment of inferences drawn from Ricardo and Malthus have transferred the problem from the domain of speculation to demonstration Patton has remarked that "Secular diminishing returns can be said to occur if the number of hours required to produce a given quantity of food-stuffs shows a tendency to increase, or if a growing proportion of the world's labour supply is necessary to produce enough food to avert starvation" Such secular diminishing return has not been statistically demonstrated, and until this ultimate result has arrived, the import of the abstract notion is not clear

Developments in Agriculture.—There seems to be a widespread impression that the art and science of manufacture are relatively more advanced than those of agriculture and that during the last century urban industry has out-distanced rural industry This is doubtful Certainly for the United States it seems fair to conclude that farm out-put per man has advanced as rapidly as factory out-put per man Improvements in agriculture apply both to extensive and intensive agriculture and in particular are important in the adaptation of machine cultivation to terrains that up to the present have been cultivable only by primitive methods Agricultural technique is very unevenly distributed over the world. In general, highly industrialized countries have well-developed agriculture, industrially backward countries have undeveloped agriculture. The agriculture of India and China, for example, is primitive and inefficient; but the future improvement of China and India depends more on industrialization than on advances in agriculture. The advance in production per head of farming population over the past half century has been facilitated by cheap money, growing familiarity with foreign investments, perfection of world-wide systems of credit and exchanges and developments in transport and refrigeration Researches and inventions are gradually making agricultural operations feasible in regions where they have been impracticable Through plant breeding and selection of seed, the cereal belts are being gradually pushed towards the poles This is strikingly illustrated in Canada and will hold for Russia, Siberia and Manchuria when the agriculture of those regions becomes skilful When the period required for maturing wheat is reduced 20 days, this will permit substantial extension of the wheat belt towards the poles Plants are being made more resistant to extremes of heat and cold, drought and moisture, and are being adapted to less favourable soils Through the physical and chemical study of soils, notable progress is being made in the recovery of barren land When such advances are technically appraised from the standpoint of experimental botany, it becomes clear that the possibilities are not approaching exhaustion, on the contrary, the technically practicable improvements have scarcely more than begun

In two directions in particular, improvements still to be accomplished will result in wide extension of agricultural operations throughout the world Predatory animals, insects and parasitic diseases have inflicted enormous losses, so onerous indeed as to operate heavily in restraint of agriculture, both intensively and extensively Some of the enemies of the agriculturist tend to retreat with advancing population, but others, in particular certain diseases of plants, are favoured by increasing concentration of cultivated units The problem is both direct and indirect direct as involving the plants and animals that represent the crops of agriculture, indirect as involving human beings, for whose occupancy, disease-infested regions must be made safe It seems now established that if infectious diseases are eliminated, all parts of the tropics are fitted for habitation and agriculture The effects of tropical isolation have apparently been much exaggerated If the world could be made free of infectious diseases involving human beings (in particular those transmitted by insects, among them sleeping sickness, yellow fever, typhus and malaria), the world scope of agriculture would be greatly extended If, thereafter, predatory animals, insects and infectious diseases destructive to domesticated animals, forests, orchards and plants could be reduced to a minimum, or exterminated, the result would be an enormous increase of output with lowering of cost Notable advances have been achieved in the prevention and control of infectious diseases of animals Less has been achieved in the prevention and control of infectious diseases of plants; and it is not too much to say that herein lies one of the major future problems of agriculture These improvements are entirely practicable, technically and socially If one will compare the sanitation of civilized communities with the sanitation of backward countries, and apply a corresponding advance to the control of predatory animals, insects and infectious diseases afflicting animals and plants, one secures a measure of the possibility of future improvements

The potential of the agricultural resources of the world cannot be regarded as even relatively attainable until full application is made of the principle of the division of labour This implies fluidity of transport, both within countries and between countries, also fluidity of credit and convertibility of exchanges Quarantines must cease to set up barriers to international trade These several conditions are not yet attained for any one continent, and their attainment for the world at large will presumably be delayed beyond the lifetime of the present generation. Fertilizers represent a substantial, if indirect, agricultural resource, since the indispensable elements must be returned to the soil if depletion is to be

controlled Valuable as are the natural manures, they fall short of the minimum requirements Recent improvements in manufacturing technique have greatly enlarged the supply of chemical fertilizers With cheapening of fixation of atmospheric nitrogen, improvements in recovery of low-grade natural saltpetre, and continuing development of recovery of ammoniacal by-products, the supply of nitrogenous fertilizers may be expected to expand greatly and the price to decline The available and developed deposits of phosphate rock promise also relatively unlimited supplies of soluble phosphate, presumably on a declining price level The same thing may be said of potash, of which the out-turn from developed deposits in different parts of the world is being restrained in order to maintain price In addition, fixation of atmospheric nitrogen through the action of micro-organisms in the soil is becoming better understood and more effectively applied Corresponding actions by micro-organisms, whereby insoluble phosphate and potash are converted into soluble forms in the soil, seem also to exist, and in view of what has been accomplished with nitrogen it does not seem utopian to look forward to practical developments in these directions In the gradual transfer of agriculture from the extensive to the intensive basis, the use of fertilizers may be expected to become continuously more important

Soil erosion is an important and difficult problem in many parts of the world It has different causes in different regions, such as slashing of forests, destruction of brush cover, over-grazing, artificial drainage and misdirected tillage Soil erosion tends to be progressive and the area denuded is added to annually Loss of surface soil, loss of water and alteration of terrain are all of importance Soil erosion, like reforestation, becomes a public problem because there is little incentive for private capital to enter upon long-time corrective measures

It is an anomalous situation that the world is just now concerned with the economic problem of surplus of agricultural products and at the same time constrained to fear that the pressure of population on resources may soon lower the level of subsistence In truth, however, the anomaly consists not in the questions themselves, technically considered, but in lack of perspective of the time relations The present surplus problem, which in one way or another is practically world-wide, is not an emergency, but is still to be regarded as a relatively short-time situation On the other hand, a forecast of significant pressure of food supply on population lies far in the future, even in the view of neo-Malthusians

In judging of the agricultural potential of the globe, we must bear in mind that land has other uses than raising primary food-stuffs and supporting domesticated animals Land must also be used for producing trees and fibres—industrial raw materials The world requirements of building timber, fuel wood, paper pulp, rubber, cotton, linen, jute, hemp, sisal, naval stores, gums and other raw materials, are large and for the most part expanding Since the growth of forests is rarely at the rate of over 3% per annum, in terms of material, the current rate of depletion of forests would seem to imply that in the not distant future, land in many countries will need to be formally withdrawn from agriculture for reforestation under State control There are many substitutes for wood for building, but while the relative demand may decline through substitution with other materials, the absolute requirements, with growth of population and improvement in standards, may exceed the prospective rate of growth of the established stands of timber The per caput use of rubber is steadily expanding The per caput use of fibres for clothing is apparently growing slowly, if at all, while its use, outside of clothing, is obviously expanding. One must expect the time to arrive in the near future when in many countries it will be more profitable to raise industrial raw materials over certain areas than to raise food crops, feed crops, or animals. One must not construe the expanding world requirements of industrial raw materials grown on land as an enlargement of the Malthusian doctrine, whereby the future race may be compelled to choose between being warmed from the inside by food or warmed from the outside by clothing and dwellings But it is necessary to bear in mind that modern improvements in the standard of living carry with them greatly enlarged consumption of industrial raw materials, at the same time that food requirements are being reduced through substitution of machine power for manual labour and better protection of human beings from the elements

Forms of Agriculture.—Considering the agriculture of the world dynamically, it may be separated into five divisions One division includes land and labour devoted to the breeding and support of work animals In some countries like India, this is the principal form of animal husbandry, since very rarely is use made of milk and meat The flesh of work animals is generally used for food only in an incidental manner, but the hides commonly go into leather The land used to raise and maintain work animals is usually adapted to the raising of primary food-stuffs In advanced countries, work animals are being replaced by automotive machines, in backward countries, progress is being made in the use of animals to replace human workers

The second division of agriculture includes land and labour devoted to the raising of animals primarily for production of industrial materials There are now few countries in the world where animals are raised solely for wool and hides The sheep, goats and cattle kept primarily for hides and wool furnish more or less milk and meat, indeed, in many countries meat is a joint product equal in importance with hides and wool The land devoted to raising animals for hides and wool is to a large extent, in the present state of agriculture, not adapted to the raising of primary food-stuffs

The third division of agriculture includes land and labour devoted to the raising of industrial plant products Much of the land thus used in the temperate zone is adaptable to the other forms of agriculture, but in the tropics, this is less the case

The fourth division of agriculture includes land and labour devoted to the raising of animals primarily for the production of milk and meat Cattle may be used incidentally as work animals, and hides and wool are important joint products; but the primary purpose of such animal husbandry lies in the out-turn of secondary food-stuffs In agriculture, the land devoted to such animal husbandry is usually adapted to the raising of primary food-stuffs, and is devoted to animal husbandry as the expression of economic or vocational choice

The last division of agriculture includes the land and labour devoted to the raising of primary food-stuffs—tillage for harvested crops Such land is also necessarily employed in the raising of feeding stuffs for domesticated animals

These five divisions of agriculture overlap to some extent in all countries, varying according to the place and time With improvements in transport and exchange, and with increase of population, these relations tend to change in the direction of increase in the agriculture devoted to primary food-stuffs with decrease in the agriculture devoted to animals and secondary food-stuffs. The conversion of nutrients into animal products is a wasteful process on account of the metabolic and caloric requirements of the animals With continued increase in population, the food supply will tend to contain more of primary and less of secondary food-stuffs If one can imagine a population of 5,000,000,000 on the globe, one must picture their diet as largely vegetarian with only such animal products (disregarding aquatic animals) as would be secured incidentally from work animals and such cattle, sheep, goats and swine as could subsist on land unadapted to the growing of primary food-stuffs plus the residues of primary food-stuffs devoted to human beings Such animal husbandry, for a population of 5,000,000,000, might be as large as the present animal husbandry of the world, or larger, particularly in the event of control of animal diseases in tropical regions Obviously, however, the intake of secondary food-stuffs, animal products of all kinds, would be lower than to-day There is enough truth in the doctrine of vegetarianism to make it clear that with proper selection and combination of different plant products, a competent diet could be arranged to include only such animal products as could be secured without using for animals land adapted to the raising of primary food-stuffs.

Classes of Food-stuffs.—The food resources of the world are conditioned by (a) the agricultural potential of the land area of the earth; (b) the state of the arts and sciences in the culti-

vation of the soil, the raising of plants, the rearing of animals, and in the manufacture of food-stuffs; (c) the annual out-put of edible animals from fresh and salt waters; and (d) by the state of transport and exchange The value of the food resources is to be measured in the light of the existing population of the globe To some extent, these factors are static, but to a large extent they are dynamic In a certain way, the food resources of the world are static in the same sense as are the resources of coal and iron, *i e*, they rest upon a chemical basis But even in the case of minerals and metals, the resources are not to be measured solely by chemical analysis and geological surveys, they depend also upon the state of technique in the recovery of demonstrated deposits, and to that extent are dynamic In the case of agricultural products, the static limitations imposed by composition of soil, rainfall and climate hold far less than in the case of minerals and metals, partly because the chemical elements involved are less circumscribed in quantity and location, and partly because there is in agriculture more of human art and less of nature than in the case of mining In what follows we endeavour to present a succinct statement of the present food resources of the world A static comparison of food supply with population has important immediate interest, but little import for the future A dynamic comparison of food resources with population has little practical importance, but large import for the future

A convenient classification of food-stuffs, commercial rather than botanical, separates the main food-stuffs into five groups cereals, legumes, roots, oil-seeds and animal products The remaining food-stuffs, mostly fruits and vegetables, though highly nutritive, have little importance as sources of energy and only incidental significance in international trade Different peoples, in different regions and circumstances, cover their protein requirements with various amounts of animal products, cereals and legumes, and their caloric requirements with different amounts of carbohydrates and fats The standard of subsistence is at once a cause and a result of agriculture and commerce

Cereals.—The cereals are the most important food-stuffs, furnishing the largest proportion of calories In a country like the United States, with a high standard of living, the cereals may contribute less than a third of the calories of the diet In most of the countries of Europe it is over 50% In Asia, cereals contribute over three-fourths of the calories of the diet The important cereals are wheat, rice, maize, barley, oats, rye and the sorghum grains The cereals are quite adaptable in agriculture, relatively non-perishable, and the crushed or milled products lend themselves well to culinary preparation, both in the home and in commercial avenues

An estimate of the cereal crops of the world is to be undertaken only in very rough figures, since for large regions, especially Asia, reports are mere guesses If in any year the grain fields of the world were to have large crops, the wheat would approximate 5,000,000,000bu, rye 2,000,000,000bu, corn 4,000,000,000bu, oats 4,500,000,000bu, barley 2,000,000,000bu, and rice 4,000,000,000 bushels Converted into pounds, this would mean for the world population of 1,800,000 000 a per caput supply of about 600lb per annum for all purposes Grain used for seed and animal feed would represent a heavy proportion Despite relatively small numbers of domesticated animals in Asia, contrasted with the human population, it is difficult to picture more than half of the grain produced in the world being consumed as food for human beings

Wheat occupies the premier position, largely on account of gluten, which enables wheaten flour to be baked in loaves of yeast-leavened bread Rye resembles wheat in this particular Rice, maize, barley, oats and the sorghum grains do not lend themselves to the making of yeast-leavened bread These grains are therefore used in the form of groat, grits, flakes or meals, prepared for ingestion by steaming, boiling, baked as biscuit or used as alimentary paste To some extent, the preparation of cereals depends upon the cost and the nature of available fuel; this is one of the elements in the preference accorded to rice in Asia Although wheat is raised in large amounts in both China and India, rice and millet are the predominating cereal

While cereals may be consumed in their natural state, or crushed and milled without loss, it is customary to separate the cereal meals into a flour and offal fraction. The offal comprises the coat and the germ, including the bran; the flour corresponds roughly with the endosperm of the seed In the case of rice, the offal is removed by polishing, without crushing the berry, a similar process is followed in the manufacture of pearl barley. Broadly speaking, in the manufacture of cereals into food-stuffs, between one-fourth and one-third of their weight is thus separated as offal This offal is employed as concentrated feeding stuff for domesticated animals, for which it is highly prized In regions where animal husbandry is undeveloped, cereals tend to be consumed in their entirety Also, there is some consumption of whole-grain flour in all countries, since whole-grain bread is preferred by some to bread made of bolted flour In fact, the offal of cereals contains elements of value in nutrition—mineral salts, vitamines and roughage If one were subsisting solely on cereals, it would be necessary to consume them in their entirety In a mixed diet it is a matter of choice Bolted flour and whole-grain flour are both incomplete foods, in a diversified diet, however, the one is as good as the other, since it is possible to secure in fruits and vegetables the minerals, vitamines and roughage removed from grains in the manufacture of bolted flour In countries with a diversified diet, the milk-equivalent of grain offal is more important than the offal as human food

The cereal-raising capacity of the world is by no means fully developed A world crop of 6,000,000,000bu of wheat is possible within a relatively short time Beyond the wheat lands lie the rye lands, rye being a hardier cereal than wheat, and representing the second line of bread defence It would not be extravagant to suggest a world crop of 3,000,000,000bu of rye, along with 6,000,000,000bu of wheat Corresponding expansions are also feasible for the other cereals All in all, therefore, it would not seem out of perspective to envisage the gradual expansion of the world crop of cereals during the next century, to double the present volume if necessary Since the per caput count of domesticated animals is expected to decline, a continuously larger proportion of cereals would be used as primary food-stuffs, and the expanded future population of the world would depend more upon cereals than at present

Legumes.—Legumes (using the term in the broad sense to include all varieties of beans, peas, lentils and other pulses) have long been important as supplements to cereals They are widely distributed, being as prominent in the diet in Central America as in China; however, we have no real statistics on production Though relatively non-perishable, they are far less conspicuous than grain in international trade, though gram and soya bean are prominent articles of commerce Most legumes are poor in fat, except the soya bean and peanut, rich in fat and often classified as oil-seeds Legumes are richer in protein and poorer in starch than cereals Legumes, being rich in protein, are substitutes for meat Since legumes are a primary food-stuff, protein may be more cheaply secured therein, other things being equal, than in animal products Therefore, with increase in population and its initial evidence of local pressure on food supply, legumes tend to supplant animal products as sources of protein India and China may be cited in illustration, especially China, where the use of meat is restricted by economic conditions rather than by fanaticism or superstition It is from this point of view that efforts are now being made in Europe to increase the production of soya beans in the hope of supplying the population with a cheaper source of protein than meat Under usual circumstances, more protein can be secured from the unit of land in the form of legumes than in the form of grain and much more than in the form of meat But that Europe is approaching the position where legumes need to be substituted for meat, as has long been the situation in China, is hardly to be believed The position of soya bean products in the Chinese diet is an illustration of skilful adaptation in covering with available domestic food-stuffs the minimal requirements for the congested population. Had China been an industrialized nation, it is doubtful if the present Chinese dietary would have been evolved Europe's export of manu-

factured goods and disposition of services in finance and trade, enable her to continue the customary diet of bread and meat. China's lack of export and undevelopment of transportation compelled her to perfect the national diet in the direction of legumes and away from meat. The different political spirit of Europeans and Chinese, as expressed in government and education, has of course played a large part in their historical developments

As population increases, the production and consumption of legumes may be expected to expand, primarily in substitution of meat, and later possibly in substitution of grain For North America, western Europe and the dominions of the British empire outside of India, this development lies in the distant future For them, these legumes remain merely vegetables, in the United States, indeed, of declining use and not a staple source of protein in the national diet

Roots.—Under roots we here class potatoes, sugar-beets, sugar-cane, fodder roots, cassava, sago-palm and analogous tropical products. These food-stuffs are largely composed of carbohydrates and are farinaceous, containing in their raw state only small amounts of protein and still less of fat When refined by manufacture, they are practically pure starch or sugar Consumed in the fresh state, these food-stuffs rank as vegetables, prepared in the dry state, they are highly valuable, because concentrated and practically non-perishable

Though coming from a stalk and not from a root, cane sugar is to be classed with beet sugar Before the World War, the world production of sugar was about 18,000,000 tons, of which about half was cane sugar and half beet sugar The present sugar production is around 25,000,000 long tons, of which 16,000,000 are cane sugar and 9,000,000 tons are beet sugar As a result of the World War, the production of cane sugar expanded, that of beet sugar contracted With the recovery of beet sugar, the level of world sugar is rising Broadly speaking, beet sugar is a product of the temperate zone, while cane sugar is a product of the tropical (or sub-tropical) zone With selection of seed, protection from pests and diseases, and appropriate fertilization, the output of cane sugar on tropical lands seems to be a function of temperature Much land adapted to sugar-cane is still available for future expansion of that crop and substantial increases in the yield per acre is demonstrably practicable. In the case of the sugar-beet, with selection of seed, control of diseases and pests, and appropriate fertilization, the output seems to be the function of hours of sunlight, and, other things being equal, the farther north the beet can be brought to maturity, the higher the sugar content Large areas still remain adapted to the sugar-beet, so that substantial future expansion is practicable The refining of sugar is an efficient and economical operation, producing a concentrated and non-perishable food-stuff of expanding importance in the diet and in international commerce Both crops are restrained by hand-labour requirements, as yet unsolved by development of machines A world crop of 30,000,000 tons of sugar is to be anticipated within a decade or two

The world crop of potatoes is not even roughly measurable The usual crop in North America and Europe except Russia, is around 100,000,000 long tons Potatoes of one sort or another, white and sweet, are adapted to many climates and soils and give a large yield of calories per acre. Potatoes are of outstanding importance in Europe and North America. They have not secured the favour of oriental peoples, due presumably to the fact that the oriental diets are already low in protein The potato is highly perishable, and does not lend itself to refining, as does the sugar-beet; considerable potato starch is prepared for food and industrial use, but nothing comparable with the refining of sugar The potato remains, therefore, an important vegetable, of limited transportability, but highly valuable as human food, animal feeding stuff and material for the fabrication of alcohol

The tropical flora include a number of plants whose roots, stalks and leaves contain large deposits of starch Of these, the cassava and the sago-palm are the best known. The cultivation of these plants is expanding and land adapted to them is abundantly available. They are of course one-sided food-stuffs and need to be supplemented with protein But as sources of cheap starch they are of considerable importance These farinaceous products compete with rice rather than with wheat and are broadly comparable with the potato in the diet The production of these food-stuffs may be expected to expand upon improvements in machinery for harvesting and refining quite as much as upon adaptability of soil

Oil-seeds.—An important and expanding food resource has, within comparatively recent times, been uncovered in oil-seeds Under this term are included all seeds and nuts that are rich in oil, the segregation of grains from oil-seeds is of course to some extent arbitrary. The important oil-seeds include flax, tung, olive, sunflower, rape, sesame, soya-bean, peanut, cotton, palm, palm kernel and coconut Some of the plants are annuals or perennials, some are legumes; some come from grasses, others from trees; some are strictly tropical or sub-tropical, others widely distributed over the temperate zone

Oil-seeds contain starch and protein as well as fat Contrasted with grains, they contain much more fat and protein but much less starch Since protein is relatively scarcer than fat and starch, oil-seed crops would seem to possess some advantage over grain crops, but for several reasons, both agricultural and nutritional, the theoretical advantages of an oil-seed crop frequently disappear in practice The principal disadvantage of the oil-seed crop is that the unexpressed meal is unadapted to culinary uses, while the expressed meal is much less esteemed than flour In the case of the soya-bean, the Chinese have developed uses whereby the expressed meal, freed of fat, finds uses comparable to those of meals from grains But in Europe, the expansion of soya-bean growing is limited by disinclination of the public to expand the food use of the expressed residue To use the meal as feeding stuff is an imperfect solution of the problem, because the recovery of the protein in terms of edible animal products will be not over one-third, and often less, of the protein of the oil-seeds To raise an oil-seed primarily as a source of fat, with secondary utilization of the protein and starch as feeding stuffs, is much less advantageous than if two or all three could be employed as food-stuffs Up to the present, the fat-free residues of coconut, palm, palm kernel, peanut, sunflower and flax are used largely as feeding stuffs, and for little else Nevertheless, oil-seeds have a large importance as a food resource, and as a concentrated feeding stuff, the residues are highly important in the industrialized countries of Europe and North America

Apparently, the production of oil-seeds could be greatly expanded if agricultural hindrances in the tropics could be overcome and the utilization of the fat and carbohydrate as food-stuff brought into conformity with established customs and tastes. In a certain sense, it was tropical oil-seeds that made possible the present industrialization of Europe To what extent added expansion in tropical oil-seeds will contribute to the further development of industrialism in Europe, indirectly by providing feeding stuffs for European animals or directly by providing food-stuffs, is a matter on which it is hardly possible or desirable to speculate When one attempts to forecast the future use of oils and fats in the diet, it is necessary to realize that to a considerable extent vegetal oils and fats are competitive with animal oils and fats and that consumption may shift from one to the other The tropical regions possess surpluses of vegetal oils, nevertheless, animal fats (butter, milk, lard and pork) are shipped in to meet the desires of the white population On the other hand, the industrial nations of the northern temperate zone are increasing the use of vegetal oils from the tropics It is not possible to say whether the use of vegetal oils and fats in Europe and North America is merely additive, supplementing animal oils and fats; or whether, and if so to what extent, it represents a substitution In any event, it is clear that for some countries the point must have been reached where the current use of vegetal oils is in partial replacement of animal oils and fats Certainly also, it is difficult to doubt that in the future the trend toward substitution is likely to become more pronounced. It is hard to interpret otherwise the enormous expansion in the manufacture of vegetal lard substitutes in the United States and vegetal butter substitutes in Europe When the imitations are made technically perfect, use will be based on price. Vegetal lard substitutes have made little

headway in Europe and vegetal butter substitutes have made little headway in the United States We do not expect the use of butter substitutes to expand rapidly in the United States, but it is to be anticipated that the use of vegetal lard substitutes will expand largely in Europe Gradually it will become true for the food supply, as it already is for the manufacture of soap, that one fat is practically as good as another

Domesticated Animals.—It is difficult to form an opinion on the count of domesticated animals in the world Except for countries with unusual development of the census of animals, the data are both fragmentary and untrustworthy The world over, animal husbandmen—whether nomads, peasants or squires—conceal animals in order to avoid taxes Of the count of animals in backward pastoral countries little is known The number of animals on public ranges tends to decline, certainly in North America On the other hand, animals tend to increase in the diversified agriculture of advanced countries The losses of the World War have been restored and the inflations liquidated Taking the figures at their face value, the world population of domesticated animals has been estimated as follows, in rounded figures horses, mules and asses, 140,000,000, cattle, 580,000,000, swine, 200,000,000, sheep and goats, 860,000,000, camels and buffaloes, 60,000,000 These estimates are too low, especially for asses, sheep, goats, camels and buffaloes, but how much too low is indefinite Apparently, the world population of domesticated animals is almost as large as that of human beings, but the subsistence requirements of the latter are much larger With improvements in transport and in the standard of living, one might expect an increase in domesticated animals, yet it is doubtful if this can be demonstrated A per caput increase in domesticated animals is certainly not in evidence, but a shift from cattle to swine is possible

More important than the number of domesticated animals is the improvement in grades With each generation measurable progress is achieved in all except backward countries Through breeding and selection, improved types are secured, animals are brought to maturity earlier, by better utilization of nutrients, and the turn-over is increased In the case of sheep, improvement is attained both in wool and in the carcass In the case of cattle, the frame and flesh are being improved, but the improved breeds do not possess the heavy hides of unimproved breeds With each decade, the average annual secretion of milk rises, and the return of milk per unit of nutrient is enlarged The same fact holds for swine, both the lard-type and bacon-type hogs are brought to maturity earlier and the return of nutrients in the form of edible products is enlarged In the case of all animals, a considerable part of the gains have been the result of cutting down the mortality in early life, thus increasing the turn-over of the breeding stock In short, while the number of animals per million inhabitants may be declining, the out-put of edible products per head of population may be increasing However, we have no trustworthy statistics

The meat consumption of the world is very unevenly distributed, the highest being observed in Australasia, Argentina, Canada and the United States, the lowest, in Asia Consumption of meat is influenced not merely by the state of agriculture, relation of population to area and limitation of transport, but also by fanaticism and superstition, as is illustrated in the dietaries of Hindus, Mohammedans and Jews Occasionally one observes a country, such as Japan, in which consumption of fish takes the place of consumption of butcher meats, but for the most part, fish cannot be relied upon to replace the flesh of domesticated animals

It seems reasonable to conclude that the consumption of milk may everywhere be expected to increase Fanaticism and superstition do not oppose the use of milk With improvement in the herds in pastoral countries, incidental milk production tends to increase The decline of animal husbandry on public ranges, with increase in diversified agriculture, represents enlargement in the production of milk Finally, improvements in the manufacture of butter, butter oil, cheese, condensed milk and dried milk are gradually making practicable the utilization of the milk of animals in outlying regions The importance of this trend of developments is enhanced by the fact that the milch cow is an efficient converter of feeding stuff into food-stuff

Sea-food.—The resources of the sea are measurable with less accuracy and greater difficulty than those of the land The sea area of the globe is four times that of the land, but the productivity is very much lower Aquatic animals depend on aquatic plants and there is little plant life in water over 200ft deep The shallow area of the sea is estimated at less than 2,000,000,000 acres Even if the plant growth in the shallow sea were comparable with that on land, the return in edible animal products cannot be as large relatively as on land Thus appraised, the food-producing potential of the seas appears low The growth of marine plants must be conditioned to some extent by the availability of soluble salts of potassium, phosphorus and nitrogen utilizable by plants These are being continuously added to the sea with the inflow of waters from the land Probably bacterial fixation of atmospheric nitrogen occurs in sea water, and possibly conversion of insoluble into soluble phosphates through the action of micro-organisms But these elements would seem to be distinctly limited in sea water except close to land It is practically impossible to estimate the number of aquatic animals, to appraise the rate of growth, the limitations of the food supply and depredations of natural enemies and diseases For a few species of marine animals, it is known that the numbers are declining—for example, whales, sturgeon and salmon For other varieties, much less is known The general impression is that the resources of the fresh waters are declining rapidly and those of salt waters less rapidly but still progressively

To some extent marine animals find uses outside of the diet Substantial amounts are employed as fertilizer and animal feed The oils and fats find widespread uses in industry For some marine animals, extermination is to be feared because of their exploitation for industrial materials

The technique of catching fish and other marine animals has been highly perfected within recent years, and distribution and utilization have been advanced by technical developments Fish do not need to be salted, but may be transported frozen over long distances Extensive processing and packing may occur on the high seas Marine fats may now be so refined and transformed as to become substitutable for vegetal and animal oils and fats Thus, from marine fats may be prepared butter substitutes that are nearly as good imitations as margarines prepared from vegetal oils Up to the present, the public is unsympathetic to such substitutions, but experience teaches that this attitude will wear off with time The future questions are not the extent to which marine materials may be adapted to food uses, nor the conversion of the public to such use, but rather the quantity of material available and the prospective length of time over which new industries might count on supplies large enough to make it worth while to develop the business

The present use of the flesh of fish and other marine animals in the human diet cannot be measured For North America, the fish of salt and fresh waters are little more than incidental luxuries, but in the countries of western Europe, in regions surrounding certain inland seas, like the Caspian, and in the coastal regions of Asia, fish constitute an important part of the diet The trend of output is impossible to estimate Over-catching is difficult of restraint, both in inland and territorial waters, and especially on the high seas Gradually we are coming to question the practical results of artificial propagation in hatcheries Pollution, whether by oil film on the surface, suspension of insoluble particles, or solution of noxious chemicals, has everywhere widespread and destructive effects, especially to the young Apparently, fresh and coastal water fish are on the decline, also fish that come from deep-sea water to spawn in fresh water or vice versa. The whale, walrus, seal and other large marine animals are, only incidentally, sources of food supply With respect to other marine animals, the evidence is less conclusive Fishing on the high seas is at present largely confined to banks, most of which are adjacent to the mainland, of which the banks off western Europe and Newfoundland may serve as illustrations It is difficult to measure the trend of fish supply on such banks. With replacement of sails with motors, the efficiency of fishing and radius of cruising are

much increased. There is the feeling in trade circles that the supplies of cod, herring, halibut and mackerel are on the decline. Beyond this, there is a popular notion that practically unlimited numbers of fish exist in deeper and more distant waters (especially tropical waters) awaiting improvement in methods of fishing, with the technique of refrigeration already perfected. Just how extensive are such supplies of fish, what are the limitations of season and the costs of procurement are not known. One cannot, however, resist the inference that the importance of deep-sea fish, like that of the reindeer, is more hypothetical than demonstrated

In a mixed diet the flesh of fish, on the basis of dry weight, has about the same value as the flesh of domesticated animals The fats of fish differ rather widely from those of domesticated animals, but by modern technological methods lend themselves both to industrial and dietary uses Refrigeration and canning make the flesh of fish as safe and dependable as that of domesticated animals It is, however, doubtful if the flesh of fish will ever exert a world-wide appeal as a food of preference The use of fish on fast-days has not tended to favour its use as a regular article of diet On the whole, the flesh of aquatic animals contributes relatively little to the food supply of the world in terms of calories and for the immediate future the prospect is for decline rather than for increase

Minerals and Vitamines.—Minerals and vitamines are indispensable factors in the diet. Very often, otherwise adequate diets have failed because of shortage in these essential factors A normal ration of minerals and vitamines is not only of direct importance in maintenance of health, it is indirectly of importance in extending the effectiveness of an otherwise minimal intake of protein, fat and carbohydrate Fortunately, such shortage need no longer be feared, since information on the processes of nutrition and advances in manufacturing technique make it readily possible to supply balanced salt rations and adequate intakes of vitamines

Industrial Utilizations.—Food-stuffs have important industrial uses This holds especially true of starch and fat, starch being the common material for the fabrication of alcohol, while fat is the raw material for soap-making and other industrial processes The more alcohol made from sugar residues, straw and sawdust, the less demand for grain for this purpose The larger the use of oils and fats in industrial directions, the heavier the competition to be encountered by oils and fats as food-stuffs For the most part, the tendency has been toward increase in the industrial use of oils and fats In several directions, however, the contrary is to be observed, substitutes in industrial uses replacing oils and fats previously employed Paints and varnishes containing linseed-oil are being widely replaced by pyroxylin enamels prepared from cellulose At present, this is limited to automobiles, railway cars, steamships and household interiors, but it is not improbable that paints may be replaced for commoner exterior uses Mineral and other non-fat detergents are taking the place of soap During the World War substantial technical progress was achieved in the perfection of substitutes for soap and the future limit of such substitution is not yet definable The total use of detergents is greatly on the increase, but in many directions soaps are being replaced by cheaper substitutes Mineral lubricants are replacing lubricants made of animal and vegetal oils and fats Lastly, the use of vegetal and animal oils and fats as illuminants is being everywhere replaced by mineral oils, gas or electricity, surviving only for sacramental and social occasions not involving large volumes of the materials.

Conclusion.—The food resources of the world have never been more ample for the population than at present This is the result of developments in agriculture, perfection of transportation, improvements in distribution, reduction in wastes and efficiencies in finance and commerce. Expansion in manufacturing, the so-called industrial revolution, has been accompanied by growth in agriculture and improvement in the standard of living. Improvement in the standard of living in turn reacts upon agriculture, as upon manufacturing There is no sign that these bilateral movements are approaching a decline (A. E. T.)

FOOD VALUES: *see* DIET AND DIETETICS; NUTRITION.

FOOL, a stupid person; a buffoon or jester.

Professional fools or jesters appear to have existed in all times and countries Not only have there always been individuals naturally inclined and endowed to amuse others; there has been in most communities a definite class, the members of which have used their powers or weaknesses in this direction as a regular means of livelihood *Scurrae* and *moriones* were Roman parallels of the mediaeval witty fool; and during the empire the manufacture of human monstrosities was a regular practice, slaves of this kind being much in request to relieve the languid hours After the conquest of Mexico court fools and deformed human creatures of all kinds were found at the court of Montezuma.

The dress of the court fool of the middle ages was not altogether a rigid uniform To judge from the prints and illuminations which are the sources of our knowledge on this matter, it seems to have changed considerably from time to time The head was shaved, the coat was motley, and the breeches tight, with generally one leg different in colour from the other The head was covered with a garment resembling a monk's cowl, which fell over the breast and shoulders, and often bore asses' ears, and was crested with a cockscomb, while bells hung from various parts of the attire The fool's bauble was a short staff bearing a ridiculous head, to which was sometimes attached an inflated bladder, by means of which sham castigations were effected A long petticoat was also occasionally worn, but seems to have belonged rather to the idiots than to the wits

The fool's business was to amuse his master, to excite him to laughter by sharp contrast, to prevent the over-oppression of State affairs, and, in harmony with a well-known physiological precept, by his liveliness at meals to assist his lord's digestion The names and witticisms of many of the official jesters at the courts of Europe have been preserved by popular or State records In England the list is long between Hilard, the fool of Edmund Ironside, and Muckle John, the fool of Charles I, and probably the last official royal fool of England Many are remembered from some connection with general or literary history.

Richard Tarleton, famous as a comic actor, cannot be omitted from any list of jesters A book of Tarleton's *Jests* was published in 1611, and, together with his *News out of Purgatory*, was reprinted by Halliwell Phillips for the Shakespeare Society in 1844. Archie Armstrong, for a too free use of wit and tongue against Laud, lost his office and was banished from the court In French history, too, the figure of the court-jester flits across the gay or sombre scene at times with fantastic effect In Germany, Rudolph of Habsburg had his Pfaff Cappadox, Maximilian I his Kunz von der Rosen.

Late in the 16th century appeared *Le Sottilissime Astuzie di Bertoldo,* which is one of the most remarkable books ever written about a jester It is by Giulio Cesare Croce, a street musician of Bologna, and is a comic romance giving an account of the appearance at the court of Alboin, king of the Lombards, of a peasant wonderful in ugliness, good sense and wit. The book was for a time the most popular in Italy

That the private fool existed as late as the 18th century is proved by Swift's epitaph on Dicky Pearce, the earl of Suffolk's jester, but the professional fool died out soon after his day of glory in the Elizabethan period The principle of his existence has lasted to the present day; he disappeared in name only In the circus and the rodeo, he is the clown; in the motion picture, he is the slap-stick comedian; in the ventriloquist act, he is the clever repartee—the "dummy", in the opera, the comedy-drama, the musical comedy, he appears under various names

See Flogel, *Geschichte der Hofnarren* (Leipzig, 1789); Doran, *The History of Court Fools* (1858), Olive M Busby, *Studies in the Development of the Fool in the Elizabethan Drama* (1923).

FOOLS, FEAST OF, the name for certain burlesque, quasi-religious festivals which, during the middle ages, were the ecclesiastical counterpart of the secular revelries of the Lord of Misrule. (Lat *festum stultorum, follorum;* Fr *fête des fous*) The celebrations are directly traceable to the pagan Saturnalia of ancient Rome which, in spite of the denunciation of bishops and ecclesiastical councils, continued to be celebrated by the people with all

their old licence In the 11th century Bishop Burchard of Worms thought it necessary to fulminate against the excesses connected with it The clergy set apart certain days as special festivals for different orders. the feast of St Stephen (Dec 26) for the deacons, St John's day (Dec 27) for the priests, Holy Innocents' Day for the boys, and for the sub-deacons Circumcision, the Epiphany, or Jan 11 The Feast of Holy Innocents became a festival of children, in which a boy, elected by his fellows of the choir school, functioned solemnly as bishop or archbishop, surrounded by the elder choir-boys as his clergy. (*See* Boy-Bishop) At first there is no evidence to prove that these celebrations were characterized by any indecorous behaviour, but in the 12th century such behaviour had become the rule In 1180 Jean Beleth, of the diocese of Amiens, calls the festival of the sub-deacons *festum stultorum* A young sub-deacon was elected bishop, vested in the episcopal *insignia* (except the mitre), and conducted by his fellows to the sanctuary. A mock mass was begun, during which the lections were read *cum farsia,* obscene songs were sung and dances performed, cakes and sausages eaten at the altar, and cards and dice played upon it

This burlesquing of things sacred, though condemned by serious-minded theologians, conveyed to the child-like popular mind of the middle ages no suggestion of contempt, though when belief in the doctrines and rites of the mediaeval Church was shaken, it became a ready instrument in the hands of those who sought to destroy them This naive temper of the middle ages is nowhere more conspicuously displayed than in the Feast of the Ass, which under various forms was celebrated in a large number of churches throughout the West Often the ass was a mere incident in the Feast of Fools, but sometimes he was the occasion of a special festival, ridiculous enough to modern notions but by no means intended in an irreverent spirit.

Celebration at Beauvais.—A singular celebration at Beauvais, which was held on Jan. 14, represented the flight into Egypt A richly-caparisoned ass, on which was seated the prettiest girl in the town, holding in her arms a baby or a large doll, was escorted with much pomp from the cathedral to the church of St Étienne There the procession was received by the priests, who led the ass and its burden to the sanctuary Mass was then sung; but instead of the ordinary responses to the *Introit, Kyrie, Gloria,* etc , the congregation chanted "Hinham" (Hee-haw) three times The rubric of the mass for this feast actually runs: *In fine Missae Sacerdos versus ad populum vice, Ite missa est Hinhannabit· populus vero vice, Deo Gratias, ter respondebit Hinham, Hinham, Hinham* (At the close of the mass the priest, turning to the people, instead of saying, *Ite missa est,* shall bray, the people, instead of *Deo gratias,* shall thrice respond Hee-haw, Hee-haw, Hee-haw)

Celebration at Sens.—At Sens the Feast of the Ass was associated with the Feast of Fools, celebrated at Vespers on the Feast of Circumcision The clergy went in procession to the west door of the church, where two canons received the ass, amid joyous chants, and led it to the precentor's table Bizarre vespers followed, sung falsetto and consisting of a medley of extracts from all the vespers of the year Between the lessons the ass was solemnly fed, and at the conclusion of the service was led by the precentor out into the square before the church (*conductus ad ludos*), water was poured on the precentor's head, and the ass became the centre of burlesque ceremonies, dancing and buffoonery being carried on far into the night

Various efforts were made during the middle ages to abolish the Feast of Fools How little effect these had, however, is shown by the fact that in 1265 Odo, archbishop of Sens, could do no more than prohibit the obscene excesses of the feast, without abolishing the feast itself; the festival was, in fact, too popular to succumb to these efforts, and it survived throughout Europe till the Reformation, and even later in France; for in 1645 Mathurin de Neuré complains in a letter to Pierre Gassendi of the monstrous fooleries which yearly on Innocents' Day took place in the monastery of the Cordeliers at Antibes.

See B Picart, *Cérémonies et coutumes religieuses de tous les peuples* (1723); du Tilliot, *Mémoires pour servir à l'histoire de la fête des Fous* (Lausanne, 1741); Aimé Cherest, *Nouvelles recherches sur la fête des Innocents et la fête des Fous dans plusieurs églises et notamment dans celle de Sens* (1853), Schneegans in Muller's *Zeitschrift fur deutsche Kulturgeschichte* (1858); H Böhmer, art. "Narrenfest" in Herzog-Hauck, *Realencyklop* (ed 1903), Du Cange, *Glossarium* (ed. 1884), *s.v.* "Festum Asinorum "

FOOLSCAP, the cap, usually of conical shape, with a cocks-comb running up the centre of the back, and with bells attached, worn by jesters and fools (*see* Fool); also a conical cap worn by dunces The name is given to a size of writing or printing paper, varying in size from 12x15in to 17x13½in. (*see* Paper). The name is derived from the use of a "fool's cap" as a watermark. A German example of the watermark dating from 1479 was exhibited in the Caxton exhibition (1877).

FOOL'S PARSLEY, in botany, the popular name for *Aethusa Cynapium,* of the family Umbelliferae, a common weed in cultivated ground in Great Britain and sparingly naturalized in the eastern United States and Canada It is an annual herb, with a fusiform root and a smooth hollow branched stem 1 to 2 ft high, with much divided (ternately pinnate) smooth leaves and small compound umbels of small irregular white flowers. The plant has a nauseous smell, and, like various other members of the family (*e g* , hemlock), is poisonous

FOOT, the lower part of the leg, in vertebrate animals consisting of tarsus, metatarsus and phalanges, on which the body rests when in an upright position, standing or moving (*see* Anatomy *Superficial and Artistic;* and Skeleton· *Appendicular*). The word is also applied to such parts of invertebrate animals as serve as a foot, either for movement or attachment to a surface. From the resemblance to the foot, in regard to its position, as the base of anything, or as the lowest member of the body, or in regard to its function of movement, the word is applied to the lowest part of a hill or mountain, the plate of a sewing-machine which holds the material in position, to the part of an organ pipe below the mouth, and the like In printing, the bottom of a type is divided by a groove into two portions known as "feet " Probably referring to the beating of the rhythm with the foot in dancing, the word was applied in prosody to a grouping of syllables, one of which is stressed, forming the division of a verse "Foot," *i e.* foot-soldier, was formerly with an ordinal number prefixed, the name of the infantry regiments of the British Army It is now superseded by territorial designations, but is used in the five regiments of the Infantry of the Household, the Foot Guards As a lineal measure of length the "foot" is of great antiquity, estimated originally by the length of a man's foot (*see* Weights and Measures) For the ceremonial washing of feet (*see* Maundy Thursday)

FOOT-AND-MOUTH DISEASE (Aphthous Fever, Epizootic Aphtha, Eczema Epizootica), a virulent contagious and inoculable malady of animals, characterized by initial fever, followed by the formation of vesicles or blisters on the tongue, palate and lips, sometimes in the nostrils, fourth stomach and intestine of cattle, and on parts of the body where the skin is thin, as on the udder and teats, between the claws, on the heels, coronet and pastern The disease begins suddenly and spreads very rapidly A rise of temperature precedes the vesicular eruption, which is accompanied by salivation and a peculiar "smacking" of the lips The vesicles gradually enlarge and eventually break, exposing a red raw patch, which is very sensitive The animal cannot feed so well as usual, suffers much pain and inconvenience, loses condition, and, if a milk-yielding creature, gives less milk, or if pregnant, may abort More or less lameness is a constant symptom, and sometimes the feet become very much diseased and the animal is so crippled that it has to be destroyed It is often fatal to young animals It is transmitted by the saliva and the discharges from the vesicles, though all the secretions and excretions are doubtless infective, as well as all articles and places soiled by them This disease can be produced by injecting the saliva, or the lymph of the vesicles, into the blood or the peritoneal cavity. The cause of the disease is a filter passing virus (*q.v*).

If we were to judge by the somewhat vague descriptions of different disorders by Greek and Roman writers, this disease has

been a European malady for more than 2,000 years. But no reliance can be placed on this evidence, and it is not until we reach the 17th and 18th centuries that we find trustworthy proof of its presence, when it was reported as frequently prevailing extensively in Germany, Italy and France. During the 19th century, owing to the vastly extended commercial relations between civilized countries, it has, like the lung-plague, become widely diffused. In the Old World its effects are now experienced from the Caspian sea to the Atlantic ocean. Hungary, Lower Austria, Bohemia, Saxony and Prussia were invaded in 1834. Cattle in the Vosges and in Switzerland were attacked in 1837, and the disease extending to France, Belgium and Holland, reached England in 1839, and quickly spread over the three kingdoms (*see* also under AGRICULTURE). At this time the importation of foreign animals into England was prohibited, and it was supposed that the infection must have been introduced by surplus ships' stores, probably sheep, which had not been consumed during the voyage This invasion was followed at intervals by 11 distinct outbreaks, and for a period after 1902 Great Britain was free of foot-and-mouth disease Since the World War the disease has appeared in numerous districts but has been held in check by restriction of movement of cattle over a radius of 15m from the centre of infection and compulsory slaughtering of diseased animals From the observations of the best authorities it would appear to be an altogether exotic malady in the west of Europe, always invading it from the east; this has been the course noted in all the principal invasions It was introduced into Denmark in 1841, and into the United States of America in 1870, from Canada, where it had been carried by diseased cattle from England It rapidly extended through cattle traffic from the State first invaded to adjoining States, but was eventually extinguished, and does not now appear to be known in North America It was twice introduced into Australia in 1872, but was stamped out on each occasion. It appears to be well known in India, Ceylon, Burma and the Straits Settlements. In 1870 it was introduced into the Andaman islands by cattle imported from Calcutta, where it was then prevailing, and in the same year it appeared in South America. In South Africa it is frequently epizootic, causing great inconvenience, owing to the bullocks used for draught purposes becoming unfit for work These cattle also spread the contagion. It is not improbable that it also prevails in central Africa, as Schweinfurth alludes to the cattle of the Dinkas suffering from a disease of the kind.

In 1926 a disastrous epidemic occurred in Scotland which was traced to a bacon factory receiving weekly consignments of fresh carcasses of pigs from Europe In consequence the importation of fresh carcasses and their offals from Europe was prohibited. In January 1927 the Foot-and-Mouth-Disease Research Committee reported that they had found by experiment that bone-marrow from infected carcasses kept at 22° remains infective for 42 days and kept at 15° remains infective for 76 days Blood kept at either of the two low temperatures remains active for 30–40 days In 1928, negotiations were proceeding between Great Britain, Argentina, Brazil and Uruguay to prevent the export to Great Britain of the carcasses of animals killed during the infective stage of the disease or of animals that had been in contact with them The Argentine Government thereon passed a decree on Feb. 1, 1928, and similar decrees by other Governments were pending.

Though not usually a fatal malady, except in very young animals, or when malignant, yet it is a most serious scourge. In one year (1892) in Germany, it attacked 150,929 farms, with an estimated loss to the owners of £7,500,000 sterling. It is transmissible to nearly all the domestic animals, but its ravages are most severe among cattle, sheep, goats and swine. Human beings are also liable to infection.

The treatment of affected animals comprises a laxative diet, with salines, and the application of antiseptics and astringents to the sores. The preventive measures recommended are: isolation and slaughtering of the diseased animals, boiling the milk before use, and thorough disinfection of all places and substances which are capable of conveying the infection.

FOOTBALL. Few of the investigators who tried to discover the origins of the game of football have gone very far, for they have soon found that the sport of football as enjoyed by ancient peoples had no relation to the organized game which is played in modern times. The early history of football, in England, and its nature, are also obscure Joseph Strutt, writing in 1801, said. "It was formerly much in vogue among the common people, though of late years it seems to have fallen into disrepute and is little practised." Yet at the same time he had hazy ideas that some sort of a football game was then being played in England, for he adds that when a match of football is played there are two goals, with a distance of 80 or 100 yards between them, that the object of each party is to drive the ball, a blown bladder cased with leather, through the goal of its antagonist, and that sometimes the players kick each others' shins without the least ceremony.. Only in the '50s of last century did sane order begin to appear and the basis was laid for the distinction between Rugby and Association. (*See* FOOTBALL, ASSOCIATION, FOOTBALL, RUGBY)

FOOTBALL, ASSOCIATION. Out of the chaos existing during the '40s and '50s emerged certain clubs which considered that football was a game to be played with the feet and not with the hands, and certain other clubs which regarded carrying the ball as the salt of the game The advocates of football for the feet were the first to take any decisive actions and in 1848 or 1849 a meeting was held at Cambridge attended by old boys from Eton, Harrow, Winchester, Rugby and Shrewsbury. A list of rules was drawn up and published as "The Cambridge Rules," but what they were, or what became of the printed rules, or whether they were ever put into action, is unknown The next attempt of which there is any record was made in 1862 when a set of rules was drawn up and published, with no known results In the meantime the number of clubs had increased, and Sheffield (1855), Blackheath (1857), Hallamshire (1857), Old Harrovians (1859), and the Forest F C (1860?), afterwards known as "The Wanderers," were among the earliest of any note In Oct 1863 another determined effort was made, and a code of rules was drawn up at Cambridge and published In the same month a meeting of representatives of the chief London and other clubs was held at the Freemasons' Tavern, Great Queen street, and the Football Association was formed The Blackheath club, which played the carrying game, was willing at first to join the new association, but when the rules were published on Dec 1, it protested against the omission of the permission to hack, and withdrew. Henceforth each party played in its own way

The Laws and the Off-side Rule.—When the laws of Association football were first published in 1863 they were recognized as good work, they were expressed clearly and so easy to understand But there was one law which, although it was easy to understand, was difficult to carry out This was the off-side rule, which from 1866 to 1926 read as follows. "When a player plays the ball, or throws it in from touch, any player of the same side who at such moment of playing or throwing in, is nearer to his opponents' goal-line, is out of play, and may not touch the ball himself, nor in any way whatever interfere with an opponent, until the ball has been played, unless there are at such moment of playing or throwing in, at least three of his opponents nearer their own goal-line. A player is not out of play in the case of a corner kick, or when the ball is kicked off from goal, or when it has been last played by an opponent"

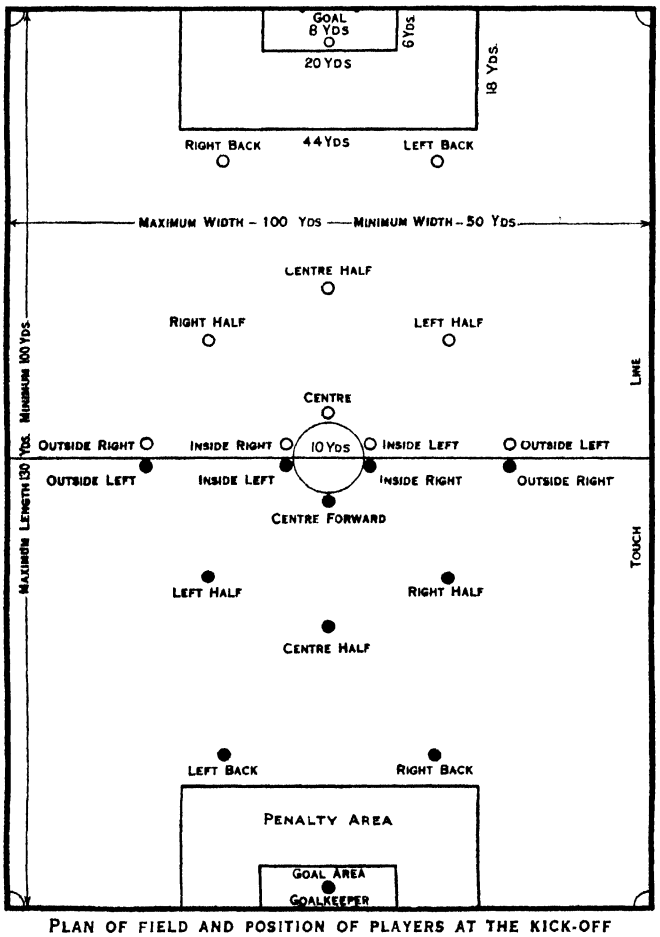
The difficulty of applying the law is concerned with the words "at such moment of playing or throwing in." Suppose a centre forward (A) has the ball at his feet at the half-way line, that the outside left (B) is behind the half-way line, and that seven or eight of the opposing side are in their own half, A now kicks the ball forward and high towards the left touch line; the attention of the players and probably the referee is naturally directed to the spot where the ball will drop. But just as it is about to fall B suddenly arrives, having rushed up, and takes the ball on with him, only two of the opposing side being now between him and the goal-line. B is obviously not off-side, for when the ball was kicked by A he was behind the kicker But from the crowd would come

a vociferous shout of "off-side!" and it was not unlikely the referee would blow his whistle This difficulty of seeing exactly where each forward is placed at the moment of kicking has been the cause of endless disputes, but if there is an off-side law at all there must always be this difficulty, which may easily be exaggerated A player could not (in 1928) be off-side in his own half of the ground, but may as before be off-side unless there are at least two opponents between him and the goal-line. But the difficulty of application has only been altered, not removed.

For a few years after the World War there was often consternation among the forwards when the opposing side played the "one-back" game That is to say, one of the two backs would suddenly advance and place a forward off-side The manoeuvre was exploited with great success by McCracken, an Irishman playing for one of the Football League clubs, but it gradually died out Many forwards learned that by passing back they could easily outwit the "one-back" method Most of the other laws have been slightly altered as the years have gone by, and the law as to throwing in from touch has been changed several times At one period the thrower need use but one hand, and strong men like William Gunn and George Brann could throw it in this way as far as a man could kick

THE GAME AND ITS GREAT PLAYERS

There can be no doubt that one of the chief reasons why the Association game is so popular is that although in its highest



PLAN OF FIELD AND POSITION OF PLAYERS AT THE KICK-OFF

form it gives scope for an immense amount of skill, it can be played and thoroughly enjoyed by those who have hardly any skill at all Another excellent reason is that a spectator who has hitherto never seen a game of football can in a few minutes follow the progress of the game with ease and understanding To learn the rudiments of the game is a matter of a few minutes With the aid of the accompanying plan a would-be spectator or player can see how the different players are standing just before the game begins. When the ball is kicked off from the centre by the centre-forward of one side, he generally pushes it gently forward in such a way that his inside left or inside right may get to it first. Whether he or one of the opposing side gets it, the game is in progress, and resolves itself into a continued struggle between the two sides for the possession of the ball. In a general way the players will keep their relative positions wherever the ball may be, so that there is not the same difficulty in following their movements as there is in the Rugby game, in which, to the uninitiated spectator, the players may in a few minutes seem hopelessly mixed up In the Association game the attacking force, the forwards, pass the ball to each other until the defending force of the other side, the half-backs and backs, take it away from them and give their own forwards a chance to attack But except on the rarest occasions there is no confusion, and each player should be found in his proper position The skill shown by the forwards in passing the ball to each other, and by the half-backs and backs in taking the ball from them and passing to their own forwards, is a continual feast of pleasure to the spectators; sometimes this skill is lacking when the forwards have a chance of kicking a goal

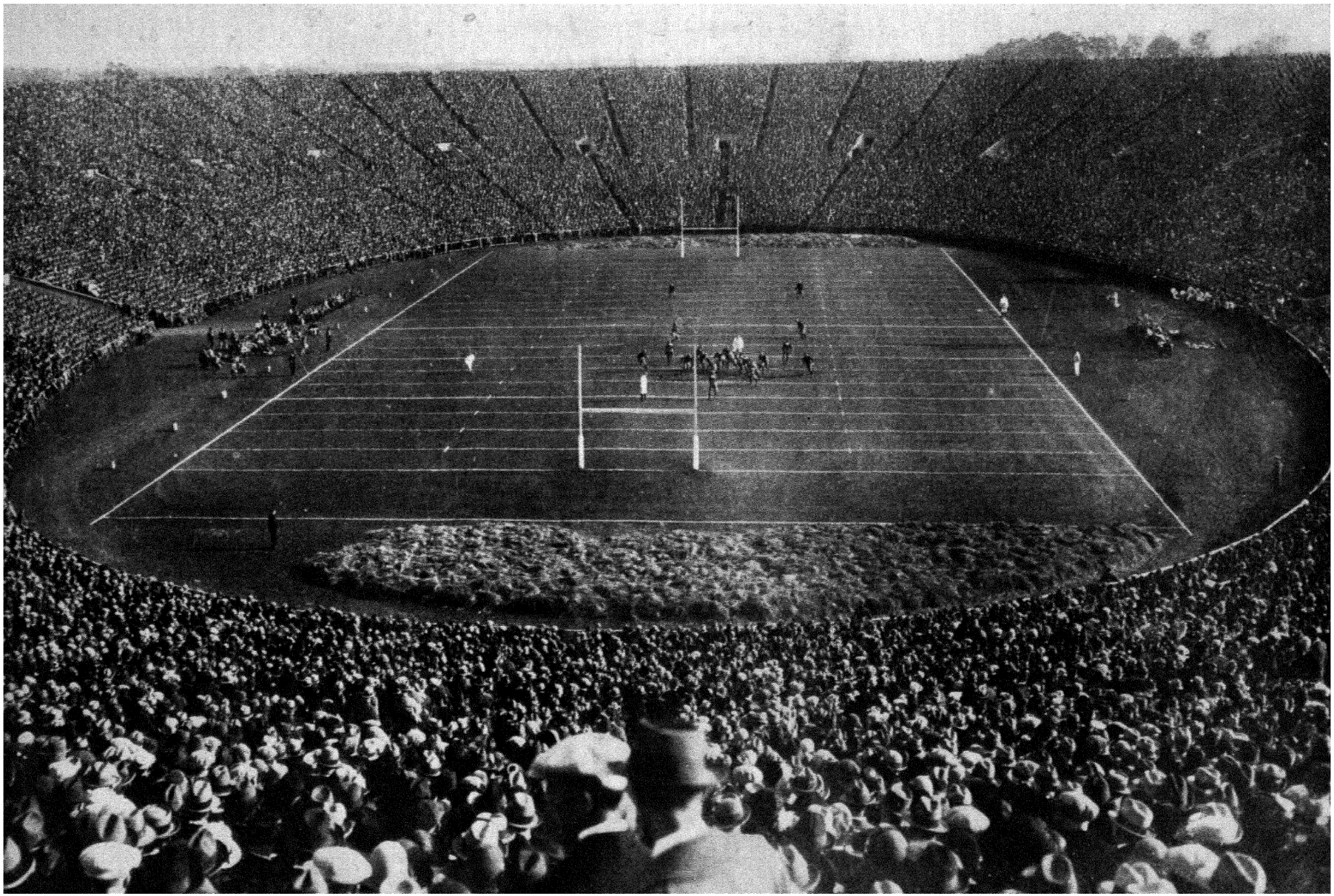
The Dribbling Period.—In the years which immediately followed the formation of the Football Association, the forwards, as an attacking force, concerned themselves very little with passing; they made progress chiefly by keeping the ball close to their feet and dribbling it, often at a great pace, round one defender after another, until it was taken away from them It might seem to-day that the backs and half-backs would have a very easy time if dribbling were the only means of progression, but some of the old dribblers were so quick in their movements, so clever and so elusive, that the task of stopping them was anything but easy.

In estimating the position held in the football world by a player who is gone, it must be remembered that whereas a cricketer leaves behind him invaluable records in the way of scores or analyses, a footballer leaves nothing but his memory He can only be judged by the men of his own time, and their opinions often differ widely. Hence in attempting to give the names of the greatest players of their time it is only possible to pick out men who were generally regarded by their contemporaries as being in the very first rank—there can be no finality and no unanimity The Association game, moreover, by its very nature does not give the same scope as Rugby for a player to force himself clear above all his contemporaries, but it produces many great players of about equal ability

The Years of Passing and Dribbling—First Period.—Many people think that the years between 1880 and 1896 were the palmy days of Association football

The forward play was very good, and by its very excellence produced good defenders The old dribbling forwards still playing had become experts in passing, but at that time men passed only when they thought a comrade was in a better position to take the ball, or had a better chance of scoring: they did not neglect the art of dribbling. Old players can still feel a thrill when they remember the glad shout of the spectators, "He's off," when William Gunn (Notts), George Brann (Ardingly and Swifts and the Sussex cricketer) or W I. Bassett (West Bromwich Albion) on the right wing, or W. J. Townley (Blackburn Rovers) on the left wing, received the ball near his own goal and sprinted up the line, apparently with quite a straight run, but in reality dodging with the greatest cleverness. The defenders never knew what they might do with the ball, for they might pass it when half way up the ground, or go straight to the corner and then centre just in front of the goal. Nor will old players ever forget the long, elusive runs and deft passes of W. N. Cobbold (Charterhouse and Cambridge), whose contemporaries are agreed that he was the very best forward the game had so far produced. At inside left he was magnificent as a dribbler, being very elusive and very fast, getting into his pace at once. Above all, he had the instinct of knowing when to shoot at goal, and the ability to turn the instinct to good account.

The Second Period.—At the beginning of the '90s, passing had become something like an exact science, and dribbling was



PHOTOGRAPH INTERNATIONAL NEWSREEL

THE YALE BOWL

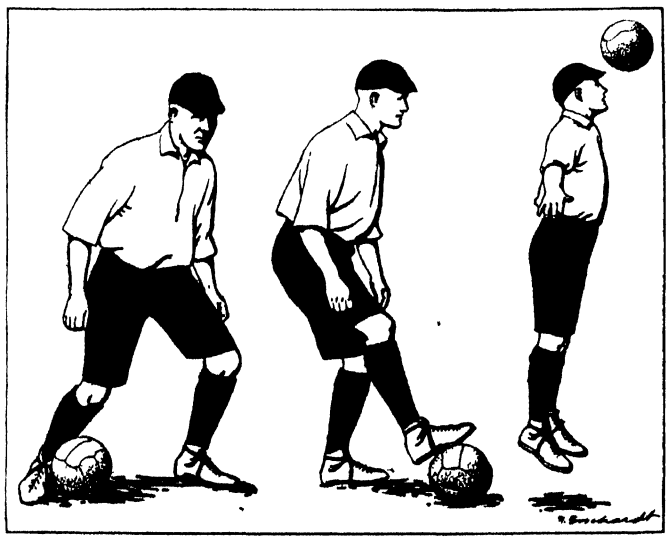
The Army-Yale game, 1924, played in the Yale bowl, New Haven; score 7–7 The actual seating capacity of the Bowl, not including extra seats, is 74,786

not so frequently practised. The consequence was that there were fewer opportunities for special distinction, and outstanding players became less numerous.

But this was a period of great levelling up from below and levelling down from above, and although there were many very fine forwards most of them just missed greatness.

The Age of Levelling.—In the next 20 years before the World War there was more levelling up and levelling down; the first-class game had become so scientific that there were fewer and fewer opportunities for special distinction. To mention the names of the greatest players of this period would practically be to give a list of half the men in the teams of the Corinthians and the chief leagues Already passing was becoming a fetish, and many forwards, finding themselves in such a position that they had the glorious opportunity to shoot, were afraid to take the responsibility, and passed to a comrade simply because they were anxious to get rid of the ball But there were still men who, by reason of their personality or special skill, were able to stand out among their fellows.

After the World War.—During the World War men played football in the army in their intervals of rest, but naturally, not being able to get first-class practice, they fell off in skill, just as men did in cricket and all other games Ever since then, all the great leagues have been straining every nerve, and spending large sums of money in trying to find satisfactory centre-forwards, but although every now and then the right man seemed to have been discovered, he usually fell off in his play after a few matches It was the same with men in other positions; they sometimes did so well for a time that the greatest hopes were raised, but in a short time the hopes were disappointed; either they were injured or their great skill seemed to leave them A tendency developed for every player, whether he was a back or half-back or a forward, to part with the ball at once, even if he was in a much better position than any of his comrades to go on with it himself This resulted in much fascinating play in mid-field, but when the ball was near the goal these tactics were fated not to succeed Heading the ball, which in the early days of the game was seldom practised, has become so general and produces so little



TRAPPING WITH INSIDE OF FOOT AND LEG (LEFT), TRAPPING WITH SOLE OF FOOT (CENTRE), HEADING WITH FRONT OF HEAD (RIGHT)

good result, that many footballers are beginning to think that it might be abolished Even if a man has a hard skull it cannot be good for him constantly to meet a ball with his head, however hard it may be kicked or however heavy through wet. Nor can a man possibly know, when he heads a ball, exactly where it will go, and as likely as not it goes to an opponent.

A glance at the list of internationals will always show how a game stands at any period in regard to outstanding players. If the names of several men appear time after time it does not follow that they are great players, or even the best; but it does follow that they were outstanding players of their time. If, as in the case of Association football since the World War, the names of players are constantly changing, it is a certain sign of the absence of outstanding players Everything since the war has tended to merge the individual in the team, and a list of the greatest players of the day would be a list of the men in the chief leagues in England, Scotland, Ireland and Wales To differentiate between them is a task which even selection committees seem to find nearly hopeless.

THE FOOTBALL ASSOCIATION

Ever since its formation in 1863, the Football Association has shown a talent for organization. In 1905 it turned itself into a limited liability company, although no dividends may be paid to the shareholders nor may the directors be paid for their services, and has managed its affairs with an ability which would have done credit to any great company.

In its early days the Association was not without its struggles against adversity Its rules were not generally adopted, and the newly formed Scottish Association would not allow the claim of the Football Association to be the lawmakers, and the Irish and Welsh associations insisted on certain rules of their own. Finally the Football Association, anxious to put the game on a perfectly sound basis, suggested that an International Board should be elected, consisting of two representatives each from England, Scotland, Ireland and Wales This proposal was adopted in 1882, and there has been complete peace since then After the legalization of professionalism, the Football Association settled down to its task of reorganizing the game, rendered necessary by the admission of professionals, and since then it has had no trouble except a few disagreements with the professional leagues, which were always increasing in power Until 1886 Mr. C. W. Alcock was honorary secretary of the Football Association, and he was then made secretary He retained the office until he retired in 1895, when he was succeeded by Mr F J Wall, who had been honorary secretary of the Middlesex Association.

The Football Association Cup.—The competition for this trophy, which was once stolen and replaced, has been the cause of much enthusiastic rivalry It began in a humble way in 1871, and the Scottish cup, instituted two years later, had many more entries for several years In the first year of the Football Association cup, the Wanderers were the winners, and there were only 15 entries Until the season 1882–83 the cup had always been won by a Southern club, but times were changing Although professionalism was illegal, the amateur status of some of the Northern clubs was so questionable that gradually the best Southern clubs began to drop out The cup was won in 1883 by the Blackburn Olympic club, and when two years later professionalism became legal, the big amateur clubs practically dropped out With the formation of the Football League, the competition for the cup so rapidly increased that in 1888 it was divided into two parts a qualifying competition and the competition proper As the years went by even the matches in the qualifying competition attracted spectators from all parts of the district. The matches in which the chief league clubs were concerned filled the grounds to their utmost capacity, and when the final began to be played at the Crystal Palace, the spectators sometimes mustered about 120,000 By the time that the final tie was transferred to Wembley the enthusiasm of the public had increased so much that for the first match many thousands had to be turned away The consequence was that the Association was compelled to take the hitherto unknown step of reserving the ground for the holders of special tickets, which have always been sold out long before the date of the match.

Success or failure means so much to the professional clubs that the actual players often become too much excited to be able to do themselves justice and "cup-tie" play has become a thing quite apart from play in ordinary matches Often the cup has been won by a team which in league games could make no headway at all, but by sheer rush and boldness could force itself through the numerous, preliminary and grimly-fought rounds of the cup competition.

The Cup Winners.—Up to 1928 the cup had been won six times by Aston Villa and Blackburn Rovers, five times by Wanderers (amateur), four times by Sheffield United, twice by Old Etonians (amateur), West Bromwich Albion, Bury, Sheffield Wednesday, Tottenham Hotspur, Wolverhampton Wanderers, Newcastle United and Bolton Wanderers, and once by Oxford University (amateur), Royal Engineers (amateur), Clapham Rovers (amateur), Old Carthusians (amateur), Blackburn Olympic, Preston North End, Notts County, Nottingham Forest, Manchester City, Exeter, Manchester United, Bradford City, Barnsley, Burnley, Huddersfield Town and Cardiff City Amateur clubs won the cup between 1872 and 1885, since then the winners have been professional clubs

THE FOOTBALL LEAGUES

When, in 1888, Mr William McGregor, known afterwards as the "Father of the League," wrote a letter to certain clubs suggesting that they should band themselves together and arrange to play out-and-home matches with each other, he cannot even have dreamed that the seed which he had sown would produce so prolific a crop Twelve of the clubs agreed, formed themselves into the Football League, and for some years became a sort of close corporation The success of the new league was so great that a second league was formed in 1892, consisting of 12 clubs, the number of the parent league being increased to 16 A southern league was formed which, after a chequered existence, asked in 1920 to be admitted to partnership as a third division, and in the following year a northern section of the third division was formed In 1927 each of the four sections comprised 22 clubs. Various systems of promotion and relegation have been tried, with the result that in 1927 Blackburn Rovers, Aston Villa and Everton were the only clubs which had always kept their places in the first division Frequent alterations have been made in the payment of players, in the arrangements for transferring them, and in the rules for the conduct of the leagues In the early days of these organizations most of the teams included local players, but in the process of time the constant rearrangement of the teams resulting from transfers and importation, brought about many kaleidoscopic changes Most of the leagues and other professional clubs have formed themselves into limited liability companies, but the directors are not paid, and the shareholders may not receive a larger dividend than 5%

THE AMATEUR FOOTBALL ASSOCIATION

When a large number of the amateur clubs, including nearly all the old boys' clubs, seceded from the Football Association in 1907, they unwisely retained the old name with the addition of the word "amateur," thus beginning their new career by causing confusion They instituted an Amateur Football Association cup on the lines of the already famous Football Association cup, but the Football Association promptly replied by taking a much greater interest in their own amateur cup The result was that footballers at large refused to take the trouble to differentiate between the Amateur Football Association cup and the Football Association Amateur cup The new association abolished the penalty kick, which most amateur players so much disliked; but very little headway was made, partly because the committee did not understand the use of advertisement, partly because there was no sort of punctuality in beginning the matches, and partly because the actual position was never properly realized. There seemed at first no reason why the new association should not become as powerful an organization as the Rugby Union, but the position of the two bodies was not the same. When the Rugby Union began its career its clubs were few, and the great players had to be discovered, whereas the A F.A. had many clubs with the best players already well known What happened was that the greater players, being all members of the Corinthian football club, had no strong opposition to meet, and they soon desired to meet the professionals again. In 1914 the Amateur Football Association and its clubs returned to the Football Association, but still retained its title and its own cup Times had changed, and the separatists found that they were not on the old footing. Their best players had been deteriorating, and the league clubs opposed to them were generally content to put reserve teams in the field against them By slow degrees their players were eliminated from the International teams, and by 1927 these were practically confined to professionals The Amateur Association also found that when public school after public school began to play Rugby, there was always increasing difficulty in obtaining recruits for the universities and the old boys' clubs; and as, by the terms of readmission they were not allowed to recruit from the amateur clubs already belonging to the Football Association, the teams became weaker every year. In 1927 an arrangement was made by which they might recruit from certain other clubs.

The Corinthians.—When the professional clubs had become so strong and their players so well trained that the untrained amateurs had no chance at all of beating them, the amateur clubs dropped out of the association cup But there were some great players among the amateurs, and they very naturally regretted their want of opportunity to try their strength against professionals In 1882 the idea occurred to N. L. Jackson, who was then honorary secretary of the London Association and assistant honorary secretary of the Football Association, that if a club was formed to include only the very best of the amateurs it would not only enable the great amateur players to meet professional opponents, but would help towards combination in international matches A meeting was convened at which the Corinthians came into being, and in the second year of the new club N L. Jackson became its honorary secretary, an office which he held until 1898 The new club quickly became so popular that the professional clubs were glad to arrange matches with it The result was interesting and scrupulously fair football, it became even a rare thing for the referee to blow his whistle—in many of the Corinthians' matches against the professionals the whistle would be heard no more than half a dozen times during the game including the "kick-off," "half-time," and "time" So long as Jackson directed the fortunes of the club it flourished greatly but when he retired it began slowly to lose ground It had a great opportunity of reviving its former greatness when it seceded from the Football Association with the other amateur teams and joined the Amateur Football Association If it had followed the example of the M C C and had been content to be a missionary club, sending out well-chosen teams to all parts, and not caring overmuch whether victory or defeat was the result, the matches would have had an immense educational value Unfortunately this method was not adopted, and the Corinthians gained a series of bloodless victories which were of no use to them or to anybody else On the return of the amateurs to the Football Association, the Corinthians resumed their matches with the League clubs, but their glory had departed, and the leagues seldom put their strongest teams in the field From the earliest days of the club the Corinthians had resolutely refused to enter for any competition, except for the Sheriff of London's shield; but apparently in hope of regaining their old supremacy, they entered for the Football Association cup in 1922. They were exempted from preliminary matches, but in 1927–28 results were not satisfactory

Association Overseas.—At the beginning of the 20th century Association football was more or less confined to Great Britain and Ireland, but since then and more especially since the World War, it has made so great an advance abroad that it would be difficult to name a country where it is not played. It is becoming almost as popular in France, Holland, Belgium and Germany as it is in England. It is rapidly gaining a foothold in Spain, Portugal and Italy; it is making great progress in the United States where it is already holding its own with baseball; it is popular in Canada, South Africa and Australia; it is played in Japan and Egypt; and the most remote outposts of the British empire have their clubs. There are associations and federations and leagues overseas, but in some of the countries the ideas of the authorities as to what constitutes an amateur are distinctly hazy

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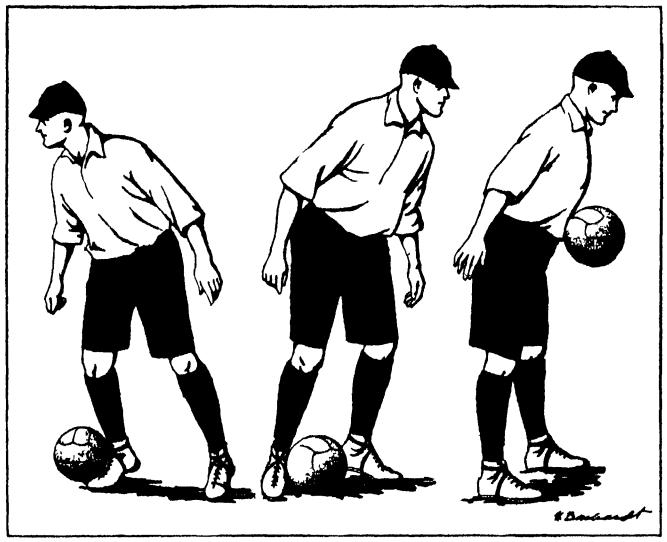
UNITED STATES

Association football (soccer) of a kind has been played under varying conditions of popularity in the eastern United States since colonial days. Although at times it has been in danger of discontinuance because of lack of interest or greater interest in other games, it has shown a gradual increase in public favour From a contest under limited and ill-defined rules with an irregular number of players on a side, played occasionally by towns-



PASSING WITH OUTSIDE OF FOOT (LEFT), PASSING WITH INSIDE OF FOOT (CENTRE), TRAPPING WITH THE BODY (RIGHT)

people or school boys, soccer has developed into a definite and well-codified game with a place among the leading sports of the eastern States Other parts of the country have been slower but no less sure in recognizing its merits It is estimated in 1928 that 75,000 individuals played soccer in the United States A great number of these were Europeans employed by industrial companies and professional leagues or immigrants who played soccer previous to emigrating Strenuous efforts are being made to increase the popularity of soccer among the native youth of America.

With the exception of a brief period in the '50s and '60s, before Rugby was developed, soccer had not been generally regarded in the United States as a school and college game until about 1920 Its increased use by colleges and schools, however, is enhancing its popularity among non-scholastic and non-collegiate groups, particularly among city leagues, industrial leagues, composed largely of foreign-born players and occasional teams.

Collegiate Soccer.—As early as 1830 a sort of football was played between the classes in Harvard college, and by 1844 football was being played in a number of American colleges. It varied in different institutions and, strictly speaking, was neither Association football nor Rugby. In general characteristics it was closely related to the former, however, and in fact developed in a logical fashion into the Association game. During the '40s and '50s everything concerning the game was excessively informal There was no definite number of players, no special uniform was worn by the players, any available space relatively flat and open was utilized as a field, and the ball consisted of rubber or cloth, or perhaps a pig or beef bladder in its natural state or inserted within a covering. Rules were practically non-existent. By 1860 a dozen colleges along the Atlantic seaboard were playing Association football regularly (no inter-collegiate contests as yet) and the game had become somewhat uniform in its standards of play On Nov. 6, 1869, the first inter-collegiate contest was played at New Brunswick between Rutgers college and Princeton college. It was essentially Association football. Stimulated by this introduction of inter-collegiate matches, the game was popular for the following six or eight years. Each of the colleges, Princeton, Rutgers, Columbia, Yale, University of Pennsylvania, Harvard, Haverford, Stevens, New York university and the College of the City of New York, as opportunity afforded, arranged one or more inter-collegiate games unless prohibited—as Yale and Harvard were in 1871. For each contest a compromise was necessary, since each college had its own code of play Delays were frequent. About 1874 Harvard began to favour the Rugby game. Other colleges soon did likewise, and by 1877–78 Rugby football, which was fast making strides toward the modern brand of the American game, replaced Association football as the official fall sport.

Association football did not entirely disappear from college campuses before the gains of its rival, Rugby, but the years 1877–1905 were a lean period for the game During 1904–05 interest was revived and enough inter-collegiate matches were played in the spring to decide a championship In 1914 the season was changed to autumn, as originally. For most of the academic year, however, the game is found on the campus, an extended period that gives opportunity to develop native players There is a larger percentage of foreign students on soccer teams than on teams in any other sport Since the World War a growing number of institutions have adopted soccer. Experienced ex-players have not been obtainable for coaching in sufficient numbers, with the result that many of the college teams—even occasionally successful teams—are being coached by men who know the game chiefly from a theoretical standpoint Consequently soccer in the colleges generally is not played with the same finesse as in Europe.

It is significant, however, that an increasing number of colleges and universities are giving soccer a permanent place on their intramural and inter-collegiate programmes from year to year. The quality of playing is improving quite naturally as boys who have learned the game in secondary schools enter the colleges In 1926 32 or more institutions played inter-collegiate soccer matches with four to eight games on a schedule, making a total of approximately 150 contests. In addition these institutions and some 30 others play intra-mural matches The number playing at any one institution ranges from 15 at a very small college where the sport is new to 750 at a large university like that of Pennsylvania or Ohio State. Slight changes and adaptations of the rules by colleges (the use of substitutes, four quarter-periods, goal judges, offside rule, providing two defenders instead of three) are not looked upon with favour by non-collegiate officials Association football is also being adapted for women at a few colleges and universities.

In general, Association football among colleges in the United States is strongest in the East, making fair headway in the Middle West and on the Pacific coast, and being introduced in the South. While at the University of Pennsylvania and Dartmouth college it has been given the standing of a "major" sport, at most institutions it remains in the "minor" sports class Until this handicap is removed, soccer can not come fully into its own as a college game.

Non-collegiate Soccer.—Practically all soccer associations, clubs, leagues and competitions in the United States whether amateur or professional are affiliated with and controlled by the U S Football Association, Inc. This association, which also regulates international competition through its affiliation with the Federation Internationale de Football Association, was incorporated April 5, 1913, as an outgrowth of the revived interest in soccer in America, the need for international affiliation, and the progress of the game during the previous decade Prominent among the regional associations which had already existed was the American Football Association, organized in 1884 and reorganized in 1906. The U S F.A. sponsors the organization of city, county, and district leagues and State associations the country over Approximately 20 State associations have been organized and more than 1,000 clubs are playing A large proportion of these are in and around centres with a prominent foreign-born population. The association stimulates competition through the National Challenge Cup Competition which it has conducted annually since 1913. Entries are permitted from all clubs under the jurisdiction of the association either by direct or indirect affiliation. In the 1926–27 contest, 124 teams participated Total attendance at these matches has reached as high as 172,000 in one year Rounds commence as early as October and extend to the grand finals in late spring Since 1922–23 an amateur cup competition has also been conducted by the association. In 1926–27 57 teams entered General

public interest which has been relatively small is increasing

Professional soccer in the United States began in 1918 with the organization of the Bethlehem team Practically all the players were Europeans. Since that time the same practice has been followed, so that few of the men playing on professional teams are native Americans The professional organizations are privately owned but controlled by the U S F.A. Approximately 215 of the 2,000 registered players are employed by the American Soccer League comprising 10 leading teams in the East.

In public and private high schools soccer is notably popular in a few sections and is gaining acceptance consistently in many others In New York city and Philadelphia schools the game is officially encouraged. Rugby is prohibited in State high schools of Maryland while soccer has been made a "major" sport in that State. The Playground Athletic League in Baltimore has had as many as 372 teams playing in one season. In the District of Columbia Municipal League the numbers participating doubled from 1925–26 to 1926–27 At the tournament held by the University of Pennsylvania 12 teams competed. In Michigan, and more particularly in Detroit, soccer among boys of school age is popular Eighteen schools competed in the Tulsa (Oklahoma) league Chicago, St Louis, Cleveland and other large cities are sponsoring soccer among school boys Over a great portion of the country, however, the game has not been introduced or has not as yet gained foothold

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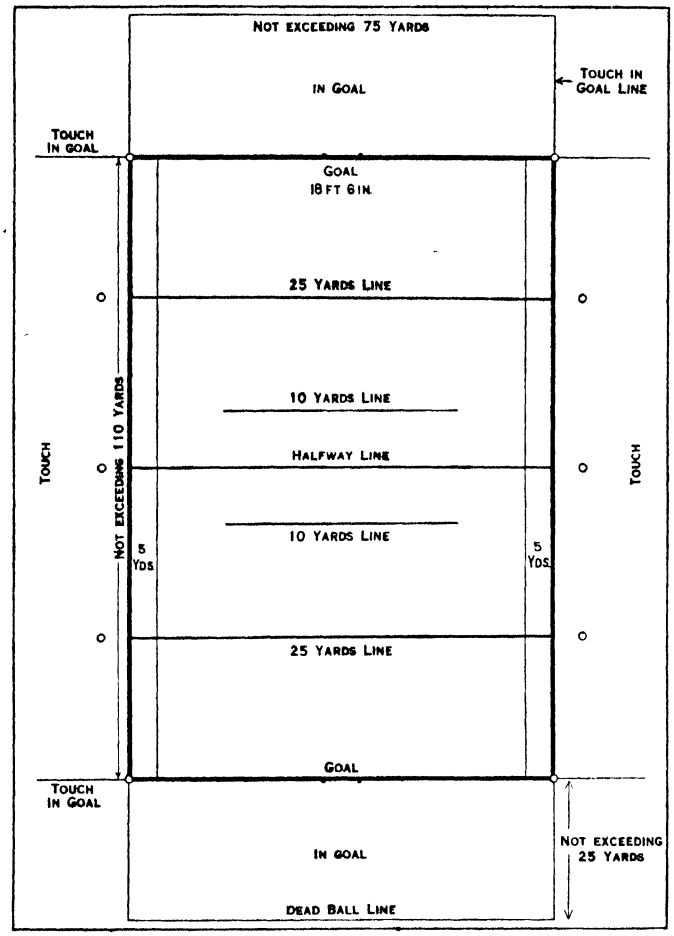
FOOTBALL, RUGBY. From the first there were two distinct camps among football players—those who preferred to use only their feet, and those who used both hands and feet—and, for some reason which no one seems to know, the Rugby school game gained more adherents than any other among those who favoured the handling of the ball A Rugby boy named William Webb Ellis is said to have been the first player to catch the ball and run with it, thus originating the distinctive feature of the Rugby game. This was in 1823; but it was not until the '60s that the game began to be taken seriously by clubs Two of the first to do so were Blackheath, in 1862, and Richmond, in 1863 In the next few years many more new clubs sprang into existence, including the Oxford university club, in 1869, and the Cambridge university club, in 1872, in which year matches between the two universities were begun In Jan 1871, 17 clubs and three schools met and formed a governing body under the title of the Rugby Union From this time the two games of Rugby and Association football went their separate ways, and were rendered the more distinctive by the fact that the Rugby players used an oval ball and the Association players a round one

THE GAME IN ITS INFANCY

The Early Scrummages.—In both character and methods the Rugby game has changed more completely from its original form than any other game In its earliest days the methods of play were based almost entirely on the traditions of the game at Rugby school, with its Bigside matches, in which anything from 40 to 100 or more players took part. Similar matches became popular in other schools, but it was customary in ordinary matches to play 20 a side Though the players of the time seem to have enjoyed the game immensely, it was undoubtedly a rough and tumble affair, with many features which would have prevented its development without drastic modifications It consisted mainly of fierce scrummaging, in which the bulk of the players would be locked and wedged together, in a heaving mass, sometimes for ten minutes or more at a time, struggling and kicking for a ball which most of them could not see. Often these scrummages would be continued long after a player outside the scrummage had run off with the ball; or sometimes the ball would eventually be found lying perfectly still a yard or so away. But one great principle animated the players—that it was immaterial if, in kicking for the ball, they kicked their opponents' shins.

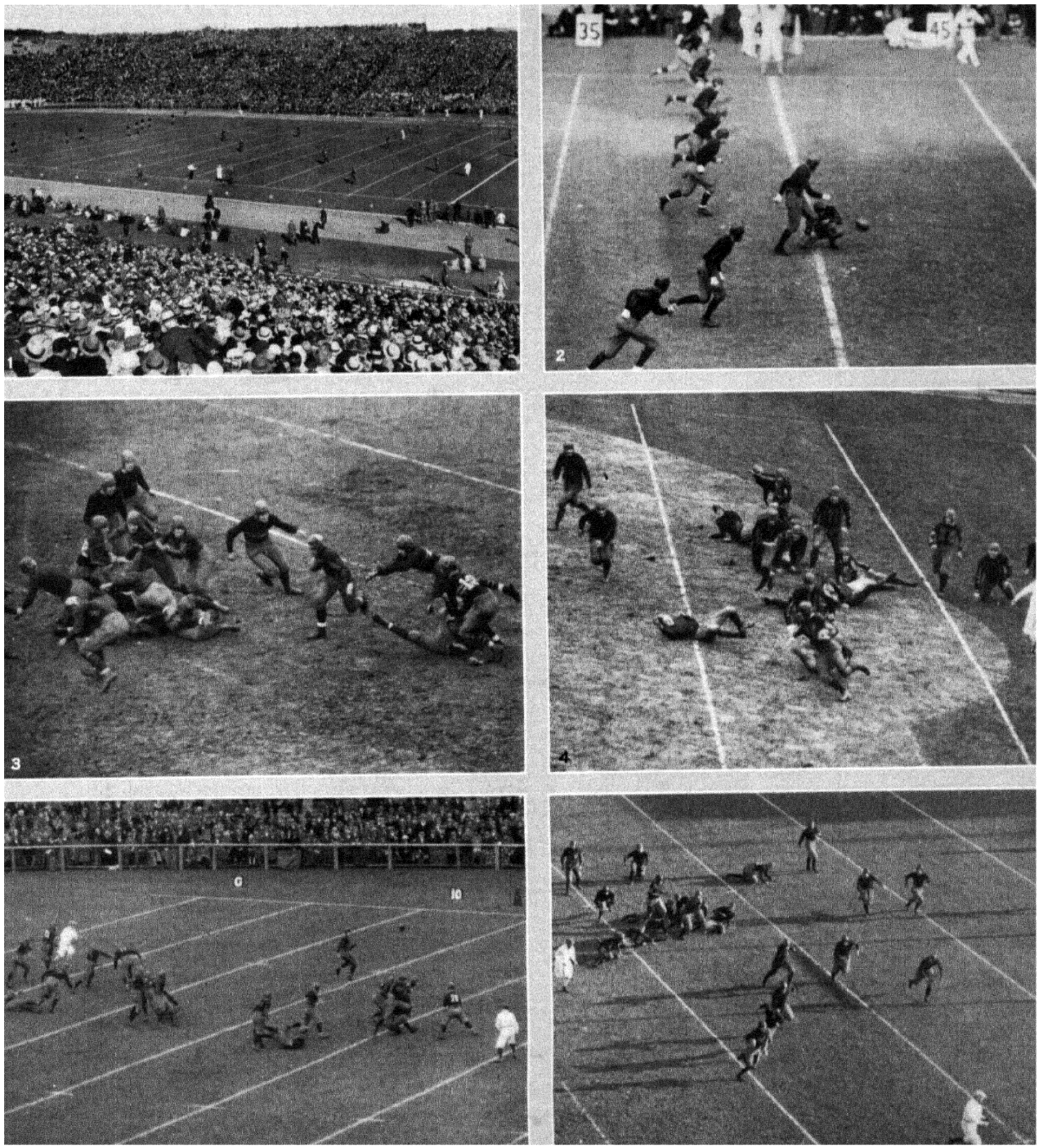
Hacking and Mauling.—From accidental kicking of this kind it was a natural step to intentional kicking, or hacking as it was called, and a player who could not give and take hacks was not considered worth his salt Hacking developed into a deliberate means of forcing a way through the opposition, and kicking the shins of a player when running—known as "hacking over"—became a recognized feature of the play. An old Rugbeian, the late A G Guillemard, who assisted in the foundation of the Rugby Union, related how he once saw the crack "hack" of the Woolwich Academy team, then noted for its fierce forward play, come through the scrummage and finish off his triumphal progress by kicking a half-back clean off his legs Another curious feature of the game at that time and for many years afterwards was the maul-in-goal. This occurred when a player with the ball was tackled over the goal line The tackler and the tackled player would then engage in a sort of private wrestling match for possession of the ball, while the rest of the players in both teams became merely interested spectators It was not uncommon to see the two men lying on the ground, locked in deadly grips, motionless sometimes for several minutes until one of them gave a sudden heave, which might only alter their positions a little. On the initiative of the Richmond club, most other clubs in the London area abandoned hacking by mutual consent after 1866, and when the Rugby Union drew up its first laws in 1871, the practice was made illegal



FIELD OF PLAY IN RUGBY FOOTBALL, SHOWING DIVISIONS AND GOALS

THE GAME ESTABLISHED

Fifteen a Side.—The new laws did much towards improving the general tone of the game, but the dawn of the modern game really broke with the general reduction in the number of players from 20 a side to 15 a side. The universities first adopted the change in 1875, and in the following year it was introduced into international matches. From that time the game became more and more open and interesting in character, players began to



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PLAYS FROM UNIVERSITY GAMES IN THE UNITED STATES

1 General view of the field and grandstand at the Navy-Notre Dame game, 1927, at Baltimore, Maryland The photograph, taken immediately before the game opened, shows the teams in their respective positions for the kick-off

2 The Army-Navy game, 1927, Polo Grounds, New York City Murell of the Army making the kick-off The Army eleven in line, in tense playing position, ready to follow the ball

3 The Army-Navy game 1925, Polo Grounds, New York City, played before 70,000 spectators Banks of the Navy is shown in early part of game, plunging through the line for a gain of 23 yds.

4 Washington and Jefferson versus Lafayette, 1925, Polo Grounds, New York City Millman, right half-back for Lafayette, is shown running the ball around left end for a 9 yd gain

5 Princeton-Yale game, 1925, at the Yale Bowl, New Haven, witnessed by 78,000 spectators Allen of Yale throwing forward pass to Kline, which made possible a touch-down for Yale

6 Princeton-Harvard game, 1926, at Cambridge Caulkins Princeton quarter-back is shown going around left end, after a triple pass, for the only touch-down of the entire game

realize the value of team work, and new methods developed rapidly. Instead of pushing blindly in the scrummages, standing upright to form the tighter mass, forwards began to push with their heads down so that they could see the ball, and to develop skill in controlling it and breaking away with it Forwards were no longer chosen entirely for their weight and strength, but also for their ability to dribble the ball and to combine in concerted tactics.

Wheeling and Heeling Out.—Of these tactics wheeling or screwing the scrummage, so as the better to start a concerted rush, became a prominent feature Some of the old players were frankly disgusted at this manoeuvre For instance, Mr Arthur Budd, a great forward of his day, wrote contemptuously of "a forest of legs scraping for possession of the ball," and characterized the proceeding as "extremely unfair" Nevertheless wheeling became recognized as a skilful and effective part of the game, and there was no more thrilling sight than a pack of well-trained forwards wheeling the scrummage and breaking away with the ball in a rush Dribbling developed into a high art, and it was wonderful to see men like the brothers E T and C Gurdon, of the Richmond club, two of the greatest forwards of their day, break away with the ball at their feet and steer it past opponent after opponent

When the practice of heeling the ball out of the scrummage to the backs first appeared, it met with just as severe condemnation from old players as wheeling had done Mr Budd referred to it as a "canker-worm of work," and wrote in the Rev F Marshall's classical book on the game. "You can bet your bottom dollar that a team who habitually heel-out are no pushers Their sole anxiety is to get the ball to their half-backs, and the same miserable scraping goes on as in wheeling" Mr Budd's indignation may be the better understood when it is remembered that at one time it was regarded as exceedingly bad form, almost unfair in fact, to heel the ball out of a scrummage even if the players were in such a position that a certain score would have resulted from it But other times, other manners To-day Mr. Budd's "miserable scraping" for the ball is recognized as a highly specialized job, known as hooking and a clever hooker is invaluable

Developments in Back Play.—New forward tactics brought with them new methods among the backs Hitherto their functions had been chiefly those of defence, and for many years it was customary to play two half-backs behind the scrummage, one three-quarter behind them, and two or three full-backs. To pass the ball was practically unknown, and regarded as a sign of "funk" in any player who attempted to do so When one of the backs happened to secure the ball he either kicked it or tucked it under his arm and ran and dodged until he was brought down and forcibly compelled to part with it With the development of more open play by the forwards, the backs found themselves with more work to do and fewer opportunities for individual efforts The activities of the half-backs in particular became more and more hampered by the opposing forwards, and the position of three-quarter-back became of increasing importance. It was soon found an advantage to play two three-quarters instead of one, and one of the full-backs was accordingly transferred to that position.

The Inception of Passing.—Although the backs handled the ball more than the forwards, it was, curiously enough, among the forwards that hand to hand passing first developed to any extent. The Blackheath club gave special attention to short passing by the forwards and achieved such success by it that public interest was aroused, and other players quickly followed their example. But it was left to the most famous of all university captains, H. Vassall, to show the real possibilities of passing among forwards. The Vassall era at Oxford was one of the outstanding periods of the game Himself a fine forward, he trained his men not only to exploit the short passing game, but to give and take long passes, and to combine in rapid team work. The results took most of their opponents by surprise, and in four seasons, from 1881, the Oxford team suffered only two defeats—both at the hands of Edinburgh university In the season 1882–83 the side scored 28 goals and 26 tries, and had only a goal and two tries scored against them Apart from their success in the development of new methods, the Oxford teams of that period contained some exceptionally talented players, and among them was Alan Rotherham, who proceeded to revolutionize half-back play just as Vassall had revolutionized forward play. It is claimed that passing by the half-backs had already been started in Scotland, but Rotherham was the first to demonstrate its great possibilities. He made the half-back a connecting link between the forwards and the three-quarters, and showed the possibility of a wide variation of tactics He demonstrated the great advantage of getting the three-quarters on the move before passing, and also of making openings for them, and it is not too much to say that on the methods he introduced, half-back play has ever since been modelled At about the same time as Rotherham was thus gaining fame, there appeared in the Bradford club team a player named Rawson Robertshaw, who extended Rotherham's methods still further by developing passing among the three-quarter-backs One of three brothers whose name became a household word in Yorkshire, he showed genius as a three-quarter. By that time the practice of playing three three-quarters, instead of two, had been generally adopted, and at centre three-quarter Robertshaw introduced passing to the outside men, and developed combined work with it in a way that gave players an entirely new conception of a three-quarter line as an attacking force. It was but a short step to the introduction of another player into the three-quarter line, with the idea of making it more effective, but curiously enough it was left to Welsh clubs to demonstrate its advantages before the three-quarters were universally increased to four players Indeed, some years elapsed before the Welshmen were able to perfect the four three-quarter game so as to show its real effectiveness Opinion in the other countries held out against it for some time on the ground that it meant weakening the forwards who were thereby reduced from nine to eight players

LATER DEVELOPMENTS

The Orthodox Formation.—There have been a few isolated variations in the formation of the players since then, but the orthodox arrangement of a fifteen has remained unaltered—that is, eight forwards, two half-backs, four three-quarter-backs and one full-back In New Zealand a formation consisting of seven forwards, two half-backs, two five-eighth-backs, three three-quarters, and a full-back was adopted, and visiting teams from the Dominion have shown remarkable skill in making use of the extra back A few clubs in England and Ireland followed their example, but have never been able to show definite superiority as a result, for it has been clearly demonstrated that seven forwards must be exceptionally good to hold their own against eight; and without that condition the extra back is generally useful only in defence Though the scrummage is not the dominating feature of the game that it used to be, the balance of power still remains with the forwards, and modern developments have chiefly centred in them A forward is expected to be able to take his share in practically every phase of the game, and without a doubt his is the most exacting work on the field. Of real scrummaging, as it was known to the old players, there is very little to be seen; but in their anxiety to obtain possession of the ball the forwards have had recourse to all sorts of manoeuvres of which their forbears never dreamed The normal formation of the eight forwards in a scrummage is in three rows—three players in the front, two in the second row, and three at the back The front three forwards on each side pack down shoulder against shoulder, with their heads tucked down so that they can see the ball as it is thrown between them by the scrummage half-back. The middle man in each front row is the hooker, who endeavours to sweep the ball back with his foot through the legs of those behind him. Now it is obvious that when three men pack down in this way against another three, one of the outside men on each side will have a disengaged shoulder, and that the middle men will not be directly opposite to each other. The half-back who puts the ball in will naturally choose, if possible, to put it in on that side of the scrummage on which his own forward has the disengaged shoulder, since the middle man will then be a little

nearer than his opposite number, and will thus have the first chance of hooking the ball—the outside men being debarred from doing so

Wing Forwards.—One forward development which has had a large influence on the game all round is what is known as wing forward play This concerns mainly the back row players in the scrummage Briefly, it means that these players must break

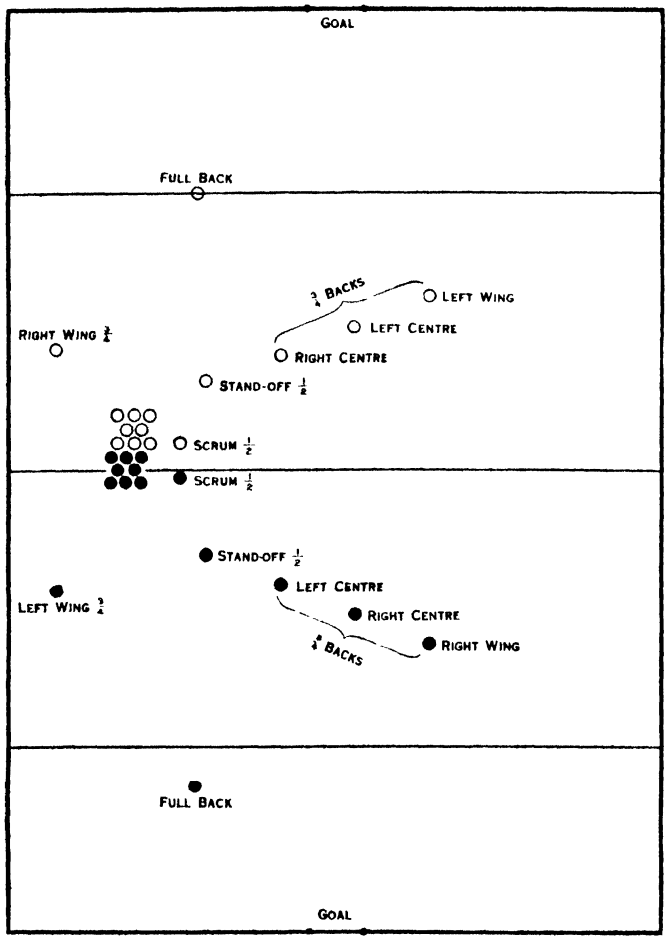

DIAGRAM SHOWING PLAYERS IN THE FIELD IN POSITION FOR A SCRUMMAGE

very quickly from the scrummage and, if their opponents get the ball, rush on the opposing backs to nip any possible attack in the bud, if their own side get the ball they are expected to follow up to support the backs in passing In most teams players are now specially chosen as wing forwards for their ability to break away quickly, and at the right moment, and for their instinct to see at once where they are likely to be of most use in open play The New Zealand team which visited Great Britain in 1905 demonstrated the possibilities of wing forward play. Their captain, David Gallagher, used as a rule to take no part in the scrummage, but stood outside it, ready to go in any direction as the ball was gained or lost by his forwards Though the idea and principles of wing forward play were then entirely unknown in England, Gallagher prophesied that they would soon become established At first, like previous developments, the wing forward was anathematized as a curse to the game, but he has now been accepted as an inevitable consequence of the general tendency towards speeding up the play

THE LAWS

Until the formation of the Rugby Union in 1871 the Rugby school laws of the game were the only ones in existence, and they were so complicated that teams generally compromised and made rules of their own, so that when they played each other it was necessary for the captains to meet and agree as to how they should play. Even when the Rugby Union drew up a revised code of laws they were not properly understood by players for some time, and though many modifications and alterations have since been made, complete uniformity in interpretation has so far never been attained The Rugby Union produced an entire re-draft of the laws in 1926, but the new form did very little to simplify them.

The Field of Play.—A plan is here given showing the dimensions of the field of play and the method of marking it out; and though it looks complicated, it is really very simple The ten yards line, for instance, concerns only the kick-off from the middle of the field, which takes place at the beginning of the game and after every score The ball must be kicked as far as or beyond the ten yards line, and none of the opposing side may advance over that line until the ball has been kicked The 25 yards line similarly has very little to do with the play, except when the ball has been made dead behind the goal line other than by means of a score. The defending side may then take a drop kick from any point behind the 25 yards line, and the opponents may not advance over the line The broken line marked five yards inside each touch line was introduced in 1926 in connection with an alteration in the laws providing that when the ball goes over the touch line it must be thrown in at least five yards The goal line is the most important line on the field, since a try may be scored anywhere in the area between it and the dead ball line The ball is in play in this area until a player touches it on the ground with his hand, or it is kicked over the dead ball line or the touch-in-goal lines On most big grounds the dead ball line is marked at the maximum distance of 25 yards behind the goal line, but it varies on some grounds which are not large enough to permit of the maximum distance being used There is no recognized height for the goal posts and they are found of various heights on different grounds When the United Services Rugby team was formed, and Lord Fisher, then First Lord of the Admiralty, was appealed to for support he is said to have replied, "Certainly, and the United Services shall have the tallest goal posts in England"—and he at once sent out an order for them to Portsmouth Dockyard It is an advantage to have the tallest possible posts, for as the ball may be kicked at any height over the cross-bar to score a goal, it is often difficult to judge a kick if the posts are short.

Points in the Game.—Though the play in detail is frequently very complicated, the game can be followed easily if one or two of the chief features are understood Two of the cardinal principles are that a player may never pass forward, and that, with certain reservations, he may take no part in the play while he is in front of the ball when it is being kicked or carried by one of his own side These rules sound simple enough, but in practice the second of them, which relates to off-side, is complicated by various provisions and conditions The enforcement of both rules depends solely on the opinion of the referee In most of the other rules of Rugby the referee has only to deal with plain questions of fact For certain deliberate infringements or unfair play, he may award a penalty kick to the opposing side; otherwise the game is resumed after an infringement by means of a set scrummage, the ball being put into the scrummage by the half-back on the non-offending side A player may be tackled only when in actual possession of the ball, and must then play the ball; he is considered to have been tackled only when he is so held that there is a moment when he cannot pass or play the ball

Kicking.—There are three distinct methods of kicking the Rugby ball—the place kick, the drop kick, and the punt. The place kick is a simple kick at the ball after it has been placed on the ground for the purpose It is used in kicking at goal after a try, and is generally employed in attempts to score from penalty kicks The drop kick is made by letting the ball fall from the hands to the ground and kicking it almost simultaneously, actually just as it is rising. A goal may be scored by the use of a drop kick from any part of the field during the play, and a drop is frequently used for penalty and free kicks The punt, or kick at the ball before it touches the ground, is used chiefly for kicking into touch. There was once a time when a deliberate kick into touch met with howls of derision from spectators, but it has

come to be one of the most applauded features of the Rugby game.

Scoring.—Many changes have been made from time to time in the methods of scoring in the Rugby game, but the goal kicked from a try has always been supreme At one time a match could not be won unless a goal was scored, no matter how many tries had been gained, since the basic significance of a try was that the side which obtained it had the privilege of "trying for a goal." The first change came in 1875, when it was ruled that if neither side had an advantage in goals, a match should be decided by a majority of tries This was still unsatisfactory, for one goal would still beat any number of tries In 1886 a system of scoring by points was introduced, and three tries were made equal to a goal. Five years later another change was made, two points being awarded for a try, and five for a goal, and in 1905 the present system was adopted, with scoring values as follows A try—3 points, a goal from a try (in which case the try does not count)—5 points, a dropped goal, other than from a free kick or penalty kick—4 points, a goal from a penalty kick—3 points, a goal from a "mark"—3 points The "mark" is the only occasion when a free kick, as distinct from a penalty kick, is given It may be claimed by any player who makes a fair catch either direct from an opponent's kick, or when the ball is knocked forward—or thrown forward by an opponent

THE GREAT PLAYERS

So many changes have taken place in the methods of play in the Rugby game that opinions are bound to differ widely as to the comparative merits of players who gained fame in their day Some of the older players shone perhaps with a special glamour because they were pioneers of new methods, and the players of one generation will nearly always champion their particular stars against all others All that can be done in this article is to indicate some of the most outstanding players of their times

Full-Backs.—By general consent two of the best full-backs the game has ever seen were H B Tristram and H T Gamlin It is impossible to compare them in any way, for Tristram played in the days when there were only three three-quarters, while Gamlin did not appear until four three-quarters were played and the game had changed a great deal Both were particularly noted for their deadly tackling, and Tristram is still remembered for the way in which he saved the game for England in 1887 by stopping the Herculean rush of W E Maclagan, the greatest Scottish three-quarter-back of that time, on the goal line Some of the old full-backs were wonderfully long kickers, and among those who excelled in this way were F J. Byrne, who played for England in the middle '90s, and W J Bancroft, the most famous of Welsh full-backs, who played in 33 international matches from 1890. Bancroft was a particularly fine drop kicker and an extremely clever player in every way One of the very safest of full-backs was A. R Smith, who played for Scotland from 1895 to 1900, and was an unusually fast runner Among more modern full-backs W. R Johnston, who played 16 times for England between 1910 and 1914, was undoubtedly a great back, who was hardly ever known to misfield the ball, even in its most greasy state. Since the war three fine full-backs have appeared in B S Cumberlege (England) who always inspired the players in front of him with complete confidence in everything he did, W E Crawford (Ireland), a player of unsurpassed brilliance in his day but not so consistent as Cumberlege, and D S Drysdale (Scotland), a clever player with very safe methods

Three-quarter-backs.—Among the earliest three-quarter-backs when the game became organized, Lennard Stokes, a younger brother of F Stokes, the first English captain, was both a great player and an outstanding personality in the game He began playing when teams had only one three-quarter and he saw the increase to two three-quarters, and then to three W E Maclagan, who made an equally great name in Scottish Rugby at that time, was tremendously strong and his tackling was a terror to opponents. Mr R. W. Irvine, who captained the Scottish team in his time, wrote "I would rather fall into the hands of any back in the three Kingdoms than into those of Maclagan" But the foremost attacking three-quarter of the '80s was undoubtedly A E Stoddart, the great cricketer Possessed of great speed, he had an extraordinary faculty for running through his opponents, who would seem hypnotized While Stoddart was playing for England, Wales produced A J. Gould, whose daring agility and versatility earned for him the soubriquet of "monkey", and hard on his heels came E Gwyn Nicholls, perhaps the most famous of Welsh three-quarters At that time the four three-quarter system had not long been adopted, and Nicholls was largely instrumental by his play at centre three-quarter in bringing it to a perfection that will long be remembered in Welsh Rugby. He was a player with a born instinct for making openings for his colleagues, and always seemed to do things a little quicker than any other player Between 1896 and 1906 Nicholls played in 24 international matches J E Raphael, who played for England from 1902–06, was a three-quarter who always kept his opponents wondering what he would do, for he had an instinct for making the best use of an opening and had a swooping, dodgy run which made him very difficult to tackle J G Birkett was another outstanding personality in English Rugby for many years in the early part of this century, and opponents always held him in great respect, for he had a fine physique, of which he knew how to make the best use in running and tackling Scotland had a player of conspicuous all-round ability in K. G MacLeod, and Ireland in Basil Maclear But the player who was most prominent for several years before the World War was R W Poulton-Palmer He was a great tactician and often won matches by daring strategy C N Lowe has been perhaps the most remarkable three-quarter since the World War, though he began playing for England in 1913 He must have been the lightest wing three-quarter in history for he never weighed more than 10st but he was very compactly built and could bring down much bigger players than himself because he timed his tackles so perfectly. He was a very elusive runner with a natural instinct for position. As a complete line the Scottish International three-quarters of 1924–25, I S Smith, G P. S Macpherson, A I Aitken, and A C Wallace, who all played for Oxford, stand out for their clever combination

Half-Backs.—The half-backs may well be considered in pairs, for although several players have shone individually, it is in partnerships that most of them have become famous Scotland and England had two remarkable pairs at about the same time in the '80s in A G Grant-Asher and A R Don Wauchope (Scotland) and Alan Rotherham and H T Twynam Wales has had two outstanding pairs in the brothers D and E James, who were extremely nippy, and were very clever in passing, and R. M. Owen and W J Trew, with Owen a master-hand at evolving surprise tactics Before them W H Gwynn was noted as the most scientific half-back of his day, and after them there was T H Vile, a diminutive but brainy player, who improved on many of Owen's methods Irishmen still think that Louis Magee, whose international career extended from 1895 to 1904, was the greatest half-back Ireland has ever had, but R A Lloyd, who played from 1910 to 1920, was a very good second. P. Munro, of Scotland, and A D Stoop made a great pair in the Harlequin team a few years before the war Stoop created new methods which revolutionized English half-back play, and had much to do with a revival of England's fortunes in international matches from 1910, when he first appeared But there can be no question that W. J. A Davies and C A Kershaw, who came together in the navy and England teams after the war, were players worthy to be compared with any of their predecessors With a lithe, compact physique, Davies always had the quickness of genius in seizing his chances, and was a most elusive runner. When he had the ball no one knew what he might do, and he would sometimes drop a goal from an apparently impossible position. Kershaw, a strongly-built player, was not only able to give a much longer and swifter pass out from the scrummage than most other players, which helped Davies enormously, but he was a player of brilliant originality.

Forwards.—Fifty years ago, when forward play was more largely a matter of weight and strength than it is to-day, there

were some terrific men in the game The two brothers E. T and C Gurdon, who stood out among English forwards for many years, were very muscular men, C Gurdon in particular having enormous strength C Reid, reckoned the "champion forward" of Scotland at about the same time, was another giant with great tackling powers, and J W Taylor, a great Irish forward, was of similar type, while there was no better example of the solid forwards of the '80s than C J B Marriott, who afterwards became known to every Rugby player as the secretary of the Rugby Union. In the '90s S M J Woods and F Mitchell were among the greatest forwards as well as the greatest cricketers of their time, as also was J Daniell in the early part of the present century No one could inspire and control a pack of forwards better than he did Among later forwards C H Pillman, who played for England from 1910 to 1914, earned distinction for the skill with which he developed wing forward play L G Brown, a very solidly-built player, who appeared for England both before and after the war, was a great leader as well as a player of conspicuous skill and judgment W W Wakefield has been easily the most outstanding forward since the war, both for his skill as a player and his genius as a leader Very sturdily built, he is a fine scrummager, but very fast in the open, and no player knows better than he how to put his full weight and strength into a rush for the goal line W F Browne is another exceptionally sturdy and fast forward who has been dominant in Irish Rugby in the last few years Among the players who have gained special distinction as wing forwards, H L Price has shown perhaps the truest instinct for the position, but A T Voyce has rivalled him very closely.

THE FOUR RUGBY UNIONS

How They Were Founded.—When the Rugby Union was formed in 1871 it received the support of both English and Scottish clubs, but the Scottish clubs had already become strong enough to challenge England to play an international match, which took place in Edinburgh in March 1871 Soon afterwards the Scottish clubs decided to form a ruling body of their own, and the Scottish Rugby Union was founded in 1873 Meanwhile the game had been making substantial headway in both Ireland and Wales, and Irish clubs began to make a move towards establishing a separate governing body The southern clubs put the idea into shape by forming the Irish Football Union in 1874 but the northern clubs resented their action and formed a rival North of Ireland Union in 1875 It was not until 1881 that they became reconciled, and founded the Irish Rugby Union The Welsh Rugby Union grew out of the South Wales Union, which was dissolved to give place to it in 1880

Disputes.—The code of laws drawn up by the Rugby Union was at first accepted by all the other unions, but in 1884 the Scottish Union disputed the validity of a try scored by England in the international match on a point of law, and as the two unions, after long correspondence, could not reach an agreement, Scotland declined to play England in the following year, 1885 Scotland challenged the right of the Rugby Union to be the sole interpreters of the laws, and when in 1886 the Rugby Union proposed to alter the method of scoring, disaffection spread to the other unions, who as a consequence withdrew from playing matches against England during the season 1887–88 A proposal was then made that the laws for international matches should be framed by an international board composed of an equal number of representatives from each union The Rugby Union had agreed to the formation of such a board to settle disputes only, but, as the parent body in the game, it could not agree to join the board on a basis of equal representation if it was to make the laws Eventually the Rugby Union offered to submit the matter to arbitration, and the other unions agreed The arbitrators were Lord Kingsburgh and Major Marindin who met in April 1890 and decided for the formation of an international board to control the laws and settle disputes in connection with international matches, with six representatives from England, and two each from Scotland, Ireland, and Wales Except that the Rugby Union's representation has been reduced to four members, the board has continued on the same basis ever since

The Fight Against Professionalism.—No sooner had the international difficulties been settled than the Rugby Union began to be seriously perturbed by the increase in the number of cases of professionalism which came to its notice. These emanated principally from the north, where the game had taken a hold among players of the working class, many of whom were being secretly compensated for time which, through playing, they lost at work In 1893 the matter came to a head at the general meeting of the Rugby Union, when the Yorkshire representatives put forward a motion "That players be allowed compensation for *bonâ fide* loss of time" The meeting was historic The amateur forces in the game rallied strongly to the support of the union, and the motion was defeated by 282 votes to 136 But the evil was only partially checked, and in order to quash it decisively the Rugby Union drew up a comprehensive code of laws as to professionalism which closed practically every loophole by which a player might receive any financial benefit from playing As a result, a number of clubs in the north resigned from the union, and formed the "Northern Football Union" which, at first admitting only payment for broken time, soon sanctioned outright professionalism In course of time the Northern Union adopted a different form of the game, with 13 players instead of 15, and a few years ago its name was changed to the "Rugby League"

International and County Matches.—Though England and Scotland were the first to begin playing international matches in 1871, Ireland very soon joined them, playing its first match against England in 1875, and against Scotland in 1877 Wales began to play matches against England in 1881, against Ireland in 1882, and against Scotland in 1883 In 1879 the Calcutta club, which had joined the Rugby Union four or five years previously, presented a handsome silver cup, known as the Calcutta cup, to be competed for annually by England and Scotland Though several other minor cup competitions exist among the clubs, the four unions have always discouraged them, as inimical to the best interests of the game

County matches began to be played by Yorkshire and Lancashire teams in 1870 Other counties soon joined in, and in 1890 the Rugby Union approved a system of grouping for a recognized championship competition

RUGBY OVERSEAS

France.—The Rugby game appears to have been started in France in the '70s, but for some years progress was very slow It began to make more headway in the '90s, and had become firmly enough established by the beginning of the present century for France to enter into international matches, which were begun against England in 1906, against Wales in 1908, against Ireland in 1909, and against Scotland in 1910 After the World War the game developed probably more rapidly in France than in any other country, and clubs sprang up all over the republic This is the more remarkable since French players, coming little into contact with clubs and players in Great Britain, had more or less to work out their own salvation in the game For years their ideas of scrummaging, in particular, were crude, and the first French teams in international matches suffered a series of most disheartening defeats In later years the play of French teams improved all round Among the clubs there has grown up an intense rivalry So far a real genius has yet to arise among French players, but some very good players have appeared, perhaps the most outstanding being A Cassayet, a fine forward, who played in 32 international matches from 1920 to 1927, and A Jaurréguy, who has been a conspicuous wing three-quarter during the same period

New Zealand.—The first Rugby match in New Zealand is reputed to have taken place at Auckland in the early '70s. The game made an instant appeal to football players, and in a few years it had become established in both the North and South Islands. It is regarded as the national game in New Zealand, and nowhere has more study been given to methods of play As early as 1888 a team composed principally of Maoris visited Great Britain and beat many of the leading clubs; and when, in 1905, the first representative New Zealand side came over, it

proved ahead of British teams, both in methods and skill, and won all its matches except one against Wales Its captain, D Gallagher, was the first to demonstrate the possibilities of wing forward play, and the general combination and cleverness of the whole team came as an eye-opener to British players Nineteen years later, in 1924, the second New Zealand team arrived in Great Britain and had an even greater triumph than the first, winning all its matches Again it proved ahead of British players in skill and tactics Its chief secrets of success were its versatility in exploiting varying forms of attack, and an intensive system of backing up, which scarcely ever left a loop-hole for a serious mistake But the team was also notable for a number of outstanding personalities among its players G Nepia was an exceptionally sound full back, strong in physique, a fearless tackler, and very safe in fielding and kicking In M Nicholls and A E Cooke, as five-eighths backs, the tactics of the side largely centred, and both were unusually gifted players, while M Brownlie and J Richardson were outstanding among the forwards, both for their size and skill In 1926 a Maori team visited France and Great Britain, and beat several of the strongest clubs, but it was naturally not so strong as the representative side

South Africa.—The Rugby game developed more slowly in South Africa than in New Zealand It appears to have grown up side by side with the Association game, and a hybrid form of football, embodying features of both games, was also played Largely as a missionary enterprise, to encourage the Rugby game, the Rugby Union sent a team to South Africa in 1891, and though the side won all its matches the South African players showed considerable skill Two more teams visited the country, in 1896 and 1903, before the first South African team came to Great Britain in 1906 In this team the brilliance of the backs came as a revelation to most players They had an exceptionally clever three-quarter line in J D Krige, H A De Villiers, A Stegmann, and J Loubser, and in A F Marsburg, a great full-back The forward play was not so well developed in South Africa at that time, but it improved vastly in the next few years, and when in 1912 another team came over to Great Britain the position was reversed, the forwards proving the strongest part of the side But the team had in G P Morkel another full-back worthy to rank with the great players, and in D F T Morkel a forward with extraordinary skill as a place kicker

The Australian Game.—In Australia the Rugby game has always centred chiefly in New South Wales, while in Victoria an entirely distinct game became popular Like Rugby, this is played with an oval ball, but there the resemblance ends The game is played on an oval field 180yd long at its greatest length and 120yd at its greatest width At each end there are goal posts, 7yd apart, but without a cross-bar, in addition there are posts, called "behind posts," at 7yd distance on either side of the goal A goal, counting six points, is scored when the ball is kicked at any height, without being touched, between the goal posts A "behind," worth one point, is scored if the ball passes between the "behind posts" or is touched before passing between the goal posts The teams are of 18 a side and they are scattered over the whole field in pairs, each man of one side marking an opponent, as in lacrosse The ball may not be passed with the hands but must be kicked or punched, and a player may not run with it more than 10yd without bouncing it The entire absence of off-side avoids many of the complications of Rugby or Association, on the other hand there are constant halts for other reasons, when free kicks are given, though these are usually taken so quickly that the play is scarcely stopped A particularly interesting feature of the game is the play of one man, who is called the rover This player has no recognized position, but goes where he likes according to his judgment.

Australian Rugby Team.—Two teams of Australian Rugby players have visited Great Britain, the first in 1908 and the second in 1927 The first was not an outstanding side, but the 1927 team, composed of New South Wales players, captained by A C Wallace, an old Oxford Blue and Scottish International, and including A T. Lawton, another Oxford Blue, soon became popular It had not so many outstanding personalities as the New Zealand side of 1924, nor were its methods as versatile and enterprising as those of the New Zealanders, but it trained into a thoroughly good all-round combination

Other Countries.—In many other parts of the world Rugby football has made strides in recent years, and is now played in practically every British colony where the conditions are at all suitable In Canada and the United States its followers, comparatively, have never been very numerous This is due to the popularity of American Rugby, a derivative from English Rugby, and also to the popularity of "soccer," which likewise is a derivative from an English predecessor In South America interest in Rugby has shown a marked increase, particularly in the Argentine republic, which was visited in 1927 by a team organized by the Rugby Union under the captaincy of D J McMyn, the Scottish international The side was of fair strength and won all its matches, but the Argentine players, showed quick appreciation of what they could learn from the tour, which gave a great fillip to the game in the republic

SCHOOL GAMES

The Eton Wall Game.—Though both the Rugby and Association games are played during certain periods at Eton, the college has retained as its chief forms of football two entirely distinct games, called the Wall game and the Field game The Wall game owed its origin to the presence of a high wall enclosing part of the college grounds along the road from Windsor to Slough The area of play comprises a strip of ground running along this wall At each end there is an area known as "calx" equivalent to the area behind the goal line in Rugby One end is called "good calx" and the other "bad calx," and goals are marked at the back of each calx The teams are of 11 a side Five players on each side form down against the wall in a bully, or scrummage; the remaining players take up positions outside the bully The ball is put into the bully at the start of the game and whenever it goes out of the area of play, and the object is to work it along the wall with the feet into the calx When the ball has been forced into calx, the attacking side strive to gain a "shy," which is accomplished by a player lifting the ball with his foot against the wall, and touching it there This achieved, the ball may then be "shied" at goal In scoring, a goal outweighs any number of "shies"

The Eton Field Game.—In the Field game the usual number of players is 11 a side, though more are sometimes included The game is played in a large field with goals at each end, similar to the goals in the Association game but smaller in size The chief features of the play are the bully, resembling an attenuated scrummage in Rugby, dribbling by the forwards, who form the bulk of the team, and long and accurate kicking by the "behinds" or backs A goal may be scored either by an ordinary shot or by forcing a "rouge" The "rouge" is closely allied to the try in Rugby and is scored by an attacking player touching the ball down behind the goal line The ball is then brought out in front of the goal, a bully formed, and the attackers endeavour to force it through A goal counts three points, and a rouge from which no goal is scored one point

The Harrow Game.—The Harrow game is comparatively simple in principle and play It consists mainly of dribbling by the forwards and long kicking by the backs Two posts are set up at each end of the ground without a cross bar, and a goal, or "base" as it is called, is scored when the ball passes between them at any height The ball may not be handled, but it may be caught from a kick, when the catcher may either kick it or drop it and begin dribbling it A cardinal principle of the game is that players must keep behind the ball, otherwise they are off-side except in certain contingencies, much the same as in Rugby The great art in the play is to be able to keep the ball close under control in dribbling Usually teams are of 11 a side, but the number of players may vary according to circumstances

The Winchester Game.—The Winchester game is played on a much smaller area than either Rugby or Association, the dimensions being about 80yd by 25yd There are no goal posts, a goal being scored whenever the ball crosses the end lines This is not as easy of accomplishment as it would appear, for one of the

rules is that the ball may not be kicked more than 5ft high, unless it comes rolling or bounding towards a player direct from an opponent. The number of players varies, but in the chief matches there are six a side. The main feature of the play is the "hot," which is somewhat like an old-time scrummage in Rugby This takes place at the beginning of the game or whenever the ball goes out of play Dribbling forms no part of the game, and almost the sole business of the backs is to kick hard and straight A player is off-side if he is in front of the ball, and passing is illegal In spite of the small area of play the game is very exacting and calls for great speed and quickness

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(F I W)

AMERICAN RUGBY

This, as its name imports, is a derivative from the game invented and played at Rugby, in England, but passing through the rules of the Rugby Football Union To understand properly its position relatively in the sports of America one must be slightly acquainted with the formative period in American football which preceded the adoption of the Rugby game

Princeton and Rutgers, on Nov 23, 1869, played the first intercollegiate football game in history, Rutgers winning by 6 goals to 4. The rules of the game were specially drafted, and followed generally the rules of the London Football Association, then as now, known as "Association" or "Soccer" Football at that time, as an organized sport, was not played at any of the other colleges in America In 1870 Columbia joined Princeton and Rutgers as an opponent In 1872 came Yale, with a specially devised game of its own but based nevertheless on the Association code In 1874 McGill university, of Canada, introduced Rugby to the United States by scheduling and playing, May 14, in that year, a game with Harvard which resulted in a draw, 0 to 0 In the following year, Harvard invited Yale to play under the Rugby rules Yale accepted but exacted certain concessions in the Rugby code from which the rules of the game as played were designated as the "Concessionary Rules" Princeton brought order out of chaos in 1876 by organizing an intercollegiate convention which was held at Springfield, Mass, on Nov 23 This convention was attended by representatives of Columbia, Harvard, Princeton and Yale The convention on that date organized the colleges represented into the American Intercollegiate Football Association It adopted the rules of the Rugby Football Union of England as their common playing code, and scheduled a mutual set of games

The genius of young America for invention, however, appeared in that original convention and made one radical change in the English code The Rugby players of England for many years had determined victory in their games by a majority of goals, the touchdown ("try") being only an incident in play which entitled a team to a try for a goal The American collegians of 1876 modified this custom by changing Rule 8, in the code of that day, to read as follows

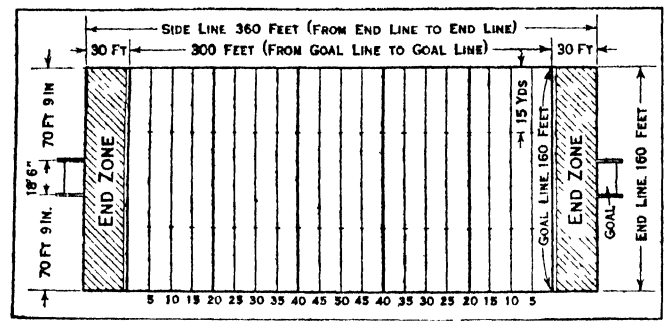
"A match shall be decided by a majority of touchdowns, a goal shall be equal to four touchdowns, but in case of a tie, a goal kicked from a touchdown shall take precedence over four touchdowns"

The adoption of this basic change in Rugby football started a movement in the American game that has become one of the features of the sport, namely, the annual changing of the rules In every year since 1876, excepting three, important changes have been introduced, and probably only the abeyance of the sport during the World War prevented the football authorities from making additional innovations in two of those years

On the whole the result of this vast body of changes has been to create a distinctive American game, featured by the presence of sustained, swift and intense action, skilful and varied performances, and by the brilliant, predominating characteristic of strategy and tactics.

This game has become the most popular of the collegiate sports. It has been adopted and is played by approximately 400 college teams and by about 3,000 school teams The games of this great army of players annually attract approximately ten million spectators To accommodate this great and growing attendance the leaders in the sport have erected gigantic amphitheatres, stadia and bowls, seating, respectively from 25,000 to 100,000. The annual income from this sport in a single university has exceeded $1,000,000 in one year The game also is evolving among professional organizations and is being adopted by progressive cities as a part of their educational or playground systems

Playing Field.—The game is played upon a rectangular field, 360 ft in length and 160 ft in width This field is marked with lines of lime It is divided into sections known as the field of play and end zones The field of play, 100 yd in length, is divided into 20 spaces, each 5 yd in width, also marked with heavy transverse lines of lime, thus giving to the field of play a resemblance to a great gridiron, hence the origin of the grid-iron as a familiar name of the field. At each end of the field is one of the end zones, 10 yd in length The lines indicating the sides of this huge field are known as side lines The lines at the end of the field of play are called goal lines, and the rear boundaries of the end zones are designated as end lines In the centre of the end lines are erected goals These consist of posts of wood or metal, at least 20 ft in height, 18 ft and 6 in in width, connected by a cross bar 10 ft. above the ground



BY COURTESY OF SPALDING

FIG 1—DIAGRAM OF FIELD OF PLAY IN RUGBY FOOTBALL, GIVING MEASUREMENTS

Number of Players.—Eleven players constitute a side or team This number is Etonian and not Rugbeian It was copied from the Eton game and introduced into the American game in 1880 These players are divided into two sections, a line of seven men, known as the rush-line, or line of forwards and a group of four men known as the back-field or backs The line-men and the positions which they occupy are named as follows. Left-end, Left-tackle, Left-guard, Centre, Right-guard, Right-tackle and Right-end As arrayed on offence in the order named, they present technically a balanced line because in the arrangement three men are arrayed on each side of the centre as below

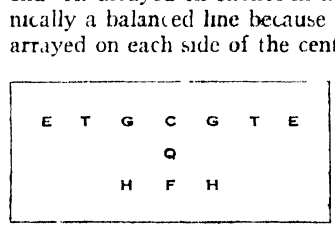


FIG 2—BALANCED LINE AND BALANCED BACKFIELD FORMATION E, end; T, tackle; G, guard; C, centre; Q, quarter-back; H, half-back; F, full-back

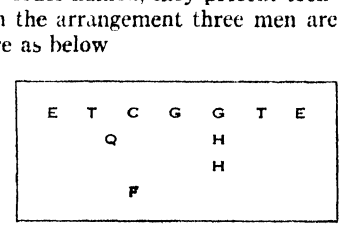


FIG 3—UNBALANCED LINE AND UNBALANCED BACKFIELD FORMATION QUARTER-BACK BEHIND CENTRE

There are, however, many derivative line arrangements. Whenever more than three players are arrayed on the same side of the centre, as in fig 3, the alignment is known as unbalanced line

The backs, likewise, take their names from the positions they occupy in primary back-field grouping, namely, quarter-back, left half-back, right half-back and full-back When these backs are so arrayed that the quarter-back and the full-back are in a straight line behind the centre with a half-back on each side of the full-back, they are said to be in a balanced formation (*see* fig. 2). When they are not thus evenly behind the centre they are said



ASSOCIATION FOOTBALL IN ENGLAND AND AMERICA

1. A span shot taken during "soccer" football game between clubs of Boston and Providence
2. Four players attempting to "head" the ball, a scene during the Lewis Cup semi-final between teams from Indiana and Brooklyn
3. Showing a strong defensive measure
4. Fast field work during a game between Brooklyn and Boston
5. Arsenal versus Cardiff City in the final for the English Football Association Cup, played at Wembley Player (centre of picture) in act of "heading" the ball
6. International Association Football, England versus France
7. The Chelsea goal keeper, Howard Baker, making a spectacular "save" in the game against Cardiff City, played at Chelsea (London)

to be in an unbalanced formation (*see* fig. 3).

Objective.—The object of the game, concisely stated, for the offence, that is the side in possession of the ball, is to advance the ball, if possible, by a player carrying it forward in his arms, a method styled the running attack; or by throwing the ball forward to be caught by a player of the same side, an advance known as a forward-pass attack, or by kicking the ball forward, an assault styled the kicking attack If the ball is carried across an opponent's goal line it constitutes a touchdown and counts 6 points If it is thrown across and caught by a player of the same side it also is a touchdown and counts 6 points The ball is kicked in three different technical ways The first of these, the punt, is commonly employed to advance the ball It is executed by dropping the ball from the hand and kicking it with the foot before the ball touches the ground Such a kick cannot score. Scoring by kicking, known as kicking a goal from the field, is accomplished by the use of a drop kick or a place kick. A drop kick is a ball dropped from the hand or hands to the ground and kicked the instant it arises from the ground A place kick is a ball kicked from a position of rest upon the ground A goal from the field counts 3 points A third method of scoring occurs, when opponents are in possession of the ball, so close to their own goal line that to extricate themselves the ball, either by accident or design, is sent across their own goal line and there touched down by one of them—a play known as a safety This play credits two points to the score of their adversaries The scoring of a touchdown not only counts 6 points but permits the scoring side to try for an additional score of one point This they attempt to accomplish by putting the ball in play at any point selected by them, provided it is 2 yd distant from the goal line, and in a single play either scoring another touchdown by carrying or passing the ball across their opponent's goal line or by kicking a goal from the field This manoeuvre is known technically as a try-for-point, or, popularly, as an extra point

The defence, that is the side not in possession of the ball, concisely stated, endeavours to prevent its opponents from carrying the ball forward by tackling the carrier To make a tackle a player of the defence wraps his arms around the carrier and throws him to the ground Similarly, the defence strives to prevent the ball from being passed forward and caught by the opponents by intercepting and catching the ball themselves, a performance technically known as an intercepted pass or by batting or otherwise forcing the ball to the ground.

When the side in possession of the ball essays to kick it, the opponents endeavour to prevent the kick by seizing the kicker before he can get his kick off, or by blocking the kick, which is achieved by a player interposing his body against the ball while the latter is starting in flight. If the kick is blocked a great effort ensues by all the players of both sides to capture the ball If, however, the kick is executed and the ball goes up the field another manoeuvre is imminent, running back the kick. The player of the receiving side attempts to catch the ball cleanly and if successful immediately bursts into a run back up the field towards his opponent's goal.

Officials.—On account of the volume, variety and complexity of action in the American game an unusually large force of officials is required to conduct it These consist of a referee, an umpire, a linesman and a field judge The linesman also may select two assistant linesmen. The referee has general oversight and control of the game He exercises a general supervision over the ball, is sole authority for the score and forfeiture of the game under the rules He supervises the proper putting of the ball in play, its position and progress The umpire is judge of the conduct and position of the players, and assists the referee in decisions involving possession of the ball. The linesman, under the supervision of the referee, marks the distances gained or lost in the progress of play His assistants operate on the side-lines two rods about 6 ft in length connected at their lower ends by a stout cord or chain, 10 yd in length, for the purpose of marking conspicuously certain distances involved in play. The field judge acts as assistant to the other officials under the jurisdiction of the referee and supervises the time.

The length of the game is 60 minutes divided into four playing periods of 15 minutes each, exclusive of time taken out for delays. There is an intermission of one minute between the first and second periods; 15 minutes between the second and third, and one minute between the third and fourth The highest score determines victory.

Kick-off.—The game opens with a formal play called the kick-off (*see* Plate II, fig. 1). Prior thereto the referee calls the two opposing captains together and directs one of them to "call the toss" of a coin. If he wins the toss he has the choice of goals, or of kicking off, or of receiving the kick-off The loser of the toss has the choice of the options which the winner does not select. These selections having been completed, the side in possession of the ball puts it down on its own 40 yd. line for the kick-off. The side in possession of the ball deploys along its 40 yd line, as in fig 4, for the purpose of running down the field under the kick, and keeping apace with the ball and prevent, if possible, its opponents from catching the ball and carrying it back The side receiving the kick spreads over its territory (*see* fig 5) so as to be able to make a clean catch of the ball, wherever it may come, and thereupon either to run it back or to kick it back

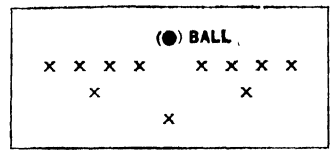


FIG 4.—OFFENSIVE FORMATION ON THE KICK-OFF

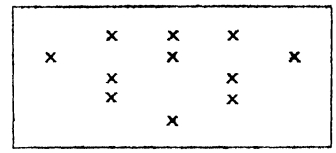


FIG. 5.—FORMATION TO RECEIVE THE KICK-OFF

Experience and study have designed a number of ingenious kick receiving formations. For the most common one *see* fig. 5.

When the players of both sides are in position the referee blows his whistle to commence play. A player trained to kick off the ball kicks it high in the air up the field. The game is then in motion.

Orderly Possession of Ball.—The rules provide for the orderly possession of the ball by one side, with the right to put the ball in play, and barring a fumble, to execute the ensuing play. A fumble is the accidental dropping of the ball from the hands or arms of the carrier. A player of either side may recover and retain a fumbled ball As the rules allow great freedom of action in the grouping of players in the methods of handling the ball, in advancing it, or of preventing an advance by opponents, there arises out of this rule relative to orderly possession another basic distinction of American Rugby, pre-arranged formations, tactics, plays and strategy. The right to put the ball in play by a team is designated as a down Ordinarily a team upon obtaining the ball possesses the right to make four attempts to advance it a total distance of 10 yards Each of these attempts constitutes a down. If in these four attempts or any part thereof this distance of 10 yd is gained, the down instantly becomes a first down and the right is renewed to advance another 10 yd. in a similar series of four attempts. If in four consecutive downs a team fails to advance the ball 10 yd, the ball goes to opponents on the spot of the last down The forward line is the line of scrimmage.

Offensive Formation.—An offensive formation is the tactical grouping of the players for the purpose of making an advance. Games frequently involve a series of preliminary formations The

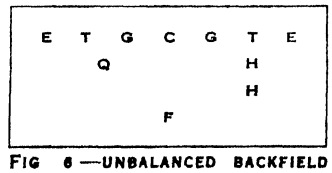


FIG 6.—UNBALANCED BACKFIELD FORMATION BEHIND BALANCED LINE. HALF-BACKS BEHIND TACKLE

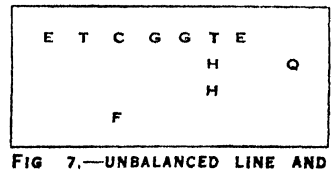


FIG 7.—UNBALANCED LINE AND UNBALANCED BACKFIELD FORMATION. QUARTER-BACK OUTSIDE END

basic formation of the offence is the balanced formation, as shown in fig. 2. From this formation every point of the defensive terrain may be attacked.

In 1893 the tandem arrangement of the backs was invented, now called the unbalanced back-field formation. It was imposed, however, in 1893 behind a balanced line, as in fig 6 This arrange-

ment was followed later by the introduction of the unbalanced line, thus giving to football its long used formation of the unbalanced backs behind the unbalanced line (*See* fig 3) This formation commonly is made by arraying two of the backs in a tandem or straight line behind one of the tackles with the full-back about 4 yd directly behind the centre and with the quarter-back kneeling or standing immediately behind the centre

This formation generally known as the tandem formation frequently is varied, as in fig 7, by moving the quarter-back to the outside of the offensive end on the long side of the line, about 1 yd behind the line

From these two basic formations the football tacticians of America have evolved ingeniously many other offensive formations upon each of which they have erected elaborate systems of attacks technically known as plays In one of these formations, frequently employed, three of the backs are arrayed in a line oblique to the line of scrimmage with the fourth-back occasionally to the outside of the oblique formation (*See* fig 8) In another formation (*see* fig 9), likewise selected as a type because of its distinct variance and popular use, a back is stationed 1 yd outside and 1 yd behind each one of the offensive ends, a third-back directly behind one of the guards and the fourth-back behind the centre The first three backs mentioned are about 2 yd behind the line, the fourth-back is about 3½ yd from the line

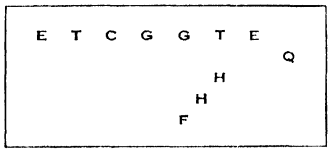


FIG 8 —UNBALANCED LINE BACKS IN OBLIQUE TANDEM

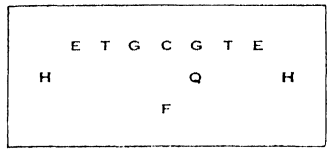


FIG 9 —BALANCED LINE BACKS IN SPREAD

Another basic formation in the tactics of the game is the kick formation shown in fig 10, a formation specially designed to protect the kicker from interference while kicking the ball, and also highly useful as a basis for launching a varied attack This formation is made by stationing the kicker, usually the full-back, or any other player selected because of his kicking skill, about 8 to 10 yd directly behind the centre with two backs in front of him on the side of his kicking foot, with the other back on the opposite side Since this kick formation is highly adapted for the execution of a kick, a run or a pass, it is known as a triple threat formation This also applies to any of its derivatives The player dropped back to kick, if also able to run or to pass, is known as a triple threat man The foregoing formations present only prominent examples of this department of tactics There are many other arrangements of the backs, particularly special formations designed not as the basis of a general attack but for special assaults Two of the most useful and most used special formations are the spread formation and the line divide

Preparatory to a spread play the line divides into two or more sections and deploys in as many groups widely across the field on the line of scrimmage The backs also separate into two or more groups and likewise widely deploy across the field, shown as above

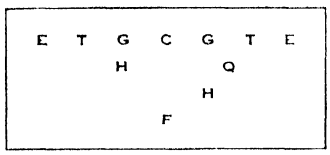


FIG 10 —KICK FORMATION

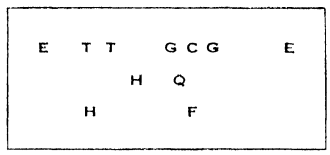


FIG 11 —SPREAD FORMATION

The object of these tactics is to compel the defence also to spread widely and therefore, through the inability of the defence adequately to cover all of their territory with only 11 men, to expose themselves to an attack in an uncovered zone As a spread formation is well suited for the launching of a run, a pass or a kick, the defence, if it concentrates to meet one of these forms of attack exposes itself to an assault by means of one of the other two arms of offence A second special offensive formation frequently employed is the split line, shown in fig 12, or as it is also called, the line divide This in reality is a modified spread play In it the line is divided by sending an end well out on the line of scrimmage, known as an End Out Formation, or by making a second wide space between the end and the tackle, known as a double

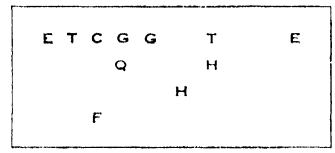


FIG 12 —A LINE DIVIDE

divide The object of the line divide or split line is to force the defence to spread to cover the points thus widely threatened

The Forward Pass Attack.—The forward pass system of attack is a highly complicated and very ingeniously organized department of offensive play On any play which starts with a scrimmage the offence is permitted to throw the ball forward provided the pass is made from a point 5 yd behind the line The pass may be caught only by players on the end of the line of scrimmage or who were 1 yd behind the line when the ball was put in play These are known as "eligible men" If one of these eligible men catches the pass, the pass is said to be a complete pass, and the receiver if not tackled at the spot where he catches the ball may run with it for a farther advance If the ball strikes the ground it is called an incomplete pass Such a pass counts as a down but goes back to the point from which it was played Any player of the defensive team may intercept in the air the forward pass of opponents by catching and retaining the ball Upon such an interception the player who catches the ball may advance it toward his opponent's goal A great many manoeuvres are designed for the purpose of executing forward passes These manoeuvres involve feints and delays in order to delude the defence and to give the "eligible men" time to get down the field to receive the pass

The Kicking Attack.—If a team fails to make the necessary gain of 10 yd in the four trials, or downs, they are required, as previously stated, to deliver the ball to their opponents on the spot of the last down Customarily, a team perceiving that it will not make the 10 yd in the four downs abandons the running attack before these downs are exhausted and turns to a kicking attack, thus delivering the ball to the opponents at a greater distance from the former's goal-line, since a kick of the ball on the final down will send it ordinarily from 35 to 65 yd deeper into the opponent's territory If, however, the offence is within kicking distance of their opponents' goal when they elect to kick they will not punt the ball but will endeavour to score a goal from the field by kicking the ball, either by a drop kick or a place kick, over their opponents' cross bar

Plays.—A "play" is any manoeuvre, either offensive or defensive On offence the plays are based upon the formations, that is to say, the team first assumes a tactical formation From this formation a play may be launched or the team may shift into a secondary formation, the first formation having been assumed merely to mislead the defence General formations are so designed that various points not only may be attacked from one and the same formation but in order that these points may be attacked in different ways These plays combine many movements on the part of the players, all of which are carefully worked out in detail by the coaches, rehearsed many times by the players and when finally perfected assigned a number by which they are known and controlled Theoretically, in every play the 11 players of the offence must be so disposed and utilized that each one of the 11 players of the defence will be prevented from stopping the attack This involves charging the line-men back, making an opening in the line, boxing or pocketing the ends, blocking off the line-men and defensive backs, and in many other ways aiding the carrier of the ball These latter men separately are called "interferers," and, collectively, "the interference"

Whenever an attack momentarily advances the ball the defence for that portion of time has been thus completely covered, and

whenever a score is achieved it has been achieved because each player of the offensive side has discharged perfectly his assignment To aid in thwarting the defence many methods are employed. Plays are organized by concentrating the players of the offence so ingeniously and powerfully that the play moves forward by sheer might. These are known as power plays. Again, craft is employed to weaken the defence The attack employs feint movements in which a certain point is conspicuously threatened while the real attack strikes elsewhere. At times the interference goes in one direction and the carrier in another; at other times, the interference divides into two sections These manoeuvres are known as split interference. Delivery of the ball is feinted, delayed and concealed to add to the confusion of the defence; or the carrier on receiving the ball will hand it secretly to another player All of these features are so well differentiated that they have come to be known technically by certain names. Plays usually take their popular names from the point and manner attacked Thus the sport presents plays familiarly known as end runs, off-tackle slants, centre plunges, cross-bucks, line-bucks, concealed, delayed, double and triple passes, end-around, cut-backs, lobs, flat passes, flying wedges, man-in-motion, wasted man, pivots, whirls, race plays, reverses, lateral and multiple passes, splits, spreads, hidden ball and trick plays

While this list indicates the existence of a great many plays a team seldom carries more than 30 plays in its equipment, and many of these are duplicates, that is, the same play but designed to strike right or left in the same manner Experience has proved that it is not a large variety of equipment that makes a team powerful but perfection of execution of an adequate number of plays.

The number of plays possible under any formation is limited only by the ingenuity of the generals of the game To illustrate this distinctive and fascinating feature of American Rugby two plays will be selected as types and explained The first of these is a wide run around the right end In this illustration the unbalanced formation as in fig 3 will be employed The quarter-back gives the secret signal for this particular play With the snap of the ball into action the 11 men in the formation leap forward to discharge their particular parts in the execution of the manoeuvre, according to the following diagram.

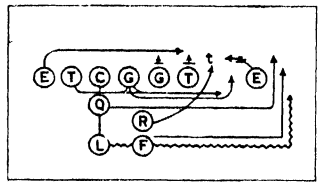


FIG 13 —WIDE END RUN TO THE RIGHT FROM UNBALANCED FORMATION

The tackles, guards and centre charge initially forward The right-end attempts to turn his opponent in, so that the play can sweep around behind him The full-back and quarter-back run out to help the right-end turn the flank The left half-back receiving the ball follows close behind them The left-tackle and the right-guard, having initially charged their opponents, likewise join the interference in the turning movement The left-end dashes behind the opponent's line and endeavours to cut down a secondary defender If each opponent is successfully blocked, the left half-back with the ball sweeps around the right-end in a wide-end run

For a second illustration of a play a cross-buck will be selected and the balanced formation (*see* fig 2) will be employed The following is a diagram of the execution of this play.

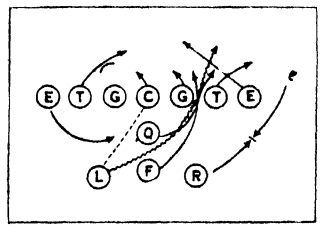


FIG 14 —CROSS BUCK FROM BALANCED FORMATION

With the snap of the ball into action the offensive line charges sharply forward, the right-guard and right-tackle charging slightly obliquely as the opening is to be made between them. The quarter-back and full-back leap with tremendous force against the point to be attacked, in order to aid in forcing the opening The right-half simultaneously blocks off the defensive left-end. The left-tackle runs behind the opponents' line to cut down a secondary The left-end does likewise, or as indicated in the diagram follows after the play to retrieve a fumbled ball. The ball in this play is passed directly to the left half-back who plunges across from left to right and strikes between his right-guard and right-tackle

Defence.—The defensive systems in American Rugby are as highly involved but more standardized than those pertaining to the offence The rules, by design, provide for a game in which the offence will have a slight preponderance of strength The object of this provision is to prevent drawn games It is accomplished by making the zones of attacks, so far as rules are concerned, larger than the defence can cover In other words, 11 men are inadequate to cover their entire territory on defence Some one spot must be exposed to attack If the defence, however, is strong enough, swift enough and skilful enough, they can overcome this handicap by mobilizing their players, or some of them, at the threatened point Therein largely originates the brilliance of defensive football.

The basic principle of line defence is 7 men on the line to withstand the offensive assault of the 7 offensive forwards The defensive players, however, are differently placed Usually the centre and the two guards face their opponents The defensive tackle plays slightly to the outside of his tackle There are two systems of deploying an end on the defence The most common one finds the end stationed about 4 yd distant from his tackle This is known as the wide-end defence The other defence, known as the close-end defence, finds the end by the side of his tackle. The spaces of these defensive line-men vary on different teams according to the system employed On some teams the spaces between the different players on the line are even, on the others the largest spaces are between tackle and end and the next larger between tackle and guard The variation as to the ends on defence not only covers their position but also extends to their use Some systems require the end to charge through and plunge headlong into the adversary's interference for the purpose of breaking it up and forcing the runner into the open This is called the smashing end defence Other systems require the end to charge through but to hold the interference off with straight arms, thus remaining upon his feet but checking the interference and forcing the runner out A third system requires the end to stand in his position on the line and wait until the interference comes to him This is known as the waiting end defence In this system the obligation is upon the tackle to get through and break the interference Another variation in line defence is the use of the centre In some junctures in the game described later under the title "Strategy," the centre plays in the line At other junctures he drops behind the line as a support thus leaving only six men on the line

The use of the backs on defence presents a variety of systems The most common of these today is the so-called "box defence," in which 7 players stand upon the line, 2 backs known as tackle supports or wing backs each about 4 yds behind his tackle, and the 2 remaining backs about 8 yd behind them, the 4 backs thus forming a square or box as in fig 15 This style of defence is the most powerful defence against a running attack, but is weak as a defence to forward passes and also ignores kicks

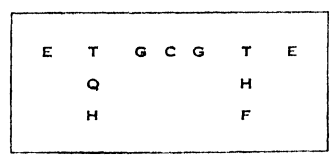


FIG 15 —BOX DEFENCE 7—2—2

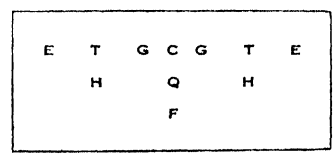


FIG 16 —A—7—3—1 DEFENCE

entirely. As the rule regulating on side play prevents members of the kicking side who are in front of the ball when it is kicked from recovering it, automatically the ball when it comes to rest must go to the defensive team. The theory of the box defence, therefore, is that unable adequately to defend the entire field they take a chance on overhead forward passes and allow the kick of their opponents to go as far as it will. Other systems of defence, however, which endeavour to cover the entire field as far as possible, are formed as in fig. 16 by placing one of the backs in the deep back field to catch kicks, the other three being

deployed about 10 yd behind the line, 2 as wing-backs and 1 as a centre defence. When a centre is withdrawn from the line an opportunity for three different defensive formations is possible; one with 6 men on the line, 2 in a secondary line, 2 in the third line, thus forming the box, with a fifth back in deep field to cover kicks and to tackle a runner who gets by the other lines of defence. (*See* fig 17) The back in the deep back field is called a safety man Such a defence among football men is technically known as a "6–2–2–1 defence"

If three backs are played in secondary line and two on the third line of defence, as in fig 18, it is known as a "6–3–2 defence."

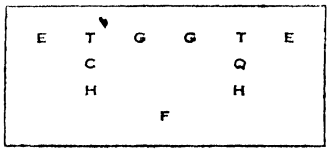


FIG 17 —A—6—2—2—1 DEFENCE

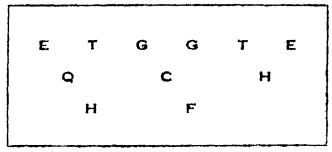


FIG 18 —A—6—3—2 DEFENCE

Signal System.—An additional basic feature distinctive of American Rugby is the elaborate signal system by which its manoeuvres, formations, tactics and plays are controlled.

Coaching.—On account of the vast knowledge and the skill required to play the various positions in football as well as to amalgamate all of the players into a team functioning in unison with precision and accuracy, an elaborate system of coaching is required in the American Rugby game Therefore, football establishments endeavour to have a staff consisting of a head coach and assistant coaches. The assistant coaches are specialists, men who are particularly skilled in coaching certain positions or in coaching some special department of play or they may be skilled in strategy and tactics These assistant coaches are assigned to their speciality by the head coach who is charged with the general preparation of the players and the team, and its supervision during a game

Strategy, or generalship, is the general policy of directing the play of a team. This depends upon many considerations First of all it depends upon the detailed character of the play of opponents as shown in previous games or as developed in the game being played The first attacks directed against a team in a game are for the purpose of advancing the ball, of course, but they also are designed to find the strong and the weak spots in the defensive establishment, either in their methods or in their individual players The field general, usually the quarter-back, therefore, studies the system of lining up of his opponents He notes the spaces between the line-men, the distance from the tackles assumed by the ends, the position assumed by the tackles and the system of defensive play of the centre Particularly he notes the disposition of the defensive backs, whether they are employing the box defence and thereby exposing their deep back-field He carefully watches the positions assumed by the wing-backs, and notes scrupulously the assumption by the defence of a 7–2–2, 7–3–1, a 7–2–1–1, a 6–3–2 or a 6–2–2–1 system.

The general plan of conducting a game also requires taking advantage of the wind when this blows with substantial force directly or diagonally upon the back of a team Such an aid brings into action frequently a vigorous kicking attack since the wind enables one full-back to out-kick the other and thereby gain ground without drawing upon the energies of the team for a running attack until a striking position is achieved. Between his own 30 yd. line and the opponents' 30 yd line, the strength of all points in the defensive line are tried out, and various general methods of attack are employed Within this zone, it is orthodox to essay difficult and hazardous plays, criss-crosses, triple passes, field reverses, forward passes and trick plays. If the field general finds he can advance, he selects for use his long gaining plays for the purpose of quickly approaching within scoring distance of his opponents' goal. Within this zone a wise field general invariably kicks on his third down unless he is behind in the score and with only inches to gain on a final desperate thrust. If play forces a team behind its own 25 yd. line, the field general abandons the general attack. In this zone he either kicks on first down or calls for one long gaining play and, if it fails, kicks on the second down. No play involving the possible loss of the ball is prudently attempted within this zone. As the advance crosses the 25 yd line the quarter-back changes his offensive policy. Here he employs a general attack but between the 25 yd. line and the 50 yd line he kicks on the third down If he successfully leads his army across his opponents' 25 yd line, he again changes his general plan of play He calls for plays that he previously has found can make headway. As he crosses his adversary's 10 yd. line he should not employ plays which attack the centre of his adversary's line The proximity of the goal-line behind his opponents has enabled them to abandon largely their back-field defence and bring up their backs to support the line and carefully to guard the centre Owing to the danger of a touch-back the quarter-back does not signal for a forward pass on second or third down.

If the offence is employing an unbalanced line and the defence does not realine or shift to match the distribution of strength the quarter-back abandons an attack towards his short side If, however, the defence realines or shifts so as to match man with man he will frequently send attacks on his weakest side. If he sees that the defensive ends are playing unusually close to their tackles, he directs his plays to their outside When the ends move in to fill this gap the quarter-back changes his attack and out-flanks them If the defensive centre is behind his line the attack is directed against the centre. With the centre behind the line, it is more difficult to complete a forward pass With the centre in line and only 4 men left to cover the extensive back field a forward pass can be used With the offence in the situation of a second or third down with only a yard to go, the defence is in a predicament If the centre plays in the line he exposes his back-field to a pass; if he plays behind his line he exposes the line to a running attack Offensively, therefore, the quarter-back in such a juncture selects his play according to the position assumed by the defensive centre

The foregoing presentation of American Rugby constitutes a brief review of the basic structure of the sport, its tactics and strategy.

GLOSSARY OF IMPORTANT FOOTBALL TERMS

Attack, Running —Plays in which the carrier of the ball attempts to advance it by running

Balanced Backs —Arrangement of the backs in which one back stands directly behind the centre with a back on each side of him

Balanced Line.—Arrangement of the line in which the seven forwards array in a regular line of end, tackle, guard, centre, guard, tackle, end, or any other alinement in which three forwards stand on each side of the centre.

Balanced Formation —An offensive grouping of the 11 players in which seven men array along the line, three on each side of centre with the quarter-back behind the centre, the full-back behind the quarter and one half-back on each side of, and equidistant from the full back

Block —The checking of the movements of a player by another player through interposition of the latter's body

Box Defence —A defensive system in which seven men stand on the line, with two backs about 5 yd distant behind the tackles and with the two remaining backs standing about 5 yd. behind the two backs on the second line, the four backs thus forming a box In this system no back plays in the deep back-field for safety or to cover kicks

Close Formation —The grouping of the players of a side in a compact arrangement

Close Line.—Arraying the line men in a straight compact line.

Cross Checking —The diagonal charge by a player in the line, not against his opposite opponent but against an adjacent opponent.

Defence 7-2-2 —A defensive system which deploys seven on the line, two in the secondary line and two on the tertiary line.

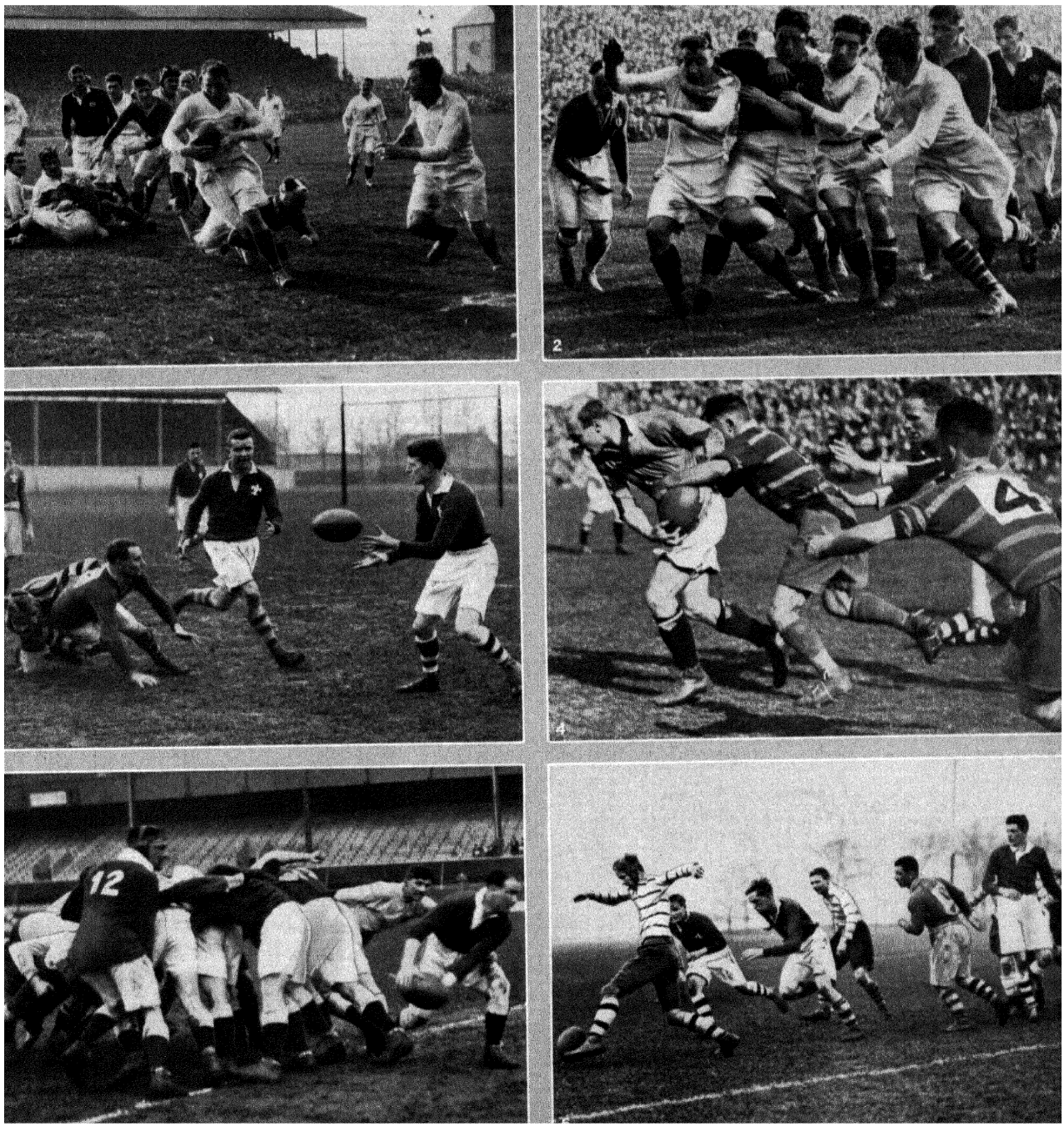
Defence 7-3-1.—A defensive system which deploys seven men on the first line, three on the secondary line and one on the tertiary line.

Defence 6-3-2.—A defensive system which deploys six men on the first line, three on the secondary line and two on the tertiary line.

Defence 6-2-2-1.—A defensive system which deploys six men on the first line, two on the secondary line, two on the tertiary line and one man farther back for safety.

Down.—The completion of a play, or the cessation of play by direction of the referee, or by the ball automatically becoming dead.

Drop-kick.—A kick made by dropping the ball from the hand or hands to the ground and kicking the ball immediately it rises from the ground.



RUGBY IN ENGLAND: SCENES AT TWICKENHAM AND RICHMOND

1 Good run through by English three-quarter-back, at Twickenham In English Rugby the standard formation makes use of four three-quarter-backs, one full-back, two half-backs, and eight forwards to each side

2 Scottish player well tackled by English opponents Calcutta Cup, at Twickenham

3 Getting the ball away the Inter-Hospital Cup, Richmond

4 A good tackle the Middlesex Seven-a-side Tournament Since the establishment by the Rugby Union in the 70's of the fifteen-a-side law, the Middlesex Tournament has become something of a curiosity

5 Clearing from a "scrum" (scrummage) Army vs Royal Air Force, at Twickenham (The picture shows the wing-forward snapping the ball out of scrummage)

6 Bart's (St Bartholomew's) get feet to ball Inter-Hospital Cup, Richmond

Free-kick.—Any kick in which the opponents are restrained by rule from advancing beyond a certain point before the ball is put in play

Goal from Field.—The kicking of the ball from the field of play either by a drop-kick or by a place-kick, over the cross-bar of the opponents' goal.

Goal from Touchdown.—The kicking of the ball from the field of play, either by a drop-kick or by a place-kick, over the cross-bar of the opponents' goal, following the scoring of a touchdown, the latter giving the scoring team the right to try for a goal from the field at this juncture and, thereby, if successful, to add an "extra point" to the total of their score.

Interference—Tactics which deploy a player or players in advance of the carrier to prevent opponents from tackling.

Kicking Game.—An attack in which kicking the ball is the principal offensive attack.

Line of Scrimmage.—An imaginary line parallel to the goal line and passing through the point of the ball as the latter rests upon the ground for the purpose of being put in play There are two such lines, one passing through each of the two points of the ball

Line Shift.—The sudden change of the players on the line from an initial alinement or position to a secondary alinement or position

Loose Centre.—A defensive centre who does not retain his position in the line but who falls back to support the line.

Off-side—A player is off-side when the ball has last been touched by a player behind him.

Off-tackle Run—A run directed, or accomplished, by the carrier of the ball which passes to the outside of and adjacent to either offensive tackle.

On-side—A player is on-side when the ball has not last been touched by a player behind him

Open Formation—The grouping of the players of a side in a distended manner

Reversing the Field.—Running across the field from one side to the other by the carrier of the ball

Safety Man—The player on defence who plays farthest back as a final defence to the goal, the player on offence who follows the carrier for the purpose of retrieving a possible fumble

Scoring—Certain plays are assigned specific numerical values which determine the victory These plays when achieved, and the numerical values thereof, are as follows:—

Touchdown	6 points
Successful try after touchdown	1 "
Goal from the field	3 "
Safety by opponents	2 "
Forfeiture of game, total score	1 "

Scrimmage—A scrimmage occurs when the holder of the ball places it flat upon the ground, with its long axis at right angles to the line of scrimmage, and puts it in play by snapping or passing it back, a game of football generally in action.

Shift Play—Any play in which the players, assuming certain positions at a signal suddenly change their positions into another system of grouping

Signal, Starting.—A signal secretly given to enable a team to charge forward in unison simultaneously with the putting of the ball in play.

Solid Charge.—A simultaneous charge forward by the seven offensive forwards, standing shoulder to shoulder and driving their opponents straight back.

Split Play.—An offensive play in which the interference or a part of the interference runs in one direction while the carrier of the ball runs in another direction, the course of the interference being designed as a feint.

Spread Play.—A play in which the forwards or backs deploy widely across the field.

Tandem.—The stationing or running of two or more players behind one another in a straight alinement (P. H D)

HOW TO PLAY AMERICAN RUGBY FOOTBALL

The five important fundamentals of offence and defence are line play, backfield play, tackling, passing and kicking.

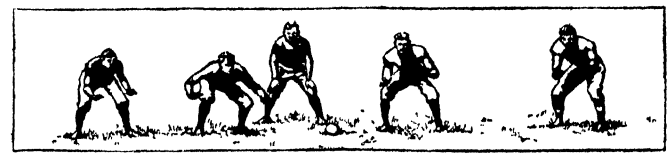
Line Play.—Line play is by far the most important On offence the player takes a crouching position on hands and feet by placing half of his weight on each, with arms extended from the ground, elbows as stiff as possible, backbone line straight and inclined slightly upward, one foot forward of the other, with head held back so eyes face straight ahead He must have balance. When he charges his opponent, he must do so with short, piston-like steps, with the rear leg always applying the power



BY COURTESY OF SPALDING

FIG 1A —PROPER POSITION FOR A CENTRE TRIO ON THE OFFENSIVE

On defence position of middle or centre, linemen remain the same when they charge they should immediately raise arms, keeping forearms stiff and using their hands freely to break through opponents. The tackles and ends on defence take another position, with one foot behind the other, slightly spread, and both hands swinging slowly until the ball is passed, then their



BY COURTESY OF SPALDING

FIG 2 —RUSH LINE DEFENCE, THE CENTRE OUT OF LINE

hands cross line of scrimmage, with forearms rigid, and they use hands freely on opponents The defensive lineman should keep eyes open while breaking through line of scrimmage

It is necessary for linemen, either on offence or defence, to get the jump on opponents; that is, to leave their marks quickly and with all power and speed possible. In charging or blocking opponent, the offensive lineman must not use hands or hold the opponent in any way. He can by use of head and neck, assist

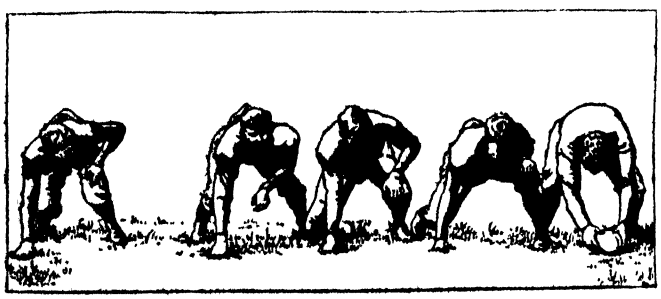


BY COURTESY OF SPALDING

FIG 3 —PROPER METHOD OF CHECKING AN OPPONENT ON THE FIELD

his charging greatly.

The three methods of defensive line play are: (1) in, under and up; (2) knifing; and (3) splitting. In, under and up is placing head and shoulders under opposing lineman and lifting up in time to stop ball carrier Knifing is twisting the body and shoulders through the offensive line. Splitting is using one hand on each of two opponents, thus dividing them as defensive man makes charge In both offensive and defensive football the original charge is straight ahead, and fighting should continue until ball carrier is tackled.



BY COURTESY OF SPALDING

FIG. 1.—STRONG SIDE OF AN UNBALANCED RUSH LINE READY FOR PLAY

Backfield Play.—A backfield man should take offensive position well balanced, with tips of fingers of one hand touching ground, ready to catch ball with hands when passed to him by centre, looking straight ahead always When receiving ball, one end should be in cup of hand and he should clamp arm down on ball so it is held tightly against his side When he is tackled, he



BY COURTESY OF SPALDING

FIG 4 —BACK BLOCKING OUT AN END, AN OFFENSIVE PLAY

should immediately place other hand on ball, using it as cushion to break fall

The back must side-step, pivot and cross-step when carrying ball When using straight-arm he should hold arm rigid and snap



BY COURTESY OF SPALDING

FIG 5 —CORRECT METHOD OF BLOCKING TO CARRY OPPONENT OUT OF THE WAY

defensive player's head or shoulders as latter is about to make tackle When bucking line, he should hit it with head down and eyes up, body slanting forward, using short piston-like steps, and lifting knees as high as possible In open field he should run as swiftly as possible, never giving any ground to opponents, but always going ahead so that when tackled he falls forward.

The most important backfield man in any combination is the back who has ability to block his opponent. To block an opponent, he must turn slightly while driving through air so as to hit opponent with the side of body or hip with enough speed and force to break through defensive man's stiff forearms. On defence the backfield man must be alert and must not leave position until he makes sure which man is carrying ball His tackle should be hard and aggressive, and he must keep his eyes open He should always try to develop his passing and kicking ability

Tackling.—Two methods of tackling are employed by football coaches One is to leave feet just before hitting ball carrier, the other, and probably better method, is running low with head down and eyes up, grasping opponent around legs just above knees and pulling him toward the body, at the same moment the tackler lifts with his shoulders, at all times making the man carrying ball land on ground first The opponent can be momentarily stopped or checked even though held only by finger tips



BY COURTESY OF SPALDING

FIG 6 —HALF-BACK'S POSITION TO START

Kicking.—A kicker lines up approximately 10 yd behind centre He should stand with arms extended, one foot behind other Upon catching ball from centre, he takes one step forward, holding ball with both hands, with lacing on upper right part of ball When the foot comes in contact with ball, toe should be extended so that foot hits as large a surface of ball as possible, landing on outside of instep It is necessary to follow through, that is, to have the foot follow ball after contact When ball is kicked, kicker should spread arms to side in order to keep balance and driving leg straight A spiral kick is best, because it spirals through air and gets greater height and distance A player catching punts should attempt to catch the ball—with hands extended but not tense—just below eyes, letting ball drop into hands as an outfielder in baseball would catch a long hit fly ball



BY COURTESY OF SPALDING

FIG 7 —BACKFIELD PLAYER RECEIVING A PUNT

Forward Pass.—To throw a forward pass lay ball diagonally across palm of hand with tips of fingers gripping lacing of ball, the nose of ball extended slightly upward The hand of the passer should follow the ball through An over-hand spiral is the best pass to throw When a player is attempting to throw a forward pass he should have his left hand and arm extended in order to prevent any player rushing him from reaching ball. A forward pass should never be thrown toward the side-line or flank, unless there is no possible chance of interception When he is throwing a pass down field he should throw as high as receiver can reach, as it is better to have an incompleted pass go over receiver's head than to have it fall too short. A pass should be thrown with a slight trajectory, as this makes an easier ball to catch. When defending against a forward pass, never let the man making catch get behind you

(J. F ME.)

SIGNALS

Football signals enable the quarter-back, the field captain, to transmit his orders to his team in terms not understood by the opponents. Football signals are commands. They are given

arlist War, the Serbian campaign of 1876, the Russo-Var of 1877, the Afghan War of 1878 and the Zulu War Of his many publications may be mentioned *Memories ies of War and Peace* (1895), much of which is auto-cal He died on March 30, 1900

ES, DAVID (1828–1876), British mineralogist, metal-l chemist, brother of Edward Forbes (*q v*), was born on 828, at Douglas, Isle of Man, and studied chemistry at rsity of Edinburgh He was superintendent of the min-ietallurgical works at Espedal in Norway, then a partner ı of Evans & Askin, nickel-smelters, of Birmingham, and ıpacity during the years 1857–60 visited Chile, Bolivia

His observations on the geology of South America ch light on igneous and metamorphic phenomena and on ing changes in rock-formations. In England he was a ı microscopic petrology He was elected F.R S in 1858, in London on Dec 5, 1876

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ES, DUNCAN, OF CULLODEN (1685–1747), Scottish , son of Duncan Forbes (1644?–1704), genealogist and Nairn, was born at Bunchrew or at Culloden near Inver-ov 10, 1685 He studied at Edinburgh and Leiden, and cate and sheriff of Midlothian in 1709 The influence gyll family and his loyalty to the Hanoverian cause in red his rapid advancement He became M P for Inver-:), lord advocate (1725), and lord president of the court (1737)

ears before the rising of Forty-five Forbes had urged government the expediency of embodying Highland regi-tting them under the command of colonels whose loyalty elied upon, but officering them with the native chieftains s of old families in the north In 1739, with Sir Robert approval, the original (1730) six companies (locally of the Black Watch were formed into the famous "Forty-egiment of the line

first rumour of the Jacobite rising in 1745 Forbes o Inverness, and through his personal influence with the Macdonald and Macleod, these clans were prevented ng the field for Charles Edward, the town itself also he l In September 1745, after Cope's departure to the rbes was the sole representative of government in the worked hard to maintain order But advances of arms y arrived too late, and though Forbes employed all his ıs and what money he could borrow on his personal his resources were quite inadequate to the emergency tful whether these advances were ever fully repaid Part out to him, after repeated solicitations that his credit maintained in the country; but it is evident his humane to mitigate the savage revenge on the rebels after their Culloden had brought him into disfavour in London. d on the 10th of December 1747

was a patriot without ostentation or pretence, a true with no narrow prejudice, an accomplished and even holar without pedantry, a man of genuine piety without or intolerance His statue by Roubiliac stands in the t house, Edinburgh

noirs of the Life of the late Rt Hon. Duncan Forbes ulloden Papers, with memoir by Duff (1815); John Hill *ves of Simon Lord Lovat, and Duncan Forbes of Culloden*

ES, EDWARD (1815–1854), British naturalist, was ouglas, Isle of Man, on Feb. 12, 1815. He studied medi-botanical results of which were published in Loudon's *Magazine of Natural History* for 1835–36 In 1836 he forsook medicine for natural science, and after a winter of lectures in Paris, he went to Algiers, where he obtained materials for a paper on land and freshwater Mollusca, published in the *Annals of Natural History*, vol ii In 1838 appeared his *Malacologia Monensis*, a synopsis of the species of Manx Mollusca, and in 1841 his *Hist of Brit Star-fishes* From 1841 to 1842 he was employed in investigating the botany, zoology and geology of the Mediterranean region, the results being made known in his "Report on the Mollusca and Radiata of the Aegean Sea, presented to the British Association in 1843," and in *Travels in Lycia* (1847) In 1842 Forbes became curator of the museum of the Geological Society of London, in 1843 professor of botany at King's College, and in 1844, palaeontologist to the Geological Survey of Great Britain Two years later he published in the *Memoirs of the Geological Survey*, i 336, his important essay "On the Connexion between the distribution of the existing Fauna and Flora of the British Isles, and the Geological Changes which have affected their Area," in which he maintains that the plants of Great Britain may be divided into five well-marked groups and that the majority of them, like the terrestrial animals, migrated to these islands over continuous land at three distinct periods, before, during and after the glacial epoch In 1851 Forbes became professor of natural history to the Royal School of Mines, and in the following year published the fourth volume of Forbes and S Hanley's *History of British Mollusca* and his *Monograph of the Echinodermata of the British Tertiaries* (Palaeontographical Soc) In 1854 he became professor of natural history at Edinburgh, but he died on Nov 18 of that year at Wardie, near Edinburgh

See G Wilson and A Geikie, *Memoir of Edward Forbes* (1861), containing a list of Forbes's writings, *Literary Papers*, ed Lovell Reeve (1855) and *Forbes' Centenary Commemoration* by the London Manx Society (1915). The following works were issued posthumously "On the Tertiary Fluviomarine Formation of the Isle of Wight" (*Geol Survey*), edited by R A C Godwin-Austen (1856); "The Natural History of the European Seas," edited and continued by R. A. C Godwin-Austen (1859).

FORBES, JAMES DAVID (1809–1868), Scottish physicist, was born at Edinburgh on April 20, 1809 He studied at Edinburgh, became F R S E (1828) and F R S (1832), professor at Edinburgh (1833–59), and principal of the United college at St Andrews (1859–68) He died on Dec. 31, 1868

As a scientific investigator he is best known for his researches on heat and on glaciers Between 1836 and 1844 he published in the *Trans Roy Soc Ed.* four series of "Researches on Heat," in the course of which he described the polarization of heat by tourmaline, by transmission through a bundle of thin mica plates inclined to the transmitted ray, and by reflection from the surfaces of a pile of mica plates placed at the polarizing angle, and also its circular polarization by two internal reflections in rhombs of rock-salt In 1846 he began experiments on the temperature of the earth at different depths and in different soils near Edinburgh; he determined the thermal conductivity of trap-tufa, sandstone and pure loose sand Later he investigated the laws of the conduction of heat in bars, and his last piece of work was to show that the thermal conductivity of iron diminishes with increase of temperature The Royal Society awarded him the Rumford Medal in 1838 and the Gold Medal in 1843 for his work on heat.

He made several visits to Switzerland and also to Norway to study the flow of glaciers and developed a theory which involved him in some controversy with Tyndall and others both as to priority and to scientific principle.

See Principal Shairp, Professor P. G. Tait and A. Adams-Reilly, *Forbes's Life and Letters* (1873); J. Tyndall, *Professor Forbes and his Biographers* (1873).

FORBES, a municipal town of Ashburnham county, New South Wales, Australia, 289 m W by N from Sydney, on the Lachlan river, and with a station on the G W railway Pop (1921) 4,650 It has steam-sawing and flour-mills, breweries and wool-scouring establishments; while the surrounding country produces

life-patent for the Haymarket, and Foote not only resumed his profession, but ingeniously turned his misfortune to account in *The Lame Lover* and *The Devil on Two Sticks*

He still retained his hold over the public, but about 1774, when he was thinking of retiring at least temporarily, he became involved in a fatal quarrel Never so far had he put any restraint on his personal satire *The Author*, with its attack on Ap-Rice, had ultimately been suppressed, but otherwise he had continued to ridicule whom he liked, medical quacks, religious enthusiasts like Dr Dodd, the whole Society of Antiquaries (in *The Nabob*), and even the Nabobs themselves But he took one risk too many It was rumoured that he intended to bring on the stage the duchess of Kingston, whose trial for bigamy was then impending (1775) She got the Lord Chamberlain to prohibit the piece After its withdrawal, and an exchange of characteristic letters between him and the Duchess, he took his revenge on one of her chief instruments, Dr Jackson, whom he gibbeted as Viper in *The Capuchin* (performed 1776), Jackson then suborned a discharged servant of Foote's to bring a charge of assault against him Though this broke down, the struggle broke down his health, and even his audiences seemed to be divided He resolved to withdraw for a time, let his theatre and set out for a journey to France. He fell sick at Dover and died there on Oct 21, 1777. He is buried in Westminster Abbey

See W Cooke, *Memoirs of Samuel Foote* (3 vols, 1805), *The Dramatic works of Samuel Foote* (ed by "John Bee," 3 vols, 1839), P Fitzgerald, *Samuel Foote, A Biography* (1910).

FOOT GUARDS: *see* GUARDS

FOOTINGS: *see* FOUNDATIONS.

FOOTSCRAY, a suburb of Melbourne, Australia, on the Salt-water river It has large bluestone quarries from which most of the building stones in Melbourne and the neighbourhood is obtained, and is an important manufacturing centre, with numerous sugar mills, jute factories, soap works, woollen mills, foundries, chemical works and many other minor industries.

FOPPA, VINCENZO (*c* 1427–*c*.1515), Italian painter, was born near Brescia. He settled in Pavia towards 1456, and was the head of a Lombard school of painting which subsisted up to the advent of Leonardo da Vinci In 1489 he returned to Brescia Among his noted works are a fresco in the Brera Gallery, Milan, the "Martyrdom of St Sebastian", and a "Crucifixion" in the Carrara gallery, Bergamo, executed in 1455 He worked much in Milan and in Genoa

See C J Ffoulkes and R Maiocchi, *Vincenzo Foppa* (1910).

F.O.R. A contraction of the expression "free on rail," used in commerce to denote the fact that a price quoted for goods is inclusive of all costs of carriage and handling in placing them on the railway ready for their transit to destination, but not inclusive of the railway charges for carriage. "F O.B " is used in this sense in the United States.

FORAGE, food for cattle or horses, chiefly the provender collected for the horses of an army. In early usage the word was confined to dried forage as opposed to grass. From this word comes "foray," an expedition in search of "forage," and hence a pillaging expedition, a raid The word "forage," directly derived from Fr *fourrage*, comes from a common Teutonic origin, and appears in "fodder," food for cattle The ultimate Indo-European root, *pat*, cf Gr *πατεῖσθαι*, Lat. *pascere*, to feed, gives "food," "feed," "foster"; and appears also in such Latin derivatives as "pastor," "pasture "

FORAIN, JEAN LOUIS (1852–), French painter and illustrator became one of the leading modern Parisian caricaturists, and in his merciless exposure of the weaknesses of the *bourgeoisie* continued the work which was begun by Daumier under the second Empire The scathing bitterness of his satire is as clearly derived from Daumier as his pictorial style can be traced to Manet and Degas; but even in his painting he never suppresses the caustic spirit that drives him to caricature He has, indeed, been rightly called "a Degas pushed on to caricature " In his pen-and-ink work he combines extraordinary economy of means with the utmost power of expression and suggestion. Forain's popularity dates from the publication of his *Comédie parisienne*, a series of 250 sketches republished in book form He has contributed many admirable, if sometimes over-daring, pages to the *Figaro, Le Rire, L'Assiette au beurre, Le Courrier français* and *L'Indiscret*. His political drawings for the *Figaro* were republished in book form under the title of *Doux Pays*.

See M Guérin, *J L Forain lithographe* (1910), *Forain aquafortiste* (1912)

FORAKER, JOSEPH BENSON (1846–1917), American political leader, was born near Ramsboro, Highland county, Ohio, on July 5, 1846 He passed his early life on a farm, enlisted as a private in July 1862, served throughout the Civil War and in 1865 received a captain's brevet After the war he spent two years at the Ohio Wesleyan university and two years at Cornell In 1869 he was admitted to the Ohio bar and practised law with great success in Cincinnati. He was a judge of the Cincinnati superior court from 1879 to 1882, and from 1885 to 1889 was governor of Ohio In 1896 he was elected United States senator, was re-elected in 1902 and served until 1909 In the Senate he was one of the aggressive Republican leaders, strongly supporting the administration of President McKinley in the debates preceding, during and immediately following the Spanish-American War During the administration of President Roosevelt he vigorously opposed various measures advocated by the President, and led the opposition to the president's summary discharge of certain negro troops after the Brownsville raid of Aug 13, 1906 (*See* BROWNSVILLE, Texas) In 1916 he published *Notes of a Busy Life* He died in Cincinnati on May 10, 1917

FORAMINIFERA. Marine single-celled animals (Protozoa) which have their protoplasm contained in a calcareous shell, which is usually perforated by numerous pores, through which issue delicate protoplasmic processes (so-called rhizopods), which serve for catching food and for locomotion They are frequently present in such numbers that their shells form a considerable proportion of the ooze which covers the floor of the ocean The best known of these is *Globigerina* (*q v*). Chalk rocks were formed in seas of past geological epochs almost entirely of the shells of Foraminifera *See* PROTOZOA

FORBACH, a town of France, dept of Moselle (Alsace-Lorraine) on an affluent of the Rossel, and on the railway from Metz to Saarbrucken, 5½ m S W of the latter Pop (1926) 7,467 Its industries include the manufacture of tiles and pasteboard wares, while there are coal mines in the vicinity On the Schlossberg near the town are the ruins of the castle of the counts of Forbach, a branch of the counts of Saarbrücken It is the capital of the arrondissement of the same name and has a sub-prefecture

FORBES, ALEXANDER PENROSE (1817–1875), Scottish divine, was born at Edinburgh on June 6, 1817. In 1836 he joined the Indian Civil Service, but in consequence of ill-health was obliged to return to England He then entered Brasenose college, Oxford, and won the Roden Sanskrit scholarship (1841), graduating in 1844. At Oxford he was powerfully influenced by Newman, Pusey and Keble This led him to resign his Indian appointment In 1844 he was ordained deacon and priest, and in 1848 succeeded Bishop Moir in the see of Brechin. He removed the episcopal residence to Dundee, where he resided till his death. He was prosecuted in the church courts for heresy, but acquitted with "a censure and an admonition." Forbes was a good scholar, a scientific theologian and a devoted worker, and was much beloved. He died at Dundee on Oct. 8, 1875

Principal works. *A Short Explanation of the Nicene Creed* (1852); *An Explanation of the Thirty-nine Articles* (2 vols, 1867 and 1868); *Commentary on the Seven Penitential Psalms* (1847); *Commentary on the Canticles* (1853). *See* Mackey's *Bishop Forbes, a Memoir.*

FORBES, ARCHIBALD (1838–1900), British war-correspondent, was born in Morayshire and educated at Aberdeen university He served for a short time as a private in the Royal Dragoons before entering journalism. Forbes was one of the greatest war-correspondents of his day, and his exploits in securing and despatching copy from various theatres of war became a legend in Fleet street. He went through the Franco-German war of 1870 for the *Morning Advertiser* and the *Daily News*, the

second Carlist War, the Serbian campaign of 1876, the Russo-Turkish War of 1877, the Afghan War of 1878 and the Zulu War of 1879. Of his many publications may be mentioned *Memories and Studies of War and Peace* (1895), much of which is autobiographical He died on March 30, 1900.

FORBES, DAVID (1828–1876), British mineralogist, metallurgist and chemist, brother of Edward Forbes (*q v*), was born on Sept 6, 1828, at Douglas, Isle of Man, and studied chemistry at the university of Edinburgh He was superintendent of the mining and metallurgical works at Espedal in Norway, then a partner in the firm of Evans & Askin, nickel-smelters, of Birmingham, and in that capacity during the years 1857–60 visited Chile, Bolivia and Peru His observations on the geology of South America threw much light on igneous and metamorphic phenomena and on the resulting changes in rock-formations. In England he was a pioneer in microscopic petrology He was elected F.R S in 1858, and died in London on Dec 5, 1876

Forbes wrote upwards of 50 papers on scientific subjects, among which are the following "The Action of Sulphurets on Metallic Silicates at High Temperatures," *Rep Brit Assoc*, 1855, pt ii p 62; "The Relations of the Silurian and Metamorphic Rocks of the South of Norway," *ib* p. 82, "The Causes Producing Foliation in Rocks," *Journ Geol Soc* xi, 1855; "The Chemical Composition of the Silurian and Cambrian Limestones," *Phil Mag* xiii pp 365–373, 1857, "The Geology of Bolivia and Southern Peru," *Journ. Geol Soc* xvii pp. 7–62, 1861, "The Mineralogy of Chile," *Phil Mag*, 1865, "Researches in British Mineralogy," *Phil Mag*, 1867–68 *See* the obituary notices by P M Duncan in *Quart Journ Geol Soc*, vol. xxxiii., 1877, and by J Morris in *Geol Mag*, 1877.

FORBES, DUNCAN, OF CULLODEN (1685–1747), Scottish statesman, son of Duncan Forbes (1644?–1704), genealogist and M P for Nairn, was born at Bunchrew or at Culloden near Inverness on Nov 10, 1685 He studied at Edinburgh and Leiden, and was advocate and sheriff of Midlothian in 1709 The influence of the Argyll family and his loyalty to the Hanoverian cause in 1715 secured his rapid advancement He became M P for Inverness (1722), lord advocate (1725), and lord president of the court of session (1737)

Some years before the rising of Forty-five Forbes had urged upon the government the expediency of embodying Highland regiments, putting them under the command of colonels whose loyalty could be relied upon, but officering them with the native chieftains and cadets of old families in the north In 1739, with Sir Robert Walpole's approval, the original (1730) six companies (locally enlisted) of the Black Watch were formed into the famous "Forty-second" regiment of the line

On the first rumour of the Jacobite rising in 1745 Forbes hastened to Inverness, and through his personal influence with the chiefs of Macdonald and Macleod, these clans were prevented from taking the field for Charles Edward, the town itself also he kept loyal In September 1745, after Cope's departure to the south, Forbes was the sole representative of government in the north. He worked hard to maintain order But advances of arms and money arrived too late, and though Forbes employed all his own means and what money he could borrow on his personal security, his resources were quite inadequate to the emergency It is doubtful whether these advances were ever fully repaid Part was doled out to him, after repeated solicitations that his credit might be maintained in the country; but it is evident his humane exertions to mitigate the savage revenge on the rebels after their defeat at Culloden had brought him into disfavour in London. Forbes died on the 10th of December 1747.

Forbes was a patriot without ostentation or pretence, a true Scotsman with no narrow prejudice, an accomplished and even erudite scholar without pedantry, a man of genuine piety without asceticism or intolerance His statue by Roubiliac stands in the Parliament house, Edinburgh

See *Memoirs of the Life of the late Rt Hon Duncan Forbes* (1748); *Culloden Papers*, with memoir by Duff (1815), John Hill Benton, *Lives of Simon Lord Lovat, and Duncan Forbes of Culloden* (1847).

FORBES, EDWARD (1815–1854), British naturalist, was born at Douglas, Isle of Man, on Feb. 12, 1815 He studied medicine at Edinburgh, and in 1833 made a tour in Norway, the botanical results of which were published in Loudon's *Magazine of Natural History* for 1835–36 In 1836 he forsook medicine for natural science, and after a winter of lectures in Paris, he went to Algiers, where he obtained materials for a paper on land and freshwater Mollusca, published in the *Annals of Natural History*, vol ii In 1838 appeared his *Malacologia Monensis*, a synopsis of the species of Manx Mollusca, and in 1841 his *Hist of Brit Star-fishes* From 1841 to 1842 he was employed in investigating the botany, zoology and geology of the Mediterranean region, the results being made known in his "Report on the Mollusca and Radiata of the Aegean Sea, presented to the British Association in 1843," and in *Travels in Lycia* (1847) In 1842 Forbes became curator of the museum of the Geological Society of London, in 1843 professor of botany at King's College, and in 1844, palaeontologist to the Geological Survey of Great Britain Two years later he published in the *Memoirs of the Geological Survey*, i 336, his important essay "On the Connexion between the distribution of the existing Fauna and Flora of the British Isles, and the Geological Changes which have affected their Area," in which he maintains that the plants of Great Britain may be divided into five well-marked groups and that the majority of them, like the terrestrial animals, migrated to these islands over continuous land at three distinct periods, before, during and after the glacial epoch In 1851 Forbes became professor of natural history to the Royal School of Mines, and in the following year published the fourth volume of Forbes and S Hanley's *History of British Mollusca* and his *Monograph of the Echinodermata of the British Tertiaries* (Palaeontographical Soc) In 1854 he became professor of natural history at Edinburgh, but he died on Nov 18 of that year at Wardie, near Edinburgh

See G Wilson and A Geikie, *Memoir of Edward Forbes* (1861), containing a list of Forbes's writings, *Literary Papers*, ed Lovell Reeve (1855) and *Forbes' Centenary Commemoration* by the London Manx Society (1915). The following works were issued posthumously "On the Tertiary Fluviomarine Formation of the Isle of Wight" (*Geol Survey*), edited by R A C Godwin-Austen (1856); "The Natural History of the European Seas," edited and continued by R. A. C Godwin-Austen (1859).

FORBES, JAMES DAVID (1809–1868), Scottish physicist, was born at Edinburgh on April 20, 1809 He studied at Edinburgh, became F R S E (1828) and F R S (1832), professor at Edinburgh (1833–59), and principal of the United college at St Andrews (1859–68) He died on Dec 31, 1868

As a scientific investigator he is best known for his researches on heat and on glaciers. Between 1836 and 1844 he published in the *Trans Roy Soc Ed.* four series of "Researches on Heat," in the course of which he described the polarization of heat by tourmaline, by transmission through a bundle of thin mica plates inclined to the transmitted ray, and by reflection from the surfaces of a pile of mica plates placed at the polarizing angle, and also its circular polarization by two internal reflections in rhombs of rock-salt In 1846 he began experiments on the temperature of the earth at different depths and in different soils near Edinburgh; he determined the thermal conductivity of trap-tufa, sandstone and pure loose sand Later he investigated the laws of the conduction of heat in bars, and his last piece of work was to show that the thermal conductivity of iron diminishes with increase of temperature The Royal Society awarded him the Rumford Medal in 1838 and the Gold Medal in 1843 for his work on heat.

He made several visits to Switzerland and also to Norway to study the flow of glaciers and developed a theory which involved him in some controversy with Tyndall and others both as to priority and to scientific principle

See Principal Shairp, Professor P. G. Tait and A. Adams-Reilly, *Forbes's Life and Letters* (1873); J. Tyndall, *Professor Forbes and his Biographers* (1873).

FORBES, a municipal town of Ashburnham county, New South Wales, Australia, 289 m. W by N from Sydney, on the Lachlan river, and with a station on the G W. railway Pop (1921) 4,650 It has steam-sawing and flour-mills, breweries and wool-scouring establishments; while the surrounding country produces good quantities of cereals, lucerne, wine and fruit

FORBES-ROBERTSON, SIR JOHNSTON (1853–), English actor, was born on Jan 16, 1853, the son of John Forbes-Robertson of Aberdeen, an art critic He was educated at Charterhouse, and studied at the Royal Academy schools, but in 1874 he turned to the theatre, making his first appearance in London as Chastelard, in *Mary, Queen of Scots.* He studied under Samuel Phelps, played with the Bancrofts and with John Hare, supported Miss Mary Anderson both in England and America, and acted at different times with Sir Henry Irving In Pinero's *The Profligate* at the Garrick theatre (1889), under Hare's management, he made a great name for himself In 1895 he started under his own management at the Lyceum with Mrs Patrick Campbell, producing *Romeo and Juliet, Hamlet, Macbeth,* and also some modern plays, among these being John Davidson's *For the Crown* and Maeterlinck's *Pelléas and Mélisande,* in both of which he found parts admirably suited to his romantic temperament In 1900 he married Gertrude Elliott, with whom he appeared at various theatres, producing in subsequent years *The Light that Failed,* Madeleine Lucette Riley's *Mice and Men,* and G Bernard Shaw's *Caesar and Cleopatra,* Jerome K Jerome's *Passing of the Third Floor Back,* etc He was knighted in 1913, and made a farewell tour of Canada and America before finally retiring from the stage in 1915

See Sir J Forbes-Robertson, *A Player Under Three Reigns* (1925)

FORBIN, CLAUDE DE (1656–1733), French naval commander, was born at Gardanne, Provence, on Aug 6, 1656 He went to Siam in 1685 with the Chevalier de Chaumont, sent by Louis XIV at the invitation of the King of Siam to introduce European civilization in that country He remained as admiral and general-in-chief to the King of Siam until 1687 He was the colleague of Jean Bart in his irregular operations in the Channel, and distinguished himself at the battle of Lagos From 1702 to 1710 he served in the French navy as *chef d'escadre,* and played a particularly brilliant part in the War of the Spanish Succession In 1710 he retired to Saint-Marcel, near Marseilles, where he died on March 4, 1733 The latter part of his life was spent in writing his *Mémoires* (1730)

FORCE. In general, strength or intensity of effort as applied to physical action It is also used to denote a military or naval unit, for its legal application *see* DURESS In physics force is that which produces acceleration *See* MECHANICS

FORCED LABOUR: *see* SLAVERY

FORCELLINI, EGIDIO (1688–1768), Italian philologist, was born on Aug 26, 1688, at Fener, Treviso, and studied at Padua under Facciolati (*q v*) From 1724 to 1731 he held the office of rector of the seminary at Ceneda, and from 1731 to 1765 that of father confessor in the seminary of Padua He died at Padua on April 4, 1768, before the completion of the vast *Latin Lexicon,* on which he had for 35 years collaborated with Facciolati

FORCHHAMMER, PETER WILHELM (1801–1894), German classical archaeologist, was born at Husum, Schleswig on Oct 23, 1801 and was educated at Lubeck and the university of Kiel, with which he was connected for nearly 65 years In 1830–34 and 1838–40 he travelled in Italy, Greece, Asia Minor and Egypt In 1843 he was appointed professor of philology at Kiel and director of the archaeological museum founded by himself in co-operation with Otto Jahn He died on Jan 8, 1894 Forchhammer represented the progressive party of Schleswig-Holstein in the German Reichstag from 1871 to 1873 His published works deal chiefly with topography and ancient mythology *Hellenika Griechenland Im Neuen das Alte* (1837) contain his theory of the origin and explanation of the Greek myths which, according to him, arose from definite local (especially atmospheric and aquatic) phenomena, and represented the annually recurring processes of nature as the acts of gods and heroes

For a full list of his works *see* the obituary notice by E Alberti in C Bursian's *Biographisches Jahrbuch fur Altertumskunde,* xx (1897); also J Sass in *Allgemeine deutsche Biographie,* and A. Hoeck and L C Pertsch, *P W Forchhammer* (1898).

FORCHHEIM, a town of Germany, in the republic of Bavaria, near the confluence of the Wiesent and the Regnitz, 16 m S S E, of Bamberg. Pop (1925) 9,574. Forchheim was the residence of the Carolingian sovereigns, including Charlemagne, in the 9th century Many diets were held here, and here Conrad I and Louis the Child were chosen German kings The town was given by the emperor Henry II. in 1007 to the bishops of Bamberg, and, except for a short period during the 11th century, it remained in their possession until 1802, when it was ceded to Bavaria The fortifications of the town were dismantled in 1838 It has a Gothic Collegiate church and industries of the town include spectacle making and weaving, dyeing, brewing and paper-making The château occupies the site of the Carolingian palace which was destroyed in 1246

FORD, EDWARD ONSLOW (1852–1901), British sculptor, was born at Islington on July 27, 1852 He was educated at Blackheath, and studied art at Antwerp, and at Munich, where he married in 1873, Anne Gwendolen, daughter of Baron Frans von Kreuzer About 1874 Ford returned to Blackheath, and attracted attention in the Academy by a bust of his wife His more important works include the statue of Rowland Hill at the Royal Exchange (1881), "Irving as Hamlet" (1883, in the Guildhall art gallery), "Gordon" (1890, examples at Chatham and Khartoum), the Shelley memorial in University college Oxford (1892), the equestrian statue of Lord Strathnairn at Knightsbridge (1895) and the memorial to Queen Victoria at Manchester (1901) Among the many busts which he modelled may be mentioned Millais, Huxley, Herbert Spencer, the duke of Norfolk, Sir Lawrence Alma-Tadema, and Sir Walter Armstrong His bronze statuettes became known by his permitting publication of small replicas The most successful were "Folly" (now in the Tate gallery), "The Singer," "Applause," "Peace" and "Echo" Ford was elected A R A in 1888 and R A in 1895. He died in London on Dec 23, 1901.

FORD, HENRY (1863–), American manufacturer, was born on a farm near Dearborn, Mich, 9m W of Detroit, of William and Mary Litogot Ford William Ford was of English descent, born near Cork, Ireland, whence the Ford family emigrated to America in 1847, settling near Dearborn Mary Litogot was born in the United States of Dutch parents Mrs Ford died when her son was 12 Henry Ford went to school until he was about 15, but worked on the farm after school hours and during vacations He began early to develop an intense interest in mechanics He was attracted first to watches, and at 13 he took a watch apart and put it together again In a little while he was repairing watches and clocks throughout the surrounding country, not for pay but because he had a burning curiosity to see how watches and clocks were made His only tools were a screwdriver made from a knitting needle and a pair of tweezers fashioned from an old watch spring All this work was done at night, later it was done secretly, because William Ford objected to the son giving his services free Also, he wanted the boy to be a farmer, while the boy wanted to be a mechanic

At 16 Henry could no longer tolerate farm work He left home, walked to Detroit, and apprenticed himself in a machine shop at a weekly wage of $2 50, working ten hours a day. His board and lodging cost him $3 50 a week In order to make up the deficit he took employment with a jeweller from 7 to 11 in the evening, for which he received $2.00 a week. In about a year he turned from machine shop to an engine shop to learn something of the building of engines There he stayed two years A company manufacturing small steam engines for farm use needed a man to install them; Ford took the place and for two years more set up and repaired these engines He had gone back to the farm to live, there he spent all his spare time in a little workshop trying to build a farm tractor—for his experience with the portable engines, as well as his own farm experience, had convinced him that power should be put to work on the farm and that it was a waste to keep horses Eventually he built a single-cylinder engine steam tractor, but he could not devise a boiler to provide pressure enough to keep the tractor at work ploughing and yet be light enough for his requirements. For the time being he gave up his tractor until he could discover a more suitable boiler. Large steam tractors were already in use, but Ford's thought even then was in the direction of inexpensive, simple apparatus.

In 1884 Ford's father offered him 40ac. of land in order to draw him away from his mechanics The land was mostly wooded Henry cut the timber, set up a sawmill and sold lumber In the summer he repaired farm engines In 1887 he married Clara Bryant, who lived in the neighbourhood He sawed the lumber for his house, which he built himself on his plot of ground, and having done this he moved his workshop from his father's farm to his new home Securing a job with the Detroit Edison company as an engineer and machinist he moved from the farm to Detroit, where he set up his shop in a shed at the back of his house After hours he worked on the building of a gasolene motor car In 1892 he completed it—although it did not run properly until the following year This, his first car, had two cylinders with a 2½in bore and a 6in stroke, set side by side over the rear axle, and developed about 4 h p, which was transmitted from the motor to the countershaft by a belt and from the countershaft to the rear wheel by a chain He ran this car about 1,000m and then sold it for $200, in order to start the building of another car which would be lighter and stronger In 1899, feeling that he had the experience he needed, Ford left his job with the electric light company and went into the making of automobiles as a business, with a company, of which he was the chief engineer, known as the Detroit Automobile company He held only a small portion of the stock, and the company would not follow the lines of manufacturing to which he had committed himself The directors wanted to make cars to order only, Ford had in his mind a universal car which could be made in quantities In 1902 he resigned in order to go into business for himself when the opportunity should arise In the meantime he rented a one-storey brick shed and continued his experiments He built several cars, two of them solely for speed One he called the "999" and the other the "Arrow" Each had a four-cylinder engine giving 80 horse-power The "999" won every race it entered, and in 1903, on the reputation of this speed car, Ford formed the Ford Motor company, with a capitalization of $100,000 Actually only $28,000 in stock was ever subscribed, and of this only about one-half was in actual cash The company in 1926 had assets of about $1,000,000,000 and was the largest motor car company in the world and the third largest industry in the United States, comprising in itself about 50 other industries and employing some 200,000 people directly and an equal number indirectly It has been built up entirely by turning back profits into construction The company has never issued bonds or borrowed money, nor has it issued stock otherwise than to enlarge the original capitalization so as to have it more nearly correspond with values It is entirely owned by Henry Ford and his son, Edsel B. Ford, they having bought out the minority stockholders in 1919 for $70,000,000

During its first year the company built a two-cylinder, 8 h p car with a chain drive, and of these 1,708 were produced and sold In the second year it made three models and during five years various models of four- and six-cylinder cars The automobile at that time was considered a pleasure vehicle, but Ford had conceived of it as a universal method of individual transportation and he was working to produce a light car of great strength, which would require a minimum of care and cost in upkeep What delayed him was finding a steel sufficiently strong for his purpose, and it was quite by accident that he came upon a piece of vanadium steel, which was not then made in the United States With that steel he designed Model T—which is what is known to-day as the "Ford car" In 1909 Ford announced that thereafter the company would build only the model T chassis, and that "Any customer can have a car painted any colour that he wants, so long as it is black"

The principles upon which the Ford industries are founded, as Ford has stated them, are.

1 An absence of fear of the future or veneration for the past. One who fears the future, who fears failure, limits his activities Failure is only the opportunity more intelligently to begin again. There is no disgrace in honest failure, there is disgrace in fearing to fail What is past is useful only as it suggests ways and means for progress

2 A disregard of competition Whoever does a thing best ought to be the one to do it. It is criminal to try to get business away from another man—criminal because one is then trying to lower for personal gain the condition of one's fellowmen—to rule by force instead of by intelligence.

3 The putting of service before profit Without a profit, business cannot extend There is nothing inherently wrong about making a profit Well-conducted business enterprise cannot fail to return a profit, but profit must and inevitably will come as a reward for good service It cannot be the basis—it must be the result of service

4 Manufacturing is not buying low and selling high It is the process of buying materials fairly and, with the smallest possible addition of cost, transforming those materials into a consumable product and giving it to the consumer Gambling, speculating and sharp dealing tend only to clog this progression

In the Ford practice the cycle of production starts with the consumer Ford holds that a commodity must first of all be designed to fit the needs of the largest possible number of consumers both in quality and price, and that the number of consumers will be continuously increased by constantly lowering the price of the article At the same time, by paying the highest possible wages to those engaged in the production and distribution of the article, he creates a high buying power In Jan 1914 Ford raised all wages in his industries to a minimum of $5 00 for an eight hour day The average wage throughout his industries at that time was $2 40 for a nine hour day The minimum wage in 1926 was $6 00 a day, with an average of $8 00 Model T (the touring car) which in the beginning cost $850, in 1926, with the average wage about four times larger than then and with materials costing at least double, sold for $310, with a self-starter and many improvements. From the introduction of Model T on Oct 1, 1908, it took the company until Dec 10, 1915, to produce a million cars, but under the new wage programme and the constant lowering of prices the company was in 1926 producing at the rate of two million cars a year

The general theory of production in the Ford plants is that everything must be kept moving, and that the work must go to the man instead of the man to the work For example, the cylinder block is cast on a moving platform in a mould made on a moving platform Thereafter it passes, without stopping, through a series of machines which perform all the necessary operations, and then, still moving, it passes into assembly, where to it are added, one by one, the hundreds of parts to create a complete motor Then it moves into the final assembly, where it is joined by other parts until eventually an automobile leaves the final assembly line under its own power Every part of the motor car has a similar train of construction and assembly, all converging either into the final assembly or into boxes or freight cars for shipment No man uses more than one tool, all the work comes waist high, a man never has to stoop or to move his feet to get anything, and the speed of the work is controlled, not by the worker's will, but by the pace of the conveyer

The Ford industries have been steadily reaching back to sources in order to cut out intermediate profits The industries have their own iron mines, coal mines and forests, their own railway, and an extensive fleet of lake- and ocean-going steamships, all of which are operated on the principle of high wages, high production and low cost In the forests no tree is permitted to be cut under 10 inches The logs are taken directly to the sawmill and, instead of being first converted into lumber and the parts sawed from the lumber, the parts are sawed directly from the log. All the woodworking is done at the forest mill, the waste goes to a wood distillation plant, and there is no waste whatsoever in shipment At the River Rouge plant, the iron from the furnace goes directly into the foundries and is poured without reheating The slag from the furnaces goes to a cement plant A combination of electric furnaces and a large rolling mill converts all the steel scrap In every direction the pressure is toward preventing the waste of time, men or material

As the business developed, it became apparent that it was a waste to assemble the cars at the factory and ship them complete. The manufacturing plants then ceased in effect to manufacture automobiles; instead, they make parts, and these are shipped to 35 branches in the United States, where they are assembled into complete motor cars Similar branches or associated companies are situated in nearly every part of the world, and these branches

also manufacture if the costs permit Foreign branches, under the theory of building consumption, employ only natives of the country in which they are located All the branches use the same methods and pay the same wages as the home plants The industry does not use a single warehouse—everything is in transit The centre of the industry is at Detroit, Mich , and at River Rouge, Mich , on the outskirts of Detroit; but with the method of assembling cars at the point of use, a decentralizing of manufacturing is taking place and comparatively small plants are being located out in the country wherever proper water-power sites are available Each of these plants makes only a single part, the thought behind their establishment is to strike a balance between industry and agriculture None of these plants employs more than 500 men, and in most cases the men divide their time between agriculture and industry This is one of the most important developments

In the spring of 1928 car number 15,000,000 was produced, and shortly thereafter it was decided to discontinue the making of Model T, on which the business had been founded, and turn to a new model Thereupon came the test of the mobility of an industry that had been built entirely upon the making of one thing The new Model T was in most respects unlike the first Model T, but the parts of the new Model T were all interchangeable with those of the first—although in most cases the designs had been changed and the materials were constantly changing Ford does not interpret quantity production as rigid production The new model, however, marked a complete departure from the old model, both in design and in many methods of manufacturing In the design of the new model it was decided to make use of new developments in manufacturing, particularly in electric welding and in the forging and spinning of metals Also nearly all wood was eliminated The purpose of the original car was to provide cheap and simple transportation When it came out, people were unaccustomed to the management of machinery, they knew nothing about internal combustion engines, and the roads were bad In the meantime, they have become accustomed to machinery and the roads have bettered Therefore, the new car was designed to fill a function different from that of the old Model T but at the same price Into it was put a standard gear shift, a new type of engine capable of picking up very quickly and of attaining a speed of between 60 and 70m an hour, the chassis was lower hung, and the designs of all the bodies were changed in the interests of appearance The advance in manufacturing skill permitted the new car to be made with tolerances approaching five-thousandths of an inch, whereas in the old Model T a thousandth of an inch had to be the practical limit of accuracy in quantity production The difficulties attending the putting of the new model into production were largely those of detail, excepting as touching the new methods and more powerful machinery This involved increasing the power used at the plant from about 100,000 to 250,000 horse power Aside from the new methods, the work was largely one of detail in changing over single purpose tools to new purposes and in devising new sequences of operations. The cost of this ran into about $200,000,000 in addition to which was the loss both to the company and its distributors of not producing cars for sale during a period of nearly six months The expense, however, while large in dollars, due to the magnitude of the operation, was not excessive on a percentage basis, running to less than 20% of the value of the plant, and so much of this was due to the new methods that it is almost impossible to discover exactly how much was due solely to design

The demonstration, however, has been made that the rigidity of quantity production has been over-estimated, and that the economies to be effected by this method of production are so great as amply to justify it in spite of the costs of introducing new models

Henry Ford is firmly against paternalism in any form He believes charity greatly harms those who receive it Carrying out this thought, he has a trade school for the education of boys with dependents, in which the boys make useful articles They earn an average of about $15 a week while receiving their education The Henry Ford hospital in Detroit, which is open to any one, is conceived on the theory that a hospital should be self-supporting All its rooms are precisely alike, all have baths attached, all the fees and services are at a scheduled rate, which is the same to everyone, and all the surgeons, physicians and nurses are on salary and have no financial relations with the patients.

The Ford Motor company also builds a light farm tractor under the same methods and principles as the motor car, and in 1926 was building experimentally all-metal aeroplanes and maintaining for experimental purposes a number of air routes with the eventual aim of putting the Ford principles into aeronautics.

Henry Ford has taken no active part in politics, although he was nominated in 1918 for U S. senator from Michigan; at the election he was defeated by a small margin. He took no part whatsoever in the campaign. In 1915 he was convinced by certain peace advocates of foreign extraction that it might be possible to end the World War if a sufficient gesture were made He thereupon chartered a ship and proceeded to Christiania, Norway. Then, convinced that the mission was futile, he returned home Ford does not believe in war, but he is not an active pacifist. For this encyclopaedia he wrote the article MASS PRODUCTION

A full account of the origins, theories and practices of the Ford industries is contained in *My Life and Work* (1922), and *To-day and To-morrow* (1926), both by Henry Ford in collaboration with Samuel Crowther. (S CR.)

FORD, JOHN (1586–*c* 1640), English dramatist, was baptized on April 17, 1586, at Ilsington in north Devon His father was in the commission of the peace and his mother was a sister of Sir John Popham, successively attorney-general and lord chief justice John Ford matriculated at Exeter College in 1601 and was admitted to the Middle Temple in 1602 In 1606 he wrote the elegy *Fame's Memorial, or the Earl of Devonshire deceased,* and dedicated it to the widow of the earl, the famous Penelope, formerly Lady Rich The elegy shows some sympathy for the fate of Essex Ford's tract of *Honor Triumphant, or the Peeres Challenge* (printed 1606 and reprinted by the Shakespeare Society with the *Line of Life,* in 1843), and the simultaneously published verses *The Monarches Meeting, or the King of Denmarkes Welcome into England,* show him in the capacity of a court poet *The Time Poets* (*Choice Drollery,* 1656) suggests that Ford withdrew from literary life in London to his native place; but nothing is known as to the date of his death

His career as a dramatist probably began by collaboration with Thomas Dekker with whom he wrote *The Fairy Knight* and *The Bristowe Merchant* (licensed in 1624, but both unpublished); and with John Webster *A late Murther of the Sonne upon the Mother* (licensed in 1624) A play entitled *An ill Beginning has a good End,* brought on the stage in 1613 and attributed to Ford, was (if his) his earliest acted play; whether *Sir Thomas Overbury's Life and untimely Death* (1615) was a play is extremely doubtful; some lines of indignant regret by Ford on the same subject are still preserved He is also said to have written, at dates unknown, *The London Merchant* (which, however, was an earlier name for Beaumont and Fletcher's *Knight of the Burning Pestle*) and *The Royal Combat;* a tragedy by him, *Beauty in a Trance,* was entered in 1653, but never printed These three (or four) plays were among those destroyed by Warburton's cook *The Queen, or the Excellency of the Sea,* a play of inverted passion, printed in 1653 by Alexander Singhe for private performance, was edited by W Bang (*Materialien zur Kunde d älteren engl Dramas,* 13, Louvain, 1906), and is by him on internal evidence confidently claimed as Ford's Of the plays by Ford preserved to us the dates span little more than a decade—the earliest, *The Lover's Melancholy,* having been acted in 1628 and printed in 1629, the latest, *The Lady's Trial,* acted in 1638 and printed in 1639

Two works, undoubtedly those most characteristically expressive of his peculiar strength, *'Tis Pity She's a Whore* (acted *c.* 1626) and *The Broken Heart* (acted *c.* 1629), were both printed in 1633 with the anagram of his name *Fide Honor.* The first is concerned with incest; the tragedy is well worked out, and the characterization vivid. The problem in which Ford was always most deeply interested is here stated at its most acute: the conflict between overwhelming passion and the whole range of restraints which can be opposed to it. *The Broken Heart* has another vivid

and sensational plot, and the pathos, if forced, is effective The influence of Burton's analysis of the emotions, strong in *The Lover's Melancholy,* is still traceable, but few were so capable of treating them sympathetically, and yet without reckless grossness or extravagance of expression. For in Ford's genius there was real refinement, except when the "supra-sensually sensual" impulse or the humbler self-delusion referred to came into play *Love's Sacrifice* (acted *c* 1630, printed in 1633), is a tragedy of a similar type *Perkin Warbeck* (printed 1634, probably acted a year later) is a chronicle play, the versification is regular, and the element of buffoonery reduced to a minimum *The Fancies Chaste and Noble* (acted before 1636, printed 1638) and *The Lady's Trial* (acted 1638, printed 1639) are negligible There remain two other dramatic works, of very different kinds, in which Ford co-operated with other writers, the mask of *The Sun's Darling* (acted 1624, printed 1657), hardly to be placed in the first rank of early compositions, and *The Witch of Edmonton* (printed 1658, but probably acted about 1621), in which we see Ford as a joint writer with Dekker and Rowley of one of the most powerful domestic dramas of the English or any other stage

Ford owes his position among English dramatists to the intensity of his passion, in particular scenes and passages where the character, the author and the reader are alike lost in the situation and in the sentiment evoked by it, and this gift is a supreme dramatic gift But his plays—with the exception of *The Witch of Edmonton,* in which he doubtless had a prominent share—too often disturb the mind like a bad dream which ends as an unsolved dissonance, and this defect is a supreme dramatic defect which has caused the neglect of this author's works in modern days

Bibliography.—The best edition of Ford is that by Gifford, with notes and introduction, revised with additions to both text and notes by Alexander Dyce (1869) An edition of the *Dramatic Works of Massinger and Ford* appeared in 1840, with an introduction by Hartley Coleridge The *Best Plays of Ford* were edited for the "Mermaid Series" in 1888, with an introduction by W H Havelock Ellis, and reissued in 1903 A C Swinburne's "Essay on Ford" is reprinted among his *Essays and Studies* (1875) The probable sources of the various plays are discussed in Emil Koeppel's *Quellen-studien zu den Dramen George Chapman's, Philip Massinger's und John Ford's* (1897) And *see* W A Mitsa in *Cambridge History of English Literature,* vol 6 (1910)

FORD, PAUL LEICESTER (1865–1902), American author, was born in Brooklyn, N Y , on March 23, 1865, the son of Gordon Lester and Emily (Fowler) Ford His delicate health led to his being privately educated, his tastes being formed largely by long hours spent in his father's library, then one of the finest collections of Americana in the world The environment of a select social circle and extensive travel on both American continents and in Europe fostered and intensified his cultural interests. At the time of his death, when but 37 years of age, he had gained distinction as an editor, bibliographer, historian and novelist, his edited works and writings totalling more than 70 In American literature he is most famous for his historical novels *The Honorable Peter Stirling* (1894) and *Janice Meredith* (1899). He was shot on May 8, 1902, by his brother Malcolm Ford, who in turn committed suicide

FORD, THOMAS (*c.* 1580–1648), English musician, of whose life little more is known than that he was attached to the court of Prince Henry, son of James I. His works consist chiefly of exquisite "Ayres," some of which may be ranked with the best of Dowland. They are set either as solos with lute accompaniment or as unaccompanied four-part songs The chief collection of his works is entitled *Musike of Sundrie Kinds set forth in Two Books, etc.* (1607).

FORD CITY, a borough of Armstrong county, Pa , U S A , on the Allegheny river, 35m N E of Pittsburgh It is served by the Pennsylvania and (through West Ford city, across the river) the Pittsburgh and Shawmut railways The population was 5,605 in 1920 (32% foreign-born white). Ford City has the largest plate-glass plant in the country, and manufactures also mill machinery, gear wheels and pottery It was founded in 1887, when Captain J. B. Ford, a pioneer in the plate-glass industry, built a factory here on land bought from farmers. The borough was incorporated in 1898.

FORDE, FRANCIS (d. 1770), British soldier, first appears on the army list in 1746 as captain in the 39th Foot, the first regiment of the king's service to serve in India Forde became major in 1755, but resigned his commission at the invitation of Clive, to become second in command of the E I company's troops in Bengal Soon after Plassey Forde was sent against the French of Masulipatam He defeated them at Condore, and was only checked by the guns of Masulipatam itself After 50 days, Forde, seeing the last avenues of escape closing behind him, ordered an assault at midnight on Jan 25, 1759 The assault was a brilliant success, in spite of the loss of one-third of the company's troops The company, however, refused to confirm Forde's commission of lieutenant-colonel On Nov 25, 1759, he won a brilliant battle against the Dutch at Chinsurah (or Biderra), and in 1760 received his commission. In 1769 with Vansittart and Scrafton, Colonel Forde was sent out with full powers to investigate every detail of Indian administration Their ship was never heard of after leaving the Cape of Good Hope on Dec 27, 1769.

Monographs on Condore, Masulipatam and Chinsurah will be found in G B Malleson, *Decisive Battles of India, 1746–1849* (1885, new ed , 1888)

FORDHAM, formerly a village of Westchester county, New York, U S A , and now a part of New York city. It lies on the mainland, along the eastern bank of the Harlem river, east of the northern end of Manhattan island It is the seat of Fordham university (Roman Catholic), founded in 1841 as St John's college, and since 1846 conducted by the Society of Jesus In 1907 the institution was rechartered as Fordham university, and now includes St. John's college High school and Grammar school, St John's college, the Fordham University Medical school (all in Fordham), and the Fordham University Law school In Fordham still stands the house in which Edgar Allan Poe lived from 1844 to 1849 and in which he wrote "Annabel Lee," "Ulalume," and other poems

The hamlet of Fordham was established in 1669 by Jan Arcer (a Dutchman, who called himself "John Archer" after coming to America), who in that year received permission from Francis Lovelace, colonial governor of New York, to settle 16 families on the mainland close by a fording-place of the Spuyten Duyvil creek, near where that stream enters the Harlem river Between 1655 and 1671 Archer bought from the Indians the tract of land lying between Spuyten Duyvil creek and the Harlem river on the east and the Bronx river on the west, and extending from the hamlet of Fordham to what is now High Bridge In 1671 Governor Lovelace erected this tract into the manor of Fordham. In 1846 it was included with Morrisania in the township of West Farms; and in 1872, with part of the township of Yonkers, was erected into the township of Kingsbridge, which, in 1874, was annexed to the City of New York, and in 1898 became a part of the borough of the Bronx, New York city.

FORD MOTOR COMPANY, manufacturer of automobiles, trucks, tractors and "all-metal" commercial aeroplanes, was incorporated in Michigan on June 16, 1903, with a capital of $100,000. Of the original 12 stockholders, Henry Ford held 25% of the stock; in 1906 he owned 51%; and a little later, 58½%. In 1919 Edsel Ford, having succeeded his father in the presidency, acquired the remaining 41½% of the stock outstanding On July 9, 1919 the company was reorganized, under the laws of Delaware, with an authorized capitalization of $100,000,000. There are 35 branches in the United States, at 32 of which Ford cars and trucks are assembled There are foreign plants, offices and associated companies in 25 cities throughout the world. The principal manufacturing units are situated in and near Detroit, Mich , they operate five days a week on eight hour shifts. At the Highland Park and Fordson plants, Mich (the general offices are located at Fordson) the company operates its own lighting, heat and power plant, fire department; glass factory; wire plant, steel mill; paper mill; large foundry; coke ovens; cement plant, body plant, blast furnaces; telephone and telegraph exchanges; freight and express offices; laboratories; machine shops; wool and cotton textile plants; the Henry Ford Trade school for boys; a motion picture studio; a park and an athletic field; hospital; safety and hygiene

departments; and grocery, drug, shoe and meat stores In the Detroit district, also, are the engineering laboratory (Dearborn), and the Lincoln Motor Company, a division of the Ford Motor Company, acquired on Feb 4, 1922 The Ford Motor Company of Canada, Ltd , supplies the trade in the Dominion and in the British empire (except the British Isles) The Fordson Coal Company (incorporated Feb 1923) owns 120,000 ac of coal and timber lands in Kentucky and West Virginia The company also owns more than 500,000 ac of timber and iron lands in Northern Michigan Lake freight steamers, also owned by the corporation, carry ore to the Fordson plant from northern Michigan mines, and on the return trips transport Ford coal to Duluth, while seagoing Ford ships carry automobile parts abroad and to company plants on the Atlantic and Pacific coasts The Stout Metal Airplane Company, a division of the Ford Motor Company, is situated at the Ford airport, Dearborn, Mich , where it builds "all-metal" commercial aeroplanes, and the parent company operates two air lines (one to Chicago, one to Buffalo) over which company freight is carried daily There is also a railway (Detroit, Toledo and Ironton) owned principally by the Ford family, which operates 470 m of track and connects with the principal transcontinental lines The company's glass plants have an annual capacity of 25,000,000 sq ft , the open-hearth furnaces have a daily capacity of 1,400 tons of steel, and the storage bins at Fordson are capable of holding 2,000,000 tons of iron ore, coke and limestone The company sold its first car in July 1903, and produced 1,708 cars during its first fiscal year On Oct 1, 1908 the first Model T car was manufactured, seven years later number 1,000,000 was produced, on June 4, 1924, No 10,000,000 was turned out, and on May 26, 1927 No 15,000,000 was completed, and the manufacture of the Model T Ford car was discontinued to permit a factory change for the production of an entirely new product, the new model A car The first model A engine was assembled on Oct 20, 1927 and the car was formally introduced to the public on Dec 2, 1927 The authorized capital stock of the company aggregates $100,000,000, of which there was outstanding on Dec 31, 1926, $17,264,500 The headquarters are at the Fordson plant, at Fordson, Michigan

(B R D)

FORDUN, JOHN OF (d *c* 1384), Scottish chronicler It is certain that he was a secular priest, and that he composed his history in the latter part of the 14th century, and it is probable that he was a chaplain in the cathedral of Aberdeen The work of Fordun is the earliest attempt to write a continuous history of Scotland We are informed that Fordun's patriotism was roused by the removal or destruction of many national records by Edward III and that he travelled in England and Ireland, collecting material for his history This work is divided into five books The first three are almost entirely fabulous The 4th and 5th books, though still mixed with fable, contain much valuable information The 5th book concludes with the death of King David I in 1153 Besides these five books, Fordun wrote part of another book, and collected materials for bringing down the history to a later period These materials were used by a writer in the middle of the 15th century, who is identified with Walter Bower (*q v*), abbot of the monastery of Inchcolm The additions of Bower form 11 books and bring down the narrative to the death of King James I in 1437 In addition he did not hesitate to interpolate Fordun's portion of the work with additions of his own, and the whole history thus compiled is known as the *Scotichronicon*

Fordun's work was first printed in Thomas Gale's *Scriptores quindecim* (vol iii 1691). This was followed by Thomas Hearne's (5 vols) edition in 1722 The whole work, including Bower's continuation, was published by Walter Goodall at Edinburgh in 1759 In 1871 and 1872 Fordun's chronicle, in the original Latin and in an English translation, was edited by Wm F Skene in *The Historians of Scotland,* the preface of which contains full bibliographical details.

FORECLOSURE, in the law of mortgage, the extinguishment by order of the court of a mortgagor's equity of redemption. In the law of equity the object of every mortgage transaction is eventually the repayment of a debt, the mortgaged property being incidental by way of security Therefore, although the day named for repayment of the loan has passed and the mortgagor's estate is consequently forfeited, equity steps in to mitigate the harshness of the common law and will decree a reconveyance of the mortgaged property on payment of the principal, interest and costs This right of the mortgagor to relief is termed his "equity of redemption " Under the new legislation this estate is no longer merely equitable, but legal However, this has not changed its attributes, which are that it can only be defeated by the mortgagee taking possession of the mortgaged property and retaining it for 12 years without acknowledging the mortgagor's title, or by the decree of the court ordering the foreclosure of it or the sale of the mortgaged property, or by a sale by the mortgagee under his statutory powers A foreclosure action is brought by the mortgagee against the mortgagor in the chancery division of the High Court in England claiming that an account may be taken of the principal and interest due to the mortgagee, and that the mortgagor may be directed to pay the same, with costs, by a day to be appointed by the court and that in default thereof he may be foreclosed his equity of redemption In such an action the court may always order a sale instead of foreclosure English county courts have jurisdiction in foreclosure actions where the mortgage or charge does not exceed £500, or where the mortgage is for more than £500, but less than that sum has been actually advanced In a Welsh mortgage there is no right to foreclosure

(J A St)

United States.—The American law on foreclosure is like the English in perpetuating a mortgagor's right to redemption until it is barred by valid foreclosure—typically but not always by way of action in equity—or, if the mortgagee has obtained possession under the mortgage, by the statute of limitations (*q v*) But the American law is otherwise highly diversified among the several States, and differs often radically from the English In part the differences reflect the early American reaction against that flat forfeiture of the mortgagor's land to the mortgagee which was involved in the English conception of mortgage, hence "strict" foreclosure can be had, even by judicial decree, almost nowhere outside of New England The further differences and divergences arise from the various devices employed in an effort to accomplish the next to impossible, viz , to assure to an unfortunate mortgage debtor some return for the supposed excess in value of his land over the amount of the debt The practical impossibility arises from two fairly obvious facts first, that failure to pay off the mortgage commonly proves either that the land mortgaged is a losing proposition, or that conditions (either in general or in real estate) have become such as to make advantageous sale difficult, second, that forced sale is a poor way to make anything realize its value On the other hand, differences and divergences appear because of the steady pressure of mortgage-lenders and their counsel to invent a quick, sure way to liquidate the debt despite the law

The first expedient to avoid forfeiture was the substitution of foreclosure by compulsory *sale* for foreclosure by forfeiture, and, often, a requirement that the premises should be sold in parcels, if possible, so as to save what might be saved Experience showed, however, that the anticipated surplus for the mortgagor rarely materialized; indeed, the mortgagee is himself commonly forced by lack of competition to purchase at such a sale Especially through the middle West, where debtor and farmer influence was strong, there then resulted the enactment of a statutory further period of redemption—redemption from the purchaser at the foreclosure sale—the period running from six to 18 months These provisions operated in part as a sort of poor law, assuring the mortgagor a chance to live undisturbed and make another crop, in part as an opportunity to canvass still further, perhaps under conditions changing for the better, the chances of private sale or of refinancing But they greatly retarded the realization by the mortgagee, and often decreased his security because of the tendency of mortgagors to exploit the foreclosed premises, or let them run down, during the statutory period of grace Lenders' efforts to avoid these difficulties have taken the form, chiefly, of incorporating into the mortgage at the outset a power of private sale of the land if default should occur. Where allowed full effect, such a power does away with court and sheriff's costs, and makes foreclosure quick. On the other hand, it is obviously subject to abuse. The States have varied in their attitude toward such informal

foreclosure. Some sustain the power as written, even if it requires no notice to the mortgagor that a sale is intended Commonly, the sale is required to be by auction Commonly, too, a fixed number of advertisements of the sale is required, or the mailing of notice to the mortgagor, or both In some States the statutory redemption period is made to apply even after sale under such a power; and such is the policy of the proposed Uniform Mortgage Act On the other hand, in some States the restrictions on such powers of sale which are insisted upon in mortgages made directly to the mortgagee seem to be avoided if the transaction is put in the form of a deed to a third person as trustee, to secure the mortgage debt; in which case the security deed of trust comes practically to displace the strict mortgage form On the whole, it is worth note that even under strict foreclosure by forfeiture, a mortgagor has sometimes a fair chance of realizing something from his "equity," indirectly, since junior mortgagees or judgment creditors are entitled to redeem the premises if he does not—in which case any surplus that may thereafter be realized will wipe out a debt of the mortgagor in addition to the mortgage debt Under the statutory redemption system this chance is definitely increased for the junior lienor redeems not by paying off the senior mortgage, but by paying off the price (plus interest and expenses) realized at foreclosure sale It should further be noted that foreclosure by judicial action (whether resulting by way of sale or of forfeiture) is effective only against those persons having an interest in the premises who are duly served with legal process, whereas informal foreclosure under power of sale, wherever sustained, is free from this danger and expense to the mortgagee And, finally, that unusually slow, or complicated, or expensive foreclosure of course reacts to raise interest rates on mortgages, even though a legal prohibition exists against charging interest at more than a fixed rate Hence the net social effect of compulsory delays in foreclosure approaches roughly that of compulsory mutual insurance, in which all mortgage debtors pay a somewhat heavy premium for the partial benefits any of them will derive who are forced to default

Where the mortgaged premises are so leased as to produce income from the rents, as in the case of apartment or office buildings, foreclosure proceedings are commonly accompanied by the appointment of a receiver to collect the rents pending determination of the suit, and thereby insure against an inadequate price being realized at the sale The use of the receiver is also common in foreclosing large mortgages, especially those securing bond issues, on corporate assets, and it should be noted that in such cases the sale under foreclosure is never for cash, but for part or all of the bonds secured—it being, in view of the values involved, practically impossible to produce a cash (or even a rival) bidder The result is a corporate reorganization, in which the original holders of the bonds foreclosed are the dominating factors, the participation of stockholders (who correspond to the mortgagor) in the new corporation being not a matter of right, since they have been foreclosed, but a matter of expediency, since the new capital needed can commonly be collected from them under the inducement of some participation in the new organization (*See* also MORTGAGE)

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FORECLOSURE SALE, the sale of property conducted pursuant to the foreclosure clauses of a mortgage upon the property When property is sold under foreclosure proceedings the proceeds are applied first to the legal expenses of the sale, then to the principal of the debt on account of which the sale was brought about; the remainder, if any, reverts to the mortgagor, *i.e.*, the former owner of the property which was disposed of. (*See* FORECLOSURE.)

FOREIGN EXCHANGE: *see* EXCHANGE, FOREIGN.

FOREIGN INVESTMENT: *see* CAPITAL, EXPORT OF

FOREIGN LANGUAGES, TEACHING OF. The revolution that has taken place in the methods of teaching modern languages may be said to date from Viëtor's pamphlet *Der Sprachunterricht muss umkehren* (1886). His doctrines were largely adopted in the Frankfurter Reformschulen, but it was not till after 1900 that the movement became widespread in England and France Broadly speaking, the idea of the reformers was to substitute direct comprehension and acquisition of the foreign language for mere knowledge attained through the medium of the mother tongue

They insisted on oral study at the outset of the language, involving explanations in the foreign tongue itself, on inductive methods of learning grammar and on the use of reading and of free composition in place of formal grammar and translation from or into the foreign language Hence the introduction of the phonetic script and chart, the employment of gesture, the utilization of pictures, postcards, coins and other *Realien;* and the stress laid on the teacher and not the text-book being the centre of the instruction—the whole idea being to render the classroom a sort of French or German *enclave,* and to make the pupil think as far as possible in the language

Some of these doctrines were pushed to excess. Certain teachers attempted to exclude the mother tongue entirely from the classroom, others devoted an inordinate time to phonetics or conversation on pictures, and exalted the oral side as the goal of all teaching Others again neglected the grammar or interpreted their new-won liberty as a right to teach as they pleased, irrespective of their colleagues To-day, while phonetics (*q v*) have been generally accepted in England (though not in France), it is seen that the extent of their use (apart from the chart) may be left to the choice of the teacher, Again new grammar points should be learnt inductively, but the grammar must be systematized and codified With most pupils grammatical points are more safely explained in English Due co-ordination of method can usually be secured by the appointment of a head of department Translation from or into the foreign language is often begun two years before the final examination and not often earlier As regards the exclusion of the mother tongue, we may take it as an axiom that the cleverer the child the more direct the teaching Hence with the duller child the aim should probably be to concentrate rather on reading and translation than on composition (free or otherwise) At the extreme end of the scale there are, in the opinion of some experts, a few non-linguistic pupils, who would be more profitably engaged in confining themselves to the mother tongue

It is probable that the earlier reformers laid insufficient stress on the rapid acquisition of vocabulary, possibly from their dread of rote-work To-day there is a fruitful tendency to learn by heart, not merely poems but duly prepared prose passages, a practice that is at the back of much of the mastery attained by the French in their own language Of course such passages need occasional revision. Again, the principle of private reading, which has made such strides in English has been promoted by the formation of class and school libraries, and the practice has been further fostered by the introduction of free study periods in certain schools Such are the main features of the teaching in English secondary schools, up to the first school examination

In the central schools, which often prepare their fifth-year pupils for similar examinations, the methods are largely the same, except that in the first year the classes, which are larger, are sometimes divided for conversation, with excellent results In the advanced courses of the secondary schools, the methods of reading and *lecture expliquée* without translation are largely followed, and essays on literature are written in the foreign language A burning point is that the universities which conduct the higher certificate examinations appear to prefer answers in English in the literature papers A possible solution would be the award of extra marks for one question to be answered in the foreign tongue In the evening schools methods have been modernized, but the need of covering the ground more quickly necessarily limits the use of the leisurely practices of the direct method (C BR.)

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UNITED STATES

The attempt to make general the employment of the "direct method," in the teaching of foreign modern languages in the United States had begun to subside before 1909, when it became clear that the method was looked on askance in the best high schools and preparatory schools, and especially in the colleges and universities Many teachers were well acquainted with foreign languages by ancestry and study abroad; but some could not speak such languages with ease Also, the increasing desire for travel in Europe, now so manifest, was only beginning to develop In the universities and colleges, the professors laughed the matter out of court But agitation over the direct method has borne fruit. Indeed, nearly all the text-books in modern languages bear an imprint, however faint, of the direct method, the influence of which has been beneficial It is true, furthermore, that the World War gave a strong and perhaps lasting impulse to the study of the spoken language

Much of the improvement in the teaching of the modern languages came from another source the introduction of phonetics This study made its way under two forms formal or theoretical and experimental phonetics The first came from both France and Germany, as well as from the English school of Bell and Sweet; the latter came from France French influence was also seen in the steady extension through the universities and high schools of the international phonetic alphabet, which is now the only one used in the United States in teaching the foreign spoken languages This alphabet was contrived by Paul Passey (who took hints from Ellis, Bell, Sweet and others) and began to be known in the early '90s

The science of experimental phonetics was founded by the Abbé Rousselot, whose laboratory at first was in the *Institut Catholique*, Paris, then in the Collège de France Two or three scholars began research at Harvard university at about the same time as Rousselot in France The study of experimental phonetics is being given an ever growing importance in the training of teachers of the modern languages in the United States Courses in this subject are offered in many American universities and colleges, *e g*, at the universities of Chicago, Michigan, Ohio State, Utah, at New York university and Washington and Jefferson college Middlebury college offers in the summer a full list of courses in experimental and theoretical phonetics for teachers It is said that Boston university is about to equip a laboratory The University of Havana, Cuba, did so many years ago

The World War favoured the extension of French in the United States Combined reports from about 76% of the elementary schools, public and private, and the high schools and academies and from about 89% of the colleges and universities indicate an enrolment during the year 1923–24 of 629,000 students of French, 392,000 of Spanish and 65,000 of German (R WE)

FOREIGN LEGION: *see* LEGION

FOREIGN OFFICE, in Great Britain, that department of the executive which is concerned with foreign affairs The head of the Foreign Office is termed principal secretary of State for foreign affairs, and his office dates from 1782 From the Revolution until that time there had been only two secretaries of State the Southern, administering Home, Irish, American, French, Spanish, Portuguese, Barbary States, Italian, Swiss and Turkish affairs, while the Northern looked after the rest of Europe In 1782, under Rockingham's administration, the Southern department became the Home Office, keeping the charge of Irish affairs and such colonial business as remained after the secession of the United States, and the Northern department became the Foreign Office, with Charles James Fox as first secretary of State for foreign affairs.

The office was then in Cleveland row: the duke of Leeds transferred it in 1786 to the Whitehall Cockpit. In Grenville's time (1791), when the secretary of State was assisted by a staff of two under-secretaries and 11 clerks, it came to small, dark and inconvenient premises in Whitehall, and stayed there until its final move to its present buildings in 1868. The greatest secretaries of State of the 19th century were Canning (1822–27), Palmerston (1830–34) and Salisbury (1878–80, 1885–86 and 1887–92) (*qq.v.*) The most important permanent officials have been Joseph Planta (1787–1847), who controlled the procedure of the office in its early years; Lord Hammond (1802–90, permanent under-secretary 1854–73) and Lord Sanderson (1841–1923, permanent under-secretary 1894–1906), who ruled in middle and late Victorian times respectively; Sir Eyre Crowe (1864–1925, permanent under-secretary 1920), to whom the present organization of the office is greatly due; and Sir Edward Hertslet (1824–1902, librarian 1857–96), who originated the great treaty collections, etc., still associated with his name, and the Foreign Office List

A qualifying entrance examination for Foreign Office clerks was instituted by Lord Clarendon in 1856, and they are now in almost all respects on an equality with other members of the civil service (*q.v.*), though there are some special provisions as regards languages in the entrance examination taken by them In 1881 lower (subsequently second) division clerks were introduced, and there is at the present time, in addition to the diplomatic establishment, a non-diplomatic staff to deal with establishment, accounts and other questions of a non-diplomatic character Women typists were first introduced in the early '90s and had by 1906 taken over all copying work. As a result of the Royal Commission on the Civil Service, 1912–14, the Foreign Office and diplomatic staffs (*see* DIPLOMACY) were made interchangeable, and the "property qualification" (*i.e.*, the necessity of possessing some private means) for the latter was abolished

The secretary for foreign affairs is the official agent of the Crown in all communications between Great Britain and foreign powers, his intercourse is carried on either through the representatives of foreign States in Great Britain or through representatives of Great Britain abroad He negotiates all treaties with foreign States, protects British subjects residing abroad, and demands satisfaction for any injuries they may sustain at the hands of foreigners, he, or some person appointed by him with cabinet approval, also represents Great Britain on the Council of the League of Nations

He is assisted by a permanent under-secretary of State, a parliamentary under-secretary, a deputy under-secretary and two assistant under-secretaries all of these, except the second, are permanent civil servants

The Foreign Office at present (1928) is made up of the following departments: (a) *Territorial* American (North and South America, Liberia, liquor traffic, slave trade); Central (Central Europe, Italy, Balkans, execution of the peace treaties); Eastern (Turkey, Persia, Hejaz); Egyptian (Egypt, Sudan, Abyssinia); Far Eastern (China, Japan, Siam, opium); Northern (Russia, Afghanistan, Poland, Scandinavia, Finland, Baltic States); Western (France, Spain, Portugal, Holland, Belgium, Switzerland, League of Nations, arms traffic) (b) *General* Treaty (international law, foreign marriages, nationality, diplomatic privilege, ceremonial); Consular (under the administrative control of the Department of Overseas Trade, for which *see* below; dealing with the consular service [*see* CONSULS] throughout the world); News (press, wireless news service), Dominions Information (inter-imperial relations as affecting foreign countries), Communications (telegrams, king's messengers), Passport office and passport control department; Chief Clerk's department (estimates, finance, establishment, fabric); Library (books, custody of correspondence, preparation of memoranda, facilities and information, legalization of documents); registry, a sub-department of the Library (arrangement, indexing, despatch and custody of current correspondence) There is a legal adviser, whose post was created in 1878, now with three assistants, and (temporarily) an historical adviser.

British trade abroad has always been the joint concern of the Foreign Office and the Board of Trade (*q.v.*), and until 1917 there was a Commercial department of the Foreign Office to act as the channel between British diplomatists and consuls abroad and the Board of Trade at home. In that year the Department of Overseas Trade was formed, with its own permanent head and parliamentary under-secretary, and it now occupies a quasi-independent position between the two older offices, having especially close relations with the Consular department of the Foreign Office, and

dealing also with British trade in the dominions and colonies

The World War naturally caused a vast expansion in the work of the Foreign Office. Its most important manifestations were the Contraband Department (the Foreign Office side of the Ministry of Blockade), with its subsidiary licensing and statistical branches, and an organization for the promotion and control of British propaganda, until this activity was handed over to a Ministry of Information created *ad hoc.*

Despatches, telegrams, letters, etc., are registered on receipt,[1] and the registry clerks attach to them previous correspondence on the same subject, or papers affording precedents or analogies. They are then sent to the appropriate department for minuting. Minor matters are settled within the departments, while those of greater importance pass on upwards to the under-secretaries, and to the secretary of State himself: the latter, in the weightiest matters of all, will consult his colleagues of the cabinet, and keep the King informed and if necessary obtain His Majesty's approval.

The salaries of officials of the Foreign Office, and the diplomatic, commercial, diplomatic and consular services will be found in the Foreign Office List, published annually by Messrs Harrison and Sons, Ltd

The numbers employed in the Foreign Office and connected departments are (June 1928) —

Foreign Office	*Permanent*	*Temporary*	*Total*
Men	240	81	321
Women	129	120	249
Passport Office			
Men	8	179	187
Women		10	10
Department of Overseas Trade			
Men	291	48	339
Women	38	85	123

See *Foreign Office List*, annual, *Cambridge History of Foreign Policy* (1923), vol iii, ch viii (S Ga)

FOREKNOWLEDGE: *see* Free Will

FOREL, FRANÇOIS ALPHONSE (1841–1912), Swiss geographer, was born at Morges on Lake Geneva, on Feb 2, 1841. He was trained for and practised the medical profession, but his life-interest was found in the lake on whose shore he lived. The fruits of his studies were embodied in *Le Léman* (3 vols., 1892–1902). On the science of limnology his standard work is *Handbuch der Seenkunde* (1901), in this connection his investigations of the previously mysterious movements of lake-waters known as seichs call for special notice Among other researches of Forel's those in seismology and upon Swiss Alpine glaciers are noteworthy He died at Morges on Aug 7, 1912.

FORELAND, NORTH and **SOUTH,** two chalk headlands in Kent, England, on the Strait of Dover. The North Foreland forms the north-east corner of the Isle of Thanet, and South Foreland is 3 m N E of Dover Both form bold cliffs, with one lighthouse on the North Foreland (51° 22½′ N., 1° 27′ E.) and two on South Foreland (51° 8½′ N, 1° 23′ E). Another Foreland is on the north coast of Devonshire, on Bristol channel, 2½ m N.E. of Lynmouth.

FOREORDINATION: *see* Free Will

FORESHORE, that part of the seashore which lies between high and low water mark at ordinary tides In Great Britain it is ordinarily and prima facie vested in the Crown, except where it may be vested in a subject by ancient grant or charter from the Crown, or by prescription from which a grant may be presumed. The chief acts showing title to foreshore are, taking wreck or royal fish, right of fishing, mining, digging and taking sand, seaweed, etc., embanking and enclosing. There is a public right of user in that part of the foreshore which belongs to the Crown, for the purpose of navigation or fishery, but there is no right of passage over lands adjacent to the shore, except by a particular custom. So that, in order to make the right available, there must be a highway or other public land giving access to the foreshore. Thus it has been held that the public have no legal right to trespass on land above high-water mark for the purpose of bathing in the sea, though if they can get to it they may bathe there (*Blundell* v *Catteral*, 1821, 5 B & Ad 268) There is no right in the public to take sand, shells or seaweed from the shore, nor, except in certain places by local custom, have fishermen the right to use the foreshore or the soil above it for drawing up their boats, or for drying their nets or similar purposes Improvements made by a tenant under the Landlord and Tenant Act, 1927, must not infringe the rights of the public. As to registration of land comprising foreshore, *see* c 21 of 1925, s 97. (For foreshore protection *see* Coast Protection)

In the United States the foreshore generally belongs to the State in which it lies except in some States, as Maine, Massachusetts, New Hampshire and Virginia, where it belongs to the owner of the upland The State may make such reasonable regulations as to its use by the public as are not inconsistent with the provisions of Federal law

See S A Moore, *History of the Foreshore and the Law relating thereto* (1888); H J. W. Coulson and U A. Forbes, *Law of Waters* (1902).

FORESTALLING, in English criminal law, the offence of buying merchandise, victual, etc , coming to market, or making any bargain for buying the same, before they shall be in the market ready to be sold, or making any motion for enhancing the price, or dissuading any person from coming to market or forbearing to bring the things to market, etc *See* Engrossing

FOREST CITY, a borough of Susquehanna county, Pa , U.S A , in the Moosic mountains, 20m N E of Scranton It is served by the Delaware and Hudson, the Erie and the New York, Ontario and Western railways. The population was 6,004 in 1920 (29% foreign-born white) and was estimated locally at 7,000 in 1928 Anthracite mining and farming are the chief occupations of the region The borough was incorporated in 1888

FORESTERS, ANCIENT ORDER OF: *see* Friendly Societies

FOREST LAWS, the restrictive laws applicable to land converted by exercise of the royal prerogative into a "forest," in which game was preserved But, whereas an offender against the ordinary game laws was punishable by the courts of common law, an offender against forest laws was punishable in special courts Trials took place in the swainmote, held three times a year, where freeholders within the forest did suit and of which the verderers were the judges, on charges presented by the foresters in the woodmote, held every 40 days Judgment, however, only took place in the justice seat, held by one of the two chief justices for the forest every three years The land within a forest might be owned by anyone, but rights of ownership were so restricted by the forest laws that constant complaint of hardship was made by landowners in and near the forests The forest laws were among the grievances which united the barons and people against John They were dealt with by Magna Carta but the first forest charter was Henry III 's, in 1217, by which land afforested under Richard and John became *purlieu,* subject to forest law as it affected non-owners of the land, but (subject to certain protection for the king's wild beasts) disforested for the landowners Charles I revived the forest laws to extort revenue, but in 1640 parliament confined forests to their limits as in 1623 Since the Revolution the forest laws have fallen into complete disuse.

See Manwood, *On the Forest Laws* (4th ed., 1717).

FOREST PARK, a city of Cook county, Ill , U S A., 12m W. of Chicago, served by the Chicago, Aurora and Elgin, the Chicago Great Western and the Soo Line railways. The population was 10,768 in 1920 (27 7% foreign-born white). It is a residential suburb, and also has a variety of manufactures, including cedar chests, mouldings, cement posts, celluloid and mica products. Floriculture is an important industry.

FORESTS AND FORESTRY. The meaning of the word "forest" has undergone many changes with the change in economic, political and social conditions of the people. Originally the word "voorst" or forest designated the segregated property of the king or leader of the tribe. Toward the end of the eighth century, it referred to all the royal woods in which the right to hunt was reserved by the king, but other rights, such as the right to cut

[1] These receipts were 68,000 in 1913 and 146,500 in 1927. The number of out-going despatches (including letters, telegrams, etc) is considerably larger than this

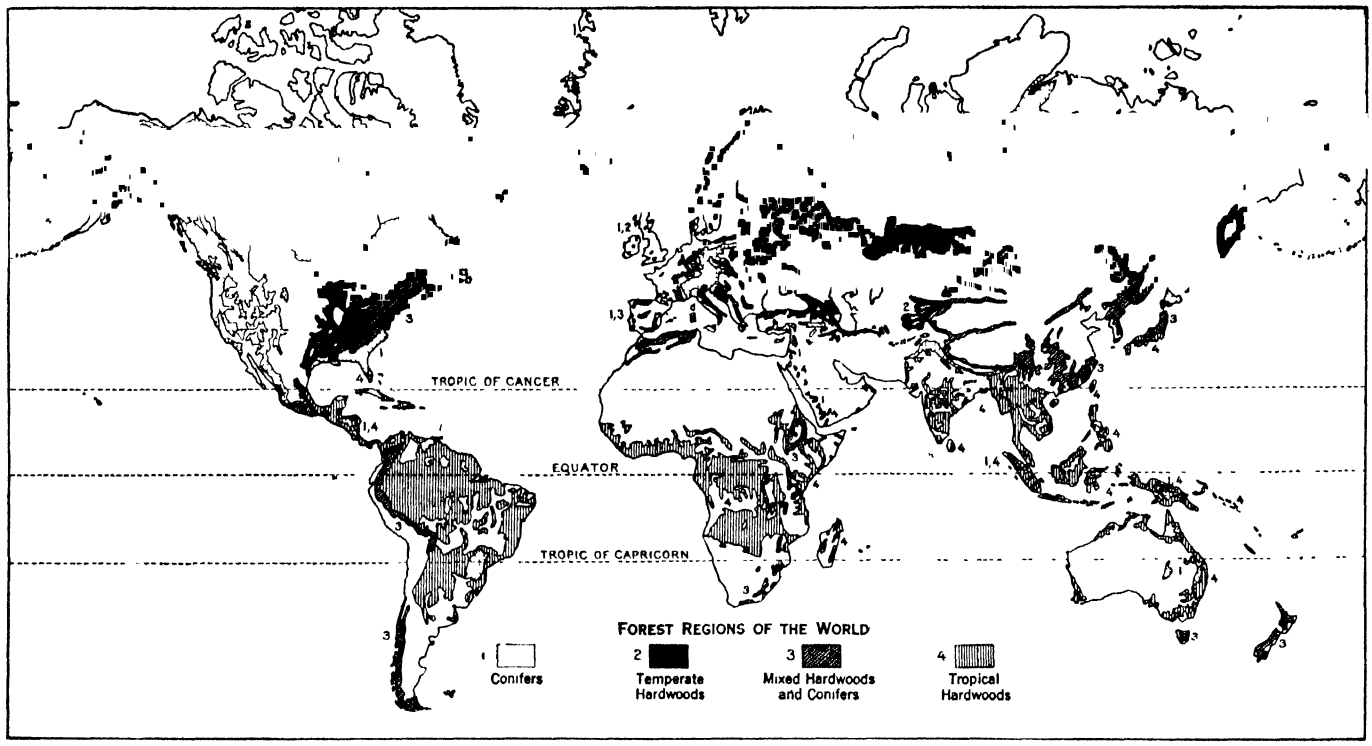


FIG 1

wood, clear for agricultural use or pasture, remained free to all Toward the end of the ninth century, "forest" meant a large tract of land, including woods as well as pastures and whole villages, on which not only the rights to the chase were reserved to the king but also all other rights, often even the activities of the persons themselves living on it, were restricted "Forest" was a legal term, applied to a large tract of land or district governed by special "forest laws," with the royal prerogative—"the right to hunt"—as the basis The forests of Dean, Windsor, Epping and Sherwood, and the New Forest in England, made famous by legend and history, were such legal districts set aside by the Norman kings for their pastime With the decadence of the regal prerogative, the old legal meaning wore away, and "forest" came to mean a natural condition, land covered by wood growth as contrasted to prairies and plains, meadows and field

In modern times as the economic aspect of forests as a source of wood material came more into the foreground, "forest" came to mean a woodland, whether of natural growth or planted by man, designated as an object of man's care for the growing of timber and other forest products With the advance of plant science, better understanding of the nature of the forest, its life history, and its relation to climate, soil and other environmental factors, the forest is conceived as a biological entity—a plant society governed by definite natural laws, the knowledge of which is basic to intelligent management of the forest as an economic resource *The present conception, then, of a forest is that of a plant society of arborescent and shrub species, which has both an economic and biological significance* Its economic significance lies in the production of timber and other forest products Its biological significance lies in its effect upon climate, streamflow, protection of the soil from erosion, and in the mutual relationships that exist between the trees in the forest

Rôle of Forests in Human History.—The relations between forests and man are manifold and varied throughout the course of human progress from the primitive stage to the present highly developed economic organization Forests have had an important effect on the distribution of mankind over the earth's surface They have deeply affected the spiritual and religious life of the tribes living within them or nearby They have been a source of raw material, indispensable to the economic development of the human race

At the dawn of human history, the forests did not offer favourable conditions for the settlement of primitive man, on the contrary, they were always an element inimical to the spread of mankind over the earth

Only a few traces of prehistoric man are found in densely forested regions The chief memorials of Neolithic man in Britain are found on the moorlands, which at that time appeared as islands of open, habitable land, above the vast stretches of swamp and forest The first cradle of human civilization was not a primeval forest The first great nuclei of population, the seats of the earliest recorded civilizations both in the Old and in the New World, originated in arid regions, at best only scantily covered with forests In the Old World, the Egyptian, Babylonian, Assyrian and Phoenician civilizations arose in hot and dry regions Similarly, in the New World, the nations which developed a high degree of civilization were those in the arid regions of Mexico and Peru—the Aztecs and the Incas

Barriers to Travel.—Forests have acted as barriers to human colonization in all parts of the world It took the American colonists about 200 years to reach the crest of the Appalachians The expansion of the Inca empire from the high plateaus of Peru and Bolivia eastward was limited by the impenetrable forests of the headwaters of the Amazon river The Romans, the greatest colonizers of ancient times, were forced to stop in their expansion and empire building at the boundaries of the dense, virgin German forests Later, the successive waves of nomadic tribes which moved from the eastern prairies westward—Huns, Magyars, Avars, and the like—broke up when they reached the barrier of primeval forests The routes of migration in western and central Europe were largely determined by the openings in the primeval forest

The difficulty of travel in the forests made them play during early stages of human culture, the part of territorial boundaries Forests formed political boundaries in the ancient nations of central Europe According to Grimm, the German word, *mark*, which means boundary, was originally a synonym of *Waldland*, or woodland Even today, among the more primitive races, forests still serve as political boundaries When the forests did not afford a safe defence in themselves, then the natives resorted to the construction of additional barriers, which, primitive as they may seem to us at present, probably proved very effective for those times

As a source of fuel, the forest has exerted a most powerful

influence upon human progress. The polar boundary of human settlement in the interior of northern Asia and North America closely coincides with the northern limit of forest vegetation In Alaska, the northern timber limit reaches as far as 67° N , in Labrador, it ends at 52° N , or 15 degrees farther southward. The Indian settlements follow closely these fluctuations of the northern timber line.

Cultural Influence.—The forest left a deep impression upon the soul of primitive man. The forest figures largely in the religious beliefs of primitive races all over the world With many primitive peoples, trees are considered to be the abode of the souls of the dead The Hindu philosopher, Tagore, in his book on *The Realization of Life,* describes very vividly the part which the Indian forests have played in the development of Indian civilization and philosophy. The influence of the forest upon the spiritual life of man is not confined, however, to primitive tribes. The folklore of North American Indian, Teuton and Slav is permeated with the atmosphere and joy of the forest

Landscape painting has drawn much inspiration from the forest. The forest is a great natural structure from which architecture has often borrowed its form The trunks of the trees gave rise to the pillars of stone The bending branches served as models for arches, and foliage and flowers provided the ornaments adorning many works of man Music has also found inspiration in the dense forest

Domination of Primitive Man.—At the low stages of development, man is dominated by the forest Primitive man, possessing crude stone implements only, found but few parts of the earth's surface which were either too barren or too heavily forested to be suitable for his habitation When, however, the arts of life advanced, man learned to overcome forest and other natural difficulties At a certain stage there begins, therefore, a reverse influence, namely, that of man upon forest, the penetration of forests by man

The primitive nations could not change to any marked degree the forest cover of the earth Their tools were too crude and, moreover, their activities were rarely concentrated at the same place for any length of time, because their mode of life was largely nomadic The dense forests of central Europe did not give way before the efforts of the Romans or the ancient Teutons Only in the middle ages, beginning with the era of Charlemagne, when there arose an imperative need for more room, did the Teutons succeed in clearing any large areas of the dense forest This clearing was not the work of individuals, but was the result of many concentrated and persistent efforts on the part of the religious and knightly orders.

Forest Settlements.—The earliest settlements in the forest were comparatively small In the earlier settlements, the surrounding forest served as a supplementary source of food for the primitive agriculturist The cultivation of small parcels of cleared land was supplemented by grazing of stock in the oak or other adjoining forest. The forest also furnished acorns as food for animals and even man, while the wild animals provided meat and hides.

As the gathering of wild plants is displaced gradually in the course of economic evolution by the regular production of cultivated crops, grazing supersedes the hunting of game As an intermediate stage from hunting to stock raising, there is often domestication of animals, as, for instance, the breeding of foxes in a state of semi-domestication, or the raising of bees. In the primitive horticulture of the primeval forests, it was customary to cut down the trees in the portion of the forest destined for cultivation, then to burn all the wood or at least the branches and underbrush The ashes served as fertilizer; the ground was broken, and the seed, shoots, or tubers were planted The peasants of eastern Russia, as well as some agricultural colonists in South America, burn the forest and cultivate the ground for some years, merely to abandon it and repeat the same process every 10 or 15 years.

Use of Forest Products.—Extensive as this form of agriculture may be, it in itself would not have been sufficient to have reduced the forested area of the world to its present size It is the increased needs for the products of the forest itself, particularly its timber, that has made the heaviest inroads upon it Next to food, wood has been one of the most important factors of civilization, particularly at the time when iron, brick and other structural materials were either unknown or little used In the early stages of economic development, the forests furnished man with fuel for overcoming the rigours of winter cold It furnished fuel also for metal working, and a number of secondary products, such as charcoal, pitch, ashes, gallnuts, some of which were more widely used in the past than they are now At a higher stage of civilization and with the development of means of communication and transportation, the products of the forest are no longer merely the means with which to satisfy immediate needs; they become commodities of widespread use far beyond the forest boundary Many industries, which were dependent upon wood as fuel, found their location in the forest Thus, the occurrence in the same area of forests and mineral deposits gave rise to metallurgy and the art of glass making In France about the 15th century, before the invention of high ovens, metallurgists and glass makers resided in the forest In the Middle Ages, an entire forest population, employed exclusively in industries growing out of the use of wood, lived in the forests of France Kilns, charcoal furnaces, forges, glass furnaces, limekilns, and establishments where wood was worked up gave a peculiar aspect to the forests of that time In the Ural mountains of Russia, the metallurgical industry is still closely connected with the forest, from which the necessary charcoal is obtained The forests of the eastern United States were once extensively used for charcoal making, in connection with the iron industry

Rôle of Navigable Rivers.—The penetration of the forests and the development of forest industries have been greatly favoured by rivers Water courses, penetrating forest regions, are the natural means of access and with their banks constitute the first zone of attack on the phalanx of the forest This was the case in Europe, the Rhine and its tributaries formed the principal routes by which extensive openings could be made in the German forests The same was true in Italy during the Roman epoch, when the Aniene, the Liri and the Chiana served as means of transporting wood from the Apennines, and wood from the Alps reached Rome by way of rivers and the ocean The vast territory included between Hudson bay and the Saskatchewan river was revealed to missionaries and fur dealers—*voyageurs, coureurs de bois*—by way of the St Lawrence river The development of the lumber industry in the United States and Canada in the early days would not have been so rapid had it not been for the proximity of the New England forests to the coast and the large number of navigable streams. Where forests lack navigable rivers, they remain intact for a long time

Influence on Pioneer Character.—The battle against the forest has left a deep influence upon the life and character of man Many of the specific pioneer traits of the original settlers in the United States may be traced to their battle against the forest on the slopes of the Alleghenies to provide a place for settlement The hazardous work of hewing farms out of the virgin forest bred a race of men of sturdy character and of enormous enterprise and self-reliance In the United States, this pioneer life of the settler in combating the forest has produced leaders, such as Lincoln, Henry Clay, Jackson, Benton, Cass and scores of others, who for over half a century helped to shape the destiny of their country The entire ancient history of Sweden may also be reduced to the same struggle with the primeval forest It is the colonization of the forests of northern Russia that has developed in the Russian people the necessary qualities which enabled them to spread to Siberia and take possession of it If, of all the present nations, the Anglo-Saxons, Teutons and the Russians display the great colonizing capacity, may it not be attributed largely to their original impenetrable forests, in the struggle with which they have developed the persistence and unrelenting energy required for pioneer work?

Forest Restoration Imperative.—As man progressed, his capacity for mastering the forest and other natural obstacles increased manifold with the result that over a large part of the world the forest is now conquered It is not only conquered, it

is exterminated beyond any possible chance of natural recovery. It has now become important to civilization to preserve and restore the forest instead of struggling against it.

The disappearance of the forest has not done away with the use of wood by the present civilization; on the contrary, it has only intensified it The clearing of the forest, aside from depriving the thickly settled and highly civilized countries of timber needed for their industries, has produced other bad economic and social effects. The stripping of the mountain forests resulted in the occurrence of torrents, in erosion, in floods and in a general change in the régime of streams The disappearance of the forest has also affected the climate and with the growth of industrialism has resulted in the physical deterioration of a large part of the population. Much of the forest land that has been cleared on mountain slopes, sandy plains or rocky hills, has proved unsuitable for agriculture and has failed to provide room for permanent settlement.

The products of the forest have now become altogether too valuable and no civilized nation can afford forest devastation on a large scale without regard to the future possibilities of the land. Practically all of the civilized countries of the world have now come to realize that there is a point where further clearing of the forest, no matter how dense the population may be, proves detrimental to progress itself. Europe reached that point several centuries ago.

The lesson of the older countries found a reaction also in countries still having abundant forests. In practically the entire civilized world, a new economic force has now been born—a general appreciation of the value of the forest and a movement toward the introduction of rational forest management

Forests and Climate.—Observations continued for many years in different parts of the world establish with certainty the following facts with regard to the influence of forests upon climate:

The forest lowers the temperature of the air inside and above it. The vertical influence of forests upon temperature extends in some cases to a height of 5,000 feet. The *yearly* mean temperature at equal elevations and in the same locality has invariably been found to be less inside than outside a forest. In a level country this difference is about 0·9° F. It increases, however, with altitude, and at an elevation of about 3,000 ft is 1·8° F. The *monthly* mean temperature is less in the forest than in the open for each month of the year, but the difference is greatest during the summer months, when it may reach 3 6° F, while in winter it does not often exceed 0·1° F. The *daily* mean temperature shows the same difference, but to a greater degree During the hottest days the air inside the forest was more than 5° F cooler than that outside, while for the coldest days of the year the difference was only 1 8° F The temperature of the air within the forest is, therefore, not only lower but also subject to less fluctuation than in the open.

In tropical and subtropical regions, the influence of the forest upon the temperature of the air is the greatest Forests influence the temperature of the soil in almost the same way as they do that of the air, except that the differences are greater in the case of soil The forest soil is warmer in winter by 1·8° F and cooler in summer by 5·4° to 9° F than soil without a forest cover, and this holds true for a depth of as much as 4 feet. In the spring, and especially in the summer, the forest soil is cooler than that of open land In the autumn and winter, however, it is warmer, but the degree of difference is always less than in summer The soil under the forest may remain soft when the ground in the open is frozen hard to some depth. If it does freeze, it is to a depth of one-half to less than three-fourths of that in the open

Forests and Rainfall.—In the summer the relative humidity of the air is higher in the forest than in the open. This difference is usually between 4 and 10%, but in some places may be as much as 12%. In regions of heavy snow there is practically no difference in the relative humidity during the spring, when the snow melts. The evaporation of water in the forest from the soil under forest cover is considerably less than in the open. The wind movement in the open is greater than in the forest.

Of the total amount of precipitation that falls over the forest only 83% reaches the ground under the forest in the winter and 70% in the summer. The temperature of the trunks, branches, and twigs is always lower than the temperature of surrounding air. This is true for day and night, winter and summer.

This difference in the temperature causes the formation of dew on the branches The difference in the temperature of the air in the forest and open field is the cause of air currents from the forest into the field and reverse. These movements facilitate the formation of dew and fogs over fields adjoining forests. In the spring and autumn, these fogs save the fields from early frosts and in the summer from damage by hail. Repeatedly and in different countries it has been observed that forests prevent hail falling over the fields adjoining the forest. Coniferous forests have the greatest effect in deflecting hail storms Statistics collected for 20 years, from 1877 to 1897, by a company insuring against hail, confirm the fact that forestless regions are subject to hail storms very frequently, while in forested regions hail storms are of very rare occurrence.

Although there is no complete agreement as to whether forests actually increase precipitation, most observations tend to show that forests do increase both the abundance and frequency of local precipitation over the areas they occupy The excess of precipitation, as compared with that of adjoining unforested regions, amounts in some cases to more than 25%

The influence of mountains upon precipitation is increased by the presence of forests The influence of forests upon local precipitation is more marked in the mountains than in the plains

Forests in broad continental valleys enrich with moisture the prevailing air currents that pass over them, and thus enable larger quantities of moisture to penetrate into the interior of the continent. The destruction of such forests, especially if followed by weak, herbaceous vegetation or complete baring of the ground, affects the climate, not necessarily of the locality where the forests are destroyed, but of the drier regions into which the air currents flow

While the influence of mountain forests upon local precipitation is greater than that of forests in level countries, their effect upon the humidity of the region lying in the lee of them is not very great.

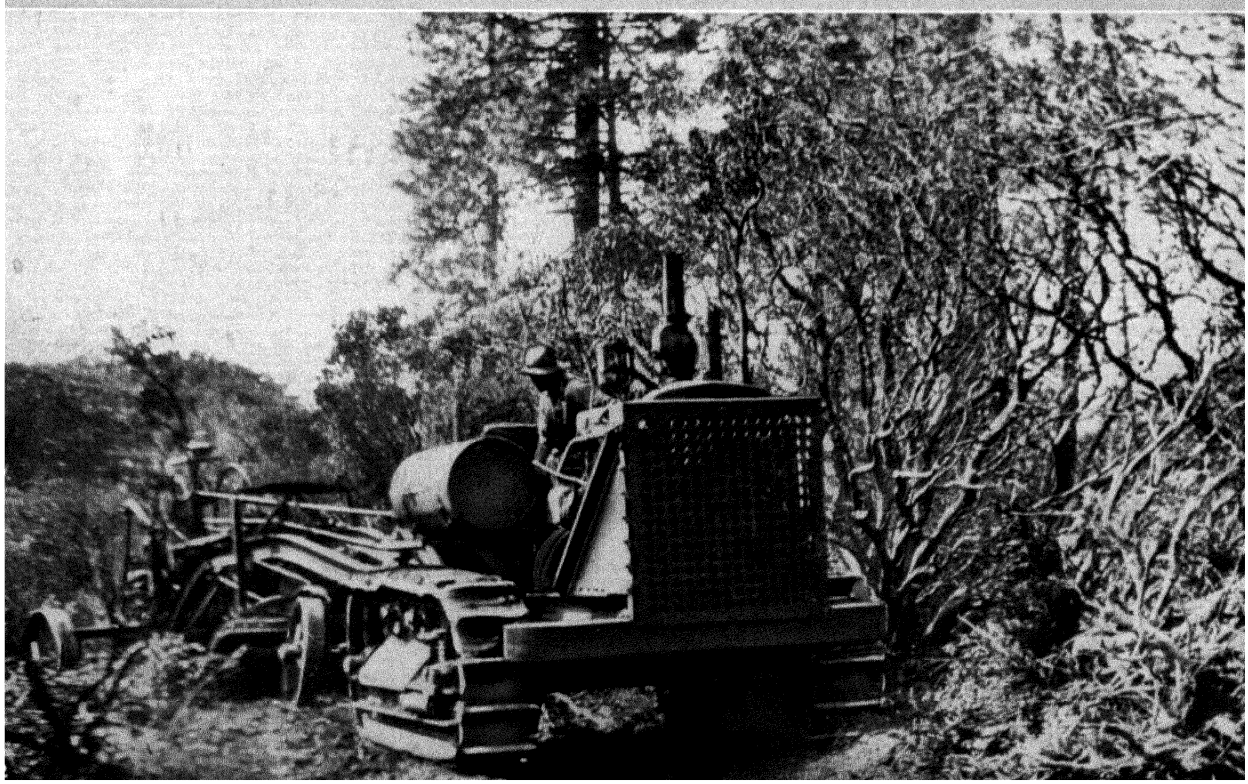
Forests and Waters.—The hydrological rôle of forests in level countries differs from that of forests in hilly or mountainous regions

In *level* country, the forests constitute an effective means of draining and drying up swampy lands, the breeding places of malaria and fever-carrying insects The reforestation of the Landes, Sologne, the Pontine marshes, and a hundred other examples prove this It draws moisture from a greater depth than does any other plant organism, thus affecting the unutilized water of the lower horizontal strata by bringing it again into the general circulation of water in the atmosphere, and making it available for vegetation While it lowers to some extent the subterranean water level, it has no injurious effect upon springs, since these are practically lacking in the level countries with horizontal geological strata where its lowering influence has been chiefly noted It refreshes the air above it and increases the condensation of moisture carried by the winds, thus increasing the frequency of rains during the vegetative season.

In *hilly* and *mountainous* country, forests are conservers of water for streamflow. Even on the steepest slopes they create conditions with regard to surface run-off such as obtain in a level country Irrespective of species, they save a greater amount of precipitation for streamflow than does any other vegetable cover similarly situated. They increase underground storage of water to a larger extent than do any other vegetable cover or bare surfaces. The steeper the slope, the less permeable the soil, and the heavier the precipitation, the greater is this effect. In the mountains, the forests, by breaking the violence of rain, retarding the melting of snow, increasing the absorptive capacity of the soil cover, preventing erosion and checking surface run-off in general, increase underground seepage, and so tend to maintain a steady flow of water in streams.

Forests and Soil Erosion.—One far-reaching influence of the forest upon streamflow lies in its ability to protect the soil from





BY COURTESY OF THE U S FOREST SERVICE

FIRE LINE METHOD OF CONTROLLING FOREST FIRES

1 Fire line along ridge of forested mountain in Southern California The cleared space is broad enough to enable forest officers to check the spread of fire from either side of the mountain

2 Building a fire break or fire line in a forest in the western United States. Caterpillar tractor with blade grader is used over cleared section The preservation and cultivation of forests are now in charge of State and Federal bureaus

washing. The forest is the most effective agent for protecting soil from erosion because (1) the resistance of the soil to erosive action is increased by the roots of the trees, which hold the soil firmer in place, and (2) at the same time the erosive force of the run-off is itself reduced because the rate of its flow is checked, and its distribution over the surface equalized Erosion has a bearing on the height of flood waters in the rivers, since the sediment carried by the rivers and the coarser detritus brought down by mountain streams often increase stream volume to such an extent that the height of the water is raised far beyond the point it would reach if it came free of detritus and sediment.

When the channel of a stream has become filled with waste material, even a slight rainfall will cause a flood, while if the channel were deep it would have no perceptible effect upon the height of water in the stream The filling of mountain streams with waste not only increases the frequency of floods but causes the streams to assume the character of torrents.

Floods, which are produced by exceptional meteorological conditions, cannot be prevented by forests, but without the mitigating influence of the latter, they are more severe and destructive

Forests and Public Hygiene.—The hygienic influence of forest air is due to its great purity Forest air is free of smoke, particles of dust, and injurious gases, which are found in the air of cities All kinds of bacteria are less numerous in the forest air than in the outskirts, generally from 23 to 28 times less The foliage of the trees acts as a kind of filter and retains the dust and other particles which are contained in the air that passes over a forest The bacteria retained on the leaves are then readily killed by exposure to the sun.

The former idea that the forest air contains more oxygen and less carbon dioxide has not been confirmed The amount of oxygen exhaled by a forest is insignificant and is offset by the increase of carbon dioxide, resulting from the decomposition of organic matter in the floor of the forest Ozone, which is usually absent from the air of cities, has been found in quantities in the forest, just as it is found in the mountains and on the sea shore. Hydrogen peroxide was found also to exist in minute quantities in the air of the forest, but what its hygienic importance may be is not known

The soil of the forest was found to contain less albuminoid matter and salts suitable for bacterial growth Moreover, the humus produced by the growth of trees is inimical to pathogenic bacteria, which up to the present time have not been found in the soil of forests

It was shown that the soil has an important bearing upon the spread of cholera and typhoid fever. In India, it is claimed that villages surrounded by forests are never visited by cholera, and troops are removed to barracks built in the forest to arrest the disease Huffel confirms this by the statement that the town of Haguenau in Alsace, surrounded by a dense forest nearly 50,000 ac. in extent, was always free from the epidemics of cholera which in the last century attacked several times the other towns in the same district Forests by affording protection against prevailing cold and humid winds make life more healthy and bearable in districts subject to such winds.

The advent of the automobile and the opening of remote forests with highways have made them accessible to large masses of people and enhanced tremendously their recreational value. In some localities of Canada and the United States, the recreational value of the forests exceeds their value as a source of raw materials.

Occurrence of Forests.—Forests grow naturally only where there is present a certain minimum of heat and moisture. According to Heinrich Mayr, forests can grow only where the average temperature during the four months of the vegetative period (in the northern hemisphere—May, June, July and August, and in the southern—November, December, January and February) does not fall below 50° F and where during the same four vegetative months the precipitation is above two inches.

The warm ocean currents (the Gulf stream and Japan current, *Juro Siwo*) raise the northern limit of the forest from 57° northern latitude to 65°. The northern coast of America, Greenland, the north of European Russia and Siberia are forestless because of lack of heat. The south-eastern extremity of South America, central Africa, Sahara, Arabia, Persia, Gobi, the west coast of central Africa, and the interior of Australia are treeless because of lack of moisture

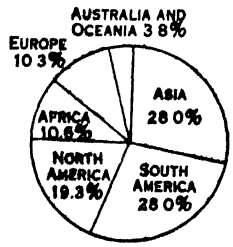
In many parts of the earth's surface, where no natural forest occurs, forests, however, can be established artificially. The young trees require certain favourable conditions of heat and moisture for their development during the early years of their life Once such conditions are afforded them in artificial reforestation by means of irrigation and cultivation, they themselves create later under the forest canopy conditions for their further development.

Kinds of Forests.—The forests of the world may be classified broadly into three main groups, *conifers* (softwoods), *temperate hardwoods*, and *tropical hardwoods* For the world as a whole, conifer forests (pines, spruces, firs, hemlocks, larches, cedars, sequoias and cypresses) occupy 35·4% of the forest area; temperate hardwoods (oaks, maples, birches, poplars, etc), 16%; and tropical hardwoods (mahogany, fustic, logwood, balsa, rosewood, teak, cedrela, ebony, etc), 48·6% Fig 1

A most striking fact, and one of great economic significance, is that 95% of the conifer forests upon which the world depends for its construction material and 89% of the temperate hardwood forests are in the north temperate zone This zone, including Europe, most of Asia, and North America, and the north coast of Africa, has almost three-fourths of the world's population and consumes an even greater share of the timber used in the world. The tropical hardwoods are confined to the tropical and adjacent subtropical regions of the earth, which have less than one-fourth of the population.

Original Forest Area.—In prehistoric times and also according to tradition and the written record of the earliest historic times, forests occupied a much larger proportion of the earth's surface As a result of land clearing and forest fires, that followed in the wake of forest exploitation, much of the original forest has disappeared

With the exception possibly of China, the greatest change has taken place in Europe, where of a total land area of nearly 2½ billion acres, only one-third, or 774 million acres, remains in forest. Almost two-thirds of this, or about 500 million acres, is in European Russia and Finland, and only 275 million acres in the rest of Europe In Great Britain 95% of the original forest is gone; in France, Spain, Belgium, Italy and Greece, from 80 to 90% of the original forest has been destroyed; while Sweden and Finland are the only countries with half of their forests left. The forest area of Norway has been reduced 2 million acres from 1875 to 1907 In European Russia the privately owned forests shrunk between 1880 and 1913 by about 25 million acres In Serbia the forest area has decreased 12½% from 1889 to 1904. In the United States of North America, the original forest has shrunk more than 40% in the course of three centuries. Canada's productive forest area is decreasing at the rate of about 3 or 4 million acres a year. Large areas of forest have been cleared in the more populous regions of Africa and South America, and even in the less developed regions the process is going on slowly but steadily. The World War still further accelerated this process. The forests in the occupied territories have been greatly depleted, as, for instance, in Belgium. Great forest devastation occurred also in northern France and Poland. The demands of war caused over-cutting in many other central European countries



FROM ZON AND SPARHAWK, "FOREST RESOURCES OF THE WORLD" (MCGRAW HILL)

FIG 2.—DIAGRAM SHOWING DIVISION OF FOREST AREA OF THE WORLD AMONG THE CONTINENTS

Present Forest Area.—The present forest area in round figures is about 7½ billion acres, which is 22% of the land area, exclusive of the polar regions. This is 4·35 acres per capita for the population of the world The area of actually productive forest, however, is probably one-fourth less than this amount, or 5½ billion

acres, which is 16% of the land area, and 3 2 acres per capita

The present distribution of the forests among the six grand divisions of the earth's surface is shown in fig 2

The extent of forests in individual countries, together with the ratio of forests to total land area of each country and the relation of forest area to population, are given in Table I

TABLE I —*Forest Areas of the World*

Europe

Country	Forest area	Ratio of forest to total land area	Forest area per 100 inhabitants
	Acres	Per cent	Acres
Austria	7,600,000	37 7	120
Belgium	1,321,240	18 ·	20
Bulgaria	7,515,420	28·0	140
Czechoslovakia	12,354,000	34 3	90
Denmark	872,000	8 2	30
Estonia	1,964,050	13 3	110
Finland	49,410,000	60 0	1,470
France	24,420,150	18 4	60
Alsace-Lorraine	1,088,270	30 3	60
Germany	30,905,840	23 8	50
Great Britain and Ireland	† 3,315,200	4 3	10
Greece	4,446,000	15 0	90
Hungary	3,148,000	14 0	40
Italy	14,252,000	18 1	40
Jugo-Slavia	17,258,000	25 2	120
Latvia	3,030,550	19 4	120
Lithuania	4,466,500	19·1	100
Luxemburg	197,600	30 9	70
Netherlands	644,480	8 0	10
Norway	17,037,570	21 4	650
Poland	21,881,140	22 8	90
Portugal	5,000,000	22 0	80
Rumania	21,758,000	27 8	120
Russia	440,000,000	38 7	440
European Caucasus	5,473,500	10 0	100
Spain	16,886,350	13 9	80
Sweden	55,550,000	54 8	960
Switzerland	2,320,000	22 7	60
Total	774,125,760	31 1	170

†Including Irish Free State and Northern Ireland

South America

Country	Forest area	Ratio of forest to total land area	Forest area per 100 inhabitants
	Acres	Per cent	Acres
Argentina	264,000,000	36 1	3,200
Bolivia	128,000,000	38 9	4,400
Brazil	1,000,000,000	47 5	3,280
British Guiana.	49,780,000	86·9	15,950
Chile	29,900,000	16 1	770
Colombia	150,000,000	53 8	2,700
Dutch Guiana (Surinam)	26,500,000	90 0	29,000
Ecuador	57,600,000	76 0	2,880
French Guiana (Cayenne)	21,000,000	98·0	42,000
Paraguay	37,000,000	58 0	4,600
Peru	224,000,000	51·2	3,860
Uruguay	1,070,000	2 3	70
Venezuela	103,840,000	41 2	3,650
Total	2,002,690,000	44 0	3,245

Australia and Oceania

Country	Forest area	Ratio of forest to total land area	Forest area per 100 inhabitants
	Acres	Per cent	Acres
Australian Commonwealth	90,291,500	5 8	1,760
New Zealand	17,073,920	25·7	1,610
Oceania	176,093,300	71·9	8,880
Total	283,458,720	15·1	3,470

Asia

Country	Forest area	Ratio of forest to total land area	Forest area per 100 inhabitants
	Acres	Per cent	Acres
Afghanistan	2,352,000	1·5	40
Arabia	1,150,000	1 5	20
British East Indies.	40,504,000	82 2	4,550
Ceylon	13,031,040	79 9	280
China	190,000,000	6 9	60
Dutch East Indies	154,330,000	41·4	330
French Indo-China	62,000,000	33 4	360
India	260,139,520	22·7	80
Japan	90,484,040	53 3	120
Malay Peninsula	22,570,240	67 2	750
Mesopotamia			
Palestine and Syria	770,000	1 7	20
Persia	32,000,000	8 0	320
Philippines	38,400,000	50 0	430
Russia (Asiatic)	1,136,153,150	29 3	3,070
Siam	35,000,000	22 5	400
Turkey	17,121,000	13 4	170
Total	2,096,014,590	21 6	240

North and Central America

Country	Forest area	Ratio of forest to total land area	Forest area per 100 inhabitants
	Acres	Per cent	Acres
Canada	506,746,000	25 0	8,230
Newfoundland and Labrador	6,400,000	23 8	2,630
United States	550,000,000	28 9	520
Alaska	95,000,000	25 0	172,700
Mexico	74,100,000	15 1	480
Central America			
British Honduras (Belize)	3,825,000	75 0	9,000
Costa Rica	9,000,000	75 2	1,040
Guatemala	20,000 000	65 0	900
Honduras	23,700,000	80 0	3,750
Nicaragua	22,400,000	70 7	3,930
Panama	12,400,000	60 0	2,750
Salvador	925,000	17 8	70
West Indies			
British West Indies			
Bahamas	370,000	13 0	650
Barbados	Area insignificant		
Bermuda	1,500	12 1	7
Jamaica	850,000	30 0	95
Leeward Islands	102,500	22 4	70
Trinidad and Tobago	756,500	59 4	195
Windward Islands	78,500	34·0	45
Cuba	13,000,000	46 0	450
Dutch West Indies	13,000	5 0	20
French West Indies	82,500	11 7	20
Haiti	4,250,000	60 0	170
Porto Rico	441,500	20 1	30
Santo Domingo	9,500,000	77 0	1,000
Virgin Islands of the United States	15,000	18 0	60
Total	1,443,957,000	26 8	998

Africa

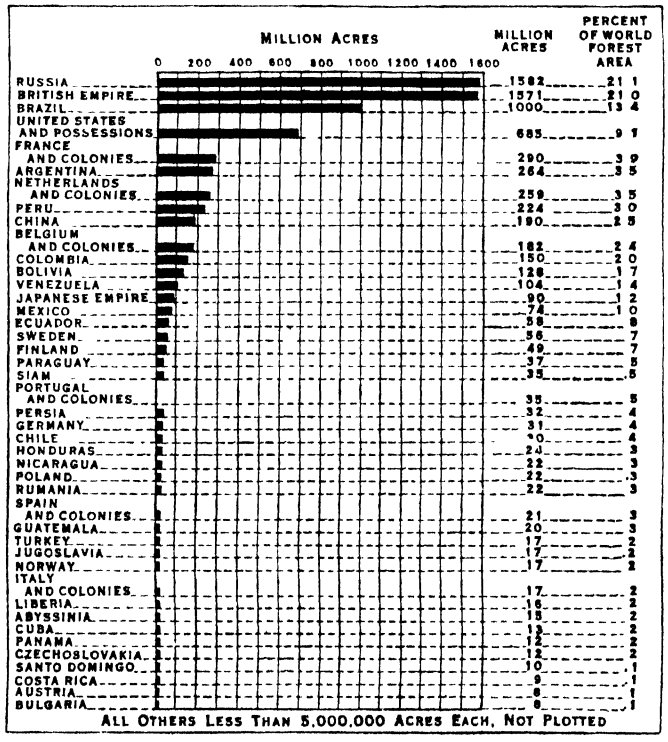
Country	Forest area	Ratio of forest to total land area	Forest area per 100 inhabitants
	Acres	Per cent	Acres
Belgian Africa	180,000,000	30·9	1,500
British Africa	349,371,000	15·7	670
Former German Africa	45,940,000	7·7	400
French Africa	154,627,000	7·5	500
Abyssinia	14,820,000	6 6	190
Liberia	16,000,000	62·5	800
Italian Africa	2,500,000	0·7	120
Portuguese Africa	29,700,000	5 0	390
Spanish Africa	4,500,000	5·5	550
Total	797,458,000	10·7	560

Political Control of Forest Wealth.—If the forests of the colonies, protectorates and dependencies are added to those of their mother countries, we obtain a picture of the political control of the forests of the world (fig 3)

Russia has the most extensive forests and the British empire is a very close second Each has more than one-fifth of the world's forests Brazil and the United States come next, and these four countries together have nearly two-thirds of the forest land of the world The remaining one-third is divided among about 50 countries It is interesting to note that Great Britain, France, Belgium and the Netherlands, which together have but 0 4% of the world's forests, control more than 30% in their colonies and dependencies

World Production and Consumption of Wood.—In spite of the fact that this is the "age of coal, iron, steam and electricity," wood still forms the basis of modern civilization The world production and consumption of wood amounts to approximately 56 billion cu ft , which is an average of 32 cu ft per capita, or a cut of 7 5 cu ft per acre of forest Almost half of it, or nearly 26 billion feet, is sawtimber, and 30 billion feet is fire wood

As populations grow and as living standards rise and human wants become more complex, timber consumption increases, in spite of the extensive and growing use of substitute materials, and in spite of the tendency to utilize wood more economically. No sooner do substitutes take the place of wood in some particular place than new uses are found A century ago railroad ties, railroad cars and telegraph poles had not been thought of Now, American railroads alone use more lumber in a year than was required to meet all the needs of the 30 million people living in the United States in 1860 Newsprint and other products of wood pulp, automobiles, phonographs, radio cabinets and many other



FROM ZON AND SPARHAWK, "FOREST RESOURCES OF THE WORLD" (MCGRAW HILL)

FIG 3 —CHART SHOWING THE POLITICAL CONTROL OF FORESTS

articles requiring large quantities of wood, all have come into extensive use within a generation

In Great Britain timber consumption has increased much more rapidly than has the population In 1915 with the total national consumption nearly *six times* as great as in 1851, the requirements per capita were almost *four* times as great Even in France with a practically stationary population, timber consumption was slowly increasing until 1914; that of Germany more than doubled within the century; in the United States at least seven times as much lumber is now used in a year as in 1850, and even the per capita rate of consumption is considerably larger Judging from the rates of increase in these and other important countries, the world's timber needs may be expected to double within approximately 50 years

North America, with one-twelfth of the world's inhabitants, uses nearly half of all the timber and more than half of all the sawtimber. Its per capita consumption (188 cubic feet) is five times as great as that of Europe, and if the tropical countries south of the United States, all of which have a very low consumption, be left out, it is **six** and one-half times that of Europe. Australia, South America and Europe use about equal amounts of wood per capita (39 cubic feet) The proportion of sawtimber to total amount of wood used, however, is quite different, being only one-ninth in South America, two-fifths in Australia and over one-half in Europe Asia and Africa use comparatively small amounts of wood (9 and 5 cubic feet, respectively), and most of what they do use is for fuel (*See* Table II)

The Amount of Wood Grown in the World.—The total quantity of wood grown in the world each year is roughly estimated at about 38 billion cubic feet If this increment were spread evenly over the whole forest area, it would amount to only 5 1 cu ft per acre It is apparent that the present annual growth of 38 billion cu ft is not replacing the present annual cut of 56 billion cubic feet As a matter of fact, the amount of growth each year represents the growth of only a small part of the forest Vast areas of virgin tropical forests, as well as much of the virgin forests of the temperate regions, must be left out of the calculation, because in their present condition there is no net growth in them Twenty-two billion cubic feet, or more than half of the growth that is actually taking place at the present time, is in the forests of Europe, a large proportion of which are under management for the production of timber If all the forests of the world were placed in a growing condition, even without much care of them beyond a moderate amount of protection against devastation, they could produce annually at least 355 billion cu ft of wood, or nearly 50 cubic feet per acre Under intensive management the growth would be much greater

The World Trade in Wood.—The total value of the world's export of all forest products, before the World War, amounted to about $1,063,400,000 or 5 6% of the total foreign trade of the world The foreign trade in forest products during the last decade before the war showed a tendency to rapid increase, exceeding in some items the general rate of increase of the world trade The entire world export from 1899 to 1911 increased 80% in value The trade in wood pulp, at the same time, showed an increase of 330%, the trade in rubber and other chemical products of tropical forests showed even a greater rate of increase

Of the total trade in forest products, sawn, round, planed and split timber formed about 44% of the value of all exported forest products Rubber, balsams and similar forest by-products, made up about 26% of the export; paper and wood pulp, and cellulose, 20% of the world's foreign trade; wooden furniture, toys and similar mechanically manufactured wood products, 8%, the export of tropical cabinet woods, such as mahogany, ebony and others, 2 per cent This did not include the trade in many edible products of the forests, such as vegetable oils, nuts, etc Of the total volume of trade in wood products, about 80% are composed of conifers, principally for construction and paper pulp The temperate hardwoods, used for staves, railroad ties, furniture, finish, cabinet work and other special purposes, constitute about 18%, while tropical hardwoods are only 2% of the total

The Crux of the World's Timber Supply.—With about 5½ billion acres of actually productive forest area in the world, much of it bearing heavy stands of virgin timber and with a possible annual growth many times the world's present timber requirements, it would seem that there is enough timber to last for centuries This would be true if all kinds of wood were equally capable of satisfying human wants. There are about 2,645,000,000 acres of softwoods or conifer forests in the world; some 1,204,000,000 acres of temperate hardwoods or broad-leaf forests, and 3,638,000,000 acres of tropical hardwoods Although the softwoods and temperate hardwood forests form only *one-half* of the total forest area of the world, 91% of all the timber

TABLE II.—*Share of the Principal Producing Countries in the World's Cut of Timber*

	Million cubic feet (0 5 10 15 20 25)	Per cent of total world production: Saw timber	All timber
United States		52·6	43·2
Russia		17·4	14·2
Canada		4·2	4·4
Japan		1·5	4·0
China		1·1	3 5
India		0 7	2·8
Sweden		4·6	2·8
Finland		3·4	2·3
Brazil		0·4	2·3
Germany		2 3	2·1
France		1·2	1·7
Yugoslavia		1 1	1·4
Mexico		0·2	1·2
Chile		0·2	1 2
Poland		1·2	1·2
Czechoslovakia		1·3	1·0
Italy		0 3	0·8
Norway		1·1	0·8

cut and used in the world comes from the softwood and temperate hardwood forests of the northern hemisphere, and only 9% from the tropical hardwoods The softwood forests are furnishing three-fourths and the temperate hardwoods one-fifth of the construction timber of the world The temperate hardwoods, in addition, supply three-fourths of all the firewood

The amount of standing timber in the tropics is far greater than the amount remaining in the temperate regions, yet until recently, the tropical forests have played a minor part in supplying the world's timber. Until recently there has been prevalent an idea in the northern hemisphere that the tropical forests are composed chiefly of cabinet woods, such as mahogany, ebony, boxwood and satinwood, or dyewoods, such as logwood and brazilwood, and similar kinds of hard, heavy, deeply colored wood, possibly suitable for furniture and a few special uses but not for construction Recent explorations have dispelled considerably this belief It is known now that there are many excellent construction woods, equal if not superior to the woods of conifers for use in the tropics because more resistant to decay and termites It will be a great many years, however, before the tropical forests are able to supply a large part of the world's requirements for wood, if they ever can Before they can do this, they must be opened up by adequate systems of cheap transport and adequate supplies of efficient labour must be at hand, both to construct the transportation facilities and to exploit the timber This means a fairly large population of races accustomed to or easily adaptable to carrying on woods work on a large scale

Another difficulty which must be overcome is the nature of the tropical forests themselves. They are mostly composed of a very great variety of species, intermingled in the greatest confusion, and can be exploited economically only if practically all the important species can be utilized Only a few of them are now known on the world's markets, and those are chiefly cabinet woods, of which the supply and possibilities for utilization are more or less limited In order to dispose in the general market of large quantities of the less known timbers, particularly those which are more suited for common lumber and construction, a long process of education and economic pressure will be necessary to overcome the established habits and idiosyncrasies of the consuming nations. Meanwhile, the timber requirements of the tropical countries themselves will doubtless grow as their industries develop, while their most accessible forests will probably be destroyed or rendered less productive, just as has happened in other regions passing through a corresponding stage of development.

The crux of the world's timber supply problem, during the next two or three generations at least, lies in the available supplies of softwood and temperate hardwood forests, especially of the softwoods

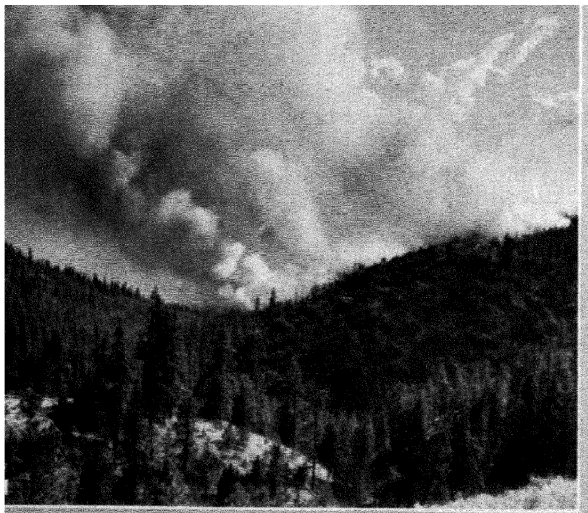
Softwood Supplies.—The softwood forests are confined to the cooler regions of the northern hemisphere Although some conifers occur in the southern hemisphere, such as the Paraná pine of Brazil, the alerce, pino, and cipres of Chile, the cedar and yellow-wood of Africa, the pines of the East and West Indies, and the kauri and other softwoods of New Zealand, they do not occur in sufficient abundance, however, to become important beyond their own regions The present growth of conifer timber is not quite 80% of the present cut It is evident, therefore, that the forest capital is being steadily depleted

The principal conifer regions are (1) North America, including Canada, the United States, and the Sierras of Mexico, (2) northern Europe and central Europe, (3) Asiatic Russia, Manchuria, and part of Japan

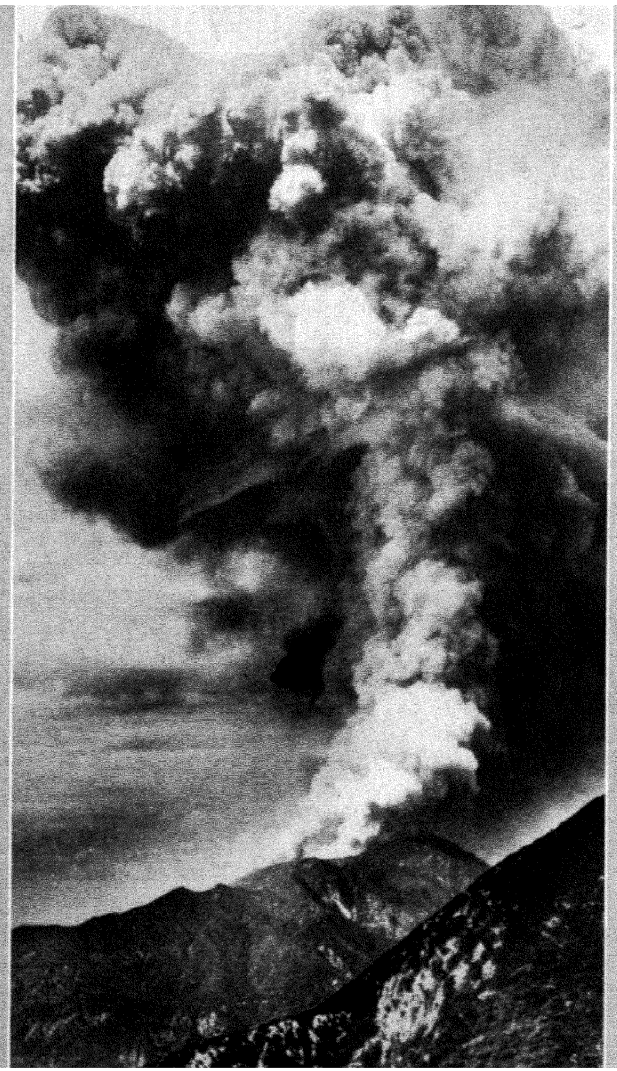
In *Canada* the total amount of accessible merchantable sawtimber is estimated at approximately 61½ billion cubic feet and of pulpwood 52 billion cubic feet The forests are being destroyed from two to two and one-half times faster than they are being grown Taking an annual drain upon the forests of 5 billion cu.ft, the accessible stands of virgin forests will be exhausted in about 25 years Canada uses now three-fifths of the lumber she produces and as her population grows her lumber requirements may be expected to increase also. The Canadian supply of pulpwood, although large, is already giving so much concern that the exportation of unmanufactured wood is subject to restriction in several provinces

In the *United States* roughly only 385 billion cubic feet of softwoods of sawtimber size remain Softwoods comprise two-thirds of the 13 billion cu ft. of large timber used annually and more than three-fourths of the sawed lumber. Nine-tenths of the paper consumed in the United States is made of softwoods. The United States now exports about 2 billion board feet of softwood timber annually, or about 7% of the amount cut. Almost as much is imported, however, so that the net export is only about *one per cent* of the production. To meet its present requirements, the United States is cutting about four times as much as it grows each year. *Alaska* has great reserves of virgin timber in her coast forests and when fully developed will contribute large quantities to the world trade

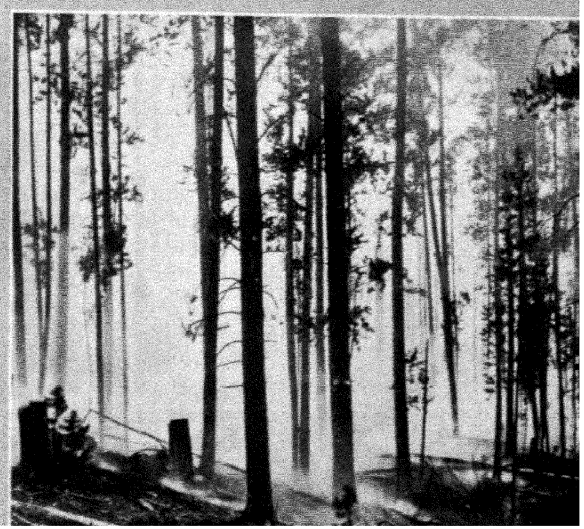
Mexico has about 20½ billion cu.ft. of pine in her mountainous forests at an elevation between 7,000 and 10,000 feet These











PREVENTABLE DESTRUCTION OF FORESTS BY FIRE

1. Pine forest on fire in the Klamath National Forest, California. Coniferous trees are especially subject to destruction by fire on account of their resinous sap
2. A view from high altitude of a forest fire on Echo Mountain, California, ten minutes after the fire started The size and height of the smoke cloud indicate the rapid spread of the fire
3. Fire fighters in Lassen National Forest, California 1927 A corps of men is stationed in each large forest preserve for this and for other services, such as reforestation
4. Fighting fire in the Wasatch National Forest, Utah By widening the fire lines, and keeping them clear of brush and debris, the fire is prevented from spreading beyond the lines
5. Pine trees in the Arapaho National Forest, Colorado, after passage of fire This fire spread through the crowns of the trees and was not extinguished until it had burned its way to the forest floor

mountainous forests have so far been able to withstand the primitive hand-lumbering methods and ox and mule transportation over poor roads or pack trails. They will melt away, however, quickly before the attack of modern steam power logging and milling equipment backed by rail connections to the consuming centres of Mexico and the United States. Mexico may, therefore, in the near future export considerable quantities, at least for a few decades Her own requirements are bound to grow, however, and at present she imports a great deal of pine lumber

However, *Europe* as a whole is barely self-sufficient in meeting its needs for softwood timber Western Europe depends upon imports to meet a large part of its present needs in softwoods Just before the World War Great Britain imported 97% of the timber she consumed, France, Germany, Italy, Belgium, and the Netherlands imported approximately 30, 47, 65, 77 and 82% respectively The only European countries that have any prospect of increasing their output of softwood timber for any considerable period or even of continuing to export at the present rate are Sweden, Finland, Russia, and possibly Czechoslovakia and Yugoslavia Should Russia increase her own home consumption of timber, as is apparently inevitable with the rising standard of living of her population, Europe may be compelled to seek additional sources of softwood supplies from North America or Asia.

In *Asia* the only country exporting on a fairly large scale at present is Japan Within a few years even Japan will need all her timber and may have to import some in addition In Asia only western and eastern Siberia are reputed to have enormous supplies of virgin softwood timber Siberian forests, however, are largely unexplored, and little is known of their actual condition According to rough estimates of the potential production of her forests, Siberia can furnish to the world market about 6 billion cu ft. of softwood timber a year, which is double the quantity now entering international trade and 30% of the world's consumption of conifer sawtimber

Of the vast forest area of *South America* only 5% is composed of conifers The bulk is in the Paraná pine region of southern Brazil and adjacent portions of Argentina and Paraguay Southern Chile, Paraguay and northern Argentina, the heaviest wood-consuming districts of South America, may be expected to take practically the entire output of Paraná pine At present the entire region produces only from one-third to one-half as much softwood timber as Argentina alone buys from the United States and Canada. The other South American countries depend upon the northern hemisphere for a considerable portion of their construction timber, although most of them have extensive forests of tropical hardwoods

Africa, although it possesses extensive equatorial forests, does not contain enough softwood timber to furnish even the small amounts required locally for construction purposes. African countries import nearly all of their softwoods from Europe and North America

In *Australia,* the softwood supply is inadequate for local needs. Much pine, fir and spruce lumber is imported from North America, Europe, and north-eastern Asia. The small area of softwood forest in New Guinea and the other islands of the Pacific is insignificant from the standpoint of the world supply.

Lord Lovat, after a survey of the softwood forests of the world, arrives at the conclusion that, except in Russia, the main softwood virgin timber reserves will be exhausted before very long, and Europe will have to depend more and more on timber raised by the agency of man, that the United States shortage is likely to come more quickly than the European one; that the more the American supply becomes centred in the Pacific Coast states, the greater is the probability of the industrial states of north-eastern America coming into European markets for sawtimber in the same way that they do now for pulpwood; and, finally, that as the United States consumes over 13 billion cu.ft. of softwoods, as opposed to a total European consumption of 9 billion cu ft., the United States advent into European markets will have an important bearing upon European prices.

There are, however, several hopeful factors in the situation. The potential growth of the existing conifer forests if they could be put under careful management, is probably three times the present cut. In most countries, possessing coniferous forests, the appreciation of their value and economic significance is becoming general and will undoubtedly prove a powerful factor in maintaining them permanently in a condition to supply the world's needs.

Temperate Hardwood Supplies.—Like the conifers the temperate hardwoods are confined chiefly to the northern hemisphere and are located fairly close to consuming centres They as a rule occupy the better soils of the more favourably situated lands and, therefore, have been progressively destroyed to make room for cultivation. The large old timber has been depleted even to a greater extent than that of the softwoods.

Europe has still extensive areas of hardwood forests and even exports special kinds, such as the oak of Poland and Slavonia. On the whole, however, the consumption of hardwoods in Europe greatly exceeds the production, so that there is a net annual importation of about a hundred million cubic feet.

In *Asia,* Japan exports small quantities of oak. Walnut and other hardwoods are exported from Asiatic Turkey and the Caspian region Siberia has about 30%, by area, of the temperate broad-leaved forests of the world. Except in the Far East, however, they consist of fairly light stands of aspen and birch, much of it valuable chiefly for firewood or pulp and not to be compared with the oak, ash, birch, maple, beech and other hardwoods of the United States and Europe.

In *North America* the United States now has the largest supply of temperate hardwoods. The other North American countries have no surplus over their own needs. For many years the United States has been the largest exporter of high grade hardwoods. Now the original stand of approximately 250 billion cu.ft. of merchantable hardwoods has dwindled to about one-fourth of that amount and is being further depleted at the rate of over two billion cu ft. a year The United States uses nearly four billion cu ft of hardwood timber a year, exclusive of firewood, or almost two-thirds of the entire world consumption of temperate hardwood timber

In the temperate region of the southern hemisphere including *southern Chile* and *Argentina,* portions of *New Zealand* and *Tasmania,* and the *high mountains of South America* and *Africa,* are only relatively small quantities of valuable hardwood timber, little or none of it available for export

The outlook for future supplies of hardwoods, however, is probably better than for softwoods, because woods adapted to the same uses can be got from the tropical forests, though they may cost considerably more.

Forestry as a Science.—Forestry, which is the science and art of growing timber, is a child of necessity As long as forests are plentiful, they are exploited without thought for their renewal. It is only when forests become scarce and their complete exhaustion threatens that efforts are put forth toward their perpetuation. Forests, unlike mines, can be renewed They are the product of the soil and, therefore, can be regrown like any other crop. The science underlying the growing of timber crops is, therefore, nothing but a branch of general plant science Like agriculture, forestry is built on the foundations of plant science, soil science, and the science of the atmosphere (meteorology). The science of forestry comprises all the knowledge regarding forest growth,—its component parts, the life history of the species and their behaviour under varying conditions, their development and dependence upon natural conditions, the forest's retroactive influence upon those natural conditions—in short, the forest's place in the economy of nature and man

Forestry, however, has characteristics which set it apart from other plant sciences. Forestry, unlike horticulture or agriculture, deals with wild plants scarcely modified by cultivation. Trees are also long-lived plants; from the origin of a forest stand to its maturity there may pass more than a century. Forestry, therefore, operates over long periods of time It must also deal with vast areas. The soil under the forest is as a rule unchanged by cultivation, and most of the cultural operations applicable in arboriculture or agriculture are entirely impracticable in forestry. Forestry is thrown back upon the same resources for maintaining the soil

fertility as nature does Forestry must make the forest itself conserve not only the fertility of the soil but even improve it It does it by maintaining a certain density of stand, by regulating the density of the crowns, by creating an undergrowth, by controlling the composition and the form of the forest The mechanical tilling of the soil is assigned to the roots of the forest trees and the fauna of the soil The fertilizing of the soil is assumed by the trees in the stand They, by shedding their foliage, supply the soil with a continual reservoir of material from which humus is made The drying out of the soil is also accomplished with the aid of the stand itself Forestry as a science must learn how to use the forest itself as an apparatus for the accumulation, conservation and intelligent use of moisture in the soil The relation between forest and soil is much closer and deeper in forestry than in agriculture Aside from the soil, the forester must know also the subsoil to a much greater extent than the agronomist because the roots of the forest trees often go very deep into the ground



BY COURTESY OF THE U S FOREST SERVICE

FOREST RANGERS' LOOKOUT IDAHO
From such points of vantage the Forest Service keeps watch to protect the national forests of the United States against fire and trespass

Forests are largely the product of nature, the result of the free play of natural forces Since the forester had to deal with natural plants which grew under natural conditions, he early learned to study and use the natural forces affecting forest growth In nature, the least change in topography, exposure, depth of soil, etc , means a change in the composition of the forest, in its density, in the character and humidity of the ground, and so on For these reasons, forestry, although it is based like agronomy chiefly on plant physiology, is more closely related to oecology because intelligent management of the forests must be based on a thorough understanding of the relationships which exist between forests as living plants and their environments Forestry may even be defined as applied oecology

Forestry as an Art.—Like agriculture forestry is concerned in the use of the soil for crop production As the agriculturist is engaged in the production of *food crops,* so the forester is engaged in the production of *wood crops,* and finally both are carrying on their art for the practical purpose of revenue If forestry as a science furnishes us the reason for forest practice—the *why,* forestry as an art teaches us *how* to apply our knowledge to the growing of timber Two principles underlie the practice of forestry as opposed to forest exploitation. (1) the *continuity* of timber production or *sustained* yield, this means that the cut in the long run should always equal the growth in the forest; and (2) that the *harvesting* of the forest and its *renewal* should be nearly *identical operations* In other words, the conditions for the regrowth of the forest should be provided for in the manner in which the forest is cut The specific methods of accomplishing this naturally vary with the character of the forest, the species involved, the soil, and the kind of forest products to be grown

The entire field of forestry, both theoretical and applied, may be subdivided as follows

I *Forest Production*

Scientific Basis	*Application*
1. Forest botany Dendrology, systematic and biologic (anatomy, plant physiology, mycology, etc)—forest geography—biological characteristics of the species	1 Silviculture Methods of growing timber crops and influencing their progress.
2 Forest oecology. Tree societies—forest types—sites—soil physics—soil chemistry—meteorology and climatology with reference to forest growth	2 Forest protection. Forest fires—forest pathology—forest entomology—climatic injuries—grazing—game—etc.
3 Forest zoology	3 Forest mensuration. Methods of ascertaining volumes and rates of growth of trees and stands and determining yields
4 Forest mathematics Algebra—trigonometry—analytical geometry—graphics—statistical or biometric analysis.	4. Forest surveys. Area and boundary—topography—ascertaining forest conditions—establishing units of management and administration.
	5. Forest valuation and finance. Ascertaining money value of forest property and financial results of different methods of management
	6. Forest regulation Preparing working plans—determining cutting budgets—organizing for continuous revenue and wood production, and the utilization of secondary forest products, such as naval stores, forage, fish and game
	7. Forest administration Organization of forest services, business practice and routine, including forest law and business law applicable to forest practice

II *Forest Utilization*

Scientific Basis	*Application*
1 Timber physics Structure—physical and chemical properties of wood, factors affecting them—diseases, faults and abnormalities	1 Wood technology. Application of wood in the arts—requirements—working properties—use of minor and by-products—preservation.
	2 Harvesting of timber crops Methods of harvesting, transporting and preparing for market

III *Forest Economics*

Scientific Basis	*Application*
1 Political economy The place of forests and forestry in the economic life of the nation	1 Forest policy Formulating rights and duties of the states—forest legislation—state forest administration—education
2 Land economics	
3 Forest statistics Areas forest conditions—distribution—composition—ownership Products trade—supply and demand—prices—substitutes	
4. History of forestry.	

Forestry is not a new science Systematic forest management existed already in France and Germany at the beginning of the 18th century and crude prescriptions as to the proper use of forests even date back to the 14th century In Germany the first courses in forestry were organized between 1770 and 1780 at the universities of Leipzig, Jena, Giessen, and Berlin In France the first forest institute was opened in 1824 at Nancy To-day every civilized country has at least one forest school and often several In the United States alone there are over 22 forest schools Both Europe and the United States have now a net of forest experiment stations at which, as at the agricultural experiment stations, the science of forestry is being advanced and new and better methods of forest management being constantly developed. Yet, if one considers that a mere 10 or 15% of the world's forests is being handled as a renewable, continuously productive resource, while an additional 15 or 20% is more or less protected from destruction, but still regarded as a timber mine, and the greater part, from 65 to 75%, receives no care whatever, forestry is barely on the threshold of its greatest development.

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FOREY, ELIE FREDERIC (1804–1872), marshal of France, was born at Paris on Jan 5, 1804, and entered the army from St Cyr in 1824 He took part in the earlier Algerian campaigns, and became captain in 1835 At the revolution of 1848 Cavaignac made him a general of brigade He took an active part in the *coup d'état* of Dec 2, 1851, and Napoleon III made him a general of division shortly afterwards He held a superior command in the Crimean War, and in the Italian campaign of 1859 distinguished himself at Montebello (May 20) In 1862 Forey commanded the French expeditionary corps in Mexico, with the fullest civil and military powers, and captured Mexico city in May 1863, receiving as his reward the marshal's bâton Marshal Forey retired in 1867, and died at Paris on June 20, 1872

FORFAR, royal, municipal and police burgh, parish and county town of Forfarshire, Scotland Pop (1921) 9,585 It lies at the east end of the Loch of Forfar in the valley of Strathmore, and is 13 m N by E of Dundee by road and 21¼ m by the L M S R It is on the same company's main line to Aberdeen, which has a branch to Brechin The court house is one of the principal buildings The hall contains portraits by Raeburn, Romney, Opie and others Peter Reid, a merchant, gave the Reid hall and the public park The burgh, with Montrose, Arbroath, Brechin and Inverbervie (the Montrose group of burghs), returns one member to parliament On a gravel bank in the north-west of the Loch of Forfar stood a castle sometimes used as a residence by Margaret, queen of Malcolm Canmore The staple industries are linen and jute manufactures and bleaching

Forfar is at least as old as the time of Malcolm Canmore, for the first parliament after the defeat of Macbeth met in the castle, which stood on a mound north of the town The parliaments of William the Lion, Alexander II and Robert II also assembled within its walls The town was created a royal burgh by David I, and was burnt about the middle of the 13th century Edward I captured the castle, but in 1307 Robert Bruce seized and destroyed it, its site being now marked by the town cross The town sided with Charles I during the Civil War, and Charles II presented the cross to it out of regard for the loyalty shown to his father The witches' bridle, a gag to prevent witches from speaking whilst being led to execution, is still preserved in the county hall One mile to the E lie the ruins of Restennet priory

FORFARSHIRE or ANGUS, an eastern county of Scotland, bounded north by the shires of Kincardine and Aberdeen, west by Perthshire, south by the Firth of Tay and east by the North Sea The island of Rossie and the Bell Rock belong to the shire The name Angus was officially adopted in 1928

In the most northerly section many rugged masses of the Grampians are found, this belt is succeeded by Strathmore, or the Howe of Angus, a fertile valley, 6 to 8 m broad, continuing the Howe of the Mearns, and running south-westwards till it enters Strathearn, to the south-west of Perth, then come the Sidlaw hills and a number of isolated heights, which sink to the plain of the coast and the Firth The mountains are all in the northern division and belong to the Binchinnin group (sometimes rather inexactly called the Braes of Angus) of the Grampian ranges The highest point is Glas Maol (3,502 ft) on the summit of which the shires of Aberdeen, Forfar and Perth meet, and summits over 2,000 ft. are numerous This northern division, consisting of the Silurian and older metamorphic rocks of the Highlands, with a great granite mass rising through the schists between Cairn Bannock and Mount Battock, is separated by a fault, extending from near Edzell to Loch Lintrathen, from the Old Red Sandstone rocks of the rest of the county In these, volcanic tuffs and lavas are interbedded in the sandstones and conglomerates The Sidlaw Hills—the greater part of which belongs to Perthshire—reach 1,493 ft within Forfarshire None of the rivers is navigable The Isla (45 m.) rises in Cairn-na-Glasha, and enters the Tay. Near Bridge of Craig is the fall of Reekie Linn (70 ft). Near Airlie castle are the cascades called the Slugs of Auchrannie The North Esk, formed by the confluence of Lee and Mark at Invermark, after a south-easterly course of 28 m enters the North sea 3 m N. of Montrose It gives the title of earl of Northesk to a branch of the Carnegie family The South Esk (48 m) rises in the Grampians near Mount Fafernie and not far from its source forms the Falls of Bachnagairn, it reaches the North sea at Montrose It supplies the title of earl of Southesk to another branch of the Carnegies Lintrathen (circular in shape and about ¼ m across), north of Airlie Castle, supplies Dundee with drinking water. The glens of the Forfarshire Grampians are beautiful, and rich in botanical interest, they include Glen Isla, in which are the ruins of Forter castle, destroyed by Argyll in 1640, Glen Clova, Glen Esk and Glen Prosen

History.—In the time of the Romans the country now known as Forfarshire was inhabited by Picts, and there are remains of weems, or underground houses Traces of Roman camps and stone forts are common, and there are vitrified forts at Finhaven, Dumsturdy Muir, the hill of Laws near Monifieth and at other points The battle in which Agricola defeated Galgacus is supposed to have occurred in the Forfarshire Grampians (AD 84); the Northumbrian King Egfrith and the Pictish king Burde fought near Dunnichen in 685, the former being slain, conflicts with the Danes took place at Aberlemno and other spots, Elpin king of the Scots was defeated by Aengus in the parish of Liff in 730, at Restennet, about 835, the Picts and Scots had a bitter encounter There is some doubt whether the county was named Angus, its title for several centuries, after a legendary Scottish prince or from the hill of Angus to the east of the church of Aberlemno It was early governed by hereditary earls and was made a hereditary sheriffdom by David II The first earl of Angus (by charter of 1389) was George Douglas, illegitimate son of the 1st earl of Douglas by Margaret Stuart, countess of Angus in her own right On the death of the 1st and only duke of Douglas, who was also 13th earl of Angus, in 1761, the earldom merged in the dukedom of Hamilton Precisely when the shire became known by the name of the county town, Forfar, has not been ascertained, but probably the usage dates from the 16th century Among old castles are the roofless square tower of Red castle at the mouth of the Lunan, the tower of the castle of Auchinleck; the stronghold of Inverquharity near Kirriemuir, the castle of Finhaven, the two towers of Edzell castle, the ruins of Melgund castle, fairly complete, the small castle of Newtyle, and the square tower and gateway of the castle of Craig

During the Glacial period the ice travelled south-eastward across Strathmore and over the Sidlaw hills, abundant evidence of this transporting agent is to be seen in the form of moraine deposits, the most striking of which is the great transverse barrier of Glenairn in the valley of the South Esk, half a mile in length and about 200 ft high Relics of the same period are found round the coast in the form of raised beaches at 100, 50 and 25 ft above the present sea-level

Agriculture.—The principal wheat districts are Strathmore and the neighbourhood of Dundee and Arbroath Oats, however, are the chief crop, barley and turnips are grown, and potatoes on the higher ground near the coast The northern belt has been turned into sheep walks and deer forests The black-faced sheep are the most common in the mountainous country, cross-bred sheep in the lowlands Though it is their native county (where they date from 1808), polled Angus are not generally reared, but shorthorns are a favourite stock and Irish cattle are imported for winter-feeding Excepting near towns there are no dairy farms Pigs and Clydesdale horses are reared

Other Industries.—The staple industries are the jute and flax manufactures Flax-spinning, linen and jute manufactures, and bleaching are carried on extensively at Dundee, Arbroath, Montrose, Brechin and Kirriemuir. Dundee is famous for jams and confectionery, and here and at Arbroath there are engineering works, iron-foundries, boot and shoe factories, breweries and distilleries Shipbuilding is carried on at Dundee, Arbroath and Montrose Sandstone quarries employ many hands and the deep-sea fisheries of Montrose are important The netting of salmon at the mouth of the North Esk is profitable. Fish is cured at

Montrose, and paper is made at Brechin

Communications.—The L.N.E.R., entering from the south by the Tay bridge, follows the coast north-eastwards, sending off at Montrose a branch to Bervie. An L.M.S.R. line runs up Strathmore to Forfar, Guthrie, Dubton and Marykirk; it reaches Dundee from Perth by the shore of the estuary of the Tay, and sends branches from Dundee to Kirriemuir via Monikie and Forfar and to Alyth Junction via Newtyle, while a short line from Dubton gives it touch with Montrose.

Population and Government.—The population was 270,950 in 1921, when 748 spoke Gaelic and English, and 14 Gaelic only. The chief towns are Arbroath (pop in 1921, 19,499), Brechin (7,446), Carnoustie (5,957), Dundee (168,217), Forfar (9,585), Kirriemuir (3,408), Monifieth (3,225) and Montrose (10,979) Forfarshire returns one member to Parliament It is a sheriffdom and there are two resident sheriffs-substitute at Dundee and courts are held also at Arbroath, Brechin, Forfar and Montrose.

FORFEITURE, in English law, the term applied (1) to loss, or liability to the loss of property in consequence of an offence or breach of contract, (2) to the property of which the party is deprived

Under the common law, conviction and attainder on indictment for treason or felony was followed not only by forfeiture of the life of the offender, but also by forfeiture of his lands and goods In the case of treason all the traitor's lands of whomsoever holden were forfeited to the king; in the case of felony, including *felo-de-se*, or suicide (*q v*), the felon's lands escheated to his immediate lord, subject to the king's right to waste them for a year and a day. This rule did not apply to lands held in gavelkind in the county of Kent. The goods of traitors and felons (*q v*) were forfeited to the king. The desire of the king and his officers to realize the profits of these forfeitures was one of the chief motives for instituting the circuits of the king's justices throughout England; and from time to time conflicts arose from attempts by these justices to extend the law of treason—under which the king levied all the forfeitures—at the expense of felony, in which the lord of the felon benefited by the escheats As regards theft, the king's rights overrode those of the owner of the stolen property, until, in the reign of Henry VIII, provision was made for restitution of the goods to the owner if he prosecuted the thief to conviction It was common practice for persons anticipating conviction for treason, or felony, to assign all their property to others to avoid the forfeiture, and in some instances the accused refused to plead to the indictment and endured the *peine forte et dure*, until death supervened, to avoid these consequences of conviction The royal rights to forfeitures arising within particular areas were frequently granted by charter to corporations or individuals. In 1897 the courts had to interpret such charters granted to the town of Nottingham in 1399 and 1448 All forfeitures and escheats with respect to conviction and attainder for treason and felony were abolished as from July 4, 1870, except forfeitures consequent upon the now disused process of outlawry, and the forfeitures included in the penalties of *praemunire*

The term "forfeit" is also applied to penalties imposed by statute for acts or omissions which are neither treasonable nor felonious In such statutes the forfeiture enures in favour of the Crown unless the statute indicates another destination; and unless a particular method of enforcing the forfeiture is indicated it is enforceable as a debt to the Crown and has priority as such The words "forfeit and pay" are often used in imposing a pecuniary penalty for a petty misdemeanour, and where they are used the court dealing with the case must not only convict the offender but adjudicate as to the forfeiture

Statutory forfeitures in some cases extend to specific chattels; *e g*, of a British merchant-ship when her character as such is fraudulently dissimulated (Merchant Shipping Act 1894, ss. 70, 76), or of goods smuggled in contravention of the customs acts or books introduced in violation of the copyright acts Recognizances are said to be forfeited when the conditions are broken and an order of court is made for their enforcement as a Crown debt against the persons bound by them

The term "forfeiture" is now most commonly used with reference to real property; *i e*, with reference to the rights of lessors to determine the estate or interest of a lessee for breach of the contractual terms of tenure By legislation of 1881 and 1892 there is jurisdiction to grant relief upon terms against the forfeiture of a lease for breach of certain classes of covenant; *e g*., to pay rent or to insure This previous legislation was reenacted by the Law of Property Act 1925

FORGERY is defined by Blackstone at common law as "the fraudulent making or alteration of a writing to the prejudice of another man's right," or "the false making, or making *malo animo*, of any written instrument for the purpose of fraud or deceit" This definition, it will be seen, comprehends all fraudulent tampering with documents

The crime of forgery in English law has been from time to time dealt with in a large number of statutes It was first made a statutory offence in 1562, and was punishable by fine, by standing in the pillory, having both ears cut off, the nostrils slit up and seared, the forfeiture of land and perpetual imprisonment. It was made capital, without benefit of clergy, in 1634 The most notable cases of those who have suffered the extreme penalty of the law are those of the Rev Dr W Dodd in 1777, for forging Lord Chesterfield's name on a bond, and Henry Fauntleroy, a partner in the banking-house of Marsh, Sibbald & Co, for the appropriation by means of forged instruments of money entrusted to the bank, in 1824

Up to 1913 there was no statutory definition of forgery, but in that year in the Forgery Act, 1913, a statute passed "to consolidate, simplify and amend the law relating to Forgery and kindred offences," the following definition is given (s 1) Forgery is the making of a false document in order that it may be used as genuine, and in the case of the seals and dies mentioned in the act the counterfeiting of a seal or die, and forgery with intent to defraud or deceive, as the case may be, is punishable as in the act provided. A document is false within the meaning of the act if the whole or any material part thereof purports to be made by or on behalf or on account of a person who did not make it nor authorize its making, or if, though made by or on behalf or on account of the person by whom or by whose authority it purports to have been made, the time or place of making, where either is material, or, in the case of a document identified by number or mark, the number or any distinguishing mark identifying the document, is falsely stated therein, and in particular a document is false.—(*a*) if any material alteration, whether by addition, insertion, obliteration, erasure, removal or otherwise, has been made therein; (*b*) if the whole or some material part of it purports to be made by or on behalf of a fictitious or deceased person, (*c*) if, though made in the name of an existing person, it is made by him or by his authority with the intention that it should pass as having been made by some person, real or fictitious, other than the person who made or authorized it

Again for the purposes of the act—(*a*) it is immaterial in what language a document is expressed or in what place within or without the king's dominions it is expressed to take effect; (*b*) forgery of a document may be complete even if the document when forged is incomplete, or is not or does not purport to be such a document as would be binding or sufficient in law; (*c*) the crossing on any cheque, draft on a banker, post-office money order, postal order, coupon or other document, the crossing of which is authorized or recognized by law, shall be a material part of such cheque, draft, order, coupon or document

Sections 2 to 5 deal with the penalties for forgery of various documents and seals. In most cases forgery is a felony, and, if done with intent to defraud, is punishable with penal servitude for life in the case of wills, deeds and bank notes, and for 14 years in the case of other documents there set out. Forgery with intend to defraud or deceive is subject to a life penalty where a document has thereon the great seal or kindred seals or the royal sign manual, or these seals are forged. Fourteen years is the penalty in the case of registers of births, marriages or deaths, and of the seals of that office. These are only instances and for all the varieties of the offence and their punishments reference must be made to the sections in question

Forgery of a passport, or the making of a statement which to a person's knowledge is untrue for the purpose of procuring a passport, is made a misdemeanour by the Criminal Justice Act 1925

Every person who utters any forged document, seal, or die is guilty of an offence of the like degree (whether felony or misdemeanour) and on conviction is liable to the same punishment as if he himself had forged the document, seal or die A person utters a forged document, seal or die, who, knowing the same to be forged, and with either of the intents necessary to constitute the offence of forging the document, seal or die, uses, offers, publishes, delivers, disposes of, tenders in payment or in exchange, exposes for sale or exchange, exchanges, tenders in evidence, or puts off the forged document, seal or die, and it is immaterial where the document, seal or die was forged

Demanding property on forged documents possession of forged documents, seals, or dies without lawful excuse, making or having in possession without lawful excuse paper or implements for forgery are all felonies punishable by penal servitude for varying periods

Further, any person who knowingly and wilfully aids, abets, counsels, causes, procures or commands the commission of an offence punishable under the act is liable to be dealt with, indicted, tried, and punished as a principal offender And where an intent to defraud or an intent to deceive is one of the constituent elements of an offence punishable under any act relating to forgery or any kindred offence for the time being in force, it is not necessary to allege in the indictment or to prove an intent to defraud or deceive any particular person; and it is sufficient to prove that the defendant did the act charged with intent to defraud or to deceive, as the case may require Also if any person who is a member of any co-partnership, or is one of two or more beneficial owners of any property, forges any document, matter, or thing with intent to defraud the co-partnership or the other beneficial owners, he is liable to be dealt with, indicted, tried, and punished as if he had not been or was not a member of the co-partnership, nor one of such beneficial owners

The Forged Transfers Act 1891, made retrospective by the Forged Transfers Act 1892, enables companies and local authorities to make compensation by a cash payment out of their funds for any loss arising from a transfer of their stocks, shares or securities through a forged transfer

UNITED STATES

In the United States, in many of the States the offence of forgery now is defined by statute rather than by common law Where forgery is so defined by statute, it either enlarges the offence or prescribes a different punishment In order to constitute forgery, it is essential that there be a false making or alteration of some document, with a fraudulent intent and with the capacity to effect a fraud

FORGES, COMITÉ DES. The Comité des Forges a French body, under State control, founded in 1864 to centralize and divide up the supplies of rough casting, and to deal in British steels, was instituted as a "Professional Syndicate" in accordance with the law of 1884

The Comité des Forges deals on behalf of its adherents with matters referring to their corporative interests development of the industry on the home market and on the market abroad, commercial agreements, specifications, company matters and labour questions, etc., etc the study of these latter questions taking place in agreement with the other Syndical Chambers making part of the Union of the Metallurgic and Mining Industries, *e g*, the drafts of law on the workmen's superannuation, weekly rest, working of children in works with continuous fire, duration of work, company insurances, etc. . . .

In 1891, seven years before the legislative work, the Comité des Forges created and organized under the form of a mutual insurance pay office, the pecuniary compensation of working accidents This institution inspired the general principles of the law of 1898 Later the Insurance Pay Office against working accidents was completed by a department for prevention of working accidents

In 1894, the Comité des Forges created the Superannuation Pay Office of the forges of the metallic construction, the electric industries and industries combined with same, to insure retiring pensions for metallurgical workers Seven years later the law on workmen's pensions was voted, a legislative regulation allowed joint stock companies having the object of supplying pensions to workmen, to continue their operations; only the Pensions Pay Office of the Forges was able to benefit by this exception

The Association was in 1928 constructing in the Grenoble district on the east side of the thicket of the Grande Chartreuse, a sanatorium for workmen and clerks. (P. Pe.)

FORGET-ME-NOT, called also scorpion-grass, the name popularly applied to the small annual or perennial herbs forming the genus *Myosotis* of the family Boraginaceae, from the Greek μῦς, a mouse, and οὖς, an ear, on account of the shape of the leaves The genus is represented in Europe, north Asia, North America and Australia, and is characterized by oblong or linear stem-leaves, flowers in terminal scorpioid cymes, small blue, pink or white flowers, a five-cleft persistent calyx, a salver- or funnel-shaped corolla, having its mouth closed by five short scales, and hard, smooth, shining nutlets The common forget-me-not, *M. scorpioides*, native to Europe and Asia, found in Great Britain, and naturalized in North America is perennial, it grows to a height of 6 to 18 in., with rootstock creeping, stem clothed with lax spreading hairs, leaves light green, and somewhat shining, buds pink, becoming blue as they expand, and corolla rotate, and bright blue with a yellow centre The forget-me-not, a favourite with poets, and the symbol of constancy, is a frequent ornament of brooks, rivers and ditches, and, according to an old German tradition, received its name from the last words of a knight who was drowned in the attempt to procure the flower for his lady It attains its greatest perfection under cultivation, and, as it flowers throughout the summer, is used with good effect for garden borders Various European species are widely cultivated, especially *M scorpioides*, *M azorica* and *M sylvatica* In *M. versicolor* the flowers are yellow when first open and change generally to a dull blue Of the species in cultivation, *M dissitiflora*, with large handsome abundant sky-blue flowers, is one of the best and earliest, flowering from February onwards *M rupicola*, or *M alpestris*, 2 to 3 in., intense blue, is a fine rock plant, preferring shady situations and gritty soil

FORGING is the art of forming or shaping metal by heating and hammering. The art is as old as history Forging differs from founding or casting in the fact that the metal is never melted, but is worked while hot enough to be in a plastic or pasty condition The tools used are in the main counterparts of the shapes desired and they mould by impact Forging is divided into two broad classifications, hand forging and machine forging (*see* Drop Forging), according to the way in which the work is done rather than to the work itself; for the operations performed on the metal are of the same general character and the resulting pieces are mainly the same, the difference being that the hand forger, smith or blacksmith works with a hand hammer and variously formed hand tools, whereas machine forging employs to the fullest extent the use of automatic power-driven machines and generally one or more special tools or dies designed and made for the production of the particular piece which it is desired to produce

Hand forging does employ to some extent power-driven machines to deliver blows instead of relying completely upon muscular effort, the tools used in these machines are of a general nature and can be used on many different forgings rather than being designed for a particular piece Machine forgings are more uniform and generally of more exact dimensions than those made by hand with hammer and anvil, but the cost of the special tools required for machine forging precludes the use of this method for a small number of forgings, the quantity of equal cost by both methods depending upon the cost of the necessary tools, the cost of production and the possible saving in subsequent operations of machining due to uniformity and exactness If the requirement be a single round bar bent at right angles on one end, the advantage of hand forging is obvious If the requirement be several thou-

sand intricate pieces such as an ornamental fence picket, the advantage of machine forging is as readily apparent. One claw hammer head could be produced by the hand forger in very much less time than that necessary to produce the tools required for the machine forging process, but were a large quantity wanted the cost of the machine tools would be very minor when spread over the quantity of pieces produced, and, since after once making the tools, the machine forger's time for producing one piece would be only a small fraction of the hand forger's time, the cost per piece (which is generally though not always the determining factor) would be very much less than if the large quantity were produced by the hand process There is no definite quantity at which the cost per piece is equal This quantity is different for each different piece together with the specifications imposed but will in general be from 5 to 100 forgings The perfecting of machines for making the tools for the machine forging process lowers the point of equal cost The possibility of future requirements of the same piece should be considered as affecting the cost of the entire quantity eventually required

Hand forging operations are (1) reducing or drawing down from a larger to a smaller section (fullering and swaging), (2) enlargement of a smaller to a larger portion (upsetting), (3) bending, or turning to any angle or curvature, (4) uniting one piece of metal to another (welding), (5) the formation of holes by punching, (6) severance, or cutting off In none of these processes, the last excepted, is the use of a sharp cutting tool involved, and therefore there is no violence done to the fibre of the metal Nor have the tools of the smith any sharp edges, except the cutting-off tools or "sets" The flow of the metal, which is viscous when at full red heat, must never be lost sight of, and in forging judgment must be exercised in arranging the direction of the fibre in a way best calculated to secure maximum strength

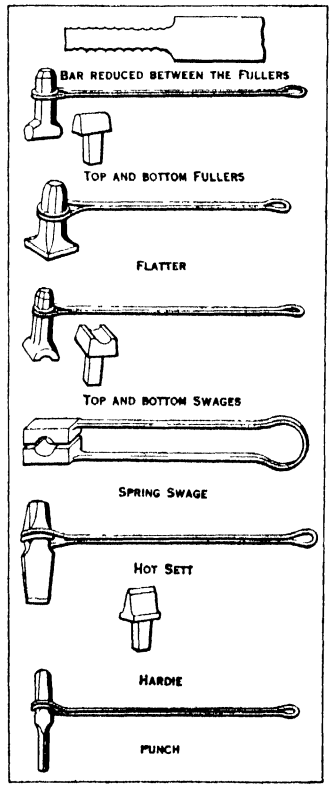


FIG 1—SOME OF THE CHIEF SMITH'S TOOLS FOR DRAWING-DOWN, SWAGING, CUTTING AND PUNCHING

Fullering is the preliminary roughing-down of the material between tools having convex edges, swaging, the completion or finishing process between swages, on dies of definite shape, nearly hemispherical in form When a bar has to be reduced from larger to smaller dimensions, it is laid upon a fuller or round-faced stake, set in the anvil, or, in some cases, on a flat face (fig 1), and blows are dealt upon that portion of the face which lies exactly opposite with a fullering tool and struck on its head by a sledge hammer The position of the piece of work is quickly changed at brief intervals in order to bring successive portions under the action of the swages until the reduction is completed; the upper face, and if a bottom fuller is used the under face also, is thus left corrugated slightly. These corrugations are then removed either by a flatter (fig 1), if the surfaces are plane or by hollow swages (fig 1), if the cross section is circular Spring swages (fig 1) are frequently used instead of separate top and bottom tools Frequently swaging is practised at once, without the preliminary detail of fullering It is adopted when the amount of reduction is slight, and also when a power hammer is available This process of drawing down or fullering is, when practicable, adopted in preference to either upsetting or welding, because it is open to no objection, and involves no risk or damage to the material, while it improves the metal by consolidating its fibres, but its limitations in anvil work lie in the tediousness of the operation when the part to be reduced is very much less in diameter and very much longer than the original piece of bar, in which case there are other alternatives

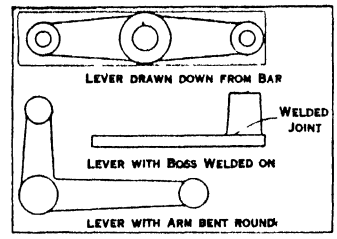


FIG 2—EXAMPLES OF FORGINGS REQUIRING DRAWING-DOWN, WELDING AND BENDING

Upsetting.—If a long bar is required with an enlargement at any portion of its length, not very much larger in diameter than the bar, nor of great length, upsetting is the method adopted The part to be enlarged is heated, the parts adjacent remaining cold, and one end is hammered, or else the bar is lifted and dropped heavily on end on the anvil, with the result that the heated portion becomes both shortened and enlarged (fig 1). This process is suitable only for relatively short lengths of upset in hand forging but is commonly adopted in machine forging to an equal extent with drawing down The alternative to upsetting is generally to weld a larger to a smaller bar or section, or to encircle the bar with a ring and weld the two (fig 2), and then to impart any shape desired to the ring in swages

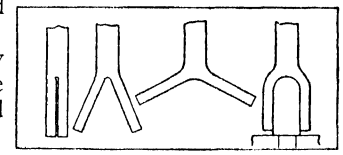


FIG 3—A FORKED FORGING MADE BY SPLITTING A BAR OPENING IT OUT AND HAMMERING THE ARMS ROUND AN ANVIL BLOCK

Bending is effected either by the hammer or by the simple exercise of leverage, the heated bar being pulled round a fulcrum It is always, when practicable, preferable to cutting out a curved or angular shape with a hot set or to welding The continuity of the fibre is preserved by bending, and the risk of an imperfect weld is avoided Hence it is a simple and safe process which is constantly being performed at the anvil An objection to sharp bends, or those having a small radius, is that the fibres become extended on the outer radius, the cross section being at the same time reduced below that of the bar itself This is met by imparting a preliminary amount of upsetting to the part to be bent, sufficient to counteract the amount of reduction due to extension of the fibres

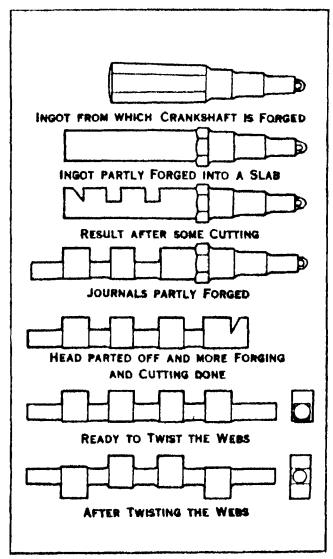


FIG 4—SOME OF THE MANY STAGES IN THE FORGING OF A 10-TON CRANKSHAFT BY 1,200-TON HYDRAULIC PRESS

Welding is the very valuable property possessed by pieces of iron or steel of uniting autogeneously while in a condition of semifusion When long portions which differ greatly in dimensions have to be united, welding is the only method practicable at the anvil. It is also generally the best to adopt when union has to be made between pieces at right angles, or when a piece on which much work has to be done is required at the end of a long plain bar, as in the tension rods of cranes and other structures with eyes The art of welding depends chiefly on having perfectly clean joint faces, free from scale, so that metal can unite to metal, union being prevented by the presence of oxide or dirt Also it is essential to have a temperature sufficiently high, yet not such as to overheat the metal. A dazzling white, at which small particles of metal begin to drop off, is suitable for iron, but steel must not be made so hot. A very few light hammer blows suffice to effect the actual union If the joint be faulty, no amount of subsequent hammering will weld it The forms of weld-joints include the scarf (fig 2), the

butt (fig. 2), and V (fig 3) and the glue, one form of which is shown in fig 3 The illustrations are of bars prepared for welding. These forms give the smith a suitable choice for different conditions A convexity is imparted to the joint faces in order to favour the expulsion of slag and dirt during the closing of the joint, these undesirable matters would become entangled between concave faces The ends are upset or enlarged in order to leave enough metal to be dressed down flush, by swaging or by flatting The proportional lengths of the joint faces shown are those which conform to good practice The fluxes used for welding are numerous but the most common is borax Electric welding is largely taking the place of the hand process, particularly in the United States, but machines are required to maintain the parts in contact during the passage of the current Butt joints without upsetting are usually employed, and a quantity of power is absorbed, but the output is immensely greater than that of hand welding

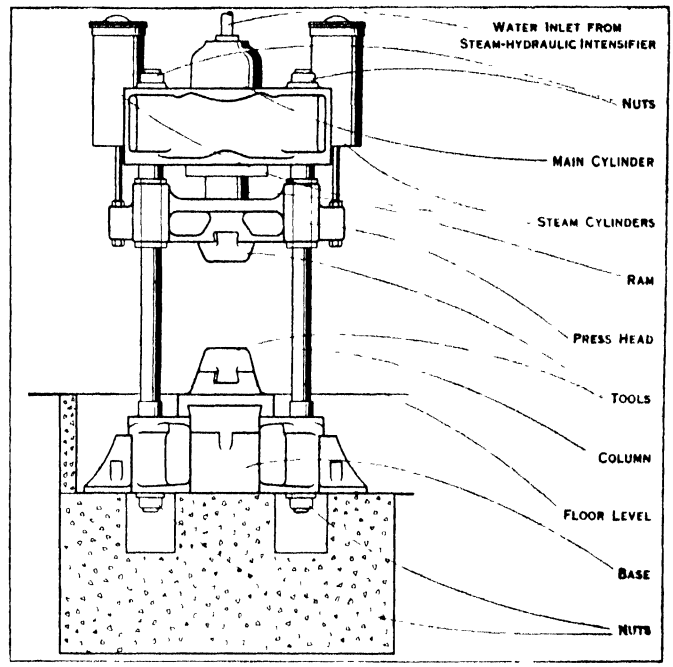
Punching.—When holes are not very large they are formed by punching, but large holes are preferably produced by bending a rod around and welding it, so forming an eye (fig 3) Small holes are often punched simply as a preliminary stage in the formation of a larger hole by the process of drifting, which is the gradual enlarging of the hole by tapered punches A piece of work to be punched is supported either on the anvil or on a ring of metal termed a bolster, laid on the anvil, through which the burr, when severed, falls But in making small holes through a thick mass, no burr is produced, the metal yielding sideways and forming an enlargement or boss Examples occur in the wrought iron stanchions that carry light hand railing In such cases the hole has to be punched from each face, meeting in the centre Punching under power hammers is done similarly, but occupies less time

Cutting-off or severance of material is done either on hot or cold metal In the first case the chisels used, "hot sets," have keener cutting angles than those employed for the second, termed "cold sets" In one set the anvil chisel is held in a hole in the anvil face, and in the other it is handled and struck with a sledge hammer (H K)

FORGING PRESS. Forging by machine can be done under steam and pneumatic hammers, drop-hammers, horizontal die-forging machines, and hydraulic presses The last-named give a squeeze to the metal, instead of a blow, with consequent absence of shock and vibration, the pressure penetrates into the interior of the forging, consolidating the metal and making it of uniform texture The press will also continue its squeeze and reduce a forging by several inches in thickness at one stroke, which a hammer cannot do The number of strokes in high-speed presses may be made to equal those of a hammer, up to 120 per minute This not only enables the smith to complete the forgings at the quickest rate he can manipulate them under the press, but produces better results than usual with the older slow-speed presses, because the metal does not have a chance to cool down to any serious degree

Although the hydraulic press has long been used for big work in preference to the steam hammer, it is now in competition with it for making forgings of quite moderate size, the power for such being from 100 to 800 tons All sorts of links, rods, levers, collars, bolts and nuts, spindles, shackles, hooks and such-like are produced thus Under the larger presses big shafts, bolts, rods, levers, wheels, anchors, tubes, cylinders, guns, shells and armour-plate are forged Presses for the last-named product have been made to exert a pressure of 14,000 tons Operations effected under the press apart from actual finish forging are *cogging*, which signifies the reduction of a steel ingot to suitable dimensions for rolling, or for *tilting*, the latter being the further reduction in the press of cogged ingots to the required section and surface finish. *Shingling*, the making of iron from puddled ball, is likewise performed in the press, and straightening, bending and welding before or after the actual forging of pieces Some presses have three rams—above, below and at the side—to do bending and welding, and move dies in some cases to stamp railway wagon and other repetition articles. Other presses have an extra long stroke for piercing or forging hollow pieces, such as shells In most forging presses the ram descends from above while the work is supported on a fixed anvil. The smaller presses have C-shaped frames and the smith is able to move around freely at the open gap to manipulate the forgings with hand tongs, or the help of a light crane

Large presses are built up with four steel bolts or columns, holding a base in the ground with the anvil or bottom *tool* so called, the top head taking the pressing cylinder, and the press head being forced by the ram to slide upon the columns The hydraulic



BY COURTESY OF MESSRS DAVY BROTHERS LIMITED

SKETCH SHOWING PARTS OF A 2 000-TON DAVY HYDRAULIC PRESS
Pressing is performed by the main cylinder, while the two steam cylinders ensure the rapid return of the ram for another stroke

pressure is delivered to the cylinder from pumps, or accumulator, or from a steam-hydraulic intensifier, this consists of a large steam cylinder with piston exerting pressure upon a small hydraulic plunger, so obtaining a pressure of about 2½ tons per square inch. The presses of Davy Brothers, Ltd, of Sheffield, who build sizes up to the largest, have two lifting cylinders (*see* the diagram) in which steam pressure gives a very rapid lift for the return stroke, rods from the pistons being connected to the press head A prefiller charges the main cylinder with water at a very low pressure, the full hydraulic force coming on when the top tool touches the work This saves expense in regard to the supply of pressure water Control gear is so designed that the movements of the press head exactly imitate those of the lever which the attendant works, slowly or rapidly or for instant arrest A 2,000 ton press of the type illustrated measures over 30ft in height from the foot of the base to the top of the cylinders Large presses have two pressing cylinders. If cheap electric or water power is available, the intensifier can be operated with compressed air produced from either of these power sources, instead of by steam

An overhead crane becomes essential to support the outlying ends of the massive forgings done under the big presses In order to take advantage of the quick action of the high-speed press, a Davy electric turning gear is suspended from the crane hook, and carries the link chain that encircles the forging An electric motor and gears revolve a drum on which the link chain laps and so it in consequence revolves the forging A slipping clutch allows the chain to stand still while forging pressure is on, and drives again when the forging is released giving it a partial turn ready for another squeeze

As the anvils or tools for the large presses are of great weight, facility of changing to the different sorts must be given rapidly by power methods. This is effected by hydraulic manipulating gear in the floor, a powerful cylinder and ram sliding plates along with the tools mounted thereon For instance, to change from flat tools to V-tools (for forging crankshafts), the top tool is re-

leased and dropped on to its bottom companion, and the set slid away; the others then come into position and the head picks up its top tool Hydraulic manipulation is also required to control a heavy bar used to forge tubes and cylinders upon (F H)

FORK, an implement formed of two or more prongs at the end of a shaft or handle. the most familiar type of which is the table-fork for use in eating In agriculture and horticulture the fork is used for pitching hay, and other green crops, manure, etc , commonly this has two prongs, "tines", for digging, breaking up surface soil, preparing for hand weeding and for planting the three-pronged fork is used. The word is also applied to many objects which are characterized by branching ends, as the tuning-fork, with two branching metal prongs, which on being struck vibrates and gives a musical note, used to give a standard of pitch, to the branching into two streams of a river or the junction where a tributary runs into the main river; and in the human body, to that part where the legs branch off from the trunk

The *furca*, two pieces of wood fastened together in the form of the letter A, was used by the Romans as an instrument of punishment It was placed over the shoulders of the criminal, and his hands were fastened to it Condemned slaves were compelled to carry it about with them, and those sentenced to be flogged would be tied to it, crucifixions were sometimes carried out on a similar shaped instrument

FORKEL, JOHANN NIKOLAUS (1749–1818), German musician, was born on Feb 22, 1749 at Meeder, Coburg. The son of a cobbler, he was a good musician, but his fame rests on his historical work, especially as the first biographer of J S Bach His library, which was accumulated with care and discrimination at a time when rare books were cheap, forms a valuable portion of the State library in Berlin and also of the library of the Koniglicher Institut fur Kirchenmusik He was organist to the university church of Gottingen, obtained the degree of doctor of philosophy, and in 1778 became musical director of the university He died at Göttingen on March 20, 1818 His most important work is the *Allgemeine Literatur der Musik* (1792) His *Über J S Bachs Leben* (1802) was translated into English in 1820 (new trans. by C. S. Terry, 1920)

FORLÌ, a town and episcopal see of Emilia (anc *Forum Livii*), Italy, capital of the province of Forlì, 40 m S E of Bologna on the railway to Rimini, 108 ft above sea-level Pop (1921) 24,700 (town), 51,994 (commune) The church of S Mercuriale in the square contains paintings, and good carved and inlaid choir stalls The fine square, brick campanile (1178–1180) is 252 ft in height The municipal picture gallery contains works by Marco Palmezzano (1456–1537) and other interesting pictures, including a fresco representing an apprentice with pestle and mortar (Pestapepe), the only authentic work in Forlì of Melozzo da Forlì (1438–1494), pupil of Piero della Francesca, and master of Palmezzano, of whose works there are several here The Palazzo del Podestà is a brick building of the 13th century The citadel (Rocca Ravaldina) was constructed about 1360–1370, and rebuilt later The felt industry has considerable importance and the surrounding territory is very fertile

Of the ancient Forum Livii, which lay on the Via Aemilia, hardly anything is known In the 12th century we find Forlì in league with Ravenna, and in the 13th the imperial count of the province of Romagna resided there In 1275 Forlì defeated Bologna with great loss Martin IV sent an army to besiege it in 1282, which was driven out after severe fighting in the streets; but the town soon afterwards surrendered In the 14th and 15th centuries it was under the government of the Ordelaffi; and in 1500 was taken by Caesar Borgia, despite a determined resistance by Caterina Sforza, widow of Girolamo Riario. Forlì finally became a part of the papal state in 1504

FORM (Lat *forma*), in general, the external shape, appearance, configuration of an object, in contradistinction to the matter of which it is composed; thus a speech may contain excellent arguments—the *matter* may be good, while the style, grammar, arrangement—the *form*—is bad The term, with its adjective "formal" and the derived nouns "formality" and "formalism," is hence contemptuously used for that which is superficial, unessential, hypocritical chap. xxiii. of Matthew's gospel is a classical instance of the distinction between the formalism of the Pharisaic code and genuine religion With this may be compared the popular phrases "good form" and "bad form" applied to. behaviour in society so "format" (from the French) is technically used of the shape and size, *e g*, of a book (octavo, quarto, etc) or of a cigarette The word "form" is also applied to certain definite objects in printing a body of type secured in a chase for printing at one impression ("form" or "forme"), a bench without a back, such as is used in schools (perhaps to be compared with O.Fr *s'asseoir en forme*, to sit in a row); a mould or shape on or in which an object is manufactured, the lair or nest of a hare From its use in the sense of regulated order comes the application of the term to a class in a school ("6th form," "5th form," etc); this sense has been explained without sufficient ground as due to the idea of all children in the same class sitting on a single form (bench)

The word has been used technically in philosophy with various shades of meaning Thus it is used to translate the Platonic *ἰδέα, εἶδος*, the permanent reality which makes a thing what it is, in contrast with the particulars which are finite and subject to change Whether Plato understood these forms as actually existent apart from all the particular examples, or as being of the nature of immutable physical laws, is matter of discussion For practical purposes Aristotle was the first to distinguish between matter (*ὕλη*) and form (*εἶδος*). To Aristotle matter is the undifferentiated primal element it is rather that from which things develop (*ὑποκείμενον, δύναμις*) than a thing in itself (*ἐνεργεία*). The development of particular things from this germinal matter consists in differentiation, the acquiring of particular *forms* of which the knowable universe consists (*cf* CAUSALITY for the Aristotelian "formal cause") The perfection of the form of a thing is its entelechy (*ἐντελέχεια*) in virtue of which it attains its fullest realization of function (*De anima*, ii 2, *ἡ μὲν ὕλη δύναμις τὸ δὲ εἶδος ἐντελέχεια*). Thus the entelechy of the body is the soul The origin of the differentiation process is to be sought in a "prime mover" (*πρῶτον κινοῦν*), *i e* pure form entirely separate (*χωριστόν*) from all matter, eternal, unchangeable, operating not by its own activity but by the impulse which its own absolute existence excites in matter (*ὡς ἐρώμενον, οὐ κινούμενον*). The Aristotelian conception of form was nominally, though perhaps in most cases unintelligently, adopted by the Scholastics, to whom, however, its origin in the observation of the physical universe was an entirely foreign idea The most remarkable adaptation is probably that of Aquinas, who distinguished the spiritual world with its "subsistent forms" (*formae separatae*) from the material with its "inherent forms" which exist only in combination with matter Bacon, returning to the physical standpoint, maintained that all true research must be devoted to the discovery of the real nature or essence of things His induction searches for the true "form" of light, heat and so forth, analysing the external "form" given in perception into simpler "forms" and their "differences" Thus he would collect all possible instances of hot things, and discover that which is present in all, excluding all those qualities which belong accidentally to one or more of the examples investigated· the "form" of heat is the residuum common to all Kant transferred the term from the objective to the subjective sphere All perception is necessarily conditioned by pure "forms of sensibility," *i e*, space and time· whatever is perceived is perceived as having spatial and temporal relations (*see* CATEGORY; SPACE-TIME; KANT) These forms are not obtained by abstraction from sensible data, nor are they strictly speaking innate. they are obtained "by the very action of the mind from the co-ordination of its sensations"

FORMALDEHYDE, the first member, H CHO or CH_2O, of the series of saturated aliphatic aldehydes (*q v*) is most readily prepared by passing the vapour of methyl alcohol, mixed with air, over heated copper or platinum; the formaldehyde vapour is condensed and absorbed, either in water or alcohol. At ordinary temperatures formaldehyde is a gas possessing a pungent smell; it is a strong antiseptic and disinfectant, a 40% solution of the aldehyde in water or methyl alcohol, sold as *formalin*,

being employed as a deodorant, fungicide and preservative It is not possible to obtain the aldehyde in a pure condition, since it readily polymerizes It is a strong reducing agent; it combines with ammonia to form *hexamethylenetetramine*, $(CH_2)_6N_4$, and "condenses" in the presence of some mineral bases to produce compounds which apparently belong to the sugars (*q.v.*). It renders glue, casein or gelatin insoluble in water, and is used in the coal-tar colour industry in the manufacture of pararosaniline, pyronines and rosamines Several polymerides have been described. *Para-formaldehyde*, obtained by concentrating solutions of formaldehyde *in vacuo*, is a white solid, which on heating changes back into the original form By cooling gaseous formaldehyde a crystalline polymeride, *trioxymethylene*, is formed $(CH_2O)_3$; this also reverts to the simple monomeric form on heating The strength of solutions of formaldehyde may be ascertained by the addition of excess of standard ammonia to the aldehyde solution (hexamethylenetetramine being formed), the excess of ammonia being then estimated by titration with standard acid. Scientific interest attaches to the formation of formaldehyde by the oxidation of methane at high temperatures (W A Bone) and by the action of ozone on this hydrocarbon Formaldehyde also appears to be a reduction product of carbon dioxide and the first stage in the assimilation of this oxide by the green plant during photosynthesis (*see* CARBOHYDRATES), whereupon polymerization of this aldehyde leads to the sugars and other carbohydrates

FORMALIN, an agneous solution containing 40% of formaldehyde (*q v*), is a commercial product After dilution this solution is used as a disinfectant, for the preservation of anatomical specimens, etc It possesses the property of converting protein substances (*q v*) into a hard elastic mass insoluble in water. It is also used in photography A photographic film with a gelatin basis is immersed in a dilute formalin solution for a short time to render the gelatin insoluble

FORMALISM, in philosophy generally, means undue attention to forms (of thought, or reasoning, etc), at the expense of content and concrete circumstances In ethics and religion it refers to the attachment of undue significance to the externals of convention, or to ritual, at the expense of the spirit and substance of morality and religion respectively

FORMAN, ANDREW (*c* 1465–1521), Scottish ecclesiastic, was educated at the university of St Andrews and entered the service of King James IV , who employed him on various foreign missions In 1501 he became bishop of Moray, and in July 1513 Louis XII of France secured his appointment as archbishop of Bourges, while pope Julius II promised to make him a cardinal In 1514 Forman was nominated by Pope Leo X. to the vacant archbishopric of St Andrews, and was made papal legate in Scotland, but his possession of the see was delayed until 1516 on account of the rivalry of Gavin Douglas, the poet, and John Hepburn, prior of St Andrews He died on March 11, 1521 As archbishop he issued a series of constitutions which are printed in J Robertson's *Concilia Scotiae* (1866). A Lang (*History of Scotland*, vol i) describes Forman as "the Wolsey of Scotland, and a fomenter of the war which ended at Flodden"

See J. Herkless and R. K Hannay, *The Archbishops of St. Andrews* (vol. ii., 1909).

FORMAN, SIMON (1552–1611), English physician and astrologer, was born at Quidham near Wilton He studied at Magdalen college, Oxford, and in Holland, and then practised as a physician in Philpot lane, London; but as he possessed no diploma, he was imprisoned more than once for quackery and his practice of necromancy. Ultimately, he obtained a diploma from Cambridge and established himself at Lambeth, where he was much consulted, especially by the notorious countess of Essex He died on Sept. 12, 1611.

Forman's *Grounds on the Longitude* appeared in 1591 His works on astrology are listed in Bliss's edition of the *Athenae Oxonienses*. For his ms. works *see* the article in the *Dict. Nat. Biog.*

FORME or **FORM.** In printing, a page or number of pages of type arranged in a metal form or frame termed a "chase." The name forme, used in Great Britain, is a Middle English spelling of form. The chase secures the type or stereo-plates in position (*See* PRINTING)

FORMERET, an architectural term for the rib of a Gothic vault that connects adjacent piers on the same side of the nave or aisle, and forms an arch in the plane of the wall; a wall-rib (*see* VAULT)

FORMIA, a town of Campania, Italy (anc. *Formiae*), province of Rome, on the new direct line between Rome and Naples, 50 m. N.W of the latter. Pop. (1921) 9,127 (town); 9,391 (commune) It is situated at the north-west extremity of the Bay of Gaeta, and commands beautiful views. It lay on the ancient Via Appia, and was much frequented by wealthy Romans; and it is still a seaside resort in the summer. There was considerable imperial property here and along the coast as far as Sperlonga, and there are numerous remains of ancient villas along the coast and on the slopes above it in some of which important sculptures have been found. The so-called villa of Cicero contains two well-preserved *nymphaea* with Doric architecture, now visible in the villa Caposele, once a summer residence of the kings of Naples There are many other modern villas, and the sheltered hillsides (for the mountains rise abruptly behind the town) are covered with lemon, orange and pomegranate gardens The now deserted promontory of the Monte Scauri to the east is also covered with remains of ancient villas; the hill is crowned by a large tomb, known as Torre Giano To the east at Scauri is a large villa with substructions in "Cyclopean" work The ancient Formiae was a Volscian town Cicero possessed a favourite villa here, and was murdered in its vicinity in 43 B.C , but neither the villa nor the tomb can be identified with any certainty.

FORMIC ACID was first prepared by distilling red ants (Lat *formica*) It occurs in some mineral waters, in animal secretions and in muscle Its reputed presence in stinging nettles has been controverted It is the first member of the series of aliphatic monobasic acids (*q v*), distinguished from the other members of the series by certain characteristic properties. For example, it shows an aldehydic character in reducing silver salts to metallic silver, it does not form an acid chloride or an acid anhydride, and, by the abstraction of the elements of water from the acid, carbon monoxide is produced, a reaction which finds no parallel in the higher members of the series. Finally, formic acid is, as is shown by the determination of its affinity constant, a much stronger acid than the other acids of the series Its formula is H_2CO_2 or H·COOH It may be prepared artificially by the oxidation of methyl alcohol and of formaldehyde; by the rapid heating of oxalic acid (J Gay-Lussac, 1831); but best by heating oxalic acid with glycerin at a temperature of 100–110° C (M Berthelot, 1856) In this reaction a glycerol ester is formed as an intermediate product, and undergoes decomposition by the water which is also produced at the same time

Formates are produced by the action of moist carbon monoxide on soda lime at 190–220° C (V. Merz and J. Tibicira, A. Geuther, 1880) An interesting process for sodium formate, due to Bredig and Carter (1915), consists in reducing solution of sodium bi-carbonate with hydrogen at 70° C under 6oatmos. pressure in presence of a palladium catalyst. Sodium formate is manufactured by absorbing carbon monoxide by caustic soda at 120–130° C under a pressure of 8 atmospheres.

Concentrated formic acid is prepared by dissolving sodium formate in an equal weight of 90% formic acid, and then distilling the mixture with concentrated sulphuric acid in copper vacuum pans (M. Goldschmidt, 1894) Anhydrous formic acid results when the lead or copper salt is decomposed by dry sulphuretted hydrogen at 130° C Formic acid is a colourless, sharp-smelling liquid, which crystallizes at 0° C, melts at 8·6° C, and boils at 100·8° C. Its specific gravity is 1·22 (20°/4°) It is miscible in all proportions with water, alcohol and ether. When heated with zinc dust, the acid decomposes into carbon monoxide and hydrogen. The sodium and potassium salts, when heated to 400° C, give oxalates and carbonates of the alkali metals, but the magnesium, calcium and barium salts yield carbonates only. The free acid, when slightly warmed with concentrated sulphuric acid, is decomposed into water and pure carbon monoxide; when heated

with nitric acid, it is oxidized first to oxalic acid and finally to carbon dioxide The formates are mostly soluble in water, those of silver and lead being the least soluble The calcium salt, when heated with the calcium salts of higher homologues, gives aldehydes The esters of the acid may be obtained by distilling a mixture of the sodium or potassium salts and the corresponding alcohol with hydrochloric or sulphuric acids

Formamide, $H CO{\cdot}NH_2$, is obtained by heating ethyl formate with ammonia, by heating ammonium formate with urea to 140° C, or by heating ammonium formate in a sealed tube for some hours at 230° C. It is a liquid which boils *in vacuo* at 150° C, but at 192–195° C under ordinary atmospheric pressure with partial decomposition into carbon monoxide and ammonia

FORMICARIIDAE: *see* PITTA

FORMIGNY, BATTLE OF (1450). The battle of Formigny, fought on April 15, 1450, was the last but one waged by the English during the Hundred Years' War Its special interest lies in the use of field artillery, and its influence on bow and lance tactics The Duke of Somerset was at Caen threatened by an overwhelming French army under King Charles To open a way to this city, Sir Thomas Kyriel and 4,500 men were despatched from England. At Formigny this force was confronted by the Count of Clermont at the head of some 3,000 lances, a body of local infantry and two small cannons Kyriel should have at once attacked the French, seeing that his object was to relieve the duke who was hard pressed, but so wedded were the English to defensive tactics that he fell back behind Formigny to a brook lined by orchards, and there drew up his men in a convex line, the archers covering their front by a trench and the usual palisade of stakes The French, having by now learnt the folly of assaults on unshaken bowmen, skirmished for a while Then Clermont ordered Giraud, "master of the royal ordnance" to bring up his two guns to enfilade the English line. This proved so effective that the archers left their defences and charged forward capturing the pieces Kyriel, in place of advancing the whole line and so taking advantage of the mêlée, persisted in the defensive, with the result that the archers who had captured the two guns were attacked in flank, and not being able to make use of their bows were thrown back in disorder onto the men at arms A clinch now took place, and the battle was decided by a fresh body of French knights under the Counts of Richemont and Laval appearing on the field This force charged the English in flank, surrounded them and annihilated Kyriel and his main battle The English losses amounted to no less than 3,750, those of the French were probably about 1,200 This battle marks one of the great turning-points in tactics, for before the 15th century ended cannon played an increasingly important part at every siege, and on every field

See Blondel, *Reductio Normanniae*, C Oman, *The Art of War in the Middle Ages* (1924) (J F. C F)

FORMOSA, a northern territory of the Argentine republic, with the Pilcomayo and Bermejo forming its northern and southern boundaries Estimated area, 41,402 sq m It is a vast plain, sloping gently to the south-east, covered with grass-lands, marshes and tropical forests The interior is still occupied by tribes of Indians The climate is hot, the summer temperature rising to a maximum of 104° F Timber-cutting for the *quebracho* industry is the principal occupation of the settlers, though stock-raising and agriculture engage some attention in the settlements near the Paraguay. The capital, Formosa (founded 1879), is a small settlement on the Paraguay with a population of about 10,000 in 1921. The population of the territory was estimated to be 21,880 in 1921. The nomadic Indians are estimated at 8,000

FORMOSA (*Taiwan*), an important island in the Western Pacific ocean between the Southern and the Eastern China seas, and separated from the province of Fukien on the Chinese mainland by the Formosa strait, 90 m in width at its narrowest. The name Formosa was given to the island on account of the majestic beauty of its scenery by the early Spanish navigators, but the Japanese who acquired it after the Sino-Japanese War of 1895 adopted the Chinese term Taiwan as the official name Formosa forms part of the marginal belt of islands and peninsulas which constitute the Asiatic section of the Circum-Pacific-fold mountain belt It is in the form of an elongated oval with a N N E–S S W. axis about 225 m in length The breadth varies from 60 to 80 m and the total area is 13,429 square miles. The outstanding feature of its build is the lofty mountain axis which occupies the central and eastern parts of the island The main water-parting lies near the eastern rim, and on this side there is a rapid descent to great ocean depths Magnificent sea-cliffs, forming perpendicular walls from 1,500 to 2,500 ft in height, face the Pacific along many sections A few small river-plains, notably that of the Giran, occur and there is an important longitudinal valley, parallel to the coast in its middle course, which has been utilized for railway construction The main mountain peaks of which Nitaka Yama (Mt Morrison 14,720 ft) and Setzu-Zan (Mt Sylvia 12,480 ft.) are the most important, lie somewhat west of the main axis, in the centre of the island Thence there is a relatively gradual descent to the coastal plain of western Formosa which is the heart of the economic life of the island The shallow Formosa strait (Taiwan Kaikyo) contrasts with the Pacific deeps, and facilitates the deposition of silt and the growth of alluvial plains Apart from the western plain, which has a width of about 20 m , the average height of Formosa exceeds 4,000 feet

Almost exactly bisected by the tropic of Cancer, and lying between two branches of the Kuro Siwo, the island has a distinctly tropical climate On the plain the mean temperature falls below 15° C only in January. The rainfall is high and well distributed throughout the year, although the south is relatively dry in winter The combination of heat and moisture, in conjunction with the variety of the topography, gives an exceptionally rich flora Most of the land under 1,000 ft (outside the territory of the aborigines) is now used for crops and grass, but luxuriant forests cover the greater part of the mountain zone A broad belt of palms, banyans, cork trees, camphor trees, tree ferns and dense thickets, up to a height of 3,000 ft , is succeeded by gigantic Cryptomerias and Chamoecyparis which yield place to pines and short grass on the higher summits

Population.—The population of Formosa was returned at 3,994,236 in 1924 It is extremely composite in character The term "natives," totalling 3,679,371, includes the Chinese and two distinct groups of aborigines The Chinese, much the most numerous element and predominant in the coast plain, are in the main derived from Fukien and Kwangtung provinces, but Hakka and Miaotze peoples from the south China plateau are also represented The aborigines are divided into. (a) The Pe-pa-hwan (*Anglice*, Pepo-hwans) or "Subdued Savages" comprising over 500 tribes which have vowed allegiance to the Government and have, in varying degrees, adopted Chinese manners and modes of life Their number is estimated at over 116,000 (b) The Chin-hwan or "Wild Savages," who live in the fastnesses of the Eastern Mountains, and seriously retard the economic development of the Prefectures of Taihoku and Takao by their antipathy to all foreigners These groups, which like the Pe-pa-hwans are probably of Malay affinities, total about 30,000, comprising 146 tribes, of which by far the most intractable is the head-hunting Taiyal group in the north-east They constitute a serious problem for the Japanese, and are enclosed by the Aiyu-Sen or guard-line, which extends for over 360 m , of which 230 m are electrified

Valuable as the island is to Japan, it is not congenial to Japanese emigrants The total Japanese population in 1924 was 181,847, the majority of whom, apart from official and military elements, is found in the mining districts of the north-east and sporadically in the plantations along the western coast plain Other foreigners, generally limited to the trading ports of the north and west, numbered about 30,000 in 1924

Administration.—The administration of the island in the settled districts closely follows that of Japan, especially since the new regulations of 1920 There is a Civil Governor-General who supervises the administration of the five prefectures of Taihoku, Shinchiku, Taichu, Tainan and Takao, in which task he is aided by a Prefectural Council The prefectures, municipalities and villages are to a large extent self-governing, their officials being appointed

by the governor of the prefecture to which they belong. Great attention is being devoted to education in accordance with the Japanese policy By regulations promulgated in 1922, the separate categories of Japanese and native schools have to a large extent disappeared, and both Japanese and natives are now placed under a uniform system of education There are over 800 elementary and public schools, and several institutions of higher rank, including a medical school and normal schools There are 27 public schools in the reclaimed aborigines' districts

The finance of the island is in a satisfactory position, revenue balancing and in some years exceeding expenditure In 1927–8 both were returned at yen 111,599,202 The revenue is mainly derived from State undertakings, customs and inland taxes

The economic development of Formosa has changed considerably under Japanese administration The Chinese regarded the island as a source of raw materials, such as rice, timber and camphor, and as a market for the manufactures of the south China coast The Japanese, by means of an active subsidized steamship service conducted by the Nippon Yusen Kaisha and the Osaka Shōsen Kaisha also use Formosa as a source of raw materials—indeed it is their tropical storehouse *par excellence*—but further have placed Formosan products on the world markets To achieve this object large sums have been spent by the Imperial and Formosan Governments on the improvement of communications and harbours Government monopolies, protective tariffs and the subsidizing of various branches of agriculture and industry are designed for the same end

Agriculture.—The main agricultural area is the western plain, more especially the section from Taichu to Takow Mining developments are most important in the north-east, in the rugged area behind Keelung The main crops are rice, sugar cane, tea, jute, sweet potato, beans and ground nuts Two rice crops per year are grown and, following upon Government aid in canalization and irrigation, the quality has improved Japan takes about 16% of the total yield, which mainly comes from the western plain south of Taichu and immediately in front of the low forest of the mountain foothills The sugar industry is probably the most prosperous and hopeful of all the island developments This product, grown under the plantation system, is concentrated in the western plain in front of the rice belt from Taichu southwards, whilst a secondary centre occurs around Shinchiku There were in 1923 about 300,000 acres under this crop There are now over 40 sugar refineries of modern type, but the total output of brown sugar produced by old-fashioned methods still far exceeds that of refined sugar. The main tea plantations are in the north-west, especially in the area between Shinchiku and Taihoku The principal type is the highly-flavoured Oolong tea, which is mainly exported to the United States via Japan, instead, as formerly, via Amoy Commercial fruit growing is another aspect of the agricultural economy of the Formosan plains, the main fruits being bananas, oranges, pineapples and longans

The forest resources of Taiwan are enormous, and the Government by careful regulation of felling and by reafforestation schemes is attempting to keep these resources as static as possible The main woods are camphor, pines and several hard woods The chief lumbering developments have been in the Arisan district, lying to the east of Kagi in the foothills of the Formosan highlands Special importance attaches to the camphor woods of the island The tree is widely distributed, flourishing up to a height of 3,500 ft , but some of the most valuable areas lie within the territory of the aborigines The Government originally placed a monopoly on Formosan camphor in 1899 in order to protect the native Japanese industry, but since that time the great increase in the demands of the industrial nations, particularly the United States, for camphor to supply the celluloid and kindred trades has much enhanced the value of the monopoly At present Japan virtually controls the world output of camphor

Mining and Communications.—Mining activities are mainly confined to the northern portion of the island. The coal mines behind Keelung are producing good bunker coal and lignites Gold is found near Shinjo on the east coast, whilst alluvial gold is washed out in the Keelung and Zuiho rivers Gold is becoming increasingly important as one of Formosa's most valuable exports. Copper, sulphur and building stone are also extracted in the same region Petroleum is found sporadically, and now competes with the American and Sumatran product in the Far East Salt extraction, by evaporation, is a Government monopoly of considerable value, and facilitates contact with the aborigines.

The topography of the island, which implies short, swift-flowing rivers of little use as commercial routes, in conjunction with the problem of the aborigines in the eastern mountains, has concentrated population, roads and railways along the western plain and in the north-east There are now 6,500 m of good roads and a railway mileage of 522 Of this the greater part forms the main commercial artery of the western plain between Keelung and Takow, and the remainder part of an uncompleted line in the longitudinal valley parallel to the east coast These Government railways are fed by narrow gauge mineral and trolley lines which serve the needs of many lumbering districts and sugar plantations, particularly in the Takow and Kagi regions

Towns and Ports.—The important towns are mainly in the developed western and north-eastern areas, the largest being Taihoku (pop 186,760) at the junction of the Tamsui and Keelung rivers The main port of the island, which taps the rich mining and agricultural areas of Taihoku prefecture, is Keelung with a population, in 1923, of 56,258 The western trunk line passes through a number of large towns, the most important, in order of population, being Tainan (83,497), Kagi (42,293), Takow (39,850), Taichu (38,094) and Shinchiku (36,377) Large towns are rare along the eastern coast, the most important being Giran (21,379) and Kaigan

Good ports are very infrequent, and are limited to the north and west Keelung is by far the best port and has been improved to accommodate ships of 26 ft draught at low water The majority of the coal, mineral and camphor exports leave by this port, and it is still more important as the distributing centre for imports Tamsui, lying north-east of Taihoku, and on the river of the same name, is the natural port for the agricultural produce of the hinterland, but its trade does not warrant the huge expenditure which would be necessary to make it a good second class port Tamsui and Keelung are both outports of Taihoku, and the foreign settlement of Taitotei below Taihoku Takow is a great sugar port and with Tamsui is the main terminal for the extensive junk trade with China

Trade.—The main competitors in Formosa are Japan and China, but the trade returns now show a remarkable balance in favour of Japan, resulting from the systematic policy of encouraging reciprocal trade The main exports, in 1923, were, in order of value sugar, fruits, coal, tea, camphor, rice, gold and fibres. The total exports were valued at 253,672,000 yen, of which 211,098,000 yen went direct to Japan China, with Hongkong, absorbed 14,696,000 yen of the remainder, while the United States and the Dutch East Indies took goods to the value of 6,596,000 yen and 3,189,000 yen respectively The imports of Formosa are considerably less in value than the exports, and are more equally distributed amongst the competing nations Imports in 1923 were, in order of value beans, vegetables, straw matting, iron, opium, cotton goods, timber and tobacco, the total being valued at 132,839,000 yen Of these, imports from Japan were valued at 86,573,000 yen, from China and Hongkong at 21,993,000 yen, whilst the United States and the Dutch East Indies sent goods valued at 6,370,000 and 4,023,000 yen respectively These statistics show clearly the value of Formosa as a constituent part of the Japanese empire The Chinese population, however, remains an indispensable factor in the development of the island (P M R)

Ethnology.—Apart from recent Japanese and Chinese settlers the peoples in the island include Chinese Hakkas, related to the tribes of Kwangtung province in China and aborigines The latter belong physically to the Nesiot type conspicuous in the Philippines and the Dutch Indies, with brown skins and long heads, but they have undoubtedly mixed with other eastern Asiatic elements, including isolated instances of individuals apparently of pygmy stock who have crinkly hair, an indication of a Papuasian negroid element. In culture and in language they have affinities

with the Indonesians, such as the Igorotes of the Philippines. They practise "head-hunting" (*q v*) which regulates the social standing of the men and is connected with marriage; they have age grades and matriarchy The lobes of the ear are mutilated, tattooing is practised and as a puberty ceremony boys and girls have the two upper lateral incisor teeth removed They practise hoe culture The unmarried men live apart in bachelor houses, usually built on piles Property rights are ill defined Salt is used by some as currency Ancestor worship is notable, and the priestesses are diviners and act as rain-destroyers (L H D B)

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History.—The island of Formosa must have been known to the Chinese at a very early date, but it was not settled extensively by them until late In the 16th century the Portuguese and Spaniards made some attempts at establishing settlements In 1624 the Dutch built a fort, Zelandia, on the east coast, and maintained a settlement there for 37 years On the conquest of China by the Manchus, adherents of the defeated Ming dynasty, under a leader known to Europeans as Koxinga, expelled the Dutch and took possession of a large part of the island By the close of the 17th century the Chinese portion of the island submitted to the Manchus and Formosa came to be reckoned as part of the empire Chinese immigrants rapidly came in and conflicts with the aborigines ensued By the treaties of Tientsin (1858) two ports on Formosa, Taiwan and Tamsui, were opened for foreign trade and Christian missionaries soon followed In 1874 the island was invaded by the Japanese for the purpose of obtaining satisfaction for the murder of a shipwrecked crew by aborigines, and war with China was narrowly averted During the Franco-Chinese war of 1884–85 the French partly blockaded the island and held Keelung for some months In 1895 the island was ceded to Japan by the Treaty of Shimonoseki The resident Chinese objected and declared a republic, and it was only by force that the Japanese were able to take possession Some years elapsed, indeed, before they fully pacified the island, and unrest has not been unknown since

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FORMOSUS, pope from 891 to 896, first appears in history when, as bishop of Porto, he was sent on an embassy to the Bulgarians Having afterwards sided with a faction against John VIII, he was excommunicated, but Marinus, the successor of John VIII, restored him to his dignities, and in 891 he was chosen pope. At that time the Holy See was engaged in a struggle against the oppression of the princes of Spoleto, and Formosus was forced to consecrate as emperor Lambert, the young son of Guy of Spoleto In 895 Arnulf, king of Germany succeeded in seizing Rome, and Formosus crowned him emperor But, as he was advancing on Spoleto against Lambert, Arnulf was seized with paralysis, and forced to return to Germany Overwhelmed with chagrin, Formosus died on April 4, 896 The validity of his acts was contested on the pretext that, having been originally bishop of Porto, he could not be a legitimate pope His body was disinterred in 897 by Stephen VI, and treated as that of a usurper of the papal throne; but Theodore II restored it to Christian burial, and at a council presided over by John IX the pontificate of Formosus was declared valid

FORMS: *see* DIFFERENTIAL FORMS

FORMS OF ADDRESS. Every country has its own conventions in regard to modes of address; in few countries are these conventions so numerous as in England The Anglo-Saxon has evolved a very strict code of style and title, which has grown through the centuries according to a tradition often illogical, but never to be broken with social impunity

GREAT BRITAIN

To begin with the peerage in Great Britain: dukes and duchesses are always dukes and duchesses when addressed either in speech or in writing; but it is a grave solecism to use the full formal title in addressing any member of the four lesser orders of peers either in conversation or in the intimacy of a private letter. On envelopes, on invitations, and in, as well as on, legal documents or tradesmen's communications and bills, they are marquises and marchionesses, earls and countesses, viscounts and viscountesses; but in conversation, or in letters beginning "Dear . . " they must be addressed as "Lord So-and-So" or "Lady So-and-So." In the case of the lowest order, *i.e*, the peer who is merely a baron, the use of the title is even more restricted; it is used on or in legal documents only On envelopes in non-legal intercourse, however formal, on invitations or in letters even written in the third person, he is never styled anything but "Lord" Oddly enough, though, this does not apply to the lady who is a baroness in her own right, but these are very few in number. except in speech, and in letters beginning "Dear .," she is always called "Baroness," *e g.*, Baroness Ravensdale, Baroness Burton, Baroness Petre, etc

In invitations, the full title, except in the case of Barons, is always used In letters written in the third person, the full title is used in the first place, but afterwards reference is made by means of the colloquial designation. For example "The editor presents his compliments to the Marquis of Piccadilly and will be much pleased if Lord Piccadilly . ," etc, etc

The prefixes "his (or her) grace," "the most noble," "the Rt. Hon" before the names of peers are never used except by tradespeople, lawyers, Court officials and servants

The sons and daughters of peers have titles of their own, which can only be merged in other peerages In the case of the three higher orders the eldest son bears a courtesy title, *i.e.*, he is known by one of his father's peerages, but that of course does not provide him with a seat in the House of Lords; the younger sons of dukes and marquises have the prefix "Lord" placed before their christian names and surnames, the younger sons of earls and all the sons of viscounts and barons have that of Honourable, generally shortened to Honble or Hon. Thus a younger son of a duke of Richmond is Lord Esmé Gordon Lennox, Lord James Douglas was the younger son of a marquis of Queensberry, but the younger son of the earl of Erroll is The Honble Gilbert Hay, the sons of Viscount Clifden are The Honble Arthur Agar-Robartes and The Honble. Cecil Agar-Robartes, and the son of Lord Ebbisham is The Honble Rowland Blades Some of the older Scots families use their own traditional courtesy titles

The daughters of dukes, marquises and earls likewise bear the title of Lady prefixed to the Christian name and surname Thus Lady Mary will remain Lady Mary all her life, unless she marries a peer or a younger son whose father has a higher rank than her own father If she marries a commoner, a knight or baronet, or an Honble, she still remains Lady Mary, and should always be addressed as such whether in conversation or in writing The average Englishman seems to find it extremely difficult to remember that to talk to or of Lady Mary Debrett as "Lady Debrett" is to commit one of the deadly sins in social etiquette

The prefix "Honble," which applies to the daughters of viscounts and barons, follows the same rule as that which applies to the sons, so long as the daughters are unmarried, *i e.*, the girl is The Honble Mary Deburke, just as her brother is The Honble Thomas Deburke, but when she marries, the christian name is dropped and she becomes The Honble Mrs Blank, unless she marries a peer or a man with a courtesy title in the peerage higher than her own If, for example, she marries Lord Edward Jones (who must be a son of a marquis or a duke) she becomes Lady Edward Jones—she can never become Lady Mary Jones unless her father should become a marquess or a duke. But there is one great difference between these courtesy titles of Lord and Honble. —the latter title is absolutely ignored in conversation, and is never printed on visiting cards

Baronets and knights bestow the prefix of "Lady" on their wives, but there is nothing in the wife's title to show to which order her husband belongs The baronet's name is differentiated in writing because the abbreviation "Bart." follows it on envelopes; the ten different orders of knighthood have their initial letters placed after the names of their knights (K.G. Knight of the Garter, and so on down to the last), but their "ladies" have no right to use these letters. Now that the number of knights

and baronets has so enormously increased, there are many ladies in their ranks who bear the same surname, and of late years a habit has grown up in the press of specifying which Lady Debrett or Lady Deburke is meant by mentioning the husband's christian name between brackets, thus "Lady (James) Debrett." This is absolutely wrong both in heraldry and in tradition, but it will probably come to be accepted in the long run on account of the difficulty of indicating, in any other way, to which "Lady" reference is made.

The order of mere knighthood, belonging to none of the ten specified ones, also exists, and the recipient of it has no right to place after his name any letters denoting an order But of course there are many letters to which he may lay claim if he possesses the necessary qualifications, such as M D , or R N., or M P , the last being always added to the name of any member of the House of Commons, no matter what his titles may be

The title of Right Honourable (Rt. Hon , Rt Honble), which belongs of right to all peers—though in their case it is never used, as has been stated before, except on bills or legal or official documents—is the prerogative of members of H M 's privy council, and as such, is borne by those of them who are not peers, and by cabinet ministers It is used in the same way as "Honble ," *i e* , directly in front of the christian name, *e g* , "Rt Hon Stanley Baldwin," "Rt Hon Sir William Joynson-Hicks " What may be termed professional designations, such as "Dr " or "Rev ," or naval or military, *precede* the prefix of "Honourable," whereas titles of baronetcy and knighthood *follow* the prefix, *e g* , The Right *Rev* The Honble Benjamin Plunket, *Captain* The Honble Otway Cuffe, General The Honble *Sir* Cecil Bingham, Captain The Honble *Sir* Seymour Fortescue, K C V O , C M G , R N

Soldiers and sailors are addressed on all occasions by their professional titles—admiral, general, captain, colonel, commander and so on, except lieutenants in the army, who in private life remain "Thomas Debrett, Esq " Captains in the royal navy add R N after their names to show that they belong to the senior service

There are various equally correct formulas for addressing Judges and Doctors, and the one chosen is a mere matter of preference of the judge or doctor in question This can generally be discovered by noticing how they style themselves on their visiting cards, *e g* , "Sir Horace Avory" or "Mr. Justice Avory", "C Drennan, Esqre , M D " or "Dr Drennan," or "Sir Sydney Russell-Wells, M D "

Clergymen are spoken to and of as "Mr ," and on invitations and envelopes are addressed as "The Revd (or Rev) George Debrett" and not as "The Revd Debrett " In conversation a Canon is addressed as "Canon X ," but on envelopes it must be as "The Revd Canon X " Archdeacons when written to are The Venerable, deans are The Very Reverend, but in both cases are addressed orally as "Mr Dean " Bishops and archbishops on envelopes are respectively "The Rt Revd " and "The Most Revd " (in the Church of Rome "Most Revd." and "His Grace," while a cardinal is "His eminence"); in formal speech and in formal writing the form of address is "My lord "

Ambassadors, ministers (in diplomacy) and governors-general have the words "his excellency"—often abbreviated to H E —prefixed to their official titles, and, of course, like the titles of soldiers and sailors, judges and doctors and clergymen these words apply, if we would be strictly legal, only to the actual individual bearing them. But it has become a matter of courtesy to give the wives of ambassadors, ministers accredited to foreign Courts, and governors-general the same titles and precedence accorded to their husbands But neither the precedence nor the title applies outside the limits of the country in which the official holds office

After the World War, a new order was instituted by the king, and this time it contained a special section and title for women—that of "Dame " It is used in the same way as "The Rt Honble ," that is to say, it is followed immediately by the christian name, *e.g* , Dame Edith Lyttelton (or The Honble. Mrs Alfred Lyttelton), Dame Margaret Lloyd George, Dame Meriel Talbot, and the title is not used by peeresses

Men who have no titles are termed "esquire" (commonly shortened to "Esqre " or "Esq ") on their envelopes, and this mode of address, which in pre-Edwardian days used to be severely restricted to a comparatively small class, is now almost universal. Any qualifying letters such as M P (Member of Parliament), C B. (Companion of the Bath), follow after the Esqre , but where there is a title of any kind, the Esqre, must *never* appear A doctor may be "C. Medico, Esqre , M D.," but never "Dr C Medico, Esqre." In the city of London, and in big provincial towns, where the cultivation of civic pride is recognized as a duty, aldermen and mayors bear their titles in daily life, in speech and writing; in such cases, they should always be addressed on their envelopes according to their style Mr Sheriff Jones, Mr. Alderman Brown, the Worshipful the Mayor of— In speaking it is usual to say "Mr Mayor"—except, of course, in the case of Lords Mayor, such as London, where "my Lord" takes the place of "Mr " And again in no case should "Esqre " end an address beginning "Alderman" or "Councillor " There is no definite rule for the use of these civic titles, but when a letter is written to the holder of a municipal office at his official address, the envelope must be addressed to him showing his official capacity In the case of a letter sent to him, as a private citizen, at his home address, the civic title may be dropped.

Ministers and certain other holders of official positions in some of the dominions and Crown colonies enjoy the prefix of Honble. during their term of office, and often on their retirement it is bestowed on them for life. Care should therefore be taken not to omit the prefix where it has been earned.

A source of perplexity to many people is the use of the word dowager. It is distasteful to some women, who look upon the term as practically a label of old age The associations of the word tend to hide the real meaning, *i e.*, a woman who receives a dowry In mediaeval times, such recipients were almost always the widows of men belonging to the landed gentry, who lived in the "dower house" and remained under the protection of the head of the family In these days, as in ours, the widow was so designated to differentiate her from the wife of the head. But there is no definite legal ruling in the matter, here again it is entirely a question of personal choice A widow, like everyone else, is entitled to call herself what she likes, so long as by so doing she neither deceives nor defrauds anyone She is in honour bound to show through her name that she no longer holds the position as wife of the leading member of her husband's family For practical reasons, also, this is advisable, for so long as she adheres to her old title, her successor in the position has the right to open any letters or parcels so addressed Many feuds have arisen in families over this matter

If the term dowager is disliked, the widow can use her christian name instead In that case the christian name *must* precede the title—the term dowager can either precede the title or be interpolated between the title and the surname, at the choice of the bearer—it can *never* follow it, *e g* , the countess dowager of Desart, or Nancy Lady Teignmouth, or the Dowager Viscountess Gormanston Even in the case of a duchess this rule applies, and certain people who in bygone days would talk of the late "Duchess Adeline of Bedford," instead of "Adeline Duchess of Bedford," were guilty of a serious breach of etiquette

As regards royalty, the king and princes of the royal blood are addressed in speech as "sir" and the queen and ladies of the royal house as "ma'am " Those wishing to address royalty in writing should approach them through the lady or gentleman in waiting But the regulations in connection with addressing royalty are so numerous, that to deal with these in detail would lead one far beyond the scope of this article For further information reference should be made to the books mentioned in the bibliography

BIBLIOGRAPHY —For social forms of address *see* Ellen Countess of Desart and Constance Hoster, *Style and Title a Complete Guide to the forms of Social Address—Written and Spoken; Titles, a Guide to the right use of British Titles and Honours*

For official forms of address see *Debrett's Peerage, Baronetage, Knightage and Companionage* (many edns), Sir Bernard Burke, C B LL D , Ulster, King of Arms and Ashworth P Burke, *Peerage, Baronetage and Knightage, a Genealogical and Heraldic History of the Peerage and Baronetage, The Privy Council and Knightage.*

(E C or D , C Hos)

THE UNITED STATES

Although titles, as far as society is concerned, are not customary in the United States, persons holding official positions are designated accordingly No simpler way could very well be found than this of labelling a man according to his working place in the community, but side by side with the simplicity, certain traditions have grown up regarding the labels

The president of the United States would be addressed in speech as "Mr President," and only as "Sir" in the course of a long and personal conversation Any social correspondence to the president and his wife addressed to them in Washington should read —

The President
and Mrs Hoover,
The White House

If from anywhere outside the capital, "Washington, D C" should be added Should the president be in any other country (which happens so rarely as to be most improbable), he and his wife would be addressed —

His Excellency,
The President of the United States,
and Mrs Herbert Hoover

Although the president, like every other ruler, may dine with friends, according to social form he would never receive an engraved invitation to dinner from any individual In Washington it is officially understood that he never dines out except with his cabinet officers When his presence is desired, the personage inviting him would either call at the White House and ask him to select a date, or else write to him to that effect If the president were to accept such an invitation, his placecard would read "The President" His wife's card would read "Mrs Hoover"

The same form of address should be used for the vice president, in writing —

The Vice President

in speaking, "Mr Vice President"

An ambassador is addressed in speech as "Your Excellency," his wife, as "Mrs Black" When the American ambassador to Great Britain is invited to dinner in England, his invitation should be addressed —

His Excellency,
The Ambassador of the United States,
and Mrs Black

If he were invited to dinner in his own country, his invitation should be addressed —

The American Ambassador to Great Britain
and Mrs Black

The most formal invitation would read —

Mr and Mrs John Brown
request the honour of
the company of
The American Ambassador to Great Britain and Mrs Black

His placecard would read "The American Ambassador to Great Britain", his wife's, "Mrs Black"

The governors of the States of Massachusetts and Virginia should also be addressed "Your Excellency" since American tradition, coming from England, gives them the titles prescribed by English law The less formal "Governor" is used for the chief executives of States founded under the republic An invitation would be addressed to.—

The Governor of the State of New York
and Mrs Roosevelt

A formal invitation would be worded —

Mr and Mrs John Brown
request the honour of
the company of
The Governor of New York and Mrs Roosevelt

His place card would read "The Governor of New York", hers, "Mrs Roosevelt"

The Mayor of New York would be addressed as "Your Honour" in speech

His Honour the Mayor of New York
and Mrs Walker

would be the form of address in writing To him an invitation would be worded like that to the governor, substituting "The Mayor of New York" His placecard would read "The Mayor of New York", and his wife's "Mrs Walker"

In the forms of invitation given, the word "honour" instead of "pleasure" has been suggested Either may be used, but there is a subtle distinction. "Honour" is usual for an exalted personage—such as an ambassador—especially when a mere Mrs John Brown is sending the invitation Between equals, however, "pleasure" is, perhaps, preferable

Invitations have been chosen first to illustrate modes of written address, because most of the questions asked come from those who desire social information, but we also present some of the formal official rules determining the style to be followed in diplomatic correspondence.

Addresses and Titles.—The title "The Honourable" should be used in writing to governors, cabinet officers, American ambassadors, American ministers, judges, senators, members of Congress, the secretary to the president, assistant secretaries of executive departments and the heads of independent boards and commissions The title "Esquire" should be used after the names of chief clerks and chiefs of bureaux of the executive departments, mayors of cities (when the name is used before the title, as "James Burrows, Esquire, Mayor of ", this applies also to most titles in America, American diplomatic officers below the grade of minister, American consular officers, the clerk of the U S Supreme Court and officers of other courts To this list might be added any gentleman, except when addressed with his wife The definite article should precede the titles "Honourable" and "Reverend" Professional abbreviations such as M D , LL D , D D , follow the name of the person addressed, and, according to democratic authorities, no title is prefixed "George Smith, M D" is their way of putting it Socially, however, and according to sophisticated customs, George Smith was born a gentleman (or esquire) before he became a physician or surgeon or a clergyman, and should be "Dr George Smith" or (possibly) "George Smith, Esq , M D" or "The Reverend George Smith" In America, as in England, professional titles are rarely used Mr Nicholas Murray Butler, for instance, would be addressed as "Mr" or "Esquire" and only officially as "President of Columbia University" It is never correct according to distinguished social usage to make the professional title of paramount importance Some men, however, cling to it One judges by their own wishes how to address them

The monthly *Diplomatic List*, the *State Department Register* and the *Congressional Directory* may be consulted for correct names and addresses of members of the diplomatic corps at Washington and American officials In the absence of other proper titles of honour or courtesy, correspondence should be addressed "Mr and Mrs", "Esquire" for the individual man, "Mrs" and "Miss" for the individual woman

Beginnings of formal letters should be as follows. to the president—"The President", to an ambassador—"Your Excellency"; to a minister—"Sir" To the cabinet officers, one uses "Sir" for formal salutations To a senator, informally, the salutation would be "My dear Senator Smith", to a member of Congress "My dear Mr Jones" The use of titles of Judges presents real difficulties For the U S Supreme Court it is "Mr Chief Justice," and "Mr Justice" For the court of appeals of New York State, it is "Chief Judge" and "Judge", for the Supreme Court of the State it is again "Mr Justice"

Order of Precedence.—After the president, the vice president, ambassadors or chief justices of the Supreme Court (this has never been properly settled), justices of the Supreme Court, ministers, the speaker, cabinet members, senators, chief of staff of the army, chief of naval operations, representatives, chargé d'affaires, major generals and rear admirals, counselors, military and naval attachés, the solicitor general, foreign first secretaries, under secretaries, first assistant secretaries, members of the Federal Reserve Board and Interstate Commerce Commission, secretary of the Smithsonian Institute, director of the Pan-American Union, foreign second and third secretaries, American second and third secretaries

See *Vogue's Book of Etiquette* (E W Ch)

FORMULA, in general, a stereotyped form of words to be used on stated occasions, for specific purposes, ceremonies, etc. In the sciences, the word usually denotes a symbolical statement of certain facts; for example, a chemical formula exhibits the composition of a substance (*see* CHEMISTRY), a botanical formula gives the differentia of a plant, a dentition formula indicates the arrangement and number of the teeth of an animal.

FORNER, JUAN PABLO (1756–1797), a Spanish satirist and scholar who was author of the violent diatribe *El Asno erudito* (1782), was born at Mérida on Feb 23, 1756, and died at Madrid on March 17, 1797 Under various pseudonyms, he engaged in a series of polemics with Garcia de la Huerta, Iriarte and other writers His brutality in attack is almost unexampled, but his posthumous *Exequias de la lengua castellana* testifies to his scholarship and talent

FORRES, royal burgh, Moray, Scotland Pop (1921) 4,116 Forres (Gaelic, *far ais*, "near water") is on the Findhorn, which is crossed by a suspension bridge about a mile to the west, 11 m W of Elgin by the L M S R, and 6 m by road from Findhorn, its port, due north It is one of the most ancient towns in the north of Scotland King Donald (892–900), son of Constantine, died in Forres, and in it King Duff (961–967) was murdered Macbeth is said to have slain Duncan in the first structure that gave its name to Castlehill, which was probably the building demolished in 1297 by the adherents of Wallace The next castle was a royal residence from 1189 to 1371 It was burned by the Wolf of Badenoch in 1390 The ruins on the hill, however, are those of a later building and are surmounted by a granite obelisk, 65 ft high, raised to the memory of Surgeon James Thomson, a native of Cromarty, who at the cost of his life tended the Russian wounded on the field of the Alma The public buildings include the museum, named after Dr Hugh Falconer (1808–1865), the palaeontologist and botanist The cross, in Decorated Gothic, stands beside the town hall Adjoining the town on the south-east is the beautifully-wooded Cluny hill The not extensive industries comprise the manufacture of chemicals and artificial manures, flour mills, distilleries and woollen manufactures There is considerable trade in cattle

Sueno's stone, about 23 ft high, one of the finest sculptured monoliths in Scotland, stands in a field to the east of the town It is carved with figures of soldiers, priests, slaughtered men and captives on one side, and on the other with a cross and Runic ornamentation According to an old tradition it was named after Sueno, son of Harold, king of Denmark, who won a victory on the spot in 1008, but there are other conjectures Another storied stone is called the Witches' stone, where Macbeth is said to have encountered the weird sisters

FORREST, EDWIN (1806–1872), American actor, was born at Philadelphia (Pa), on March 9, 1806 He made his first stage appearance on Nov 27, 1820, at the Walnut Street theatre, in Home's *Douglas* In 1826 he had played a great success in New York as Othello He played at Drury Lane in the *Gladiator* in 1836, but his Macbeth in 1845 was hissed by the English audience, and his affront to Macready in Edinburgh shortly afterwards—when he stood up in a private box and hissed him—was fatal to his popularity in Great Britain. His jealousy of Macready resulted in the Astor Place riot of 1849 In 1837 he had married Catherine, daughter of John Sinclair, an English singer, and his divorce suit in 1852 was a *cause célèbre* which hurt his reputation and soured his temper His last appearance was as Richelieu in Boston in 1871 He died on Dec. 12, 1872 He had amassed a large fortune, much of which he left by will to found a home for aged actors

See Lawrence Barrett's *Edwin Forrest* (Boston, 1881).

FORREST, JOHN, 1ST BARON (1847–1918), West Australian statesman and explorer, son of William Forrest, of Leschenaulty, Bunbury, West Australia, was born on Aug 22, 1847, and educated at Perth, West Australia. In 1865 he joined the Government Survey Department at Perth, and in 1869 led an exploring expedition into the interior in search of D Leichardt, penetrating through bush and salt-marshes as far inland as 123°E In 1870 he again made an expedition from Perth to Adelaide, along the southern shores. In 1874, with his brother Alexander Forrest (born 1849), he explored eastwards from Champion bay, following as far as possible the 26th parallel, and striking the telegraph line between Adelaide and Port Darwin, a distance of about 2,000m was covered in about five months with horses and without carriers, a particularly fine achievement (*See* AUSTRALIA *Exploration*) John Forrest also surveyed in 1878 the north-western district between the rivers Ashburton and Lady Grey, and in 1882 the Fitzroy district In 1876 he was made deputy surveyor-general; for a few months at the end of 1878 he acted as commissioner of Crown lands and surveyor-general, being given the full appointment in 1883 and retaining it till 1890 When the colony obtained in 1890 its constitution of self-government, Sir John Forrest (who was made K C M G in 1891 and G C M G in 1901) became its first premier, and he held that position till in 1901 he joined the Commonwealth Government, first as minister for defence, later as minister for home affairs and postmaster-general, resigning the office of federal treasurer in July 1907 Sir John Forrest was again general treasurer in the Deakin administration of 1909–10, under Sir Joseph Cook (1913–14), and again in 1917–18 His determined opposition to the Labour Party prevented his rise to the premiership He received a peerage in 1918, and died at sea on his way to England, on Sept 4 of that year He published *Explorations in Australia* (1876) and *Notes on Western Australia* (1884–1887) (*See* H G Turner, *First Decade of the Australian Commonwealth* [1911]).

FORREST, NATHAN BEDFORD (1821–1877), Confederate cavalry general in the American Civil War, was born near Chapel Hill (Tenn), on July 13, 1821 He never received any formal education, but he managed to teach himself with very fair success, and is said to have been an able mathematician. He was in turn a horse and cattle trader in Mississippi, and a slave dealer and horse trader in Memphis, until 1859, when he took to cotton planting in north-western Mississippi and acquired considerable wealth At the outbreak of the Civil War in 1861 he volunteered as a private, raised a cavalry unit of which he was lieut -col , and in Feb 1862 took part in the defence of Fort Donelson Refusing, like Generals Floyd and Pillow, to capitulate with the rest of the Confederate forces, he made his way out, before the surrender, with all the mounted troops there. He was made a colonel and regimental commander, and fought at Shiloh with distinction He was promoted brig -general in July 1862 At the head of a mounted brigade he took a brilliant part in General Bragg's autumn campaign, and in the winter of 1862–63 he was continually active in raiding the hostile lines of communication One of the most remarkable of his actions was his capture, near Rome (Ga), after five days of marching and fighting, of an entire cavalry brigade under Col A D Streight (April 1863) He was present at the battle of Chickamauga in September, after which he was transferred to the Mississippi He was made a major-general in Dec 1863

On April 12, 1864, he assaulted and captured Fort Pillow, in Tennessee on the Mississippi, U S negro troops formed a large part of the garrison and according to survivors many were massacred after the fort had surrendered The "Massacre of Fort Pillow" has been the subject of much controversy and there is conflicting testimony regarding it, but it seems probable that Forrest himself had no part in it On June 10 he decisively defeated a superior Federal force at Brice's Cross Roads (Miss), and throughout the year, in spite of the efforts of the Federals to crush him, he raided successfully in Mississippi, Tennessee and Alabama He was once more with the main Confederate army of the West in the last disastrous campaign of Nashville, and fought stubborn rearguard actions to cover the retreat of the broken Confederates In Feb 1865 he was made a lieut -general, but the struggle was almost at an end and General James H. Wilson rapidly forced back the few Confederates, now under Forrest's command, and stormed Selma (Ala), on April 2 The surrender of General Forrest and his whole command followed on May 9 After the war he lived in Memphis, and for some years was president of the Selma, Marion and Memphis railroad He died at Memphis (Tenn), on Oct 29, 1877. The military character of General Forrest was admittedly that of a great leader.

See the biographies by J. A Wyeth (1899) and J. H Mathes (1902).

FORSKÅL, PETER (1736–1763), Swedish traveller and naturalist, was born at Helsingfors, and studied at Gottingen On being required to leave Sweden because of his *Pensées sur la liberté civile* (1759), he was recommended by Linnaeus to Frederick V of Denmark, who appointed him to Carsten Niebuhr's expedition to Arabia and Egypt in 1761. He died of the plague at Jerim, Arabia, on July 11, 1763 In 1775 appeared his *Descriptiones animalium, avium, amphibiorum, piscium, insectorum, vermium, and Flora Aegyptiaco-Arabica*

FORSSELL, HANS LUDVIG (1843–1901), Swedish historian and political writer, the son of Adolph Forssell, a distinguished mathematician, was born at Gefle, where his father was professor, on Jan 14, 1843 He studied at Uppsala, and had a distinguished career in the civil service, becoming in 1880 president of the department of inland revenue He died at San Bernardino, Switzerland, on Aug 2, 1901 Of his historical writings the most important were. *The Administrative and Economical History of Sweden after Gustavus I* (1869–75) and *Sweden in 1571* (1872)

FORST (originally FORSTA or FORSTE), a town of Germany, in the Prussian province of Brandenburg, on the Neisse, 44 m S of Frankfort-on-Oder Pop (1925) 35,865. Founded in the 13th century, Forst became part of electoral Saxony in 1740 It was ceded to Prussia in 1815. The chief industry of Forst is the manufacture of cloth, but spinning and dyeing are carried on

FORSTER, EDWARD MORGAN (1879–), British novelist, was educated at Tonbridge School and King's college, Cambridge His first novel, *Where Angels Fear to Tread* (1905) was followed by *The Longest Journey* (1907) and *A Room with a View* (1908) Wider attention was won by *Howards End* (1910), but thereafter, except for some short stories, *The Celestial Omnibus* (1911), he published little till 1924, when *A Passage to India* appeared This was a fruit of first hand observation of Indian life, and with it Forster entered into a fuller recognition of his powers as a writer. In 1927 appeared *Aspects of the Novel*, his first volume of criticism

Forster deals with the interaction of two types of character, the intersection of two planes of living. In all his novels he brings into conflict those who live by convention and those who live by instinct, those for whom property and propriety, and those for whom personal relationships, are the most important things in life. The world of convention he describes with keen observation and keen satire, and his descriptions of it abound in unforgettable touches of wisdom and humour, in the world of instinct and emotion he is really at home, and perhaps never so much as when (as in several of his short stories) he is frankly telling a fairytale (J. Sp)

FORSTER, FRANÇOIS (1790–1872), French engraver, was born at Locle in Neufchâtel on Aug. 22, 1790 In 1805 he was apprenticed to an engraver in Paris, and at the same time he studied painting and engraving in the École des Beaux-Arts He obtained in 1814 the first "grand prix de gravure" The king of Prussia, who was then with the Allies in Paris, bestowed on him a gold medal, and a pension of 1,500 francs for two years He then pursued his studies in Rome, where his attention was devoted chiefly to the works of Raphael. In 1844 he succeeded Tardieu in the Academy. He died at Paris on June 27, 1872 Among his works may be mentioned—"The Three Graces," and "La Vierge de la Légende," after Raphael, "La Vierge au bas-relief," after Leonardo da Vinci, Francis I and Charles V., after Gros, St Cecilia, after Paul Delaroche, Albert Durer and Henry IV., after Probus, Wellington, after Gérard, and Queen Victoria, after Winterhalter

FÖRSTER, FRIEDRICH CHRISTOPH (1791–1868), German historian and poet, was the second son of Karl Christoph Förster (1751–1811), and a brother of the painter, Ernest Joachim Förster (1800–85) Born at Münchengosserstadt on the Saale on Sept 24, 1791, he studied theology at Jena, afterwards devoting some time to archaeology and the history of art. At the outbreak of the War of Liberation in 1813, he joined the army, and by his war-songs added to the national enthusiasm He then became professor at the school of engineering and artillery in Berlin, but was dismissed from this office in 1817 on account of his democratic leaning About 1829 he received an appointment at the royal museum in Berlin He was the founder and secretary of the *Wissenschaftlicher Kunstverein* in Berlin, and died there on Nov 8, 1868

Forster's principal works are: *Der Feldmarschall Blucher und seine Umgebungen* (1820), *Friedrich der Grosse, Jugendjahre, Bildung und Geist* (1822), *Friedrich Wilhelm I, Konig von Preussen* (Potsdam, 1834–35), *Die Hofe und Kabinette Europas im 18 Jahrhundert* (Potsdam, 1836–39), *Leben und Taten Friedrichs des Grossen* (Meissen, 1840–41); *Wallensteins Prozess* (1844); and *Preussens Helden im Krieg und Frieden, neuere und neueste preussische Geschichte*, 7 volumes (Berlin, 1849–60), the three concluding volumes of which contain the history of the war of liberation of 1813–14–15 Förster also wrote an historical drama, *Gustav Adolf* (1832), and a fragmentary autobiography, *Kunst und Leben*, ed H. Kletke (1873).

FÖRSTER, FRIEDRICH WILHELM (1869–), German psychologist and educationalist, was born in Berlin on June 2, 1869, and educated in Berlin and Freiburg After some years spent in the study and practice of education, especially among poverty-stricken or criminal classes, he began to teach at Zürich university, and to issue a series of books, which achieved immense popularity and influence, advocating education in the spirit of a positive Catholic Christianity, with reference to practical problems The chief of these works were *Jugendlehre* (1904), *Lebenskunde* (1904), *Schule und Charakter* (1907), *Sexualethik und Sexualpädagogik* (1918), *Jugendseele, Jugendbewegung, Jugendziel* (1923) In 1912 Forster resigned his post in Zürich, taking up work at Munich university in 1913 He had already published various political works, and during the World War became prominent as a pacifist His political works include *Weltpolitik und Weltgewissen* (1919) and *Mein Kampf gegen das militdristische und nationalistische Deutschland* (1920) In 1920 he was forced, on account of his views, to resign his Munich post, and returned to Zürich, where he was employed as Bavarian Minister in Switzerland He continued, however, to issue in rapid succession works which lost little of their popularity

FORSTER, GEORG (1754–1794), German traveller and author, was born at Nassenhuben, a small village near Danzig, on Nov 27, 1754 His father, Johann Reinhold Forster, was commissioned in 1765 by the empress Catherine to inspect the German colonies in the province of Saratov; later he went to England, where he taught natural history and the modern languages at the Warrington nonconformist academy He lost this appointment, and for two years he and his son earned a precarious livelihood by translations in London The turning point in Georg's career came in the shape of an invitation for him and his father to accompany Captain Cook in his third voyage round the world Forster's account of Cook's voyage (*A Voyage Round the World*, London, 1777, in German, Berlin, 1778–80), is almost the first example of the modern scientific travel book From 1778 to 1784 he was professor of natural history at Cassel There he formed an intimate friendship with the anatomist Sömmerring, and made the acquaintance of Jacobi, who induced in him a temporary leaning towards mysticism He married Therese Heyne, a clever and cultivated woman He then spent four years as a professor at Vilna, and in 1788 became librarian to the elector of Mainz. A keen sympathizer with the French revolution he actively promoted the incorporation of the left bank of the Rhine with France and in 1793 went to Paris to carry on the negotiations Meanwhile, however, the Germans seized Mainz, and Forster—already disheartened by the turn of events in France—was cut off from all return Domestic sorrows were added to his political troubles and he died suddenly at Paris on Jan 10, 1794

Forster's masterpiece is his *Ansichten vom Niederrhein, von Brabant, Flandern, Holland, England und Frankreich* (1791–94), one of the ablest books of travel of the 18th century. His correspondence was published by his wife (2 vols, Leipzig, 1829); his *Briefwechsel mit Sömmerring*, by H. Hettner (Brunswick, 1877). *See* J Moleschott, *G Forster, der Naturforscher des Volks* (1854, 3rd. ed. 1874); K. Kerstner, *Ein europäischer Revolutionar, Georg Forster, 1754–1794* (1921); W. Langewiesche, *Georg Forster* (1923)

FORSTER, JOHN (1812–1876), English biographer and critic, the son of a cattle-dealer, was born at Newcastle-on-Tyne

on April 2, 1812, and was educated at Newcastle Grammar School and London University. He was entered at the Inner Temple, but devoted himself to journalism, acting as literary and dramatic critic to the *Examiner*, and contributing to other papers At a later period (1847–56) he edited the *Examiner* His *Treatise on the Popular Progress in English History* (1840) at once secured recognition of his powers, and he was associated with the principal literary personages of the London of his day, with Bulwer, Talfourd, Fonblanque, Landor, Carlyle and Dickens. The great work by which Forster is known is *The Life of Charles Dickens* (1872–74), one of the great biographies of the English language Forster died on Feb. 2, 1876

Forster's other works include: *Lives of the Statesmen of the Commonwealth* (1836–39), *Life and Times of Oliver Goldsmith* (1848; rev. ed. 1854), *Arrest of the Five Members by Charles I* (1860); *Sir John Eliot: a Biography* (1864); *Life of Landor* (1868), and *Life of Swift* (1875, incomplete)

See a notice by Henry Morley prefixed to the official *Handbook* (1877) of the Dyce and Forster bequests, P. H Fitzgerald, *John Forster by one of his friends* (1903), R Renton, *John Forster and his Friendships* (1912).

FORSTER, JOHN COOPER (1823–1880), British surgeon, was born on Nov 13, 1823, in Lambeth, London, where his father and grandfather before him had been local medical practitioners. He entered Guy's hospital in 1841, and was connected with the hospital from 1850 onwards In 1858 he performed practically the first gastrostomy in England for a case of cancer of the oesophagus. Among his best-known papers were discussions of acupressure, syphilis, hydrophobia, intestinal obstruction, modified obturator hernia, torsion, and colloid cancer of the large intestine; and he published a book on *Surgical Diseases of Children* in 1860, founded on his experience as surgeon to the hospital for children and women in Waterloo road He became president of the Royal College of Surgeons in 1884 and died in London on March 2, 1886

FORSTER, WILLIAM EDWARD (1818–1886), British statesman, was born of Quaker parents at Bradpole in Dorsetshire on July 11, 1818, and educated at the Friends' school at Tottenham. Becoming a woollen manufacturer at Bradford, Yorkshire (whence after his marriage he moved to Burley-in-Wharfedale), he became known as a practical philanthropist. In 1846–47 he accompanied his father to Ireland as distributor of the Friends' relief fund for the famine in Connemara, when the state of the country made a deep impression on him. He married in 1850 Jane Martha, eldest daughter of Dr Arnold of Rugby Being childless they adopted the four orphans of Mrs. Forster's brother, William Arnold, when he died in 1859 One of these children, H O Arnold-Forster (1855–1909), the well-known Liberal-Unionist member of parliament, became a member of Balfour's cabinet; he was secretary to the Admiralty (1900–03), secretary of State for war (1903–05); and was the author of numerous educational books

In 1859 W E. Forster stood as Liberal candidate for Leeds, and was beaten. In 1861 he was returned unopposed for Bradford and again in 1865 and 1868 In 1865 he was made under-secretary for the colonies in earl Russell's ministry, and became a prominent advocate of imperial federation In 1866 his attitude on parliamentary reform attracted a good deal of attention He demanded universal education as the essential complement of an extension of the suffrage. Forster and Cardwell, as private members in opposition, brought in Education Bills in 1867 and 1868; and in 1868, when the Liberal party returned to office, Forster was appointed vice-president of the council, with the duty of preparing a government measure for national education. The Elementary Education Bill (*see* EDUCATION) was introduced on Feb 17, 1870 The Dissenters were by no means satisfied with Forster's "conscience clause" as contained in the bill, and they regarded him, the ex-Quaker, as a deserter from their own side; while they resented the "25th clause," permitting school boards to pay the fees of needy children at denominational schools out of the rates, as an insidious attack upon themselves The controversy assumed threatening proportions, and Dixon, the Liberal member for Birmingham and chairman of the Education League, moved an amendment, the effect of which was to prohibit all religious education in board schools The government made its rejection a question of confidence, and it was withdrawn: but the result was the insertion of the Cowper-Temple clause as a compromise Extremists on both sides abused Forster, but it is to his enduring credit that the bill of 1870, imperfect as it was, established some approach to a system of national education in England

Forster's next important work was in passing the Ballot Act of 1872 In 1874 he was again returned for Bradford, in spite of Nonconformist attacks, and took his full share of the work of the Opposition Front Bench In 1875, when Gladstone "retired," he was strongly supported for the leadership of the Liberal party, but declined to be nominated against Lord Hartington On Gladstone's return to office in 1880 he was made chief secretary for Ireland, with Lord Cowper as lord-lieutenant He carried the Compensation for Disturbance Bill through the Commons, only to see it thrown out in the Lords, and his task was made more difficult by the consequent agitation On Jan. 24, 1881, he introduced, with reluctance, a new Coercion Bill in the House of Commons, to deal with the growth of the Land League The Irish party used every opportunity in and out of parliament for resenting this act, and Forster was kept constantly on the move between Dublin and London conducting his campaign against crime and anarchy and defending it in the House of Commons He was nicknamed "Buckshot" by the Nationalist press, on the supposition that he had ordered its use by the police when firing on a crowd. After the arrest of Parnell (Oct 13) Forster's life was in constant danger, and he had to be escorted by mounted police when he drove in Dublin On May 2, 1882, Gladstone announced that the government intended to release Parnell and his fellow-prisoners in Kilmainham, and that both Lord Cowper and Forster had in consequence resigned; and the following Saturday Forster's successor, Lord Frederick Cavendish, and Burke were murdered in Phoenix Park It was characteristic of the man that Forster at once offered to go back to Dublin temporarily as chief secretary, but the offer was declined He delivered his fiercest attack on Parnell in the debate on the address (1883), charging him, not with directly planning or perpetrating outrages or murder, but with conniving at them Forster died on April 6, 1886, on the eve of the introduction of the Home Rule Bill, to which he was stoutly opposed He had found himself in an increasing degree at variance with Gladstonian Liberalism on other questions, for instance, as regards the Sudan and the Transvaal, nor was he inclined to tolerate the claims of the Caucus or the Birmingham programme When the Redistribution Act divided Bradford into three constituencies, Forster was returned for the central division, but he never took his seat in the new parliament

See T. Wemyss Reid, *Life of the Right Hon H E Forster.*

FORSYTH, ANDREW RUSSELL (1858–), Scottish mathematician, was born at Glasgow, on June 18, 1858 He studied at Liverpool and Trinity college, Cambridge, and has held the following posts: professor of mathematics, University college, Liverpool (1882–83), lecturer in mathematics, Trinity college, Cambridge (1884–95); Sadlerian professor at Cambridge (1895–1910) and professor of mathematics, Imperial college of science and technology, London (1913–23) Since 1923 Forsyth has held the post of Emeritus professor at the Imperial college, London His work covers a wide field in pure mathematics and his treatises contain much that is original, show creative ability and at the same time establish his reputation as a teacher Forsyth is the author of a number of papers on differential equations, on the theory of functions and on the differential invariants of space His *Treatise on the Theory of Functions* (1893, etc) deals with the theories of Riemann, Cauchy and Weierstrass and by means of this work and his other writings on the theory of functions, Forsyth has stimulated interest in the works of Klein, Poincaré, Weierstrass and other foreign mathematicians. He has also written exhaustively on the subject of differential equations and most of his work on this subject is contained in *A Treatise on Differential Equations* (1885, etc) and *Theory of Differential Equa-*

tions (4 vols 1890–1906) Forsyth edited volumes viii to xiii and the supplementary volume of *Cayley's Collected Mathematical Papers* and was the editor of the *Quarterly Journal of Mathematics* from 1884 to 1895 He is a member of many learned societies and was awarded the Royal medal of the Royal Society in 1897

Some of his works are *Lectures Introductory to the Theory of Functions of two Complex Variables* (1914), *Lectures on Differential Geometry* (1912, etc), *Calculus of Variations* (1927).

FORTALEZA (usually called *Ceará* by foreigners), a city and port of Brazil and the capital of the State of Ceará, on a crescent-shaped indentation of the coast-line immediately W of Cape Mucuripe or Mocoripe, 7½ m from the mouth of the Ceará river, in lat 3° 42′ S , long 38° 30′ W of Greenwich Pop of the municipality, including a large rural district, 1920, 78,536 The city stands on an open sandy plain overlooking the sea, and is regularly laid out, with broad, well paved streets and numerous squares Owing to the aridity of the climate the vegetation is less luxuriant than in most Brazilian cities The temperature is usually high, but it is modified by the strong sea winds Fortaleza has suffered much from epidemics of yellow fever, small-pox and beriberi, but the climate is considered to be healthful A small branch of the Ceará river, called the Pajehú, traverses the city and divides it into two parts, that on its right bank being locally known as Outeiro Fortaleza is the see of a bishopric, created in 1854, but it has no cathedral, one of its ten churches being used for that purpose Its public buildings include the government house, legislative chambers, bishop's palace, an episcopal seminary, a lyceum (high school), Misericordia hospital, and asylums for mendicants and the insane The port is the principal outlet for the products of the State, but its anchorage is an open roadstead, one of the most dangerous on the northern coast of Brazil, and all ships are compelled to anchor well out from shore and discharge into lighters The Baturité railway, built by the National Government partly to give employment to starving refugees in times of long-continued droughts, connects the city and its port with fertile regions to the S W , and extends nearly to the border of Pernambuco The exports include sugar, coffee, rubber, cotton, rum, rice, beans, fruits, hides and skins

Fortaleza had its origin in a small village adjoining a fort established at this point in early colonial times In 1654 it took the name of Villa do Forte da Assumpção, but it was generally spoken of as Fortaleza In 1810 it became the capital of Ceará and in 1823 it was raised to the dignity of a city under the title of Fortaleza da Nova Bragança

FORT ANCIENT, prehistoric Indian defensive work on the Miami river in Warren county, Ohio, stands on a headland (260–280 ft) projecting from a plateau, and is now included in a State park The total area is estimated at 100 acres, and its solid content at 3,000,000 cu feet The wall, chiefly of earth cast up from an inner ditch, follows the zigzag course of the bluff, except where it crosses the level neck in the rear of the fort, and is 18,712 feet, or a little more than 3½ m in length, while the height is 6 to 10 ft , except at the only level point of approach, the neck referred to above, where it is 18 to 19 feet At the north the points more easily approached are generally narrow, sloping ridges, crossed at the upper terminus by a wall, outside of which the ridge was cut down several feet to present a steep slope corresponding to the outer slope of the wall; but where similar ridges form approaches from the south and at some other points, the defences are formed by raising the wall considerably above the usual height The most vulnerable point was at the isthmus separating the two portions of the fort, known as the Old Fort and the New Fort, where a short space was undefended, though the ascent is not difficult A short distance east of the posterior wall of the New Fort are two small mounds, from each of which extends a low stone wall running nearly parallel about a quarter of a mile and forming an irregular semicircle about another small mound Several small mounds and a number of stone graves containing human remains were within the fort

FORT ATKINSON, a city of Jefferson county, Wisconsin, U S A , on the Rock river, 57m S W. of Milwaukee It is served by the Chicago and North Western railroad. The population was 4,915 in 1920 (88% native white) There are six creameries in the immediate vicinity, and the city has a number of factories Gen Henry Atkinson built a stockade here during the Black Hawk War Permanent settlement began in 1838, and the city was incorporated in 1878

FORT AUGUSTUS, village, Inverness-shire, Scotland Pop (1921) 665 It is delightfully situated at the south-western extremity of Loch Ness, about 30 m S W of Inverness, on the rivers Oich and Tarff and the Caledonian Canal A branch line connects with Spean Bridge on the L N E R via Invergarry. The fort, then called Kilchumin, was built in 1716 to check the Highlanders, and was enlarged in 1730 by General Wade It was captured by the Jacobites in 1745, but reoccupied after Culloden, and named after William Augustus, duke of Cumberland The fort was bought by the 12th Lord Lovat, whose son presented it in 1876 to the English order of Benedictines The site is now occupied by St Benedict's Abbey and school for the higher education of the Roman Catholic gentry

FORT COLLINS, a city of Colorado, U S A , 65m N of Denver and 6m E of the foothills of the Rocky mountains, on the Cache la Poudre river, at an altitude of 4,994ft ; the seat of the State agricultural college, and the county seat of Larimer county It is on Federal highway 285, and is served by the Colorado and Southern and the Union Pacific railways The population was 8,755 in 1920 (91% native white), and was estimated locally at 14,000 in 1928 Fort Collins is a delightful residential town The campus of the Colorado agricultural college (established 1870, enrolment for 1926–27, 1,848) covers 160ac half a mile from the business centre Adjoining the campus on the west is the college farm, ½m E is the experimental farm of 152ac , and 2m W is the college pasture of 1,350 acres The surrounding country is a very highly developed irrigated district, where sheep-feeding and the raising of sugar-beets predominate North of the city is a large gas and oil field, opened in 1924 Manufacturing industries include a large beet-sugar factory, brick and tile works, and one of the largest cement plants west of the Mississippi (opened in 1927) In 1864 a company of United States soldiers, under Capt Collins of the 7th Ohio volunteer infantry, was stationed here to quell the Indian uprisings The camp soon developed into a trading centre, as the region was settled by farmers from Iowa, Illinois and Ohio, and in 1873 the city was incorporated

FORT DODGE, a city of Iowa, U S A , on the picturesque Des Moines river, 85m N by W of Des Moines, the county seat of Webster county It is on Federal highway 20, and is served by the Chicago Great Western, the Fort Dodge, Des Moines and Southern, the Illinois Central, and the Minneapolis and St Louis railways The population in 1925 (State census) was 21,702 It has a large trade in grain, and is an important centre for the manufacture of gypsum and clay products, and various other articles East of the city is a gypsum bed 50 sq m in area Clay also abounds and coal is mined in the vicinity The city has a commission form of government Fort Dodge was settled late in the '40s In 1850 Fort Clarke was built to protect the settlers against the Indians, and in 1851 the name was changed, to honour Col Henry Dodge (1782–1867) The fort was abandoned in 1853 In 1854 a town was laid out, and it was chartered as a city in 1869 In 1868 George Hall of Binghamton, N Y , took a block of gypsum from the beds at Fort Dodge, carved it roughly in the shape of a human figure, and buried it near Cardiff, Onondaga county, New York, where it was "discovered" by men digging a well in 1869 The "Cardiff giant" was exhibited in various parts of the country as a "petrified man" or a statue dating from prehistoric times, and was the subject of much discussion among scientists and scholars, until the hoax was exposed by Prof Othniel C Marsh of Yale, and the perpetrator confessed his part in it

FORTE (It), loud, a familiar direction in musical scores, usually in the abbreviated form *f;* increasing degrees of loudness being indicated by *ff* (*fortissimo*) and *fff* (*fortissimo possibile*), while *mf* (*mezzoforte*) signifies a more moderate degree of force.

FORT EDWARD, a village of Washington county, New York, U.S A., on the Hudson river and the Champlain Barge canal, 55m. N of Albany. It is served by the Delaware and Hudson railway. The population was 3,631 in 1925 The Indians called this "The Great Carrying Place," as it was the starting point of their usual portage between the Hudson and Lake Champlain A stockade was built in 1709 by Governor Francis Nicholson on his way to Canada, and some years later a settlement was established by John Henry Lydius (1693–1791) and protected by a new fort, which was destroyed by the French and Indians in 1745 A third fort was built in 1755, as a preliminary to the expedition against Crown Point under General William Johnson, who named it Ft Edward, in honour of the duke of York During the Revolution it was the headquarters of General Schuyler while he was blocking the march of General Burgoyne from Ft Ticonderoga, and the region was the scene of many episodes of the war. The village was incorporated in 1852

FORTESCUE, SIR JOHN (*c* 1394–*c* 1476), English lawyer, the second son of Sir John Fortescue, of an ancient Devonshire family, was born at Norris, near South Brent, in Somersetshire, and educated at Exeter college, Oxford In 1430 he was made a king's sergeant-at-law, and in 1442 chief justice of the king's bench Fortescue held his office during the remainder of the reign of Henry VI, to whom he steadily adhered, he was attainted of treason in the first parliament of Edward IV When Henry subsequently fled into Scotland, he is supposed to have appointed Fortescue, who appears to have accompanied him in his flight, chancellor of England In 1463 Fortescue accompanied Queen Margaret and her court in their exile on the Continent, and returned with them to England in 1471 The chancellor wrote for the instruction of the young prince Edward his celebrated work *De laudibus legum Angliae* (*See* trans by F Grigor, 1917) In this treatise, in defining the position of a king, he says "he is appointed to protect his subjects in their lives, properties, and laws, for this very end and purpose *he has the delegation of power from the people,* and he has no just claim to any power but this" He was taken prisoner at the battle of Tewkesbury and on the defeat of the Lancastrian party he made his submission to Edward IV, from whom he received a general pardon dated Westminster, Oct 13, 1471 He died at an advanced age, but the exact date of his death has not been ascertained

BIBLIOGRAPHY —Fortescue's masterly vindication of the laws of England, though received with great favour by the learned of the profession to whom it was communicated, did not appear in print until the reign of Henry VIII, when it was published, but without a date It was subsequently many times reprinted Another valuable and learned work by Fortescue, written in English, was first published in 1714, under the title of *The Difference between an Absolute and a Limited Monarchy See* a revised edition of this work, with valuable historical and biographical introduction, by Charles Plummer, under the title *The Governance of England* (1885) Fortescue's minor writings were collected as *The Works of Sir John Fortescue* (1869, for private circulation), by his descendant, Lord Clermont.

FORTESCUE, SIR JOHN (*c.* 1531–1607), English statesman, was the eldest son of Sir Adrian Fortescue (executed in 1539), and of his second wife, Anne Reade or Rede Through his father's mother, Alice, daughter of Sir Geoffrey Boleyn, he was connected with Queen Elizabeth. He directed the Princess Elizabeth's classical studies in Mary's reign, and, on his pupil's accession, was appointed keeper of the great wardrobe He entered parliament in 1572. In 1589 he was appointed chancellor of the exchequer and a member of the privy council In 1592 he was knighted, and in Nov 1601, in addition to his two great offices, he received the chancellorship of the duchy of Lancaster He was a member of the court of the star chamber and an ecclesiastical commissioner, sat on various important commissions, and as chancellor of the exchequer explained the queen's financial needs and proposed subsidies in parliament. He was deprived by James of the chancellorship of the exchequer, but retained his two other offices. In 1604 Sir John, who stood for Buckinghamshire, was defeated by Sir Francis Goodwin, whose election, however, was declared void by the lord chancellor on the ground of a sentence of outlawry under which he lay, and Fortescue was by a second election returned in his place. This incident gave rise to a violent controversy, regarding the chancellor's jurisdiction in deciding disputed elections to parliament, which was repudiated by the Commons but maintained by the king The matter after much debate was ended by a compromise, which, while leaving the principle unsettled, set aside the elections of both candidates and issued a new writ. Fortescue died on Dec 23, 1607.

FORTH, river and firth of east Scotland It is formed by two head streams, Duchray water and Avondhu, or Laggan as it is called after it leaves Loch Ard, both rising north-east of Ben Lomond in Stirlingshire, and uniting 1 m west of Aberfoyle From this point till it receives the Kelty, the Forth is in Perthshire, then it becomes the dividing line between Perth and Stirling as far as the confluence of the Allan Thence it belongs to Stirlingshire to a point 1½ m due west of Cambus, whence it is the boundary between Stirling and Clackmannan Owing to its tortuous course between Gartmore and Alloa—the famous "links of the Forth,"—the actual length of the river is 66 m, or nearly double the distance in a direct line (30 m) between the source of the Duchray and Kincardine, where the firth begins. The river drains an area of 645 sq m Its general direction is easterly with a trend towards the south The alluvial plain from Gartmore to the county town is called the Carse of Stirling The places of interest on the banks are Aberfoyle, Kippen, Stirling, Cambuskenneth, Alloa and Kincardine The tide reaches 4½ m above Stirling, where the river is navigable at high water by vessels of 100 tons There is some shipping trade at Alloa.

The Firth of Forth extends from Kincardine to the North sea, a distance of 48 m The width varies from ½ m at Kincardine and 1½ m at Queensferry to 6½ m at Leith and 17½ m at the mouth The principal ports on the south shore are Grangemouth, Bo'ness, Granton and Leith, and on the north, Burntisland and Kirkcaldy Since the opening of the Forth bridge (*see* BRIDGES) in 1890 the ferries at Queensferry and Burntisland have greatly diminished in importance The larger islands are Inchcolm, Inchkeith, with fortifications and a lighthouse, and the Isle of May, with a lighthouse and a ruined chapel The anchorage of St Margaret's Hope, with the naval base of Rosyth, lies off the shore of Fife immediately to the west of the Forth bridge

FORTIFICATION AND SIEGECRAFT. "Fortification" is the military art of strengthening positions against attack The word (Lat *fortis,* strong, and *facere,* to make) implies the creation of defences Thus the boy who from the top of a mound defies his comrades, or shelters from their snowballs behind a fence, is merely taking advantage of ground; but if he puts up a hurdle on his mound and stands behind that he has fortified his position

Fortification has two tactical objects—to obtain the fullest advantage from one's own weapons, and to prevent the enemy using his to advantage It consists of two elements, viz, *protection* and *obstacle* The protection shields the defender from the enemy's missiles, the obstacle prevents the enemy from coming to close quarters, and delays him under fire

Protection may be of several kinds, direct or indirect Direct protection is given by a wall or rampart of earth, strong enough to stop the enemy's missiles The value of this is reduced in proportion as the defender has to expose himself to return the enemy's fire, or to resist his attempts to destroy the defences Indirect protection is given by *distance,* as for instance by a high wall placed on a cliff so that the defender on the top of the wall is out of reach of the enemy's missiles if these are of short range, such as arrows This kind of defence has naturally lost much of the value that it had in earlier times Another form of indirect protection of great importance is *concealment*

The *obstacle* may consist of anything which will impede the enemy's advance and prevent him from coming to close quarters In the earliest forms of fortification the protecting wall was also the obstacle, or it may be a wet or dry ditch, an entanglement, a swamp, a thorn hedge, a spiked palisade, or some temporary expedient, such as chevaux de frise The two elements must of course be arranged in combination. The besieged must be able to defend the obstacle from their protected position, otherwise it can

be surmounted or destroyed at leisure

Protection must be arranged mainly with reference to the enemy's methods of attack and the weapons he uses. The obstacle, on the other hand, should be of such a nature as to bring out the best effects of the defender's weapons It follows from this that a well-armed force operating against a badly-armed, uncivilized enemy may use with advantage very simple old-fashioned methods of protection; or even dispense with it altogether if the obstacle is a good one. When the assailant has modern weapons the importance of concealment and protection is very great In fact, it may be said that in proportion as missile weapons have grown more effective, the importance of protection and the difficulty of providing it have increased, while the necessity for a monumental physical obstacle has decreased The art of the engineer who is about to fortify consists in appreciating and harmonizing all the conditions of the problem, such as the weapons in use, nature of the ground, materials available, temper of assailants and defenders, strategical possibilities, expenditure to be incurred, and so forth The keynote of the solution should be simplicity, but this is the first point usually lost sight of by the makers of "systems," especially by those who during a long period of peace have time to give play to their imaginations

Fortification is usually divided into two branches, namely *permanent fortification* and *field fortification* Permanent fortifications are erected at leisure, with all the resources that a state can supply of constructive and mechanical skill, and are built of enduring materials Field fortifications are extemporized by troops in the field, perhaps assisted by such local labour and tools as may be procurable, and with materials that do not require much preparation, such as earth, brushwood and light timber In the course of a campaign these may, as in the World War, be developed into *semi-permanent fortification*

The *objects of fortification* are various The vast enceintes of Nineveh and Babylon were planned so that in time of war they might give shelter to the whole population of the country except the field army, with their flocks and herds and household stuff In the middle ages, feudal lords built castles for security against the attacks of their neighbours, and also to watch over towns or bridges or fords from which they drew revenue; whilst rich towns were surrounded with walls merely for the protection of their own inhabitants and their property The feudal castles lost their importance when the art of cannon-founding was fairly developed, and in the leisurely wars of the 17th and 18th centuries, when roads were few and bad, a swarm of fortified towns, large and small, played a great part in delaying the march of victorious armies In the present day isolated forts are seldom used, and only for such purposes as to block passes in mountainous districts Fortified zones are used either to protect points of vital importance, such as capital cities, military depots and dockyards, or at strategic points such as railway junctions Fortified areas are also used for more general strategic purposes, as will be explained later.

HISTORY

The most elementary type of fortification is the thorn *hedge*, a type which naturally recurs from age to age under primitive conditions. Thus, Alexander found the villages of the Hyrcanians defended by thick hedges, and the same arrangements have been seen in recent times among the least civilized tribes of Africa. The next advance from the hedge is the *bank* of earth, with the exterior made steep by revetments of sods or hurdle-work. This has a double advantage over the hedge, as, besides being a better obstacle against assault, it gives the defenders an advantage of position in a hand-to-hand fight. Such banks formed the defences of the German towns in Caesar's time, and they were constructed with a high degree of skill. Timber being plentiful, the parapets were built of alternate layers of stones, earth and tree trunks The latter were built in at right angles to the length of the parapet, and were thus very difficult to displace, while the earth prevented their being set on fire The bank was often strengthened by a palisade of tree trunks or hurdle-work.

After the bank the most important step in advance for a nation progressing in the arts was the *wall*, of masonry, sun-dried brick or mud The history of the development of the wall and of the methods of attacking it is the history of fortification for several thousand years. The first necessity for the wall was height, to give security against escalade The second was thickness, so that the defenders might have a platform on the top which would give them space to circulate freely and to use their weapons A lofty wall, thick enough at the top for purposes of defence, would be very expensive if built of solid masonry, therefore, the plan was early introduced of building two walls with a filling of earth or rubble between them The face of the outer wall would be carried up a few feet above the platform, and crenellated to give protection against arrows and other projectiles The next forward step for the defence was the construction of *towers* at intervals along the wall These provided flanking fire along the front; they also afforded refuges for the garrison in case of a successful escalade, and from them the platform could be enfiladed The evolution of the wall with towers was simple The main requirements were despotic power and unlimited labour Thus the finest examples of the system known to history are also amongst the earliest One of these was Nineveh, built more than 2,000 years B C The object of its huge perimeter, more than 50m , has been mentioned The wall was 120ft high and 30ft thick; and there were 1,500 towers After this no practical advance in the art of fortification was made for a very long time, from a constructional point of view Many centuries, indeed, elapsed before the inventive genius of man evolved engines and methods of attack fit to cope with such colossal obstacles

The earliest form of attack was, of course, *escalade*, either by ladders or by heaping up a ramp of faggots or other portable materials When the increasing height of walls made escalade too difficult, other means of attack had to be invented Probably the first of these were the *ram*, for battering down the walls, and *mining* The latter might have two objects: (*a*) to drive an underground gallery below the wall from the besiegers' position into the fortress, or (*b*) to destroy the wall itself by undermining The use of missile *engines* for throwing heavy projectiles probably came later They are mentioned in the preparations made for the defence of Jerusalem against the Philistines in the 8th century B C They are not mentioned in connection with the siege of Troy At the sieges of Tyre and Jerusalem by Nebuchadrezzar in 587 B C , we first find mention of the ram and of movable towers placed on mounds to overlook the walls

Classical Times.—The Asiatics, however, had not the qualities of mind necessary for a systematic development of siegecraft, and it was left for the Greeks practically to create this science Taking it up in the 5th century B C , they soon, under Philip of Macedon and Alexander, arrived at a very high degree of skill They invented and systematized methods which were afterwards perfected by the Romans The early days of the Roman empire is thus a suitable period at which to take a survey of the practice of the ancients

In fortification the wall with towers was still the leading idea The towers were preferred circular in plan, as this form offered the best resistance to the ram The wall was usually reinforced by a ditch, which had three advantages: it increased the height of the obstacle, made the bringing up of the engines of attack more difficult, and supplied material for the filling of the wall In special cases, as at Jerusalem and Rhodes, the enclosure walls were doubled and trebled Citadels were also built on a large scale The typical site preferred by the Romans for a fortified town was on high ground sloping to a river on one side and with steep slopes falling away on the other three sides At the highest point was a castle serving as a citadel The town enclosure was designed in accordance with the character of the surrounding country Where the enemy's approach was easiest, the walls were higher, flanking towers stronger and ditches wider and deeper Some of the towers were made high for look-out posts If there was a bridge over the river, it was defended by a bridge-head on the far side; and stockades defended by towers were built out from either bank above and below the bridge, between which chains or booms could be stretched to bar the passage. The natural features of the

ground were skilfully utilized. Thus when a large town was spread over an irregular site broken by hills, the enceinte wall would be carried over the top of the hills, and in the intervening valleys the wall would not only be made stronger, but would be somewhat drawn back to allow of a flanking defence from the hill tops on either side The walls would consist of two strong masonry faces, 20 ft. apart, the space between filled with earth and stones. Usually when the lie of the ground was favourable, the outside of the wall would be much higher than the inside, the parapet walk perhaps being but a little above the level of the town. Palisades were used to strengthen the ditches, especially before the gates

There was little scope, however, in masonry for the genius of Roman warfare, which had a better opportunity in the active work of attack and defence. For siegecraft the Roman legions were especially apt No modern engineer, civil or military, accustomed to rely on machinery, steam and hydraulic apparatus, could hope to emulate the feats of the legionaries In earthworks they excelled; and in such work as building and moving about colossal wooden towers under war conditions, they accomplished things at which nowadays we can only wonder. The attack was carried on mainly by the use of "engines," under which head were included all mechanical means of attack—towers, missile engines such as catapults and balistae, rams of different kinds, "tortoises" (*see* below), etc Mining, too, was freely resorted to, also approach trenches, the use of which had been introduced by the Greeks The object of mining, as has been said, might be the driving of a gallery under the wall into the interior of the place, or the destruction of the wall The latter was effected by excavating large chambers under the foundations These were supported while the excavation was proceeding by timber struts and planking When the chambers were large enough the timber supports were burnt, and the wall collapsed The besieged replied to the mining attack by counter-mines With these they would undermine and destroy the besiegers' galleries, or would break into them and drive out the workers, either by force of arms or by filling the galleries with smoke

Breaches in the wall were made by rams These were of two kinds For dislodging the cemented masonry of the face of the wall, steel-pointed heads were used, when this was done, another head, shaped like a ram's head, was substituted for battering down the filling of the wall. For escalade they used ladders fixed on wheeled platforms; but the most important means of attack against a high wall were the movable towers of wood These were built so high that from their tops the parapet walk of the wall could be swept with arrows and stones; and drawbridges were let down from them by which a storming party could reach the top of the wall The height of the towers was from 70 to 150ft. They were moved on wheels of solid oak or elm, six to 12ft in diameter and three to four feet thick The ground floor contained one or two rams The upper floors, of which there might be as many as 15, were furnished with missile engines of a smaller kind. The archers occupied the top floor There also were placed reservoirs of water to extinguish fire These were filled by force pumps and fitted with hose made of the intestines of cattle. Drawbridges, either hanging or worked on rollers, were placed at the proper height to give access to the top of the wall, or to a breach, as might be required Apollodorus proposed to place a couple of rams in the upper part of the tower to destroy the crenellations of the wall The siege towers had of course to be very solidly built of strong timbers to resist the heavy stones thrown by the engines of the defence They were protected against fire by screens of osiers, plaited rope or raw hides Sometimes it was necessary, in order to gain greater height, to place them on high terraces of earth In that case they would be built on the site At the siege of Marseille, described by Caesar, special methods of attack had to be employed on account of the strength of the engines used by the besieged and their frequent sallies to destroy the siege works. A square fort, with brick walls 30ft. long and 5ft thick, was built in front of one of the towers of the town to resist sorties. This fort was subsequently raised to a height of six storeys, under shelter of a roof which projected beyond the walls, and from the eaves of which hung heavy mats made of ships' cables. The mats protected the men working at the walls, and as these were built up the roof was gradually raised by the use of endless screws The roof was made of heavy beams and planks, over which were laid bricks and clay, and the whole was covered with mats and hides to prevent the bricks from being dislodged This structure was completed without the loss of a man, and could only have been built by the Romans, whose soldiers were all skilled workmen

Although these towers were provided with bridges by which storming parties could reach the top of the wall, their main object was usually to dominate the defence and keep down the fire from the walls and towers. Under this protection breaching operations could be carried on. The approaches to the wall were usually made under shelter of galleries of timber or hurdle-work, which were placed on wheels and moved into position as required When the wall was reached, a shelter of stronger construction, known as a "rat," was placed in position against it Under this a ram was swung or worked on rollers, or the rat might be used as a shelter for miners or for workmen cutting away the face of the wall The great rat at Marseille, which extended from the tower already described to the base of the tower of the city, was 60ft. long, and built largely of great beams two feet square, connected by iron pins and bands It was unusually narrow, the ground sills of the side walls being only four feet apart This was no doubt in order to keep down the weight of the structure, which, massive as it was, had to be movable. The sloping roof and sides of timber were protected, like those of the tower, with bricks and moist clay, hides and wool mattresses Huge stones and barrels of blazing pitch were thrown from the wall upon this rat without effect, and under its cover the soldiers loosened and removed the foundations of the tower until it fell down In order that it might be possible to move these heavy structures, it was usually necessary to fill up the ditch or to level the surface of the ground. For this purpose, an "approach tortoise" was often used This was a shelter, something between the ordinary gallery and the rat, which was moved end on towards the wall, and had an open front with a hood, under cover of which the earth brought up for filling the ditch was distributed

The missile engines threw stones from 75 lb. up to 600 lb. weight, heavy darts from six to 12ft. long, and Greek fire. Archimedes at the siege of Syracuse even made some throwing 1,800 lb The ranges varied, according to the machine and the weight thrown, up to 600yd. for direct fire and 1,000yd for curved fire In addition to the above, great mechanical skill was shown in the construction of special varieties of machines. A kind of jib crane of great height on a movable platform was used to hoist a cage containing 15 or 20 men on to the wall A long spar with a steel claw at the end, swung in the middle from a lofty frame, served to pull down the upper parts of parapets and overhanging galleries The defenders on their side were not slow in replying with similar devices Fenders were let down from the wall to soften the blow of the ram, or the ram heads were caught and held by cranes Grapnels were lowered from cranes to seize the rats and overturn them Archimedes used the same idea in the defence of Syracuse for lifting and sinking the Roman galleys. Wooden towers were built on the walls to overtop the towers of the besiegers. Many devices for throwing fire were employed. The tradition that Archimedes burnt the Roman fleet, or a portion of it, at Syracuse, by focusing the rays of the sun with reflectors, is supported by an experiment made by Buffon in 1747. With a reflector having a surface of 50sq.ft , made up of 168 small mirrors each six by eight inches, lead was melted at a distance of 140ft and wood was set on fire at 160 feet The development of masonry in permanent fortification had long since reached its practical limit, and the attack had become stronger than the defence

The Middle Ages.—Through the dark ages the Eastern empire kept alive the twin sciences of fortification and siegecraft and from it the Crusaders came to learn what had been lost in the West In practice the Byzantines favoured multiplied enceintes or several concentric lines of defence. In the West, however, many of the Roman fortifications remained standing, and the Visigoths, allies of Rome, utilized their principles in the defences

of Carcassonne, Toulouse, etc, in the 5th century Viollet-le-Duc's descriptions and illustrations of the defences of Carcassonne will give a very good idea of the methods then in use —

"The level of the town is much more elevated than the ground outside, and almost as high as the parapet walks The curtain walls, of great thickness, are composed of two faces of small cubical masonry alternating with courses of brick The towers were raised above these curtains, and their communication with the latter might be cut off, so as to make of each tower a small and entirely independent fort . The external ground-level was much lower than that of the tower The battlemented portion at the top was covered with a roof, and open on the side of the town in order to permit the defenders of the tower to see what was going on therein, and also to allow of their hoisting up stones and other projectiles by means of a rope or pulley" (*See* fig 1)

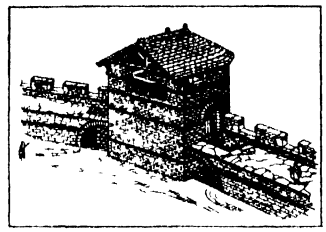


FIG 1 —INSIDE VIEW OF THE LISTS AT CARCASSONNE

Meanwhile, in western Europe, siegecraft had almost disappeared Its perfect development was only possible for an army like that of the Romans The Huns and Goths knew nothing of it, and the efforts of the Frankish kings to restore the art were hampered by the fact that their warriors despised handicrafts and understood nothing but the use of their weapons During the dark ages the towns of the Gauls retained their old Roman and Visigoth defences, which no one knew properly how to attack, and which rarely fell except through blockade and famine It was not until the 11th century that siegecraft was revived in the West, and by this time the seigneurial castle (*q v*), had come into existence Built primarily as strongholds for local magnates or for small bodies of warriors dominating a conquered country, these had special defensive assets, whereas the defences of a town had to follow the growth of the town, and would naturally have weak points The site of a castle could be chosen purely for its natural strength, and as its area was small it was often easy to find a natural position entirely suited for the purpose A small hill with steep sides might well be unapproachable by such cumbrous structures as towers and rats, while the height of the hill, added to the height of the walls, would be too much for the besiegers' missiles If the sides of the hill were precipitous and rocky, mining became impossible, and the site was perfect for defence A castle built under such conditions was practically impregnable, and this was the cause of the independence of the barons in the 11th and 12th centuries They could only be reduced by blockade, and a blockade of long duration was very difficult in the feudal age

A very instructive example of 12th century work is the Château Gaillard, built by Richard Coeur-de-Lion in 1196 In the article CASTLE will be found the plan of the main work, which is here supplemented by an elevation of the donjon (or keep) The waved face of the inner or main wall of the castle, giving a divergent fire over the front, is an interesting feature in advance of the time After the death of Richard, Philip Augustus besieged the château, and carried it after a blockade of seven months and a regular attack of one month In this attack the tower at A was first mined, after which the whole of that outwork was abandoned by the defenders The outer enceinte was next captured by surprise, and finally the gate of the main wall was breached by the pioneers When this happened a sudden rush of the besiegers prevented the remains of the garrison from gaining the shelter of the donjon, and they had to lay down their arms Château Gaillard, designed by perhaps the greatest general of his time, exemplifies

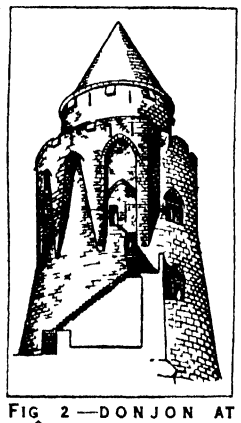


FIG 2 —DONJON AT CHÂTEAU GAILLARD

in its brief resistance the weak points of the designs of the 12th century At each step gained by the besiegers the very difficulties which had been placed in the way of their further advance prevented the garrison from reinforcing strongly the points attacked

In the 13th century many influences were at work in the development of castellar fortification The experience of such sieges as that of Château Gaillard, and still more that gained in the Crusades, the larger garrisons at the disposal of the great feudal lords, and the importance of the interests which they had to protect in their towns, led to a freer style of design We must also take note of an essential difference between the forms of attack preferred by the Roman soldiery and by the mediaeval chivalry. The former, who were artisans as well as soldiers, preferred in siege works the certain if laborious methods of breaching and mining The latter, who considered all manual labour beneath them and whose ideal of warfare was personal combat, affected the tower and its bridge, giving access to the top of the wall rather than the rat and battering ram We find, therefore, important progress in enlarging the area of defence and in improving arrangements for flanking The size and height of all works were increased The keep of Coucy castle, built in 1220, was 200ft high Montargis castle, also built about this time, had a central donjon and a large open enclosure, within which the whole garrison could move freely, to reinforce quickly any threatened point The effect of flanking fire was increased by giving more projection to the towers, whose sides were in some cases made at right angles to the curtain walls We find also a tendency towards complexity and multiplication of defences, to guard against surprise and localize successful assaults Great attention was paid to the "step by step" defence Complicated entrances with traps and many doors were arranged Almost all defence was from the tops of the walls and towers, Machicoulis galleries being employed for vertical defence

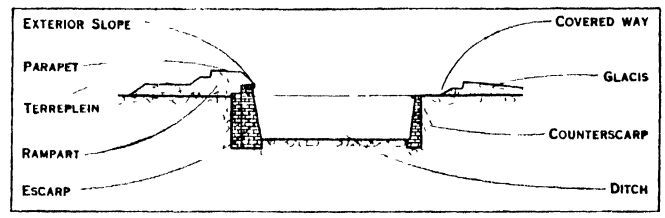


FIG 3 —DIAGRAM OF A TYPICAL CROSS-SECTION OF A FORT

The defences of Carcassonne, remodelled in the latter half of the 13th century, exemplify some of the best work of the period There are only two gates That on the east is defended by two great towers and a semicircular barbican The gate of the castle, on the west, has a most complicated approach, and beyond this is a huge circular barbican in several storeys On the side of the town the castle is protected by a wide moat, and the entrance is masked by another large semicircular barbican An interesting feature is the importance which the lists have assumed The slight wooden barricade of older times has developed into a wall with towers, and the effect is that the besieger, if he gains a footing in the lists, has a very narrow space in which to work the engines of attack The castle, after the Roman fashion, adjoins the outer wall of the town, so that there may be a possibility of communicating with a relieving force from outside after the town has fallen. There were also several posterns, small openings made in the wall at some height above the ground, for use with rope ladders

The siegecraft of the period was still that of the ancients Mining was the most effective form of attack, and the approach to the walls was covered by engines throwing great stones against the hoardings of the parapets, and by cross-bowmen who were sheltered behind light mantlets moved on wheels. Barrels of burning pitch and other incendiary projectiles were thrown as before; and at one siege we read of the carcasses of dead horses and barrels of sewage being thrown into the town to breed pestilence, which had the effect of forcing a capitulation. With all this the attack was inferior to the defence, owing to the inherent limitations of the "engineer," until gunpowder was introduced.

Introduction of Gunpowder.—Artillery was, however, in use for some time before it began to have any effect on the design of fortification The earliest cannon threw so very light a projectile that they had no effect on masonry In the middle of the 15th century the art of cannon-founding was much developed by the brothers Bureau in France They introduced iron cannon balls and greatly strengthened the guns In 1428 the English besieging Orleans were entirely defeated by the superior artillery of the besieged By 1450 Charles VII was furnished with so powerful a siege train that he captured the whole of the castles in Normandy from the English in one year But the great change came after the invasion of Italy by Charles VIII with a greatly improved siege train in 1494 The astonishing rapidity with which castles and fortified towns fell before him proved the uselessness of the old defences It became necessary to create a new system of defences, and the lead came from Italy There, where the mental Renaissance combined with constant physical conflicts, the greatest intellects, such as Leonardo da Vinci, Michelangelo and Machiavelli, busied themselves over the problem of defence It has been claimed that Albert Durer was the first writer on modern fortification This was not so, Durer's work was published in 1527, and more than one Italian engineer, certainly Martini of Siena and San Gallo, had preceded him Also Machiavelli, writing between 1512 and 1527, had offered some most valuable criticisms and general principles Durer's projects were too massive and costly for execution, but his name is associated with the first practical gun casemates

Before beginning to trace the effect of gunpowder on the design of fortification, it may be noted that two causes weakened the influence of the castles First their owners were slow to adopt the new ideas and abandon their high strong walls for low extended parapets, and, secondly, they had not the men necessary for long lines of defence At the same time the corporations of the towns had learnt to take an active part in warfare, and provided trained and disciplined soldiers in large numbers When artillery became strong enough to destroy masonry from a distance two results followed it was necessary to modify the masonry defences so as to make them less vulnerable, and to improve the means of employing the guns of the defence For both these purposes the older castles with their restricted area were little suited, and we must now trace the development of the fortified towns Probably the first form of construction directly due to the appearance of the new weapons was the bulwark (*boulevard, baluardo* or *bollwerk*) This was an outwork usually semicircular in plan, built of earth consolidated with timber and revetted with hurdles Such works were placed as a shield in front of the gates, and they offered at the same time advanced positions for the guns of the defence The first real lesson taught by improved artillery was that the walls should not be set up on high as targets, but in some manner screened, in the case of old works, by placing bulwarks in front of them, in new works by sinking the wall in a ditch

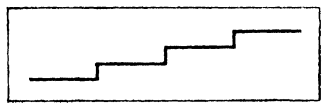


FIG 4.—CRÉMAILLÈRE OR INDENTED TRACE

For resistance to the effect of shot the most valuable expedient was the use of counterforts The earliest counterforts were simply buttresses built *inward* from the wall into the rampart instead of *outward* The effect of these was to strengthen the wall and make the breaches more difficult of ascent An alternative arrangement for strengthening the wall was an arched gallery built behind it under the rampart More important still was the development of the active defence by artillery For this purpose it was necessary to find room for the working of the guns Various modifications of the existing masonry defences were tried, but the natural solution, soon generally adopted, was the rampart; that is, a bank of earth thrown up behind the wall, which while strengthening the wall as already indicated, offered plenty of space for the disposal of the guns

The *ditch,* which had only been occasionally used in ancient and mediaeval fortification, now became essential and characteristic Serving as it did the double purpose of supplying earth for a rampart and allowing the wall to be sunk for concealment, it was found also to have a definite use as an obstacle Hitherto the wall has sufficed for this purpose, the ditch being useful mainly to prevent the besieger from bringing up his engines of attack

When the wall (or escarp) was lowered, the obstacle offered by the ditch was increased by revetting the far side of it with a *counterscarp* Beyond it some of the earth excavated from the ditch was piled up to increase the protection given to the escarp wall, and sloped gently in such manner as to be swept by the fire from the ramparts; this was called the *glacis* But the introduction of the counterscarp wall prevented sorties from the ditch, as hitherto, against the besiegers Hence a space, at ground-level, came to be left behind the glacis, allowing room for troops to assemble This was known as the *covered way* With this last addition the ordinary elements of a profile of "post-gunpowder" fortification were complete



FIG 5.—TENAILLE TRACE

Up to the gunpowder period the *trace* of fortifications, that is, the plan on which they were arranged on the ground, was very simple It was merely a question of an enclosure wall adapted to the site and provided with towers at suitable intervals The foot of the wall could be seen and defended everywhere, from the tops of the towers and the machicoulis galleries The introduction of ramparts and artillery made this more difficult The rampart, interposed between the defenders and the face of the wall, put a stop to vertical defence, while guns from the top of the wall could not be depressed sufficiently for flanking fire along the ditch The problem of the "trace," therefore, at the beginning of the 16th century was to rearrange the line of defence so as to give due opportunity to the artillery of the besieged At first for flanking purposes casemates on the ditch level were used, the old flanking towers being enlarged for the purpose Some use was also made of the fire from detached bulwarks It was soon realized, however, that the flanking defence of the body of the place ought not to be dependent on outworks, and that greater freedom was required for guns than was consistent with casemate defence The *bulwark* was too detached for security The enlarged tower, as an integral part of the lines, gave security, and its walls at right angles to the curtain gave direct flanking fire, but the guns in it were too cramped The blending of the two ideas produced the *bastion,* an element of fortification which dominated the science for 300 years The word has been in use for a long time in connection with extemporized towers or platforms for flanking purposes, the earliest forms being *bastille, bastide, bastillon,* and in its origin it apparently refers rather to the quality of work in the construction than to its defensive intention The earliest bastions were modified bulwarks with straight faces and flanks, attached to the main wall, for which the old towers often acted as keeps, and at first the terms bulwark and bastion were more or less interchangeable

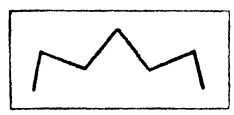


FIG 6.—STAR TRACE

Towards the end of the 16th century the term "bulwark" began to be reserved for banks of earth thrown up a little distance in front of the main wall to protect it from breaching fire "Bastion" henceforth denoted an artillery position connected by flanks to the main wall, and the question of the arrangement of these flanks was one of the main preoccupations of engineers Thus, while in the early part of the 16th century the actual modification of existing defences was proceeding very slowly on account of the expense involved, the era of theoretical "systems" had begun, based on the mutual relations of flank and face These can be grouped under three heads as follows —

1. The *crémaillère* or indented trace Faces and flanks succeeding each other in regular order (fig 4)
2. The *tenaille* trace Flanks back to back between the faces (fig 5) The development of the flanks in this case gives us the *star* trace (fig 6)
3. The *bastioned* trace Flanks facing each other and connected by curtains (fig 7).

In comparing these three traces it will be observed that unless

casemates are used the flanking in the first two is incomplete Guns on the ramparts of the faces cannot defend the flanks, and therefore there are "dead" angles in the ditch. In the bastioned trace there is no "dead" ground, provided the flanks are so far apart that a shot from the rampart of a flank can reach the ditch at the centre of the curtain Here was therefore the parting of the ways For those who objected to casemate fire, the bastioned trace was the way of salvation They were soon in the majority, perhaps because the symmetry and completeness of the idea captivated the imagination At all events the bastioned trace, once fairly developed, held the field in one form or another practically without a rival until near the end of the 18th century The Italian engineers, who were supreme throughout most of the 16th century, started it, the French who took the lead in the following century, developed it



FIG 7.—BASTIONED TRACE

It will be useful at this point to go forward a little, with a simple explanatory figure, in order to get a grasp of the component parts of the bastioned trace as ultimately developed, and of its outworks

(The line of the escarp is called the *magistral line* since it regulates the trace When plans of fortifications are given without much detail, this line, with that of the counterscarp and the crest of the parapet, are often the only ones shown—the crest of the parapet, as being the most important line, whence the fire proceeds, being usually emphasized by a thick black line)

Fig 8, reproduced from a French engraving of 1705, shows an imaginary place fortified as a hexagon with bastions and all the different kinds of outworks then in use The following is the explanation of its figuring and lettering

1 *Flat bastion* Placed in the middle of a curtain when the lines of defence were too long for musketry range

2 *Demi-bastion* Used generally on the bank of a river

3 *Tenaille bastion* Used when the flanked angle is too acute that is, less than 70°

4 *Redans* Used along the bank of a river, or when the parapet of the covered way can be taken in reverse from the front

A, B *Ravelins*

C *Demi-lunes* So called from the shape of the gorge They differ from the ravelins in being placed in front of the bastions instead of the curtains

D *Counter-guards* Used instead of demi-lunes, which were then going out of fashion

E. *Simple tenaille*

F *Double tenaille* (see L and M)

(If the tenaille E is reduced in width towards the gorge, as shown alternatively, it is called a *swallow-tail* If the double tenaille is reduced as at G, it is called a *bonnet de prêtre* Such works were rarely used)

H *Hornwork* Much used for gates, etc

I *Crown-work*

K *Crowned hornwork*

L. M New forms of *tenaille* (N B.—These are the forms which ultimately retained the name)

N New form of work called a *demi-lune lunettée*, the ravelin N being protected by two counter-guards, O

P *Re-entering places of arms*

Q *Traverses*

R. *Salient places of arms*

S *Places of arms* without *traverses*

T *Orillon*, to protect the flank V

X A *double bastion or cavalier*

Y A *retrenchment* with a ditch, of the breach Z.

&. *Traverses* to protect the terreplein of the ramparts from enfilade

Turning back now to the middle of the 16th century we find in the early examples of the use of the bastion that there is no attempt made to defend its faces by flanking fire, the curtains being considered the only weak points of the enceinte Accordingly, the flanks are arranged at right angles to the curtain, and the prolongation of the faces sometimes falls near the middle of it When it was found that the faces needed protection, the first attempts to give it were made by erecting cavaliers, or raised parapets, behind the parapet of the curtain or in the bastions The first example of the complete bastioned system is found in Paciotto's citadel of Antwerp, built in 1568 In this case we have faces, flanks and curtain in due proportion, the faces long enough to contain a powerful battery, and the flanks able to defend both curtain and faces The weak points of this trace due to its being arranged on a small pentagon, are that the terreplein or interior space of the bastions is rather cramped, and the salient angles too acute

In the systems published by Speckle of Strasbourg in 1589 we find a distinct advance—in the absence of outworks, the use of cavaliers and double parapets and in his own particular invention of the low batteries behind the re-entering place of arms and the gorge of the ravelin But his ideas were rather in advance of the powers of the artillery of his day

Early in the 17th century Marchi and Busca in Italy, if excessively geometrical, and de Ville and Pagan in France, contributed to the evolution of fortification It is the latter half of the 17th century, however, which is one of the most important periods in the history of fortification, chiefly because it was illuminated by the work of Vauban It was at this time also that a prodigious output of purely theoretical fortification began, which went on till the French Revolution Many of the "systems" published at this time were elaborated by men who had no practical knowledge of the subject, and they tended to a multiplication of outworks which culminated in such extravagances as the system of Rhana, published in 1769

Vauban.—The work of the masters who knew more than they published can always be recognized by its comparative simplicity The greatest of these was Sebastien le Prestre de Vauban

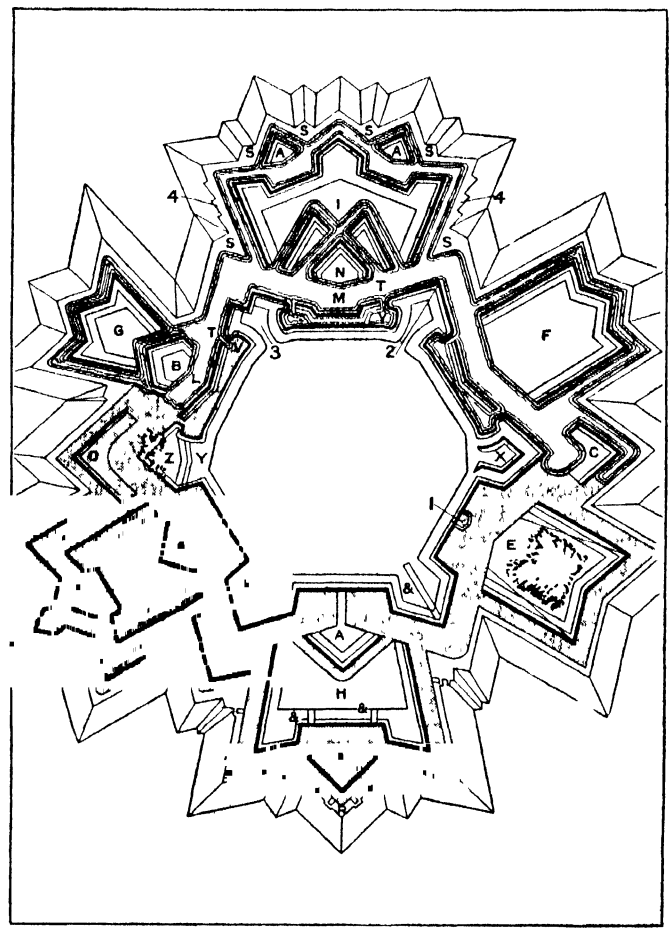


FIG 8.—TYPICAL FORTRESS OF THE 16TH CENTURY ILLUSTRATING VARIOUS FORMS OF WORKS USED

(*q v*). Born in 1633, and busied from his 18th year till his death in 1707 in war or preparations for war, his genius, no less than his experience, puts him in a category apart from others Of this it is enough to say that he took part in 48 sieges, 40 of which he directed as chief engineer without a single failure, and repaired or constructed more than 160 places. Vauban's genius was essentially practical, and he was no believer in systems. He would say, "One does not fortify by systems but by common sense." Of new ideas in fortification he introduced practically none, but he improved and modified existing ideas with consummate skill in actual con-

struction His most original work was in the attack (*see* below), which he reduced to a scientific method most certain in its results. It is therefore one of the ironies of fate that Vauban should be chiefly known to us by three so-called "systems," known as his "first," "second" and "third" How far he was from following a system is shown by de Villenoisy, who reproduces 28 fronts constructed by him between 1667 and 1698, no two of which are quite alike and most of which vary very considerably to suit local conditions

Vauban's "first system," as variously described by other writers even in his own time, is pieced together from some of the early examples of his work The "second system" is the "tower bastion" defence of Belfort and Landau (1684–88), obviously suggested by a design of Castriotto's 100 years earlier, and the "third system" is the front of Neu-Breisach (1698), which is merely Landau slightly improved In other works, between 1688 and 1698, he did not keep to the tower bastion idea It will be convenient to take the "first system," as reproduced in a text-book of fortification as typical of much of Vauban's best work He sometimes uses the straight flank, and sometimes the curved flank with orillon Parapets in several tiers are never used, nor cavaliers The ravelin is almost always used It is small, having little artillery power and giving no protection to the shoulders of the bastions The tenaille is very generally found In this form, viz, as a shield to the escarp of the curtain, it was probably invented by him There were two forms Traverses are used for the first time on the covered way to guard against enfilade fire, and the re-entering place of arms, to which Vauban attached considerable importance, is large The main dimensions of the trace are indicated As regards the profile the bastions and curtain have a command of 25ft over the country, 17ft over the crest of the glacis and 8ft over the ravelin The ditches are 18ft deep throughout The parapets are 18ft. thick with full revetments In his later works he used demi-revetments

After Vauban died, though the theories continued, the valuable additions to the systems were few Among his successors Cormontaigne (*q v*) formed a link with the school of Mézières, established in 1748, and from this time forward there was an official school of thought, based on Vauban Cormontaigne's work, therefore, represents the modifications of Vauban's ideas accepted by French engineers in the latter part of the 18th century The school of Mézières was afterwards replaced by that of Metz, which carried on its traditions Such schools are necessarily conservative, and hence, in spite of the gradual improvement in ordnance and firearms, we find the main elements of the bastioned system remaining unchanged right up to the period of the Franco-German war in 1870 Chasseloup-Laubat tells us that, before the Revolution, to attempt novelties in fortification was to write one's self down ignorant As, therefore, the official view was that the general outlines of the system were sacred, the efforts of orthodox engineers from Cormontaigne's time onwards were given to improvements of detail, and mainly to retard breaching operations as long as possible Among the unorthodox two names deserve mention The first of these is Chasseloup-Laubat (*q v*), who served throughout the wars of the Republic and Empire, and constructed the fortress of Alessandria in Piedmont Chasseloup's main proposals to improve the bastioned system were two. First, in order to prevent the bastions from being breached through the gaps made by the ditch of the ravelin, he threw forward the ravelin and its keep outside the main glacis This had the further advantage of giving great saliency to the ravelin for cross-fire over the terrain of the attack On the other hand, it made the ravelin liable to capture by the gorge, and thus was dangerous for a weak or inactive garrison Secondly, in order to get freedom to use longer fronts than those admissible for the ordinary bastioned trace, he proposed to extend his exterior side up to about 650yd and to break the faces of his bastions; the portion next the shoulder being defended from the flank of the collateral bastion and coinciding with the line of defence, and the portion next the salient, up to about 80yd in length, being defended from a central keep or caponier placed in front of the tenaille. The natural criticism of this arrangement is that it combines some of the defects of both the bastioned and polygonal systems without getting the full advantages of either

The second name is that of Capt Choumara of the French Engineers, born in 1787, whose work was published in 1827. Two leading ideas were due to him The first is that of the "independence of parapets" By making the crest of the parapet quite independent of the escarp line he obtained great freedom of direction for his fire The second idea is that of the "inner glacis" This was a glacis parapet placed in the main ditch to shield the escarp; its effect being to prevent the escarp of the body of the place from being breached in the usual way by batteries crowning the crest of the covered way The need for Choumara's improvements has passed by, but he was in his time a real teacher One sentence of his strikes a resounding note: "What is chiefly required in fortification is simplicity and strength It is not on a few little contrivances carefully hidden that one can rely for a good defence. *The fate of a place should not depend on the intelligence of a corporal shut up in a small post prepared for his detachment.*"

It must here be remarked that the reproach of "geometrical" fortification is in no way applicable to the works of Vauban and his immediate successors They excelled in adapting works to sites, the real test of the engineer The bastioned system was the 17th-century solution of the fortification problem Given an artillery and musketry of short range and too slow for effective frontal defence, a ditch is necessary as an obstacle What is the best means of flanking the ditch and of protecting the flanking arrangements? If Vauban elected for the bastion, we must before criticizing his choice remember that he was the most experienced engineer of his day, a man of the first ability and quite without prejudice What is matter for regret is that the authority of Vauban should have practically paralysed the French school during the 18th and most of the 19th century, so that while the conditions of attack and defence were gradually altering they could admit no change of idea, and their best men, who could not help being original, were struggling against the whole weight of official opposition Again, the duplication of outworks often seen is not geometric fortification It is a definite attempt to retard the attack, on ground favourable to it, by successive lines of defence

The Dutch School.—From the end of the 16th century the Dutch methods of fortification acquired a great reputation, thanks to the stout resistance offered to the Spaniards by some of their fortresses, the three years' defence of Ostend being perhaps the most striking example Prolonged defences, which were mainly due to the desperate energy of the besieged, were credited to the quality of their defences. Three conditions governed the development of the Dutch works at this time, viz, want of time, want of money and abundance of water When the Netherlands began their revolt against Spain, they would no doubt have been glad enough of expensive masonry fortresses on such models as Paciotto's citadel of Antwerp But there was neither time nor money for such works Something had to be extemporized, and fortunately for them they had wet ditches to take the place of high revetted walls Everywhere water was near the surface, and rivers or canals were available for inundations. High command was, owing to the flatness of the country, unnecessary and even undesirable, as it did not allow of grazing fire What the Dutch actually did in strengthening their towns gives little evidence of system Speaking generally, they endeavoured to provide for the want of a first-class masonry obstacle by multiplication of wet ditches, and further to strengthen these obstacles by great quantities of palisading, for which purpose the timber of old ships was used They also recognized the inherent weaknesses of wet ditches, as, for instance, that when frozen they no longer provide an obstacle, and they studied the means, not only of causing inundations, but also of arranging to empty as well as to fill the ditches at will Simon Stevin was the leader in this particular branch of the work

Coehoorn (*q.v*), the contemporary and nearest rival to Vauban, was the greatest light of the Dutch School Like Vauban he was distinguished as a fighting engineer, both in attack and defence, but in the attack he differed from him in relying more on powerful artillery fire than systematic earth-works He introduced the Coehoorn mortar

German School.—The "tenaille" system and the "polygonal" system which grew out of it are mainly identified with the *German school* It was founded on the principles of Durer, Speckle and especially Rimpler, and much influenced in execution by Montalembert "The German engineers desired a simple trace, a strong fortification with retrenchments and keeps, bomb-proof accommodation and an organization suitable for an offensive defence" These had always been the German principles In the 16th century the Prussian defences of Kustrin, Spandau and Peitz had large bomb-proof casemates sufficient for a great part of the garrison The same thing is seen in the defences of Glogau, Schweidnitz, etc., built by Frederick the Great Whether through the influence of Albert Durer or not cannot be said, but while the bastion was being developed in France the tenaille and the accompanying casemates from the first found acceptance in Germany, and thence in eastern and northern Europe De Groote, who wrote in 1618, produced a sort of tenaille system, and may have been the inspiration of Rimpler Others advocated both bastion and tenaille, sometimes in combination, the German bastion being usually distinguished by short faces and long flanks Rimpler, who was present at the siege of Candia (taken by the Turks in 1669) and died at that of Vienna in 1683, exercised a great influence He had been struck by the weakness of the early Italian bastions at Candia, and published a book in 1673 called *Fortification with Central Bastions,* which was practically the polygonal trace

Landsberg the younger (1670–1746), a major-general in the Prussian service, appears to have been the first who frankly advocated the tenaille alone, chiefly on the ground that the flank, which was the most important part of the bastioned system, was also the weakest It was, however, ultimately a Frenchman, Marc René Montalembert (*q.v.*), who was the great apostle of the tenaille, though in his later years he leaned more to the polygonal trace He objected to the bastioned trace on many grounds, principally that the bastion was a shell trap, that the flanks by crossing their fire lost the advantage of the full range of their weapons, and that the curtain was useless for defence His tenaille system consisted of redans, with salient angles of 60° or more, flanking each other at right angles, from which he gave to his system the name of 'perpendicular fortification"

Lazare Carnot (*q.v.*), the "Organizer of Victory," was, in fortification, a follower of Montalembert, and produced in 1797 a tenaille system on strong and simple lines

Carnot was also, like Coehoorn, a great believer in the mortar, but while Coehoorn introduced the small portable mortar that bears his name, Carnot expected great results from a 13in mortar throwing 600 iron balls at each discharge He endeavoured to prove mathematically that the discharge of these mortars would in due course kill off the whole of the besieging force These mortars be emplaced in open fronted mortar casemates, in concealed positions The main idea of Montalembert was that for a successful defence it was necessary for the artillery to be superior to that of the enemy This idea led him to the adoption of casemates in several tiers, in preference to open parapets, exposed to artillery fire of all kinds, high angle, ricochet and reverse In considering the defects of bastions he had arrived at the conclusion that for flanking purposes two forms of trace were preferable, either the tenaille form, or that in which the primary flanking elements, instead of facing each other with overlapping fire, as with the bastions, should be placed back to back in the middle of the exterior side With his central flanking work Montalembert laid the foundation of the polygonal system

Montalembert was one of the first to foresee the coming necessity for detached forts, and it was for these that he chiefly proposed to use his caponier flanking, preferring the tenaille system for large places In abandoning the bastioned trace he was already committed to the principle of casemate defence for ditches Montalembert is said to have contributed more new ideas to fortification than any other man, sometimes unsound, all the best work of the 19th century rests on his teaching The Germans, who already used the tenaille system and made free provision of bomb-proof casemates, took from him the polygonal trace and the idea of the entrenched camp The polygonal system in fortification implies straight or slightly broken exterior sides, flanked by casemated caponiers The essence of the system is its simplicity, which allows of its being applied to any sort of ground, level or broken, and to long or short fronts

Entrenched Camps.—The final period of smooth-bore artillery is an important one in the history of fortification It is true that the many expensive works that were constructed at this time were obsolete almost as soon as they were finished, but this was inevitable, thanks to the pace at which the world was travelling After the Napoleonic wars the Germanic confederation began to strengthen its frontiers, and took up Montalembert's idea of entrenched camps, utilizing at the same time his polygonal system for the main enceintes

The Detached Fort.—We have now reached a period when the "detached fort" becomes of more importance than the organization of the enceinte The early conception of the rôle of detached forts in connection with the fortress was to form an entrenched camp within which an army corps could seek safety if necessary The idea had occurred to Vauban, who added to the permanent defences of Toulon a large camp defended by field parapets attached to one side of the fortress The substitution of a ring of detached forts gave a wider area and freer scope for the operations of an army seeking shelter under the guns of a fortress, and at the same time made siege more difficult by increasing the line of investment The use of the detached fort as a means of protecting the body of the place from bombardment had not yet been made necessary by increased range of artillery When these detached forts were first used by Germany the scope of the idea had evidently not been realized, as they were placed much too close to the fortress Those at Cologne, for instance, were only some 400 or 500yd in advance of the ramparts Clearer views and real progress came largely through Gen von Brese-Winiari, inspector-general of the Prussian engineers

France, for a few years after 1815, could spare little money for fortifications, and nothing was done but repairs and minor improvements on the old lines Belgium, having some money in hand rebuilt and improved in detail a number of bastioned fortresses which had fallen into disrepair In 1830 France began to follow the lead of Germany with entrenched camps The enceinte of Paris was reconstructed, and detached forts were added The Belgian and German frontiers of France being considered fairly protected by the existing fortresses, they turned their attention to the Swiss and Italian frontiers, and constructed three fortresses with detached forts at Belfort, Besançon and Grenoble The enceinte was simplified on account of the advanced defences That of Paris, which was influenced by political considerations, was a simple bastioned trace with rather long fronts and without outworks As regards the detached forts there was certainly a want of clearness of conception Those of Paris were simply fortresses in miniature, square or pentagonal figures with bastioned fronts and containing defensible barracks

Period from 1855 to 1870.—During the period 1855–70 a considerable impulse was given to the science of fortification, both by the Crimean War and the arrival of the rifled gun One immediate result of these was the condemnation of masonry exposed to artillery fire The most important work of the period was the new scheme of defence of Antwerp which was initiated in 1859 This is chiefly interesting as giving us the last and finest expression of the mediaeval enceinte, at a time when the war between the polygonal and bastioned traces was still raging, though the boom of the long-range guns had already given warning that a new era had begun The defences of Antwerp were designed, as the strategic centre of the national defence of Belgium, for an entrenched camp for 100,000 men The length of the enceinte was nine miles The detached forts, which on the sides not defended by inundation were about one and a quarter miles apart and from two to three miles in front of the enceinte, were arranged for garrisons of 1,000 men In the same year the land defences of some of the British dockyards were taken in hand These first serious attempts at permanent fortification in England were received with approval on the Continent, as constituting an advance on anything that had been done before. The detached forts intended to keep an enemy

outside bombarding distance were roomy works with small keeps The parapets were organized for artillery and the ditches were defended by caponiers or counterscarp galleries The forts were spaced about a mile apart and arranged so as to support each other by their fire

Period from 1870 to 1885.—The effect of the Franco-German War of 1870 was to concentrate attention on detached forts These were thrown out to a greater distance, and the typical shape adopted both in France and Germany was a very obtuse-angled lunette, shallow from front to rear While the German type had one parapet only, the French forts had two parapets, that in the rear being placed over living casemates to command the front one There was a long controversy as to whether the artillery of the fort should be on the upper or the lower parapet, the advocates of the upper parapet attaching great importance to the command that the guns would have over the country in front The other school, objecting to having guns on the skyline, preferred to sacrifice the command and place them on the lower parapet, the infantry occupying the line of upper parapet It will be observed that the bastioned trace is abandoned, the ditches, like those of the German fort, being defended by caponiers

While a great deal of work was done on these lines, a very active controversy had already begun on the general question as to whether guns should be employed in forts at all Some declared that the accuracy and power of artillery had already developed so far that guns in fixed and visible positions would be put out of action in a very short time The remedy proposed by these was the removal of the guns from the forts into "wing-batteries" which should be less conspicuous; but soon the broader idea was put forward of placing the guns in concealed positions and moving them from one to another by means of previously prepared roads or railways Others declared that there was no safety for the guns outside the forts, and that the use of steel turrets and disappearing cupolas was the only solution of the difficulty Gen Brialmont, who had by this time become the first European authority on fortification questions, ranged himself on the side of the turrets The younger school, however, pinned their faith to mobility, and pleaded for it vehemently in numerous publications

MODERN PERMANENT FORTIFICATION

In the last quarter of the 19th century, two events changed the whole outlook on permanent fortification One, not fully appreciated at the time, was the power of the breech-loading rifle, in conjunction with improvised field works, of stopping an infantry attack, the other the introduction of high explosive shell

Breech-loading Rifles and High Explosive Shells.—The former was strikingly manifest in the defence of Plevna by the Turks in 1877 The defences, which mainly consisted of small infantry redoubts with artillery in separate battery positions, were only constructed after the first Russian attack The redoubts, surrounded by a 10ft ditch, were square in plan, with parapets 10 to 15ft above the ground and 14ft thick They had a certain amount of head cover of timber and earth and were connected by trenches 4ft deep In spite of suffering considerably from artillery bombardment, these works, stubbornly defended by the Turks with breech-loading rifles, held out against all assaults After five months, it was only through lack of supplies that Plevna capitulated

The Germans in about 1884 had begun experiments with long shell containing large charges of gun cotton But it was the experiments at Ft Malmaison in France in 1886 that set the military world speculating on the future of fortification The fort was used as a target for eight-inch shell of five calibres length containing large charges of melinite The reported effects of these made a tremendous sensation, and it was at first thought that the days of permanent fortification were over Magazine casemates were destroyed by a single shell, and revetment walls were overturned and practicable breaches made, by two or three shells falling behind them It must be remembered, however, that the works were not adapted to meet this kind of fire. The casemates had enough earth over them to "tamp" the shell thoroughly (*i e*, increase its power by confining and concentrating its effect), but not enough to prevent it from coming into contact with the masonry, and the latter was not thick enough to resist the explosion of the big charges After the first alarm had subsided, foreign engineers set about adapting their works to meet the new projectiles Revetments were enormously strengthened, and designed so that their weight resisted overturning Concrete roofs were made from six to ten feet thick and in many cases the surface of the concrete was left bare so as to expose a hard surface to the shell without tamping

Successive Fortifications of Metz up to 1899.—Of the fortresses that were strengthened to meet the new conditions Metz is a good example In 1868–70 detached forts of bastion trace, such as St Julien (Manteuffel) were built within 3,000yd of the old enceinte, which was left unaltered After 1870 the Germans added forts of the polygonal type, such as Prinz Auguste with wing batteries to reinforce the intervals Later the perimeter was strengthened by infantry positions, shelters and armoured batteries Finally in 1899 the more modern forts of Sauley and Pont du Jour, 9,000yd from the place, were commenced The distances of the detached forts from the place were thus being increased to keep pace with the range of siege howitzers The minimum distance was considered to be 8,000yd In practice, however, the position of the forts had to be determined by the lie of the ground At Verdun the distances varied from 3,000 to 12,000yd, Bucharest 8,000 to 12 000, Copenhagen 8,000 to 10,000 and Paris 15,000 to 18,000 With the extension of the perimeter came the increased difficulty of defending the intervals between the forts The flanking fire of some of the guns in the forts played an important part, but the main defence rested on a chain of redoubts and infantry positions with fire trenches, obstacles, bomb-proof shelters and communications, between the forts To stop infiltration and as the last line of the "step by step" defence the enceinte where possible was retained This was done more as a concession to tradition than for any solid reason, as it would be impracticable to enclose a modern town with a continuous enceinte, and if provided it would hardly be a favourable position for the last stage of a defence

Although the forts were all designed to contain guns of the safety armament (*i e*, permanently in position ready to come into action as soon as war broke out) it was realized that for protracted defence a considerable force of artillery outside the forts would be required If positions were prepared before-hand with concrete or armour considerable expense would be entailed, and the dispositions would be fixed without reference to the enemy's front of attack A compromise was therefore effected, only the most important batteries being completely protected, while positions for the remainder were prepared and the necessary communications made

Types of Detached Forts.—Of the many types of detached forts, there may be mentioned forts designed without any covered way, which showed that offensive action was no longer expected from the garrison of the fort but was the duty of troops in the intervals On account of the difficulty of building a revetment strong enough to withstand breaching fire the scarp was usually omitted The slope of the rampart was carried down to the bottom of the ditch and protected with a steel fence and wire entanglement obstacles

Armour.—It will be noticed that armour is included in many modern examples In 1860 Brialmont had employed armoured turrets at Antwerp in the forts which commanded the Scheldt. But for land purposes engineers were slow to adopt it It was thought that the deliberate fire of a battery on land would be so accurate that, with successive blows, it could break down the resistance of the strongest shield When this was not found to be the case, opinion turned and practical types of cupolas were produced It was argued that the object of fortifications is not to obtain resisting power without limit, but to enable men to defend themselves and use their weapons for as long as possible against a superior force, and that from this point of view armour adds strength to defensive works Of the various forms of armour, revolving cupolas with flattened domed tops are generally used Turrets which are cylindrical with flat tops are more conspicuous and pre-

sent vertical targets They both emerge from a mass of concrete which is strengthened round the opening with a collar of steel. Casemates and shielded batteries, in which guns fire through a fixed embrasure or port hole, are considerably cheaper, and have the greater strength of a fixed structure But the arc of fire of the gun is very limited and the embrasures, which are the weakest points of the system, are—except in the case of Bourge case-

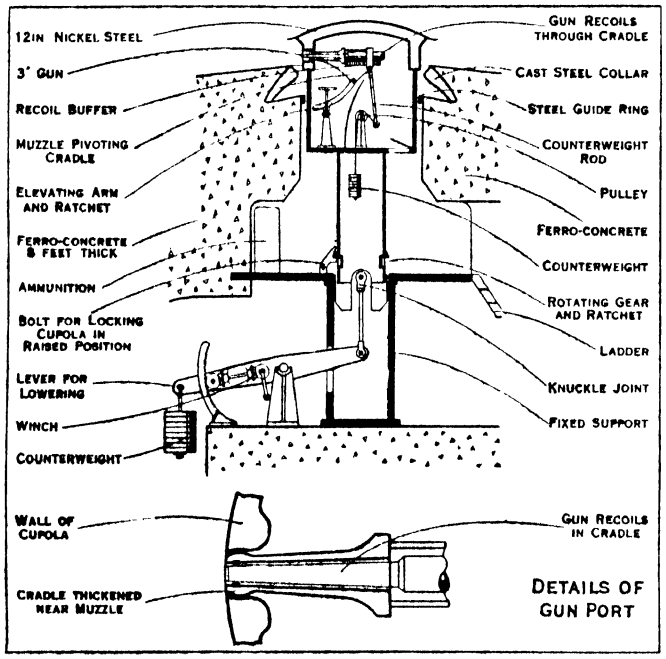


FIG 9 —REVOLVING AND DISAPPEARING STEEL CUPOLA FOR A PAIR OF 3-IN GUNS

mates for flanking batteries—constantly exposed to the fire of the enemy They are, however, well suited for flanking batteries and for barrier forts, where the Italians have used them for the end of the Mont Cenis tunnel

Fig. 9 shows a cupola for a pair of 3-in guns The shield is of nickel steel The guns are muzzle pivoting and the cradles are thickened out near the muzzle so as to close the port as much as possible The recoil is curtailed within narrow limits so as to economize space To facilitate elevation the breech of the gun (with muzzle pivoting the breech has, of course, to be moved through a much larger arc than with ordinary mounting) is balanced by a counter-weight The cupola is raised and lowered by means of a lever and counter-weight and can be locked in the raised position It can be turned through a complete circle in about one minute

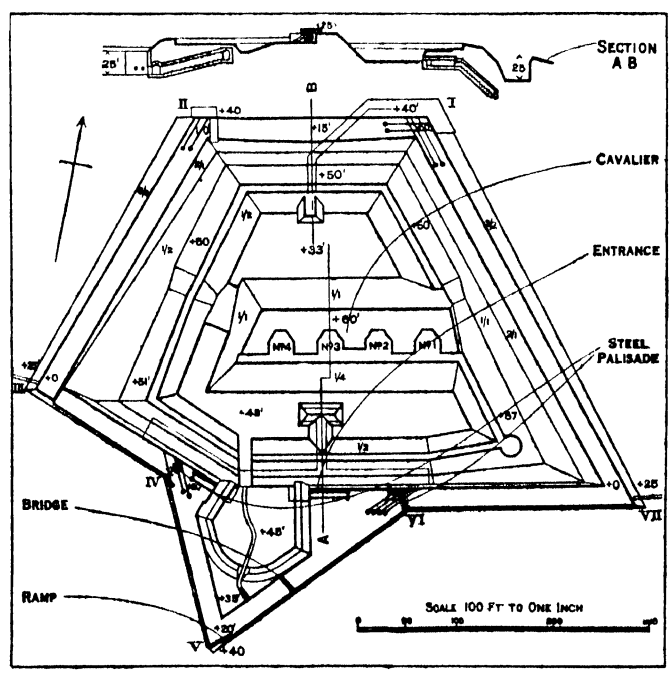
Of all the countries that adopted armour it was Rumania that used it the most Bucharest was defended by 18 main armoured forts (designed by Brialmont) some 4,500yd apart and 11,000 to 12,000yd from the town, with 18 small forts and intermediate batteries The typical armament of a main fort was six 6 in guns in three cupolas, two 8·4 in and one 4·7 in howitzer in cupolas and six small Q F guns in disappearing cupolas For the defence of the Sereth line where the three Russian lines of advance across the river passed through Focshani, Nemolassa and Galatz, the "Schumann system of armoured fronts" (1889–92) was adopted This system dispensed entirely with forts and relied on the fire of protected guns disposed in several lines of batteries of Q F guns and howitzers in cupolas In the Focshani works there were 71 batteries on a 12 m semicircular front, disposed in three lines about 500 yd apart and divided into groups The normal group consisted of five batteries, three in the first line each consisting of five small Q F guns on travelling mountings, one in the second line of six Q F guns in disappearing cupolas, and one in the third line of a 5 in gun in a cupola and two 8·4 in shielded mortars The immediate defence of the batteries consisted of a glacis planted with thorn bushes and a wire entanglement. It was claimed that with this system an attack could be stopped by artillery fire alone, but the difficulties of command fixed battery positions, and lack of infantry defence, especially at night, or in a mist, were sufficient to condemn it by all authoritative Continental opinion

Unarmoured Systems.—While European nations were including armour in their permanent fortifications, there were many distinguished soldiers entirely opposed to its use. In England Maj G S Clarke, R E. (now Lord Sydenham) published in 1900 a notable book on *Fortification* He condemned the inclusion of artillery in forts which formed conspicuous and easy targets, and for the defence, advocated strong permanent infantry redoubts supplemented by field defences These guaranteed the safety of the guns behind them, which could then dispense with armour and take every advantage of concealment, alternative positions and mobility With guns in detached forts, a compromise had to be effected between the most suitable infantry and artillery positions, to the detriment of both. When separated, the infantry redoubt could be sited in the best tactical position to give effect to rifle and machine gun fire, while the guns were placed in concealed positions in rear It was only in the special case of barrier forts that he considered armour necessary

In a typical infantry redoubt of the kind suggested, the form is simple and in order to reduce the chance of being hit the plan is shallow Invisibility is secured by low command, easy slopes and the judicious planting of trees If it is intended for 300 men there is shell proof accommodation under the parados for three-quarters of the garrison A parapet is provided for frontal fire but there are no traverses

Port Arthur.—Out of the welter of theory and experiment Port Arthur in 1904 was the first fortress to be put to the test of modern war Although designed in 1900 the permanent defences as can be seen from the plan of Fort Erh-Lung (fig 10), were of the 1870 type of detached fort

Owing to the lack of funds only three forts on the north-east side had been built, while to the north-west, the important position



FROM COMMITTEE OF IMPERIAL DEFENCE, "OFFICIAL HISTORY OF THE RUSSO JAPANESE WAR" (CONTROLLER OF H M STATIONERY OFFICE)

FIG 10 —PLAN OF FORT ERH-LUNG, PORT ARTHUR, DESIGNED IN 1900

of 203-Metre Hill (fig 15) had no permanent defences In spite of the fire of the new Japanese 11 in siege howitzers, and of the most determined attacks the siege lasted five months (*see* PORT ARTHUR) The guns in the forts, on account of their conspicuous position, were soon silenced; but the forts themselves, surrounded by deep ditches cut out of solid rock, held out against repeated assaults until blown to pieces by mining. The great stopping power of rifles and machine guns from improvised defences, even when

ubjected to the fire of heavy howitzers, was again brought out. This power is increased when the line is strengthened by permaent infantry forts with deep ditches To coop up artillery in onspicuous infantry forts is a mistake, and the weakness of a inear defence on the observation line and without depth is apparnt If one position is captured the remainder of the line can be aken in flank and rendered untenable

Infantry redoubts having proved their value as keystones of the lefensive line, Schroeter in 1905 proposed a new variation of this

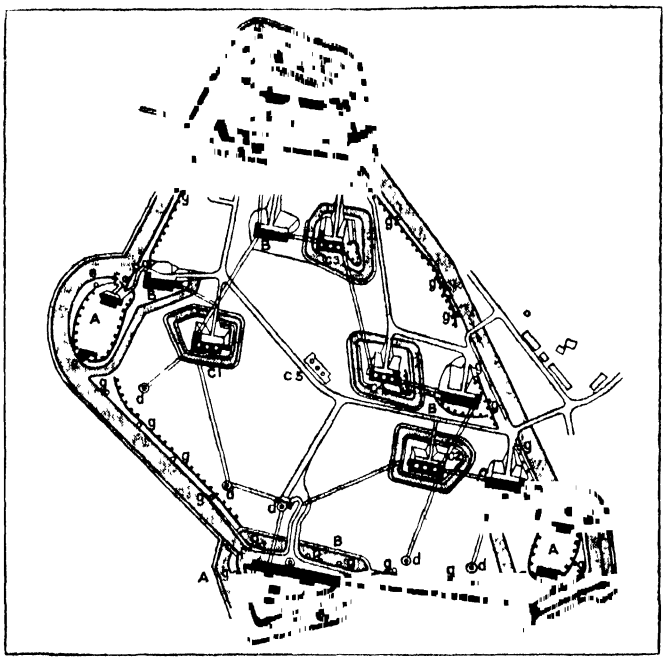


FIG. 11.—A MAIN INFANTRY WORKS B CONCRETE CASEMATES C1 ARMOURED BATTERIES (C5 DUMMY) D ARTILLERY OBSERVATION POSTS. E ARMOURED INFANTRY OBSERVATION POSTS F POSTS FOR ENFILADING OBSTACLES AND DITCHES G INFANTRY LOOKOUT POSTS

ype The command in this case is lower than in Sir George Clarke's work, while the plan is more complicated and arrangeents for close flanking defence have been introduced These orks, however, are the infantry supporting points in a line hich contains forts of the triangular type with guns and arioured batteries To obviate the weakness of this type of linear efence, and to protect the batteries from any penetration by the nemy between the redoubts, the Germans at Metz built a new orm of fortified work known as the "feste" This, as its name inicates, is rather a self-contained fortress on a small scale than a ort in the old sense The "festes" built just prior to 1914 overed a large irregular area some 1,200 yd in depth and width Vithin their wired perimeter were sited all the elements of the efence both for infantry and artillery. Strong self-contained ifantry works were situated at each of the salient angles, while he batteries (generally 6 in howitzers and 4 in guns) were disosed within the area with their weapons in revolving steel cupolas mbedded in concrete Ditches 20 ft deep, wired at the bottom nd flanked by loopholed galleries, protected the outer face of he infantry works Each battery and work was surrounded by ire and the main perimeter wire was sunk six feet deep and anked by the redoubts There were numerous steel and concrete ommand and observation posts for the artillery and infantry, and asemates protected by nine feet of concrete were provided for the hole garrison. Deep underground galleries and a complete telehone system connected the various parts of the "feste"

Developments of the 20th Century.—While land defences ere thus being evolved, changes due to the great economic and idustrial developments of the early 20th century were affecting ot only the design but the rôle of permanent fortification. The onception of a fortress as a ring of defences protecting an imortant point, and capable of withstanding an investment unsuported by a field army, though by no means abandoned, was being modified. The ring fortresses of the 19th century, which protected important places such as capitals and arsenals, and served as secure bases for field armies, or refuges for beaten ones, were no longer capable of fulfilling their rôle These changes were due to two main reasons Firstly, the increased size of armies provided by universal service necessitated the employment of several lines of communication, wide bases, and large areas for their concentration and deployment Secondly, the greatly increased range and destructive power of artillery necessitated the extension of the perimeter to such a degree that for the defence of a fortress a field army was required Zone fortification therefore was beginning to be established in the highly-organized industrial areas of Western Europe Reliance, however, was still placed on self-sufficing girdle fortresses, such as Paris, Antwerp and Bucharest, and in the less organized areas of Russian Poland

Use of Fortified Areas.—Before examining the history and trend of opinion on permanent fortification during and since the World War of 1914–18, it is advisable to consider the use and limitations of fortified areas It is an axiom of war that victory can only be won as the result of offensive action, but a defensive attitude may at times be necessary or even advantageous Fortresses can never win a victory, their rôle is to gain time and economize force The main uses are —(1) To delay the enemy on important lines of advance, such as the barrier forts of the Alpine passes, or the fort of Manonvillers, which commanded the main line of railway from Strasbourg to Paris, (2) to protect vital points such as Paris and Antwerp, (3) to canalize the attack and force the enemy, unless he wishes to spend the time and men necessary for the deliberate attack of fortresses, to advance by specified lines (the Trouée de Charmes between Toul and Epinal is an example), (4) to act as a pivot of manoeuvre It was for this purpose that the Germans used the Metz-Thionville zone

Fortresses in the War of 1914–18.—The comparatively rapid and shattering fall of the Belgian fortresses in 1914 caused a complete revulsion against permanent fortification Liége with its 12 armoured forts fell 11 days after the opening attack, and eight days after the first use of the German 17in howitzers, while the centre of the town, with the vital bridges over the Meuse, was captured within the first three days Namur withstood only four days' bombardment and four of the main Antwerp forts were rendered untenable in three On the eastern frontier of France the barrier fort of Manonvillers was reduced to ruins in two days The main fortress zones of Verdun-Toul and Epinal-Belfort were not seriously attacked except at the fort Camp des Romains, which the Germans captured and thus secured a crossing over the Meuse at St Mihiel On the other hand Maubeuge, with its permanent fortifications completely out of date and strengthened only by field works, held out for 11 days As a result of these events, the French higher command decided to abandon the permanent forts of Verdun and to rely entirely on field defences When the Germans attacked in Feb 1916, Fort Douaumont was left undefended and charges were laid for the demolition of Fort Vaux, but the electric firing cables having been cut by shell fire, the demolition could not be carried out Meanwhile it had been discovered that the concrete casemates and steel cupolas of the modern forts had suffered little damage from the heaviest shells Gen Pétain therefore ordered the forts to be re-occupied The protected observation posts and shell-proof casemates were found to be of the greatest value, but the absence of the flanking guns which had been removed, and the lack of telephonic and underground communication to the rear, were severely felt These forts were generally small—Vaux was designed for 150 men—and except for an occasional 75 or 155mm gun in a cupola for direct fire, and flanking guns in Bourges casemates, they contained no artillery The forts were provided with concrete underground galleries and casemates, protected by masonry arches three feet thick, with a three foot cushion of sand between them and the main protective layer of eight feet of concrete; and were enclosed by ditches 30ft. wide and 20ft. deep.

On the German western frontier, in order to provide a pivot of manoeuvre for Von Schlieffen's plan for the invasion of France through Belgium, the defences of Metz had been strengthened and

extended to include Thionville, while 10m west of Strasbourg the fortress of Mutzig was built to close the Col de Saales road over the Vosges These fortresses fulfilled their rôle but were never seriously threatened

German-Austrian-Russian Frontier.—The fortresses of Poland and Galicia differed from those of France and Belgium in that they were purely ring fortresses, designed to hold the few and therefore very important road and railway junctions of Poland Of these, Modlin (Nowo-Georgiewsk) was invested and rapidly fell by siege, Brest-Litovsk and Grodno fell as parts of the battle line, Deblin (Iwangorod) was evacuated by the threat of an encircling movement, while Przmysl alone, with the aid of field works, was successful in withstanding a siege On the German frontier the fortresses of the Vistula-Torun (Thorn) and Grandenz were never attacked Of the forward line, however, Konigsberg held two Russian army corps from the battle of Tannenberg, and the small fortress of Lotzen with a strong line of field defences, flanked by the lakes, never gave way

Effect of Bombardment on Forts.—The difference in the degree of resistance to shell fire shown by the various forts is remarkable Manonvillers, though not entirely modern, with its two steel cupolas, disappearing 6in guns, and casemates protected by eight feet of ordinary concrete, became a blazing inferno under the rain of 17,000 shells directed upon it The garrison, after two days, blinded by the dust and fragments, asphyxiated by the fumes of the constantly bursting shells, and almost demented by the concussion, were rendered quite incapable of defending the fort, which was captured by the Germans without the loss of a single man The forts of Liége and Namur similarly, when subjected to the concentrated fire of 17in howitzers, were soon rendered untenable, casemates were penetrated, cupolas overturned and the whole structure reduced to ruins On the other hand, the more modern forts of Verdun appeared to have withstood the heaviest bombardments without vital damage French writers claim that of the steel cupolas only one was permanently destroyed At Douaumont 13 out of the 18 casemates remained intact Forts Moulainville and Vacherauville received 6,000 to 8,000 shells each, of which in the case of Moulainville, 330 were 17in , without permanent damage to casemates or turrets The difference in the resistance of the forts was due to the higher quality of the French concrete, which was mixed with a large proportion of cement, and laid with the greatest care to ensure the masses being monolithic without lines of cleavage, and also to the great thickness and large masses which are necessary to withstand the overturning and disruptive effects of bombardment The French cupolas had 30mm thickness of steel compared with the 22mm of the Belgian ones The Belgian forts were large, crowded, and conspicuous targets, they contained guns of the main artillery armament, and were sited on commanding positions In spite of the lessons of Port Arthur, they were only built to withstand shells up to 8in The Italian barrier forts in the battle of the Isonzo failed because their armour and concrete were not sufficiently thick and there was no protection against gas, while the small Austrian works in the south of Tirol, although bombarded by 12in howitzers, held out for months

Value of Permanent Works.—From the lessons of the World War there have again grown two schools of thought On the one hand it is argued that the fortresses of the Franco-German frontier completely justified the money expended on them By their existence they forced Germany to violate the neutrality of Belgium and so brought the British empire against her The more modern forts proved their ability to resist bombardment by the heaviest shells and saved many casualties. Verdun, as a pivot of the battle line, was of incalculable value during the decisive battle of the Marne, and later as a bastion in the trench system Liége, in spite of its comparatively rapid fall, gained the allies at least four days, enabled the French army to change front and the British to come into line Paris as a pivot of manoeuvre, forced the German invasion westwards and so exposed their flank to Manoury's attack Antwerp kept two German corps from the decisive front, and "every day gained at Antwerp meant a French port saved" Maubeuge, Przmysl and Konigsberg all detained important forces from the battles of the Marne, Cracow and Tannenberg. Strasbourg and Metz-Thionville fulfilled their rôle as a pivot for the German wheel The expenditure on keeping these fortresses up to date was not great. The average annual amount spent on the defences of Verdun and the heights of the Meuse for the 40 years prior to the war was £200,000, *i.e.*, less than the cost of a destroyer, while the total spent on Metz was about equal to the cost of a battleship Battleships are not expected to last more than 12 or 15 years, they are then considered obsolete and replaced The other school of thought point out that the inherent weakness of fortresses is in their immobility Once built they remain, and when war comes may not be in the right place Their position and extent are accurately known They rapidly fall out of date and are expensive and difficult to renew Apart from the expense involved, their reconstruction is a heavy feat of engineering, and not only takes time but frequently renders them useless for the period of the repairs In 1914 four of the principal works of Belfort were out of action, as they were being rebuilt New weapons for their destruction are rapidly invented and made Manonvillers, Liége, Namur and Modlin (Nowo-Georgiewsk) were destroyed with ease and rapidity Reliance based on the security afforded by fortresses may be a delusion Of the three great entrenched camps of Antwerp, Paris and Bucharest, designed as a refuge for the Government and army, not one performed its rôle Antwerp, on which much money had been expended, and considered by the Belgian nation as up to date, was given up by the field army and Government as soon as it became a question of withstanding a siege or continuing the war in the open Bucharest was surrendered as the result of a battle in the foreground, while Paris, though valuable as a pivot of manoeuvre, was evacuated by the Government Field defences, by their concealment, dispersion and facility for rapid renewal, are just as effective for defence as permanent fortification It was not the permanent forts of Verdun and Przmysl but the trench lines of the advanced position and intervals that stopped the enemy At Verdun the important tactical position of Mort Homme, defended by nothing but field defences, held out against the heaviest bombardments and attacks for six weeks, and caused the attackers terrible casualties The expenditure is undoubtedly great, and the money could be more profitably spent on the field army, as, if the field army is overwhelmed the fortresses must fall

Conclusions Drawn from the War of 1914–18.—It is evident that fortress areas, even when not attacked, fully justified their existence, but ring fortresses are obsolete It was not Verdun the fortress, but Verdun as a solid bastion of the battle line, that resisted all assaults The immense perimeter, now necessary to protect vital spots against long range guns, requires a large garrison, and for the ammunition and supply of this garrison for any length of time, railway communication must be kept open There are, however, rare occasions when for political reasons it may be necessary to hold a ring fortress for a limited time In the northern salient of Poland it is conceivable that the Poles, for political reasons alone, might wish to retain command of Vilna, while withdrawing from the remainder of the salient until their field army was ready to advance Fortress areas equipped with concrete and armoured forts are expensive and slow to build, if they fail to gain the time they were calculated to gain, or require for their defence more men than the enemy would require to mask or neutralize them, they have been built in vain

The value of field defences is undoubtedly very great They can be rapidly made in accordance with the latest tactical ideas and sited in positions found most suitable at the time With well sited machine guns, anti-tank guns and obstacles, covered by the fire of artillery (itself protected by mobility and concealment) positions have considerable power of resistance But it must be remembered that in 1918 when attacked by tanks and unlimited artillery ammunition, even the strongest trench lines often failed to stop an attack After the declaration of war, time may not be available to prepare them. There are occasions when material defensive preparations in peace time will have to be made and areas held for military, political or industrial reasons. Munitions play so

vital a part in modern war that the retention of certain areas of manufacture or supply may be essential In other places, where for purely military reasons it might be wiser to withdraw and demolish the communications, public opinion may insist on a forward position being held Again, the effect of the systematic destruction of industrial areas by an invader is now so great, that victory even cannot efface all trace of his presence Every effort will therefore be made to fight on the enemy's ground But to protect areas until the effect of the offensive is felt and to economize men so that the striking force is a maximum, some form of permanent fortification built in peace time, will at times and in certain places be required Expense is a governing factor and new weapons and material will affect its form

New Weapons and Material.—Of the recent innovations in weapons and material, gas and ferro-concrete have added strength to the defence By means of gas inundations and gas shell bombardments, the favourable lines of advance can be denied to the attackers, while the defenders, in gas-proof works supplied with pure air, are immune The adoption of ferro-concrete for defence works adds considerably to their resistance to shell fire Four feet of ferro-concrete is proof against 6in shell and 6ft will withstand bombardment by shells up to 15in To resist overturning, however, the concrete must be used in large masses When made with quick hardening aluminous cement, ferro-concrete works can be taken into use 48 hours after completion Tanks and aircraft on the other hand, by their mobility and capacity for surprise attack, have added to the difficulties of the defence Cross-country armoured vehicles can attack rapidly over long distances and over any ordinary country except mountains, marshes and thick woods They can cross wire entanglements and require special obstacles to stop them, so that land mines, vertical faced ditches and ferro-concrete blockhouses containing anti-tank guns, will be required for the defence Aircraft compel the defenders to conceal and disperse defences to a far greater degree than formerly, and cover has to be provided against aerial bombs, which at present weigh up to 2,000 lb The fire of super-heavy artillery, directed by air observation from railway or semi-mobile mountings, causes more damage to the fixed defences of the defender than to the attack, while by sound-ranging and flash-spotting methods the defender's guns, if in protected battery positions, and therefore limited in number, can be more easily located than those of the attacker

The devastation of areas and complete destruction of communications is a powerful weapon of defence This can seldom be completely carried out in industrial areas, but in less developed countries or where communications or water supplies are restricted, thorough and complete demolition will cause a modern army considerable delay The thorough demolition of a tunnel, especially if supplemented by the use of delay action mines, will take months to repair, and the delay caused may be greater than that effected by a barrier fort In 1918 the destruction of the bridges, roads and railways by the retreating German armies often delayed the Allies more than their resistance, and had the communications, in the area between Maubeuge and the Ardennes in 1914, been totally destroyed, the effect would have been far-reaching

Future Form of Permanent Fortification.—In mountainous countries or areas where communications are limited, barrier forts, coupled with the destruction of roads and railways, will be used But generally fortification will take the form of zones of defence, without large permanent works Where the flanks can be made secure, as with the Chatalja lines of Constantinople, or the Viborg isthmus of Finland, between Lake Ladoga and the Gulf, a fortified zone will have great strength In other cases extensive zones will be used as pivots of manoeuvre, and as protected areas for munitions, aerodromes, centres of communication, etc , safe against attack by mechanized forces Within these zones the fortifications will not take the form of elaborate forts, but will consist of dispersed and concealed tank proof localities, with the intervals between them well covered by obstacles and the fire of all arms. The amount of material preparation made in peace time, will vary according to the degree of readiness required, but complete and detailed plans and schemes of defence will be made out and large scale maps prepared Arrangements will be made for communications and depots of material so that work can be carried out at short notice, and for the defence schemes to be revised periodically and brought up to date, to keep pace with modern requirements When it is decided that for military, economical or political reasons, some degree of permanent fortification in peace time is necessary, the limitation of military expenditure will control the amount that can be carried out Within these limits the following will be considered

(*a*) The provision of an obstacle against a "coup de main" carried out by cross-country armoured vehicles Waterways and inundations such as those of Fortress Holland or the Yser afford protection, while judicious afforestation would limit the lines of approach

(*b*) Arrangements for air defence, gun and searchlight emplacements, telephonic communication, and sound-location installations

(*c*) The provision of observation posts, command posts, machine and anti-tank gun positions—concealed, dispersed, protected by ferro-concrete or armour and connected by buried telephone cables

(*d*) Afforestation to give cover from aeroplane observation, and the control of building and planting so as to keep clear the field of fire or view

(*e*) Increase of road, rail and tramway communications

(*f*) Landing grounds for aircraft, provided with sunken sites for hangars to minimize the lateral effect of air bombs

(*g*) The selection of battery positions, organization of infantry tank proof localities, provision of obstacles, shell-proof cover in ferro-concrete shelters or deep dugouts, and subways Arrangements for gas proofing and the supply of pure air and electric lighting of all works, etc

Whatever the form or degree of fortification adopted may be, one can seldom rely on the theory of complete protection, or say, like Pétain at Verdun, "Ils ne passeront pas" To gain time and economize force are the objects of fortification, and the essence of defence lies in organization, concealment, observation, communication and the stout hearts of well-armed men

(E H K)

THE ATTACK OF FORTRESSES

In considering the history of siegecraft since the introduction of gunpowder, there are three main lines of development to follow, viz , the gradually increasing power of artillery, the systematizing of the works of attack and in recent times the change that has been brought about by the effect of modern small-arm fire

Cannon appear to have been first used in sieges as mortars, to destroy hoardings by throwing round stones and barrels of burning composition Early in the 15th century we find cannon throwing metal balls, not only against hoardings and battlements, but also to breach the bases of the walls It was only possible to work the guns very slowly, and archers or crossbowmen were needed in support of them, to drive the defenders from the crenellations or loopholes of the battlements At that period the artillery was used in place of the mediaeval siege engines and in much the same manner The guns of the defence were inaccurate and incapable of adequate depression so that the besieger could place his guns close to the walls, with only the protection of a few large gabions filled with earth, set up on the ground on either side of the muzzle

In the course of the 15th century the power of artillery was largely increased, so that walls and gates were destroyed by it in an astonishingly short time Three results shortly followed. The guns of the defence having gained equally in effectiveness, greater protection was needed for the attack batteries, bastions and outworks were introduced to keep the besieger at a distance from the inner walls, and the walls were sunk in ditches so that they could only be breached by batteries placed on the edge of the glacis Early in the 16th century fortresses were being remodelled on these lines, and the difficulties of the attack were at once increased The tendency of the assailants was still to make for the curtain, which had always been considered the weak point, but the besiegers now found that they had to bring their guns right up to the edge of the ditch before they could make a breach, and

in doing so had to pass over ground which was covered by the converging fire from the faces of the bastions Towards the end of the century the attack of the curtain was still more delayed and the cross-fire over the ground in front increased by the introduction of ravelins

Siegecraft Before Vauban.—Gradually the whole problem of siege work centred round the artillery The besiegers found that they had first to bring up enough guns to overpower those of the defence, then to advance their guns to positions from which they could breach the walls, and throughout these operations to protect them against sorties Breaches once made, the assault could follow on the old lines The natural solution of the difficulty of approach to the battery positions was the use of trenches. The Turks were the first to make systematic use of them, having probably inherited the idea from the Eastern empire The soldiers of Western Europe, however, strongly disliked digging, and the difficulty was dealt with in a manner reminiscent of the feudal ages, by impressing large bodies of peasantry as workmen whenever a siege was in contemplation Through the 16th and most of the 17th century, therefore, we find the attack being conducted by means of trenches leading to the batteries, and supported by redoubts often called "places of arms" also made by trench work During this period the result of a siege was always doubtful Both trenches and batteries were arranged more or less at haphazard without any definite plan, and naturally it often happened that offensive action by the besieged against the trenches would disorder the attack and at times delay it indefinitely

Another weak point about the attack was that after the escarp walls had been strengthened to resist artillery fire as has been described, there was no clear idea as to how they should be breached The usual process was merely an indiscriminate pounding from batteries established on the crest of the glacis Thus there were cases of sieges being abandoned after they had been carried as far as the attempt to breach It is in no way strange that this want of method should have characterized the attack for two centuries after artillery had begun to assert its power At the outset many new ideas had to be assimilated Guns were gradually growing in power, sieges were conducted under all sorts of conditions, sometimes against mediaeval castles, sometimes against various and widely differing examples of the new fortification, and the military systems of the time were not favourable to the evolution of method It is the special feature of Vauban's practical genius for siege warfare that he introduced order into this chaos and made the issue of a siege, under normal conditions, a mere matter of time, usually a very short time

Vauban's Teaching.—The whole of Vauban's teaching and practice cannot be condensed into the limits of this article, but special reference must be made to several points The most important of these is his general arrangement of the attack The ultimate object of the attack works was to make a breach for the assaulting columns To do this it was necessary to establish breaching batteries on the crest of the glacis, and before this could be done it was necessary to overpower the enemy's artillery In Vauban's day the effective range of guns was 600 to 700 yards The first object of the attack, therefore, after the preliminary operations of investment, etc , had been completed, was to establish batteries within 600 or 700yd of the place, to counter-batter or enfilade all the faces bearing on the front of attack, and to protect these batteries against sorties After the artillery of the defences had been subdued—if it could not be absolutely silenced —it was necessary to push trenches to the front so that guns might be conveyed to the breaching positions and emplaced there in batteries Throughout these processes it was necessary to protect the working parties and the batteries against sorties

For this purpose Vauban devised the *Places d'armes* or *lignes parallèles* He tells us that they were first used in 1673 at the siege of Maestricht, where he conducted the attack, and which was captured in 13 days after the opening of the trenches The object of these parallels was to provide successive positions for the guard of the trenches, where they could be at hand to repel sorties The latter were most commonly directed against the trenches and batteries, to destroy them and drive out the working parties The most vulnerable points were the heads of the approach trenches It was necessary, therefore, that the guard of the trenches should be in a position to reach the heads of the approaches more quickly than the besieged could do so from the covered way This was provided for as follows The first parallel was usually established at about 600yd from the place, this being considered the limiting range of action of a sortie The

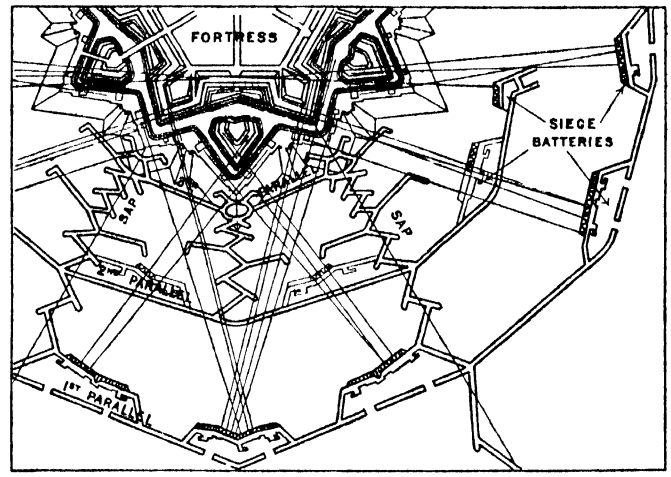


FIG 12.—REGULAR ATTACK ON A FORTRESS (VAUBAN S SYSTEM)

parallel was a trench 12 to 15ft wide and 3ft deep, the excavated earth being thrown forward to make a parapet three or four feet high In front of the first parallel and close to it were placed the batteries of the "first artillery position"

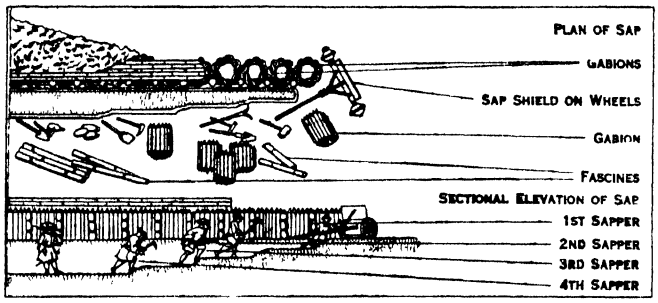
While these batteries were engaged in silencing the enemy's artillery, for which purpose most of them were placed in prolongation of the faces of the fortress so as to enfilade them, the "approach trenches" were being pushed forward The normal sector of attack included a couple of bastions and the ravelin between, with such faces of the fortress as could support them, and the approach trenches (usually three sets) were directed on the capitals of the bastions and ravelin, advancing in a zigzag so arranged that the prolongations of the trenches always fell clear of the fortress and could not be enfiladed

Fig 12, taken from Vauban's *Attack and Defence of Places*, shows clearly the arrangement of trenches and batteries

After the approach trenches had been carried forward nearly half-way to the most advanced points of the covered way, the "second parallel" was constructed, and again the approach trenches were pushed forward Midway between the second parallel and the covered way, short branches called *demi-parallels* were thrown out to either flank of the attacks, and finally at the foot of the glacis came the third parallel Thus there was always a secure position for a sufficient guard of the trenches Upon an alarm the working parties could fall back and the guard would advance Trenches were either made by *common trenchwork*, *flying trenchwork* or *sap*. In the first two a considerable length of trench was excavated at one time by a large working party extended along the trench flying trenchwork (formerly known as flying sap) being distinguished from common trenchwork by the use of gabions, by the help of which protection could be more quickly obtained. Both these kinds of trenchwork were commenced at night, the position of the trench having been previously marked out by tape The "tasks" or quantities of earth to be excavated by each man were so calculated that by daybreak the trench would afford a fair amount of cover Flying trenchwork was generally used for the second parallel and its approaches, and as far beyond it as possible In proportion as the attack drew nearer to the covered way, the fire of the defenders' small arms and surviving artillery naturally grew more effective, and it became necessary before reaching the third parallel to have recourse to sap

Sapping required trained men. It consisted in gradually pushing forward the end of a narrow trench in the desired direction. At the sap-head was a squad of sappers The leading man

excavated a trench one foot six inches wide and deep To protect the head of the trench he had a shield on wheels, under cover of which he placed the gabions in position one after another as the sap-head progressed. Other men following strengthened the parapet with fascines, and increased the trench to a depth of three feet, and a width of two feet six inches to three feet Fig 13, taken from Vauban's treatise on the attack, shows the process



FROM VAUBAN 'LA CONDUITE DES SIEGES

FIG 13.—THE PROCESS OF SAPPING IN THE 17TH CENTURY

clearly The sap could then be widened to ordinary trench dimensions by infantry working parties

As the work at the sap-head was very dangerous, Vauban encouraged his sappers by paying them on the spot at piecework rates, which increased rapidly in proportion to the risk He reckoned on a rate of progress for an ordinary sap of about 50yd in 24 hours.

The nearer the approaches drew to the covered way, the more oblique became the zigzags, so that little forward progress was made in proportion to the length of the trench The approaches were then carried straight to the front, by means of the "double sap," which consisted of two single saps worked together with a parapet on each side To protect these from being enfiladed from the front, traverses had to be left at intervals

From the third parallel the attack was pushed forward up the glacis by means of the double sap It was then pushed right and left along the glacis, a little distance from the crest of the covered way. This was called "crowning" the covered way, and on the position thus gained breaching batteries were established in full view of the escarp While the escarp was being breached, if it was intended to use a wide systematic attack, a mine gallery (*see* "Military Mining" below) was driven under the covered way and an opening made through the counter-scarp into the ditch The sap was then pushed across the ditch, and if necessary up to the breach, the defenders' resistance being kept under by musketry and artillery fire from the covered way The ravelin and bastions were thus captured successively

Vauban showed how to breach the escarp with the least expenditure of ammunition This was done by making, with successive shots placed close together (as was feasible even then at such short range) horizontal and vertical cuts through the revetment wall. The portion of revetment enclosed by the cuts being thus detached from support was overturned by the pressure of the earth from the rampart. Ricochet fire was also the invention of Vauban He showed how, in enfilading the face of a work, by using greatly reduced charges a shot could be made to drop over the crest of the parapet and skim along the terreplein, dismounting guns and killing men as it went.

18th Century Principles of Defence.—The constant success of Vauban must be ascribed to method and thorough organization. There was a deadly certainty about his system that gave rise to the saying "Place assiégée, place prise" He left nothing to chance, and preferred as a rule the slow and certain progress of saps across the ditch and up the breach to the loss and delay that might follow an unsuccessful assault His contemporary and nearest rival Coehoorn tried to shorten sieges by heavy artillery fire and attacks across the open; but in the long run his sieges were slower than Vauban's The theory of defence at this time appeared to be that as it was impossible to arrest the now methodical and protected progress of the besiegers' trenches, no real resistance was possible until after they had reached the covered way, and this idea is at the root of the extraordinary complications of outworks and multiplied lines of ramparts that characterized the "systems" of this period. No doubt if a successor to Vauban could have brought the same genius to bear on the actual defence of places as he did on the attack, he would have discovered that the essence of successful defence lay in offensive action outside the body of the place, viz., with trench against trench Fighting was so much regulated by the laws and customs of war that men thought nothing of giving up a place if, according to accepted opinion, the enemy had advanced so far that they could no longer hope to defend it successfully This is the real reason for the feeble resistance so often made by fortresses in the 17th and 18th centuries, which has been attributed to inherent weakness in fortifications Custom exacted that a commandant should not give up a place until there was an open breach or, perhaps, until he had stood at least one assault Even Napoleon recognized this limitation of the powers of defence when in the later years of his reign he was trying to impress upon his governors the importance of their charge The limitation was unnecessary, for history at that time could have afforded plenty of instances of places that had been successfully defended for many months after breaches were opened, and assault after assault repulsed on the same breach But the same soldiers of the 17th and 18th centuries who had created this artificial condition of affairs, established it by making it an understood thing that a garrison which surrendered without giving too much trouble after a breach had been opened should have honourable consideration, while if they put the besiegers to the pains of storming the breach, they were liable to be put to the sword

Peninsular War.—It has been necessary to dwell at some length on the siegecraft of Vauban and his time, not merely for its historical interest, but because the system he introduced was practically unaltered until the end of the 19th century. The sieges of the Peninsular War were conducted on his lines; so was that of Antwerp in 1830, and as far as the disposition of siege trenches was concerned, the same system remained in the Crimea, the Franco-German War and the Russo-Turkish War The sieges in the Napoleonic wars were few, except in the Iberian peninsula These last differed from those of the Vauban period and the 18th century in this, that instead of being deliberately undertaken with ample means, against fortresses that answered to the requirements of the time, they were attempted with inadequate forces and materials, against out-of-date works The fortresses that Wellington besieged in Spain had rudimentary outworks, and escarps that could be seen and breached from a distance At that time, though the power of small arms had increased very slightly since the last century, there had been a distinct improvement in artillery, so that it was possible to breach a visible revetment at ranges from 500 to 1,000 yards Wellington was very badly off for engineers, siege artillery and material Trench works could only be carried out on a small scale and slowly Time being usually of great importance, as in the first two sieges of Badajoz, his technical advisers endeavoured to shorten sieges by breaching the escarp from a distance—a new departure—and launching assaults from trenches that had not reached the covered way Under these circumstances the direct attacks on breaches failed several times, with great loss of life

Crimea.—During the long peace that followed the Napoleonic wars, one advance was made in siegecraft In England in 1824 successful experiments were carried out in breaching an unseen wall by curved or indirect fire from howitzers At Antwerp in 1830 the increasing power and range of artillery, and especially of howitzers, were used for bombarding purposes, the breaches there being mostly made by mines Then came one of the world's great sieges; that of Sevastopol in 1854–55 (*see* CRIMEAN WAR) The outstanding lesson of Sevastopol is the value of an active defence; of going out to meet the besieger, with counter-trench and counter-mine This lesson increased in value in proportion to the increased power of the rifle

In comparing the resistance made behind the earthworks of Sevastopol with the recorded defences of permanent works, it is

essential to remember that the conditions there were abnormal

The siege corps was not sufficiently strong to invest the fortress completely, in fact the Russians came nearer to investing the Allies, the Russians had the preponderance in guns almost throughout; the Russian force in and about Sevastopol was numerically superior to that of the Allies We must add to this that Todleben had been able to get rid of most of his civilian population, and those who remained were chiefly dockyard workmen, able to give most valuable assistance on the defence works The circumstances were therefore exceptionally favourable to an active defence The weak point about the extemporized earthworks, which eventually led to the fall of the place, was the want of good bomb-proof cover near the parapets

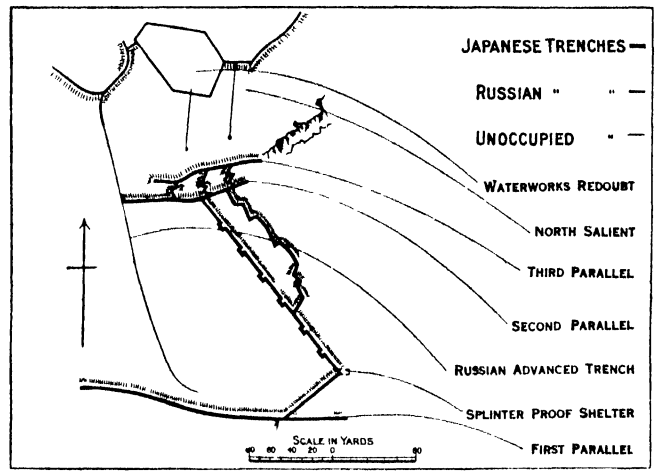
Franco-German War.—The Franco-German War of 1870 produced no great novelty The Germans were not anxious to undertake siege operations when it could be avoided In several cases minor fortresses surrendered after a slight bombardment In others, after the bombardment failed, the Germans contented themselves with establishing a blockade or detaching a small observing force By far the most interesting siege was that of Belfort (*q v*) Here Col Denfert-Rochereau employed the active defence so successfully by extemporizing detached redoubts and fortifying outlying villages, that he obliged the besiegers (who, however, were a small force at first) to take up an investing line 25m long, and succeeded in holding the village of Danjoutin, 2,000yd in advance of the enceinte, for two months after the siege began He also used indirect fire, withdrawing guns from the ramparts and placing them in the ditches, in the open spaces of the town, etc At Paris the French found great advantage in placing batteries in inconspicuous positions outside the forts The guns in the Paris forts, which were handicapped by being fired through embrasures with conspicuous parapets and the bad shooting of the gunners, were easily silenced At Strasbourg indirect fire against escarps was used The escarp of Lunette 53 was successfully breached by this method, 1,000 rounds from 60-pounder guns sufficed to make a breach 30yd wide

MODERN SIEGE WARFARE

The sieges of Belfort in 1871 and of Plevna in 1877 had shown the great strength of extemporized field works and the value of an active defence, but regular siege methods had altered little since the days of Vauban In 1880, however, the invention of high explosive shell introduced an important factor into the methods of attack By the close of the 19th century the range of guns, and the power of their projectiles, had so increased that it was thought that by a heavy bombardment resistance would be paralysed, and the way made open for an attack delivered by great numbers and provided with special appliances for crossing obstacles Imbued with these ideas, the Japanese in 1904 assaulted Port Arthur In spite of the fire of the new 11in siege howitzers, which were used in the second and third attacks, all three assaults failed It was found impossible to rush even semi-permanent works, or well prepared field defences, and a return had to be made to the old forms of methodical attack by means of parallels and saps and mines

Sapping.—Provided the primary condition of a sap, that is advancing the trench towards the enemy without being enfiladed, is fulfilled, a sap may take any form There are various methods of approach A blinded or "Russian" sap may also be used In this case the sap consists of a tunnel with about two feet of earth left above it, or it is covered over with timber and earth Saps of this description were used by the British in the opening stages of the Battle of the Somme on July 1, 1916, and were subsequently opened up to form communication trenches to the German lines As the digging of deep saps from the sap head is a very slow form of progression, whenever possible men are sent out under cover of darkness to build in prolongation of the sap a short length of parapet of sandbags or steel shields under cover of which a length of trench can be excavated

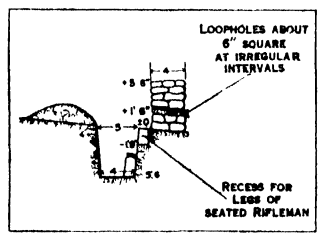
A typical example of the methods of approach by sap and the formation of parallels is shown in fig 14 which illustrates the Japanese attack on the waterworks redoubt of Port Arthur The first parallel was formed about 300yd from the redoubt by extending a portion of an advanced Russian trench to the right and left Taking advantage of the ground, the first sap was commenced right handed for 65yd A left turn was then made to bring the sap just clear of the left of the redoubt This portion was traversed to prevent the sap from being enfiladed from a Russian trench to the east About 100yd from the redoubt, a second parallel was formed, and, from here, three zigzag saps were driven forward, their heads being joined to form the third parallel within assaulting distance of the redoubt



FROM COMMITTEE OF IMPERIAL DEFENCE, OFFICIAL HISTORY OF THE RUSSO JAPANESE WAR (CONTROLLER OF H M STATIONERY OFFICE)

FIG 14.—PLAN OF JAPANESE SAPS AGAINST THE WATERWORKS REDOUBT OF PORT ARTHUR

Passage of Obstacles and Siege Appliances.—Where wire obstacles still remained between the last parallel and the defenders' position, their passage presented considerable difficulties Efforts were made at night to roll forward V-shaped steel shields, under cover of which men could use wire cutters to clear a path This method was very slow and hazardous, and, later, charges of high explosive were pushed under the wire and detonated to blast a lane through the obstacle To enable men to assault across entanglements which could not be cleared, planks, ladders, mattresses, etc, were carried forward and thrown over the wire to form a means of crossing The close and hand-to-hand fighting that resulted from this step by step method of approach, revived the use of hand grenades and trench mortars The Japanese hand grenades usually consisted of metal cylinders eight to 10in long and one and a half inches in diameter, filled with high explosive and fired by means of a short length of safety fuse The mortars were of wood bound with wire, five inches in internal diameter, and firing a 4½ lb canister of high explosive to a maximum distance of 400 yards. Seven-inch mortars were also used which fired a 14½ lb canister up to 150 yards



FROM COMMITTEE OF IMPERIAL DEFENCE, "OFFICIAL HISTORY OF THE RUSSO JAPANESE WAR (CONTROLLER OF H M STATIONERY OFFICE)

FIG 15.—PORT ARTHUR 203 METRE HILL, JAPANESE OBLIQUE APPROACH TRENCH

World War.—Except in a very few instances, little attention appears to have been paid by military opinion to the lessons of the siege of Port Arthur It was generally thought that modern European wars would be short and sharp and that no protracted siege operations would take place The rapid fall of the fortresses of Liége and Namur confirmed these opinions, and the essential siege nature of the trench warfare of 1914–15 was neither foreseen nor, at first, realized No preparation had been made for extensive siege work, and siege stores were entirely lacking. Timber for the revetment of saps and trenches, barbed wire and posts for their local protection, mining stores, light railway material, etc., were inadequate Hand grenades had to be made out of jam tins, and wood and wire bound trench mortars were again improvised The

umber of technical troops was soon found to be insufficient In ie British divisions the engineer companies were increased from wo to three and a pioneer battalion added Numerous special en- ineer units such as mining companies were also formed But it was the lack of ammunition and heavy artillery, for counter battery work and the destruction of hostile works and defences, that was most severely felt As this was gradually remedied the weight of heavy artillery fire, aided by air photography and directed by air observation and sound location, greatly increased the power of the attacker to destroy the defender's works and guns But the problem of destroying and crossing wire entanglements defended by machine guns remained unsolved The introduction of various forms of efficient trench mortar, and the "106" or instantaneous fuse, enabled wire that could be seen to be destroyed, but in extended areas and where hidden from direct observation, wire and M G 's formed the chief obstacles Smoke was found a useful adjunct for blinding machine guns, and "Bangalore torpedoes," or long tubes of explosives, thrust under the wire entanglements and detonated, were used to form lanes through the obstacles Great progress was also made in mining methods and the efficiency of close combat weapons improved Hand grenades and trench mortars were standardized and manufactured in large quantities Stokes mortars, handy and portable, which enabled a rapid rate of fire to be turned, from a short distance, on to a work, were invented, and a new and deadly, though in the long run not a very efficient, close range weapon, the flame thrower, which could throw a flaming jet 80 to 100yd , was introduced

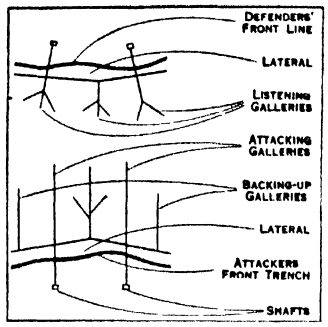


FIG 16 —DIAGRAM SHOWING MINE SYSTEM IN ATTACK AND DEFENSE

But up to 1917 artillery remained the chief weapon of the besiegers' armoury The thoroughly prepared attack on the very strong Messines Ridge position in June 1917 may be said to be the culminating act of the regular siege operations In addition to the 20 mines containing a million pounds of explosives which were detonated under the German lines, three and a half million rounds of artillery ammunition were fired during the ten days' bombardment prior to the assault The increase in depth of defensive positions, the dispersion of machine guns in concrete pill-boxes, and the introduction of tanks, put an end to siege warfare methods of attack The conduct of a siege places a very heavy strain on the administration and transportation services To enable men to live, without undue casualties from sickness, in the forward trenches, careful and detailed arrangements have to be made The provision of hot food, warm clothing, drying rooms, rest billets, baths and laundries behind the lines, the extension and improvement of communications to carry the vast quantities of ammunition and engineer stores of every kind, requires an elaborate organization, and without this organization the pressure required for a modern siege cannot be maintained. As an example of the weights that have to be dealt with, one British army in the assault of the Hindenburg Line in Sept 1918 expended 12,500 tons of ammunition in one day

(E H K)

MILITARY MINING

Mining is one of the oldest forms of siege warfare The blowing of the trumpets and circumambulation were probably done to cover the final mining of the walls of Jericho But it was not until 1487 that gunpowder was used When Shakespeare makes Fluellen say at Henry V 's siege of Harfleur "th' athversary is dight himself four yards under the counter-mines, I think 'a will plow up all . . ," he is anticipating that development of siegecraft by nearly 100 years

When the attacker, owing to casualty fears, does not care to advance above ground by means of saps and trenches he may resort to underground galleries Large charges exploded in these galleries either destroy the works attacked, or they can be made to form a series of craters, which, occupied by infantry and joined together by trenches, form a new parallel. For this offensive mining, geological conditions must be favourable, and surprise and speed are essential. Successful mine attacks, therefore, cannot be made in water-logged strata nor in hard rock As a defence against this form of attack countermines are used In olden days the object was to break into the attacker's galleries and capture them by hand-to-hand fighting Now, charges sufficient to destroy them are exploded near by In order to locate the advancing galleries listening is of the first importance

A protective system therefore consists of a series of listening galleries, usually of the herring-bone type, spaced so that the enemy are unable to drive a gallery between them without being heard The distance apart depends on the range of hearing in the soil In average chalk the naked ear can detect "picking" at a distance of 150ft , but in clay only up to 50ft The attacker having been heard, it is necessary either to destroy his galleries or to make him blow a mine prematurely To do this the defender prolongs his listening galleries in the direction of the attack and at a suitable distance fires a charge But in order not to form a crater, which would afford cover to the attacking infantry, the charge is so calculated that the explosion while destroying the enemy's gallery, will not break the surface of the ground This is known as a "camouflet" (*See* fig 16)

The action of a mine may be great enough to break the surface of the ground The effect is greatest along O A the Line of Least Resistance (L L R) The radius of the crater formed is A B The ratio $\frac{A B}{O A.}$ or $\frac{\text{Radius of crater}}{L L R}$ is the index of the mine A mine of index 1 is known as a "common mine " (Fig 17) Those of larger index "overcharged" and those of smaller index "undercharged mines " Craters are also known as one-lined, two-lined, three-lined, etc , according to whether their diameter is equal or twice or three times the L L R Thus a common mine forms a two-lined crater The charge required to form a crater of given radius depends on the nature of the soil, the explosive and depth it is laid where D = the depth of the charge in feet, N = the index of the mine $\frac{(\text{Radius of crater})}{L L R}$ S = soil factor, E = explosive factor The charge in lbs. $= \frac{S \times D}{10 \times E} (\sqrt{1+N^2-0.41})^3$.

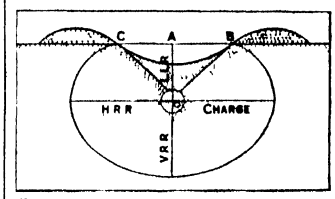


FIG 17 —DIAGRAM SHOWING THE ACTION OF A COMMON MINE

Construction.—Mine galleries are started from the bottom of vertical shafts or inclines, and to prevent collapse of the earth they are lined with timber or iron sheeting Owing to the volume of the soil excavated and to the difficulty of carrying and concealing it, the galleries are of small dimensions: 4ft 10in by 2ft 9in is a normal size, while 4ft 3in by 2ft 3in is the minimum convenient section. Alignment and direction are maintained with the help of the miner's dial, and levels with the Dumpy level

The method of excavation has altered very little since ancient times The smallness of the galleries and the necessity for silence makes the employment of machinery difficult; although various types have been tried, the results have been disappointing, and reliance is still placed on the miner with pick, shovel and grafting tool In clay or sand, "kicking" is a rapid and silent means of progress. The miner, lying with his back supported by a board fixed across the gallery, pushes his grafting tool (or push pick) horizontally into the soil The rate of advance varies with the soil and the facilities for removing the excavated soil. 15ft in 24 hours is an average rate, while 30ft. has been reached in blue clay Ventilation is important. When two entrances can be provided to a gallery, a current of air will always flow along it, but for mine heads forced ventilation by mechanical air-pumps and fans is necessary. Lighting is now provided by electricity and portable electric torches

Loading and Firing.—Of the various high explosives used, ammonal—which is three times more powerful than black powder

—has been found the most satisfactory. The charge having been packed in the mine chamber, the whole gallery is tamped with sandbags well bonded together for a distance equal to one and a half times the radius of rupture. The tamping is improved by making two right angle bends in the gallery leading to the chamber, or air spaces may be left between lengths of tamping The charge is fired by electricity with electric detonators, using alternative circuits in case of failure, or a slow and instantaneous fuse (Cordeau Detonant) may be used

Rescue and Listening Apparatus.—The presence of mine gas and carbon monoxide, which is colourless and odourless, necessitates special precautions Canaries and mice, being more easily affected than man, are used to give warning of poisonous gases For rescue work in a contaminated mine, Proto and Salvus self-contained breathing sets with portable oxygen cylinders are used, and mine stretchers of matting enable a man to be dragged along a gallery. Listening is of such vital importance that every effort is made to aid the human ear When immersed in a basin of water placed on the ground, the ear can detect sound otherwise unheard Of modern listening apparatus two types are used—the geophone, which works on the principle of the stethoscope and the seismophone, which is an electrical detector With two geophones the direction of the source of sound can be obtained, while with seismophones (which do not give direction) placed in various galleries and connected to the switchboard of a central listening chamber, one operator can listen over a wide front

Examples of Mining.—At Frederick the Great s siege of Schweidnitz in 1762 (mentioned in Carlyle's *Frederick the Great)* a mine of 5,400 lbs , 16ft below the surface, made a crater 42ft in radius Mining was extensively employed during the Crimean war At the siege of Sevastopol, over five miles of galleries were driven by the opposing armies, and the French alone used over 130,000 lbs of powder In the American Civil War an interesting mine was fired by the Federals in June 1864 at the siege of Petersburg The circumstances were all abnormal No military mines, mining tools or materials were available, and no one had any confidence in its success, except its originator, Lt -Col Pleasants, his regiment, which was recruited from a mining area, and Gen Burnside, the corps commander The opposing entrenchments were 130 yd apart. The mine gallery was started behind the Federal lines and driven a distance of 170yd until it came under a redoubt in the Confederate lines There two branches were made right and left, each about 38ft long, and in them eight mines aggregating 8,000 lb of powder were placed The first attempt to fire them failed, and an officer and a sergeant volunteered to enter the gallery to seek the cause of failure A defective splice in two lengths of fuse was thus discovered and repaired At the second attempt all the mines were successfully fired simultaneously and a crater 170ft. long by 60ft wide and 30ft deep was formed Several hundred men in the redoubt were blown up and mostly killed, but the assault which followed failed completely from want of organization Modern high explosives were first used during the Russo-Japanese War, where at the siege of Port Arthur in 1905 underground operations played an important part, and mines were used for the attack and defence of trenches

World War.—At the commencement of the World War in 1914, the power of the heavy howitzers, which had so rapidly destroyed the Belgian forts, appeared to indicate that for the reduction of fortresses, mining would be unnecessary It soon, however, became evident that with the advent of position warfare, and the difficulty of making any advance above ground in the face of machine guns and barbed wire, the attack of important localities by mining would be advantageous Further, the opposing lines approached each other so closely that a bombardment of the hostile front trenches could not be carried out by either side without damage to their own Mining was therefore resorted to increasingly Mines were effectively used in the opening stages of the battle of the Somme in 1916, and some brilliant mine attacks were carried out by the French It was, however, during the attack on the Messines Ridge in 1917 that mining reached its greatest achievement At 3:10 A.M on June 7, on a front of nine miles, and within an interval of 30secs. 20 mines containing 1,000,000 lbs of explosives, were detonated. The largest of them (at St Eloi) was 125ft. deep, took months to complete and contained 43 tons of ammonal, while the earth shake was clearly felt at Cassel 16m. away. The use of these great mines, the destructive effects of which could not be definitely foretold, was a matter of anxiety, but they were certainly successful. Ludendorff writes in his memoirs. "We should have succeeded in retaining the position but for the exceptionally powerful mines used by the British which paved the way for the attack The moral effect of these explosions was simply staggering"

With the introduction of tanks, offensive and consequently defensive mining declined It was seldom found to be worth the time, labour and materials expended and was only used as a last resort Exceptional circumstances will, however, arise when, for the possession of important and stubbornly contested localities, mining will again be used, and for underground protection against the increasing bombardment of artillery and bombing aircraft, subways and mined dugouts will be extensively required

(E H K)

FIELD FORTIFICATION

Field Fortifications, now more often spoken of as field defences, are those which are constructed at short notice, with the means locally available, usually when the enemy is near at hand Subject to the question of time, a very high degree of strength can be given to them if the military situation makes it worth while to expend sufficient labour A century or more ago, the dividing line between permanent and field fortification was rigidly drawn, as a high masonry escarp surmounted by a rampart was essential to a permanent fortress and these could naturally not be extemporized Works without masonry, in other ways made as strong as possible with deep ditches and heavy timbers, were known as *semi-permanent,* and were used for the defence of places which acquired strategic importance in the course of a war, but were not immediately threatened The term *field* fortification was reserved for works constructed of lighter materials, with parapets and ditches of only moderate development In modern fortification, if cupolas and deep revetted ditches were essential to permanent defences, the dividing line would be equally clear But actually the use of our present means of construction, in conjunction with the defensive power of modern fire-arms, makes it possible to extemporize in a very short time works having much of the resisting power of a permanent fortress Further, such works can be expanded from the smallest beginnings; and, if the site is not too exposed, in the presence of the enemy

Field fortification offers, as regards the actual constructions, a limited scope to the engineer, and a little consideration will show that its defensive possibilities were not greatly affected by the change from machine-thrown projectiles to those fired by rude

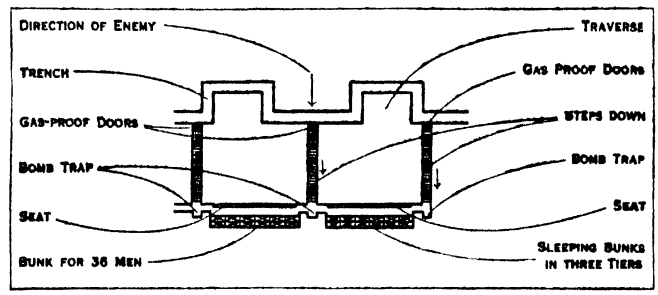


FIG 18.—DIAGRAM SHOWING CONSTRUCTION OF MINED DUG-OUTS

smooth-bore guns There is therefore nothing in the history of this branch of the subject that is worth tracing, from the earliest ages to about the end of the 18th century One or two points may be noticed The use of obstacles is probably one of the earliest measures of defence Long before missile weapons had acquired such an importance as to make it worth while to seek shelter from them it would obviously have been found desirable to have some means of checking the onrush of an enemy physically or numerically superior Hence the use by savage tribes, to this day, of pits, pointed stakes hidden in the grass, entanglements and similar ob-

stacles In this direction the ages have made no change, and the most highly civilized nations still use the same obstacles on occasion.

Another use of field defences common to all ages is the protection of camps at night, where small forces are operating against an enemy more numerous but inferior in arms and discipline In daylight such an enemy is not feared, but at night his numbers might be dangerous Hence the Roman practice of making each foot-soldier carry a couple of stakes for palisades, and the simple defence of a thorn zariba used by the British for their camps in the Sudan Palisades and trenches, abatis and sharpened stakes have always been used Except wire, there is practically no new material As to methods, the laagers of the Boers are preceded by the wagon-forts of the Hussites, and those no doubt by similar arrangements of British or Assyrian war chariots, and so in almost every direction it will be found that the expedient of to-day has had its forerunners in those of the countless yesterdays The only really marked change in the arrangements of field defences has been caused not by gunpowder but by quick-firing rifled weapons For that reason it is worth while to consider briefly what were the principles of field fortification at the end of the 18th century The field defences of the 19th century are transitional in character Based mainly on the old methods, they show only faint attempts at adaptation to new conditions, and it was not till quite the end of the century that the methods now accepted began to take shape The essential elements of fieldworks up to the time of the Peninsular War were *command* and *obstacle;* now they are *protection* and *concealment*

Old Type of Field Defences.—The command and obstacle were as necessary in the days of smooth-bore muskets and guns as in those of javelins and arrows When the enemy could get close up to a work without serious loss, and attack in close order, the defenders needed a really good obstacle in front of them Moreover, as they could not rely on their fire alone to repulse the attack, they needed a two-deep line, with reserves close at hand, to meet it with the "arme blanche" For this purpose a parapet seven or eight feet high, with a steep slope, perhaps palisaded, up which the attackers must climb after passing the obstacle, was excellent The defenders after firing their last volley could use their bayonets from the top of the parapet with the advantage of position The high parapet had also the advantage that the attackers could not tell what was going on inside the redoubt, and the defenders were sheltered from their fire as well as from view until the last moment

The strength of a fortified line in the 18th century depended principally on its redoubts Lines of shelter trenches had little power of defence at the time, unless they held practically as many men as would have sufficed to fight in the open Obstacles on the other hand had a greater value against the inelastic tactics of the time than they have now A good position therefore was one which offered good fire-positions for redoubts and plenty of facilities for creating obstacles Strong redoubts which could resist determined assaults; good obstacles in the intervals, guns in the redoubts to sweep the intervals, and troops in formed bodies kept in reserve for counter-strokes—these were the essentials in the days of the smooth-bore

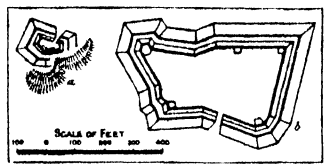


FIG 19 —TORRES VEDRAS WORKS, AN EXAMPLE OF 19TH CENTURY FIELD DEFENCES

Torres Vedras.—On irregular ground the first necessity was to fit the redoubt to the ground on which it stood, so as to sweep the whole of the foreground, and this was generally a sufficiently difficult matter without adding the complications of flanking defences Sir John Jones, speaking of the traces of the several works in the Torres Vedras lines, says.

"The redoubts (fig 19) were made of every capacity, from those limited by want of space on the ground and occupied by 50 men and two pieces of artillery, to those for 500 men and some six pieces of artillery, the importance of the object to be attained being the only guide in forming the dimensions. The profile of the several works varied on every face and flank, according to its liability to be attacked or cannonaded; the only general rule enforced being that all ditches should be at least 15ft wide at top and 10ft in depth, and the crest of the parapet have at least 5ft command over the crest of the counterscarp No parapet exceeded 10ft. in thickness, unless exposed to be severely cannonaded, and few more than 6 or 8ft ; and some on high knolls, where artillery could not by any possibility be brought against them, were made of stone

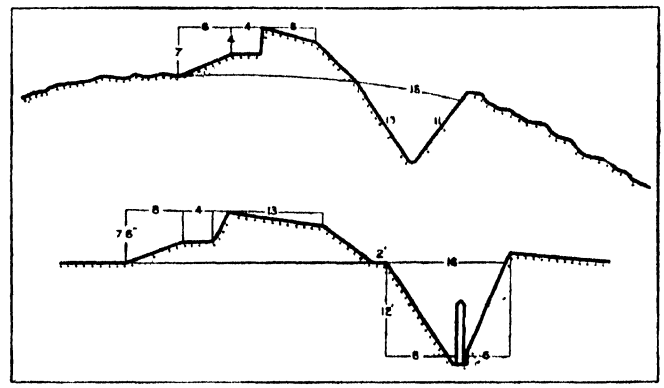


FIG 20 — SECTION THROUGH THE TORRES VEDRAS WORKS

or rubble less than 2ft in thickness, to gain more interior space, and allow full liberty for the use of the defenders' bayonets "

Fig 20 gives two typical sections of these works

The works of Torres Vedras have been chosen for illustration because they offer very good historical examples, and also because of the value of the critical remarks of Sir John Jones, who as a captain was the engineer in charge of their construction At the same time, it must be remembered that they differ from ordinary fieldworks in having an unusual degree of strength, plenty of time and civilian labour having been available for their construction In this respect they approximate more to semi-permanent works, the main reason why they did not receive under the circumstances a greater development of ditch and parapet being that in addition to the large number of works required, much labour was expended in abatis, inundations, scarping hill-sides and constructing roads

The keynote of the period was thus that the redoubts were the most important features of lines of defence, and that they combined physical obstacle and protection with good musketry and artillery positions The value of concealment was not ignored, but it was as a rule subordinated to other considerations

19th Century.—The basic methods remained unaltered until after the Crimean War In the American Civil War the power of the rifle began to assert itself, and gave greatly enhanced importance to any defences that could be hastily extemporized behind walls, hedges or any natural cover Plevna in 1877 taught a further lesson It proved the great resisting power of extemporized lines, but more than that, we begin to find new arrangements for protection against shell fire (*see* plans and sections in Green's *The Russian Army and its Campaign in Turkey*) The trace of the works and the sections of parapet and ditch suggest Torres Vedras, but a multiplication of interior traverses and splinter-proof shelters shows the necessity for a different class of protection The parapet was designed according to the old type for want of a better, the traverses and shelters were added later, to meet the necessities of the case

From 1877 to 1899 the efficiency of rifles and guns rapidly increased, and radically affected the nature of protection required and instilled the lesson of the adaptation of works to ground In the Boer War, and still more in the Russo-Japanese War, field defences not only exerted an increasingly important influence, but were themselves developed and modified until in the World War the technique of field fortification reached its height and assumed its present form Modifications since 1918 have been in the direction of simplicity of design and elasticity of organization (X)

PRINCIPLES OF MODERN FIELD DEFENCES

While the basic principle of hitting the enemy without being hit oneself remains unchanged, the increased efficiency of artillery and small arms and the introduction of tanks have considerably

affected the design of field fortification In early times command and an unclimbable obstacle were necessary, now observation, concealment and tank obstacles are required The defender by skilful use of the ground, reinforced by the artificial aid of field works, can hold out against a greatly superior enemy, but protection is required against tanks, rifle and machine gun fire Also, when time is available, against heavy high explosive shell, air

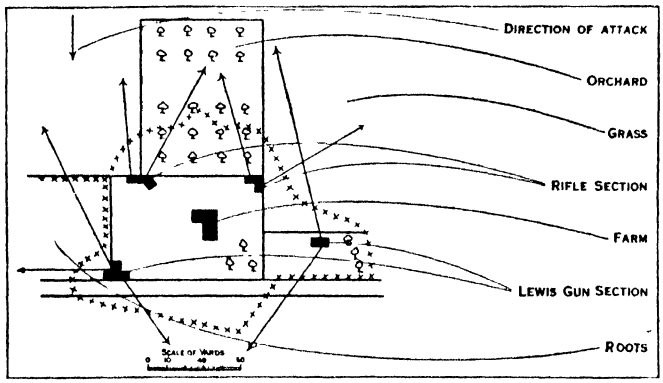


FIG 21 —PLAN OF DEFENDED LOCALITY FOR ONE PLATOON

bombs and gas Field fortification varies from "hasty" defences made on the battlefield to "deliberate" work on rear defences Machine guns anti-tank guns and artillery form the framework of a defensive position To use them to the best advantage, good observation is necessary, and as field defences seldom have sufficient strength to protect them against heavy shells, concealment is essential A continuous trench held throughout its length is a weak line lacking in strength and depth Important tactical localities, supporting one another and flanked by the fire of machine guns and artillery, are therefore held by complete infantry units These "defended localities" are sited where possible to be proof against tank attack They are organized as a system of "defended posts" consisting of short lengths of fire trench, dispersed in the best fire positions, and each capable of holding a section of infantry (seven men) *see* fig 21 In order to prevent these defended posts and localities from being easily recognized on aeroplane photographs, to provide inter-communication, and to afford the intermediate fire positions required in fog or darkness, they are later connected by trenches

Fire Trenches.—Fig 22 shows the normal section of a fire trench The thickness of the parapet is sufficient to stop rifle and machine-gun bullets, as well as shrapnel and shell splinters, but no attempt is made, as in the old days, to make it proof against shell fire To localize the effect of high explosive shells, *traverses* 15ft wide are left every 30ft and a low parapet of earth, known as the *parados,* is thrown up behind the trench To give increased

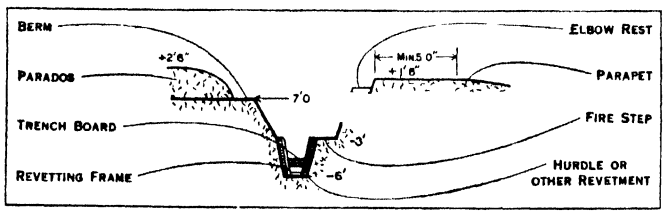


FIG 22 —SECTION OF A FIRE TRENCH

protection from shell fire and to facilitate concealment, deep narrow trenches were introduced These were satisfactorily used in the Boer War for temporary occupation in very firm soil They were also tried in the beginning of the war of 1914–18, but it was soon found that for inter-communication and to prevent the fire trench from being entirely closed up by shells falling near it, wider trenches were necessary However, short lengths of narrow trench, called shell slits, were found useful for cover during a sudden bombardment Prior to 1914 loopholes and overhead cover were provided, but under modern shell fire these were rapidly destroyed, and the débris hindered men from firing over the parapet Small and very carefully concealed loopholes for snipers and look out posts were therefore the only ones used

Revetment and Drainage.—Under the action of the weather, in normal soil the sides of the trench will not stand at a steep slope The trench must therefore either be widened at the top, at the expense of protection, and the slope lessened, or a revetment wall provided This consists of brushwood hurdles, corrugated iron, expanded metal, canvas and wire netting, sandbags, etc Corrugated iron when damaged by shell fire is difficult to dig out and replace, while canvas, whether in panels or sandbags, soon

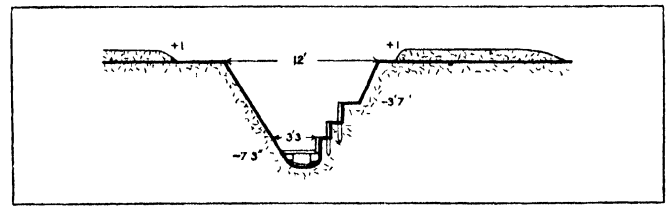


FIG 23 —TRENCH WITH WOODEN REVETTING SPACED 3 FT APART

rots The labour entailed in building the initial revetment and in its upkeep is so great that it is used as little as possible The section of the Hindenburg line (fig 24) is a good example of a trench with gentle slopes and revetted only at the fire step To enable trenches to be occupied in wet weather, and to prevent their collapse, good drainage is essential Fig 23 shows a trench with wooden revetting or "A" frames spaced three feet apart Trench boards are laid on the upper cross pieces and the bottom of the trench forms a drain Where the water level is close to the surface of the ground breastworks are used in place of trenches The time required to dig trenches naturally varies with the soil and distance marched, but 60cu ft in a four hour task may be considered as an average rate per man Investigations have been made at Chatham on the lines of the Industrial Fatigue Research Board to facilitate digging, and a simple drill formulated By attending to rhythm and working the shovel at the rate of 18 swings, alternatively with the pick at the rate of 28 strokes per

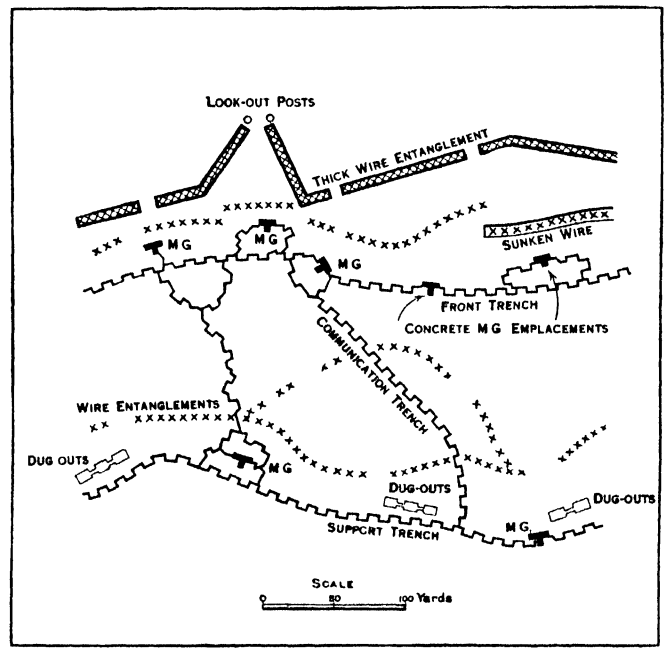


FIG 24 —DIAGRAM OF A TYPICAL SECTOR OF THE HINDENBURG LINE

minute, with rest pauses of two minutes in every ten, output is increased and fatigue lessened

Siting of Fire Trenches.—In order to secure the observation so essential for artillery, anti-tank and machine-gun fire, infantry trenches are sited in advance of the observation posts. Provided that artillery and machine-gun support can be arranged, the field of fire in front of these trenches need not be more than 150yd ; but where hasty or temporary positions are occupied, as for outposts or rear guards, 500yd is advisable Enfilade or flanking fire

is most effective A fire trench should be so designed and sited that the occupants, while being able to use their weapons to the best advantage, are protected from the enemy's fire and tank attack Concealment and anti-tank defence are, therefore, of great importance In undulating or hilly country, trenches sited near the crest line have often a long field of view and fire, but they are conspicuous and are usually close to the observation post

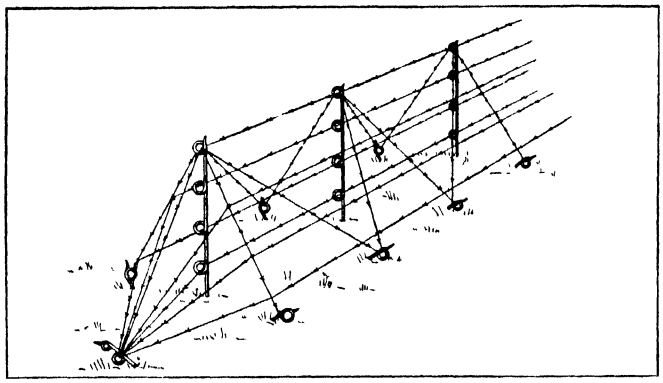


FIG 25 —APRON FENCE OF BARBED WIRE ERECTED AS A PROTECTIVE OBSTACLE FOR FIRE POSITIONS AGAINST INFANTRY

which it is one of their duties to protect A position down the forward slope is therefore often better When the attacker is greatly superior in artillery, and surprise can be attained, a position on the reverse or rearward slope, with artillery observation and machine gun fire from a ridge in rear, has considerable advantages The Hindenburg line dug by the Germans in 1916–17 between Arras and St Quentin, is an interesting example of the siting of defences The position was primarily chosen to secure good observation and cover for the defenders, while denying artillery positions and observation to the attack The front line, of irregular trace to obtain full value from flanking fire, was sited where possible down the forward slope, while the support line was in rear of the crest The position was protected by wide belts of wire, and defended by a series of ferro-concrete machine-gun emplacements 80 to 150yd apart sited to flank the wire obstacle

Obstacles.—In order to delay the enemy under the fire of the defenders and to shepherd him into areas where he can be easily dealt with, protective and tactical obstacles are erected Protective obstacles for the immediate protection of the fire positions, are placed 30 to 100yd from the trenches—close enough to prevent the enemy cutting them by night and far enough to prevent bombing by hand grenades Tactical obstacles in large irregular blocks are sited in conjunction with the artillery and machine-gun fire Against infantry, wire entanglements are generally used Fig 25 shows an apron fence of barbed wire which can be erected by ten men at the rate of 100yd an hour Abatis made by cutting down trees or bushes three feet from the ground and interlacing the branches with wire make good obstacles, but unless in hollows are apt to restrict the view of the defenders Inundations are of great value

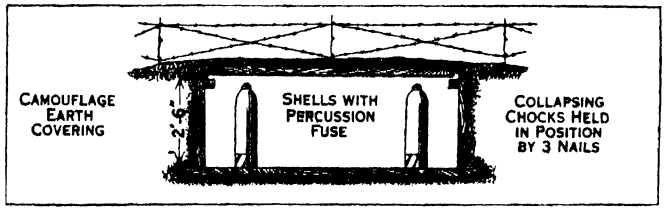


FIG 26 —TANK MINE, IMPROVISED WITH SHELLS CONCEALED UNDER A WIRE OBSTACLE

Against tanks, since artificial obstacles take considerable time and labour to erect, the greatest use is made of existing ones such as woods, marshes, waterways, steep banks, cuttings, etc In restricted approaches, such as the entrances to villages, vertical steel girders set in concrete blocks, or "elephant pits" 8ft deep and 10ft wide, lightly covered with timber and earth, are effective. For longer fronts a V-shaped ditch with a five foot vertical revetted face nearest the defenders will stop tanks until battered by artillery Tank mines, however, form the best obstacles These consist of light portable mines laid just below the surface of the ground, or may be improvised with shells with percussion fuses as shown in fig 26

Protection from Shell Fire and Gas.—While two feet of earth is sufficient to stop shrapnel or shell splinters, mined dugouts or ferro-concrete shelters are required for protection against heavy shell and aerial bombs To be proof against the most dangerous shells mined dugouts must be 50ft deep, but against 6in shells

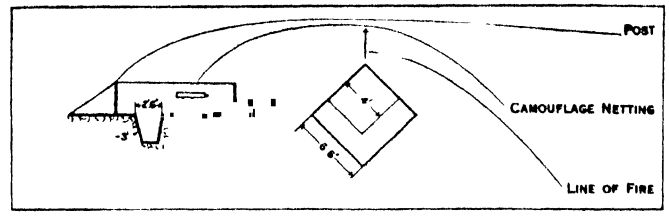


FIG 27 —MACHINE GUN EMPLACEMENT IN THE OPEN

30ft of clay or 25ft of chalk is sufficient For ferro-concrete shelters a thickness of four feet is proof against 6in shell and six feet will withstand 15in For protection against gas, dugouts, concrete shelters and cellars can be provided with doors of gas proof material, or air pumps with filters installed, which will supply pure air at a higher pressure than that outside and so prevent the entry of the gas For observation posts existing features are generally used—a platform in a tree, behind a hedge or in a house For machine gun emplacements, since concealment is essential, positions blending with existing features would as far as possible be used Fig 27 shows a machine gun emplacement in the open This would normally be hidden by camouflage netting Camouflage is used to conceal important spots from air observation and photography Trenches unless in woods cannot be hidden from the air, but observation posts, machine gun emplacements, gun positions, and headquarters, when camouflaged before occupation,

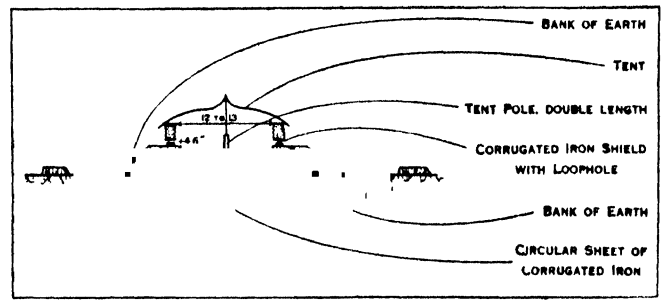


FIG 28 —DIAGRAM OF A BLOCKHOUSE, SOUTH AFRICA, 1900–1902

and the tracks to them carefully regulated, are difficult to observe

For the defence of small posts, blockhouses are frequently used These vary from the log stockades of the Red Indian wars, stone sangars for hill pickets on the north-west frontier of India, corrugated iron and shingle blockhouses (*see* fig 28) in South Africa, to the concrete "pill-box" of 1916–18 With the advent of mechanized forces, these will again be used to contain an anti-tank gun for the protection of areas liable to attack by armoured fighting vehicles (E H K)

THE HUMAN ELEMENT

In tracing the history of the science of fortification and in outlining the practice of our own time it has been necessary to dwell chiefly on the material means of defence and attack The human element has had to be almost ignored But here comes in the paradox, that the material means are after all the least important element of defence, for the best defences recorded in history owed little to the builder's art The splendid defence in 1667 of Candia, whose enceinte, of early Italian design, was already obsolete, but whose capture cost the Turks 100,000 men; the three years' defence of Ostend in 1601; the holding of Arcot by Clive, are instances that present themselves to the memory at once The very weight of the odds against them sometimes calls out the

best qualities of the defenders, and the *man* when at his best is worth many times more than the *rampart* behind which he fights. But it would be a poor dependence deliberately to make a place weak in order to evoke these qualities. One cannot be sure that the garrison will rise to the occasion, and the weakness of the place has very often been found an excuse for giving it up with little or no resistance Very much depends on the governor. Hence the French saying, "tant vaut l'homme, tant vaut la place" Among modern men we think of Todleben (not governor, but the soul of the defence) at Sevastopol, Fenwick Williams at Kars, Denfert-Rochereau at Belfort and Osman Pasha at Plevna The sieges of the 16th and 17th centuries offer many instances in which the event turned absolutely on the personal qualities of the governor, in some cases distinguished by courage, skill and foresight, in others by incapacity, cowardice or treachery The reader is referred to Carnot's *Défense des places fortes* for a most interesting summary of such cases, one or two of which are quoted below.

In 1645 the young governor of the royal post at Bletchingdon House was entertaining a party of ladies from Oxford, when Cromwell appeared and summoned him to surrender The attacking force had no firearm more powerful than a carbine, but the governor, overawed by Cromwell's personality, yielded Charles I, who was usually merciful to his officers, caused this governor to be shot A defence of another kind was that of Quilleboeuf in 1592 Henry IV had occupied it and ordered it to be fortified Before the works had been well begun, Mayenne sent 5,000 men to retake it Bellegarde undertook its defence, with 115 soldiers, 45 gentlemen and a few inhabitants He had ammunition but not much provisions With these forces and a line of defence a league in length, he sustained a siege, beat off an assault on the 17th day and was relieved immediately afterwards The relieving forces were astonished to find that he had been defending not a fortified town but a village, with a ditch which, in the places where it had begun, measured no more than four feet wide and deep

Sometimes the ardour of defence inspired the whole body of the inhabitants Fine examples of this are the defences of Rochelle (1627) and Saint-Jean de Lône (1636), but these are too long to quote We may, however, mention Livron, which is curious In 1574 Henry III sent one of his favourites, Saint Lary Bellegarde, against the Huguenots in the Dauphiné Being entrusted with a good army, this gentleman hoped to achieve some distinction He began by attacking the little town of Livron, which had no garrison and was defended only by the inhabitants But he was repulsed in three assaults, and the women of the town conceived such a contempt for him that they came in crowds to empty their slops at the breach by way of insult This annoyed him very much, and he ordered a fresh assault The women alone sustained this one, repulsed it lightheartedly, and the siege was raised

Arcot.—The history of siege warfare has more in it of human interest than any other branch of military history. It is full of the personal element, of the nobility of human endurance and of dramatic surprises And more than any battles in the open field, it shows the great results of the courage of men fighting at bay. Think of Clive at Arcot With four officers, 120 Europeans and 200 sepoys, with two 18-pounders and eight lighter guns, he held the fort against 150 Europeans and some 10,000 native troops "The fort" (says Orme) "seemed little capable of sustaining the impending siege Its extent was more than a mile in circumference The walls were in many places ruinous, the rampart too narrow to admit the firing of artillery; the parapet low and slightly built, several of the towers were decayed, and none of them capable of receiving more than one piece of cannon, the ditch was in most places fordable, in others dry and in some choked up," etc These feeble ramparts were commanded almost everywhere by the enemy's musketry from the houses of the city outside the fort, so that the defenders were hardly able to show themselves without being hit, and much loss was suffered in this way Yet with his tiny garrison, which numbered about one man for every seven yards of the enclosure, Clive sustained a siege of 50 days, ending with a really severe assault on two large open breaches, which was repulsed, and after which the enemy hastily decamped

Clive's defence of the breaches, which by all the then accepte rules of war were untenable, brings us to another point which ha been already mentioned, namely, that a garrison might honourabl make terms when there was an open breach in their main line o defence. This is a question upon which Carnot delivers himsel very strongly in endeavouring to impress upon French officers th necessity of defence to the last moment. Speaking of Cormon taigne's imaginary *Journal of the Attack of a Fortress* (which i carried up to the 35th day, and finishes by the words "It is no time to surrender"), he says with great scorn "Crillon woul have cried, 'It is time to begin fighting' He would have said a at the siege of Quilleboeuf, 'Crillon is within, the enemy is with out' Thus when Bayard was defending the shattered walls o Mézières, M de Cormontaigne, if he had been there, would hav said, 'It is time to surrender' Thus when Guise was repairin the breaches of Metz under the redoubled fire of the enemy, M de Cormontaigne, if he had been there, would have said, 'It i time to surrender'" Carnot of course allows that Cormontaign was personally brave His scorn is for the accepted principle not for the man

The World War was to confirm the value of resisting "to th last," by many examples, large and small As the obstinate re sistance of one obsolete fortress, Maubeuge, detained importan German forces from the decisive battlefield on the Marne, so th fortitude of the defenders of small posts and localities repeatedl dammed the free flow of the attacker's resources and so cumu latively helped to prevent many a threatened disastrous break through Among many examples might be quoted the Germa defence of Flesquières on Nov 20, 1917, against the British offen sive towards Cambrai, and the British resistance at many point in face of the German offensives in March and April 1918, in par ticular that at Givenchy in April

FORTLAGE, KARL (1806–1881), German philosophe was born at Osnabruck After teaching in Heidelberg and Berlin he became professor of philosophy at Jena (1846), a post which h held till his death on Nov 8, 1881 Originally a follower of Hegel he turned to Fichte and Beneke (*q v*), with whose insistence o psychology as the basis of all philosophy he fully agreed Th fundamental idea of his psychology is impulse, which combine representation (which presupposes consciousness) and feelin (*i e* pleasure) Reason is the highest thing in nature, and God i the absolute Ego, the empirical egos being his instruments

Fortlage's chief works are *Genetische Geschichte d Philos se Kant* (Leipzig, 1852), *System d Psych als empirische Wissensch* (2 vols, Leipzig, 1855), *Darstellung und Kritik der Beweise fur da Dasein Gottes* (Heidelberg, 1840); *Beitrage zur Psych als Wissen schaft* (Leipzig, 1875)

FORT LAUDERDALE, a city of south-eastern Florida U S A., on the Atlantic ocean, 26m above Miami, the count seat of Broward county. It is on the Atlantic Coast and th Dixie highways and is served by the Florida East Coast and th Seaboard Air Line railways The population was 13,187 in 1927 according to a special enumeration under the supervision of th Federal census bureau Within the city limits are over 100m o ocean, bay, river and canal frontage, and in 1928 a 35ft harbou (Port Everglades), planned for completion in the following yea was under construction at Bay Mabel Near by are the pictur esque Everglades, abounding in tropical vegetation, in whic the Seminole Indians still live in their primitive manner Th city was founded in 1837 and incorporated in 1911

FORT LEE, a borough of Bergen county, New Jersey, U S A on the Hudson river, opposite the northern part of New York city It is served by electric trolleys and motor-coach lines and by ferr to New York, and is the New Jersey approach to the suspensio bridge across the Hudson on which work was begun in 1928 The population was 5,761 in 1920, and was estimated locally a 9,000 in 1928 It is a residential suburb, lying mainly along th top of the Palisades. To the north is the Interstate Palisade park Early in the Revolution the Americans built a stronghol here, at first called Fort Constitution but later renamed afte Gen Charles Lee From Sept. 15 to Nov 20, 1776, it was hel by Gen Nathanael Greene with 3,500 men, but on the capture o Ft Washington and the approach of Lord Cornwallis with 5,00

men it was necessary for him to abandon the post and join Washington in the retreat across the Jerseys. An unsuccessful attempt to recapture the fort was made by Gen. Anthony Wayne in 1780. In 1908 a monument was erected on the site The borough was incorporated in 1904.

FORT MADISON, a city in the south-eastern corner of Iowa, U S A, on the Mississippi river, the county seat of Lee county It is on Federal highway 61, and is served by the Burlington and the Santa Fe railways The population was 11,229 in 1925 (State census) and was estimated locally at over 14,000 in 1928 It has railroad shops employing 900 men and various other manufacturing industries, with an output in 1925 valued at $7,554,170, and is the seat of a State penitentiary. A fort was built here in 1808, and was named after James Madison, who was elected president that year It was constantly harassed by the Sac and Fox Indians, who considered that its erection was a violation of the treaty made with them by Gen W H Harrison in 1804. In Sept. 1813, the little garrison of 100 men abandoned the post, burning the fort behind them, and escaping to the river through a tunnel Permanent settlement began in 1833 The town was incorporated in 1838 and chartered as a city in 1839 The court-house, built in 1842 and constantly in use ever since, is the oldest in the State

FORT MYERS, a city of south-western Florida, U S A, on the Caloosahatchee river, 18m from the Gulf of Mexico, the county seat of Lee county It is served by the Atlantic Coast Line and the Seaboard Air Line railways, by motor bus lines with extensive connections and by steamers to gulf ports, and has a municipal airport The population in 1925 (State census) was 6,674 (33% negroes) and in 1928 it was estimated locally at 18,000 The river here is about 2m wide A deep-water channel to the gulf is projected, and plans are under way for a cross-State waterway to the East Coast, via Lake Okeechobee. Grapefruit, oranges, guavas, mangoes, avocados, papayas and bananas are grown extensively in this region The city's boulevards are lined with royal palms, and nearly 100 varieties of palm are found in the city and along the banks of the river, which is stocked with tarpon. The city was founded in 1850 and incorporated in 1905 It has a commission-manager form of government Between 1920 and 1927 the area was increased from 7 to 20 sq m.; the population was multiplied by five, and the assessed valuation of property increased from $5,885,350 to $33,706,960

FORTROSE, royal burgh and seaport, county of Ross and Cromarty, Scotland Pop (1921) 963 It is on the south-east coast of the peninsula of the Black Isle, 8 m. due N N E. of Inverness, 26¼ m by rail It is the terminus of the Black Isle branch of the L M S.R.; there is communication with Fort George, 2½ m. distant, by ferry from Chanonry Ness. Fortrose consists of the two towns of Rosemarkie and Chanonry, about 1 m. apart, which were united into a free burgh by James II in 1455 and created a royal burgh in 1590

It had a monastery founded in the 6th century by St. Moluag, a friend of Columba's, and St. Peter's church built in the 8th century In 1124 David I. instituted the bishopric of Ross, with its seat here, and the town acquired some fame for its school of theology and law The cathedral is believed to have been founded in 1330 by the countess of Ross (her canopied tomb, against the chancel wall, still exists) and finished in 1485 by Abbot Fraser, whose previous residence at Melrose is said to account for the Perpendicular features of his portion of the work. It was Early Decorated in style, cruciform in plan, and built of red sandstone, but all that is left are the south aisles of the nave and the chancel, with the chapter-house, a two-storeyed structure, standing apart near the north-eastern corner. The cathedral and bishop's palace were destroyed by order of Cromwell, who used the stones for his fort at Inverness Another relic survives in the bell of 1460. The academy is also an ancient foundation The town is an agricultural centre and has a fishing harbour Rosemarkie, in the churchyard of which is an ancient Celtic cross, is a resort for seabathing.

FORT SCOTT, a city of south-eastern Kansas, U S.A., on the Marmaton river, 5m. from the Missouri State line; the county seat of Bourbon county. It is on Federal highway 54 and 73 E, and is an important railroad centre, served by the Frisco, the Missouri-Kansas-Texas and the Missouri Pacific lines The population in 1925 (State census) was 11,763. The city is built on a rolling plain, in the midst of the Kansas mineral fields, and is surrounded by a farming, stock-raising and dairying country. Coal, oil and gas, lead and zinc, building stone, cement rock and clays are found in the neighbourhood, and white sulphur water is obtained from Artesian wells (800ft deep) in the city It is an important shipping and supply centre, and has numerous and varied manufacturing industries, with an output in 1925 valued at $4,107,193 The fort which preceded the town of Fort Scott was established in 1842, when eastern Kansas was still parcelled out among Indian tribes, and was abandoned in 1855 The town was planned in 1857 and chartered as a city in 1860

FORT SMITH, a city on the western border of Arkansas, U S.A., in the foothills of the Ozarks, on the south bank of the Arkansas river, at the mouth of the Poteau; the county seat of Sebastian county It is at the intersection of Federal highways 64 and 71, and is served by the Fort Smith and Western, the Frisco, the Kansas City Southern, the Midland Valley, and the Missouri Pacific railways A toll-free concrete bridge crosses the Arkansas to Oklahoma The population was 28,870 in 1920 (85% native white) and was estimated locally at 40,000 in 1928 Fort Smith is the business centre of a fine agricultural country, and of the Arkansas coal and gas region The agricultural products of the four counties which touch its borders (two in Arkansas and two in Oklahoma) have an annual value of $50,000,000 The city compresses 100,000 bales of cotton annually, and has large railroad shops, furniture and glass factories, and numerous other manufacturing industries The factory output within the city limits in 1925 was valued at $15,529,700 The wholesale houses do an annual business of $55,000,000, retail trade amounts to $26,000,000, and debits to individual accounts in the local banking institutions in 1927 totalled $169 768 042 The public schools have an unusual endowment—the proceeds of lands formerly belonging to the military reservation, which were given to the city by Congress in 1884. There is a national cemetery here, containing 2,575 graves The site of Fort Smith was known to the early French traders as Belle Pointe. A United States army post was established here in 1817; and the town was laid out in 1821, incorporated in 1842 and chartered as a city in 1845 It was at the head of navigation on the Arkansas, and the fort was the chief supply depot for the western posts. During the Civil War Fort Smith was strongly in sympathy with the Confederacy The fort was seized by State troops in April 1861, and was reoccupied by Union forces in Sept 1863 There was considerable unrest due to border "bushwhacking" throughout the war, and several skirmishes took place here in 1864 The first railroad reached Fort Smith in 1876, and in the decade 1880–90 the population rose from 3,099 to 11,311 The old fort, part of which still stands, was abandoned in 1871.



BY COURTESY OF THE METROPOLITAN MUSEUM OF ART

THE GODDESS FORTUNA AFTER A ROMAN BRONZE STATUETTE

FORTUNA (FORTUNE), an Italian goddess of great antiquity, but apparently not native at Rome, where, according to universal Roman tradition, she was introduced by the king Servius Tullius as Fors Fortuna, and established in a temple on the Etruscan side of the Tiber outside the city, and also under other titles in other shrines. In Latium she had two famous places of worship, one at Praeneste, where there was an oracle of *Fortuna primigenia* ("original") frequented especially by women who, as we may suppose, desired to know the fortunes of their children or their own fortune in child-birth, the other at Antium, well known from Horace's ode (i. 35) It is highly probable that Fortuna was never a deity of the abstract idea

of chance, but represented the hopes and fears of men and especially of women at different stages of their life and experience, thus we find her worshipped as time went on under numerous cult-titles, such as *muliebris, virilis, huiusce diei, equestris, redux,* etc, which connected her supposed powers with individuals, groups of individuals, or particular occasions Gradually she became more or less closely identified with the Gr Τύχη, and was represented on coins, etc., with a cornucopia as the giver of prosperity, a rudder as the controller of destinies, and with a wheel, or standing on a ball, to indicate the uncertainty of fortune In this semi-Greek form she came to be worshipped over the whole empire, and Pliny (*N H* ii 22) declares that in his day she was invoked in all places and every hour She even became identified with Isis, and as *Panthea* was supposed to combine the attributes of all other deities

The best account of this difficult subject is to be found in Roscher's *Lexikon* (*s v*), *see* also Wissowa, *Religion und Kultus der Romer,* p 256 foll , W Warde Fowler, *Roman Essays* (1920) p 64 foll (W W F)

FORTUNATIANUS, ATILIUS, Latin grammarian of the fourth century AD He was the author of a treatise on metres, dedicated to one of his pupils, a youth of senatorial rank The manual discusses the fundamental ideas of metre and the rules of prosody, and ends with an analysis of the metres of Horace The chief authorities used are Caesius Bassus and the Latin adaptation by Iuba the grammarian of the Τέχνη of Heliodorus.

Editions of the *Ars* in H Keil, *Grammatici Latini,* vi , and separately by him (1885)

FORTUNATUS, the hero of a popular European chap-book He was a native, says the story, of Famagusta in Cyprus, and meeting the goddess of Fortune received a purse which was replenished as often as he drew from it He wandered through many lands, and at Cairo was the guest of the sultan Among the treasures which the sultan showed him was a hat which had the power of transporting its wearer to any place he desired Of this he feloniously possessed himself, and returned to Cyprus, where he led a luxurious life On his death he left the purse and the hat to his sons Ampedo and Andelosia, but they, by their recklessness and folly fell on evil days The moral of the story is obvious men should desire reason and wisdom before all the treasures of the world In its full form the history of Fortunatus occupies in Karl Simrock's *Die deutschen Volksbucher,* vol iii , upwards of 158 pages The style and allusions indicate a comparatively modern date for the authorship, but the nucleus of the legend can be traced back to a much earlier period The earliest known edition of the German text of Fortunatus appeared at Augsburg in 1509 Innumerable versions occur in French, Italian, Dutch and English The story was dramatized by Hans Sachs in 1553, and by Thomas Dekker in 1600 Tieck has used the legend in his *Phantasus,* and Chamisso in *Peter Schlemihl,* and Ludwig Uhland left an unfinished narrative poem entitled "Fortunatus and his Sons"

See Fr W. V Schmidt, *Fortunatus und seine Sohne, eine Zauber-Tragodie, von Thomas Decker, mit einem Anhang,* etc. (1819) ; J J Gorres, *Die deutschen Volksbucher* (1807)

FORTUNATUS, VENANTIUS HONORIUS CLEMENTIANUS (530–609), bishop of Poitiers, and the chief Latin poet of his time, was born near Ceneda in Treviso in 530 He studied at Milan and Ravenna, with the special object of excelling as a rhetorician and poet, and in 565 he journeyed to France, where he was received with much favour at the court of Sigbert, king of Austrasia, whose marriage with Brunhild he celebrated in an *epithalamium* After remaining a year or two at the court of Sigbert he travelled in various parts of France, visiting persons of distinction, and composing verses At Poitiers he visited Queen Radegunda, and she induced him to prolong his stay in the city indefinitely Here he enjoyed the friendship of Gregory of Tours and others He was elected bishop of Poitiers in 599, and died about 609 The later poems of Fortunatus were collected in 11 books, and consist of hymns (including the *Vexilla regis prodeunt,* Englished by J M Neale as "The royal banners forward go"), epitaphs, poetical epistles, and verses in honour of his patroness Radegunda and her sister Agnes, the abbess of a nunnery at Poitiers. He also wrote a large poem in 4 books in honour of St Martin, and several lives of the saints in prose.

An edition of the works of Fortunatus was published by C Brower at Fulda in 1603 (2nd ed , Mainz, 1617) The edition of M. A Luschi (Rome, 1785) was afterwards reprinted in Migne's *Patrologiae cursus completus,* vol lxxxviii *See* the edition by Leo and Krusch (Berlin, 1881–1885) There are French lives by Nisard (1880) and Leroux (1885).

FORTUNY, MARIANO JOSE MARIA BERNARDO (1838–1874), Spanish painter, was born at Reus on June 11, 1838 He entered the Academy of Barcelona, where he worked for four years under Claudio Lorenzale, and in March 1857 he gained a scholarship which enabled him to complete his studies in Rome On the outbreak of the war between Spain and the emperor of Morocco in 1859 Fortuny was sent by the authorities of Barcelona to paint the most striking incidents of the campaign He returned to Spain in 1860 He visited Paris in 1868 and shortly afterwards married the daughter of Federico Madrazo, the director of the royal museum at Madrid Another visit to Paris in 1870 was followed by a two years' stay at Granada, but then he returned to Rome where he died on Nov 21, 1874

The work which Fortuny accomplished during his short life is distinguished by facility of execution and cleverness in the arrangement of brilliant hues

See J C Davillier, *Fortuny, sa vie, son oeuvre, sa correspondance, etc* (1875), C. Yriarte, *Fortuny* (*Artistes célèbres* series) (1886)

FORT WAYNE, a city of north-eastern Indiana U S A , at the confluence of the St Joseph and the St Mary rivers to form the Maumee, the county seat of Allen county It is on Federal highways 24, 27 and 30 (the Lincoln), has a municipal airport, and is served by the Indiana Service Corporation, the New York Central, the Nickel Plate, the Pennsylvania and the Wabash railways The population was 86,549 in 1920 (90 6% native white) and was estimated locally at 115,000 in 1928

The city has an altitude of 770ft , a land area of 16 8 sq m and an assessed valuation in 1927 of $234,653,530 The streets are laid out on a rectangular plan, and are shaded with a profusion of trees A zoning system is in force The city has an official planning commission, while an unofficial committee is preparing a general scheme for the development of the adjacent area outside the city limits The surrounding country is a rich agricultural region, with extensive forests of hardwood timber Fort Wayne is an important railway centre, and three of the roads maintain large shops, employing 3,000 men The value of the city's factory output in 1927 was estimated at $120,943,193 Over 200 different articles are manufactured, chief among which are car wheels, electrical machinery and equipment, oil tanks and pumps, hosiery, overalls, agricultural machinery, pianos and organs The State School for Feeble-minded Youth is situated here

The Miami Indians had several villages in this neighbourhood, and the principal one, Kekionaga (Miami Town or Great Miami village), was within the limits of the present city A French trading post was established about 1680 on the east bank of the St Mary, and in 1749–50 the French fort was moved to the east bank of the St Joseph The English occupied the fort in 1760, and in 1763 it was captured by Pontiac, after a siege of more than three months In 1790 the Miami villages were destroyed In Sept 1794, Gen Anthony Wayne built a stockade fort on the south bank of the Maumee, where Old Fort park now lies By the treaty of Greenville, concluded by General Wayne on Aug 3, 1795, a tract of 6 sq m , including the sites of the Miami villages, was ceded to the United States and free passage to Fort Wayne and down the Maumee to Lake Erie was guaranteed by the Indians Important treaties affecting other regions were made at Fort Wayne with the Indians by General W H Harrison in 1803 and 1809 In Sept 1813, the fort was besieged by Indians, who withdrew on the arrival of General Harrison with 2,700 men It was abandoned on April 19, 1819, and no trace of it remains. Permanent settlement dates from 1815. A town was platted in 1824 and was made the county seat, and the city was chartered in 1840 It was an important fur-trading depot until 1830, and in 1843 its growth was stimulated by the opening of the Wabash

and Erie canal. The population was 4,282 in 1850, 26,880 in 1880. It increased 68% between 1880 and 1900, 92% between 1900 and 1920.

FORT WILLIAM, police burgh, Inverness-shire, Scotland Pop. (1921) 1,913 It lies at the north-eastern end of Loch Linnhe, an arm of the sea, about 62 m S S W. of Inverness by road or canal, and was, in bygone days, one of the keys of the Highlands It is 122½ m N E of Glasgow by the L N E railway The fort, at first called Kilmallie, was built by General Monk in 1655 to hold the Cameron men in subjection, and was enlarged in 1690 by General Hugh Mackay, who renamed it after William III, the burgh then being known as Maryburgh in honour of his queen The Jacobites unsuccessfully besieged it in 1715 and 1746 The fort was dismantled in 1860, and demolished in 1890 to provide room for the railway and the station. Amongst the public buildings is the low-level meteorological observatory, connected with the observatory on the top of Ben Nevis, until the latter was closed in 1904 There are distilleries about 2 m north-east Ewen Maclachlan (1775–1822), the Gaelic poet, was born in the parish Fort William is a tourist resort and place of call for steamers passing through the Caledonian canal The town is the point from which the ascent of Ben Nevis—4½ m directly east-south-east—is commonly made At Corpach, about 2 m N the Caledonian canal begins Both the Lochy and the Nevis enter Loch Linnhe immediately north of Fort William A mile and a half from the town, on the Lochy, stands the ruin of Inverlochy castle, quadrangular with a round tower at each corner Close by is the scene of the battle of Feb 2, 1645, in which Montrose completely defeated the earl of Argyll Large works for the utilization of the water power of the district, including a tunnel through the Ben Nevis group, were in course of construction in 1928

FORT WILLIAM, the principal city of Thunder Bay district, Ontario, Canada, 426 m (by rail) E S E of Winnipeg, on the Kaministiquia river, about a mile from Lake Superior It is on the Canadian Pacific and Canadian National railways, and served by several steamship lines Port Arthur lies 4 m to the N E Fort William contains numerous grain elevators, railway repair shops and docks, paper and wood pulp mills, and has a large export trade in grain and other farm produce Minerals are also exported from the mining district, of which it is the centre Industries, such as saw, planing and flour mills, have also sprung up. Pop (1921) 20,541

FORT WORTH, a city of northern Texas, U S A, 30 m W of Dallas, at the confluence of Clear Fork with the West Fork of the Trinity river, the county seat of Tarrant county, a port of entry in the San Antonio customs district, the greatest railway centre of the south-west, and the metropolis of the oil-fields and cotton-producing area of western Texas It is on four transcontinental highways (Bankhead, Dixie Overland, Colorado-to-Gulf and Meridian); is served by the Colorado and Southern, the Frisco, the Missouri, Kansas and Texas, the Missouri Pacific, the Rock Island, the St Louis South-western, the Santa Fe, the Southern Pacific, the Texas and Pacific and the Trinity and Brazos Valley railways; and has a well-equipped municipal air port (Meacham field), air mail to Chicago, the East and the cities of southern Texas, and air-transportation service The area is 50 square miles The population was 106,482 in 1920, of whom 15,896 were negroes and 7,359 were foreign-born white, and was estimated by the census bureau at 170,600 in 1928 The local estimate for 1928, taking into account large adjacent areas annexed in 1922 and 1924, was 198,000.

The city has a beautiful and healthy location on a level tract above the river, at the rise of the western foothills, with an elevation averaging about 700 feet The normal annual mean temperature is 65·3° F, and the percentage of possible sunshine during the year is 70 Much of the city is of recent construction. Ten blocks in the business centre were destroyed by fire in 1909, and many fine sky-scrapers (hotels and office-buildings) have been built since the World War to meet the rapidly growing demands. Building permits for the four years 1924–27 represented values of over $54,000,000 The assessed valuation of property in 1927 was $166,741,585. Under the city plan commission, created by the charter of 1925, a comprehensive city plan is being developed.

Parks and Schools.—There are 36 parks, containing 3,929 acres The water supply comes from Lake Worth (14 m long by 1 m wide), formed by damming the West Fork 5 m above the city, which has been developed as a beautiful recreation resort. Two new dams, to cost $6,500,000, were under construction in 1928 It is surrounded by summer homes, Meandering Road, a 30 m drive, follows its shore, a popular bathing beach is maintained by the municipality; and there is a large commercial amusement park, with a "board walk" and a casino Work has been started on a water conservation project which involves the creation of additional large reservoirs Natural gas is brought in by pipe lines from 15 fields, and the supply is expected to last for generations Public schools recently built at a cost of over $3,500,000 have caught up with the needs of the rapidly growing population, and bring the total number to 44 elementary and 9 high schools Texas Christian university (founded in 1873 at Thorp Springs as Add-Ran college, moved to Waco in 1895 and to Fort Worth in 1910) has an enrolment of about 2,000 Texas Woman's college (enrolment 1,000) was established in 1914, and the older Polytechnic college, under the auspices of the Methodist Episcopal Church, South, was merged with it The Southwestern Baptist theological seminary (established 1916) has an attendance of 750 There are several large hospitals, including the Methodist hospital (400 beds), completed in 1927 at a cost of $1,000,000

Economic Resources.—Fort Worth's present era of rapid expansion began during the war, with the increased demand for the horses, mules, grain and other products of the south-west, the establishment of Camp Bowie (1917), where 50,000 national guardsmen were trained, and three flying fields for the training of Canadian and American aviators; and the erection (1918) of the United States helium gas plant, for the production of the non-combustible, non-inflammable gas for the inflation of dirigibles It has a firm foundation for the future in the development of the agricultural and mineral resources of western Texas With the discovery of the Ranger and Burkburnett and other important oil-fields, Fort Worth became the geographical centre of the oil-producing region of the south-west By 1927 it was the focus of more pipe lines than any other city, its six refineries had a daily capacity of 50,000 barrels of crude oil, and nearly all the important companies operating in the south-western fields had established offices here Since 1920 the transition in western Texas from ranching to stock-farming and diversified agriculture (especially cotton, wheat and feed crops) has added a large and prosperous population to Fort Worth's trading territory, has supplied raw materials for new industries, has stimulated meat-packing and flour and feed mills and enlarged the grain and live stock markets Between 1920 and 1927, it is estimated, 6,000,000 ac of new land were brought under cultivation in west Texas and the population was increased by 750,000.

Industries and Trade.—Fort Worth is the largest terminal grain market, and the only primary grain market, in the South. Its elevators provide storage for 12,000,000 bu and its flour and feed mills have a daily capacity of 65,000 barrels It is also the largest live stock market and the largest meat-packing centre south of Kansas City The packing plants employ over 4,000 persons and use $90,000,000 worth of live stock a year The Texas South-western Cattle Raisers Association has its headquarters here, and the South-western Exposition and Fat Stock Show brings every spring an array of fine blood stock

Among the city's manufactures packing-house products rank first (on the basis of value), petroleum products second and grain products third Others of importance are pumps, windmills and oil-field supplies; cotton-seed oil, cotton goods, hosiery, cement, concrete pipe, furniture, shoes, clothing and printing and publishing. Among the publications are three daily papers, several journals devoted to the interests of cattle raisers and petroleum producers, with the organs of the State Teachers Association and of the State Medical Association, both of which have their headquarters in the city There are large foundries, machine shops and railroad repair shops The output of the factories within the city limits in 1927 was valued at $110,000,000; the total for all the

manufacturing industries of the county is estimated at about $200,000,000 annually

As a wholesale centre Fort Worth ranks first among the cities of the south-west in the distribution of food products, the annual value of this item reaching $200,000,000. Petroleum products amount to $50,000,000 Furniture, agricultural machinery and oil-field supplies are other lines in which the city's wholesalers do a large business The Texas Wholesale Produce Association and the Texas Grain Dealers Association have their headquarters here. Banks debits to individual accounts in 1927 amounted to $1,113,887,856 Postal receipts were $1,908,221 Fort Worth is headquarters of the U S. Railway Mail Service, 11th district

History.—At the close of the Mexican War Gen Winfield Scott sent a troop of soldiers to north Texas to establish a post for the protection of the sparsely settled territory from the Indians It was established in 1849, and named Camp Worth after Brigadier General Worth A few months later the war department changed the name to Fort Worth, but no fort was ever erected, and in 1853 the troops were sent to Ft Belknap The settlement became a trading-post for the scattered ranchers, developing some commerce in buffalo hides and bones It had a brief boom in 1873, when the Texas and Pacific Railway began building towards it, but this collapsed when construction work was abandoned (25 m E of the town) on September 1, at the first crash of the great financial panic Substantial progress began when the railway reached the city in 1876 Forth Worth had been chosen as the county seat in 1860, and had been incorporated as a city in the boom days of 1873, when it reached a population of 4,000 In 1880 the population was 6,663, in 1900, 26,688, in 1910, 73,312 A commission form of government was adopted in 1906, which was superseded in 1925 by a council-manager form In November, 1925, the citizens voted for a bond issue of $7,659,999, to be used in public improvements, the largest bond issue ever voted in a Texas city

FORTY, the cardinal number equal to four tens The name "The Forty" has been given to various bodies, particularly to a judicial body of 40 members in ancient Athens who tried small cases in the rural districts, and to a court of criminal jurisdiction and two civil appeal courts in the Venetian republic The French Academy (*see* ACADEMIES) has also been known as "The Forty" or "The Forty Immortals" The period just before the repeal of the corn laws in the United Kingdom is frequently alluded to as the "hungry forties", and the "roaring forties" is a sailor's name for the stormy region between 40° and 50° S. lat.

FORUM, an open place used, like the Greek *agora* (*q v*), for the transaction of mercantile, judicial, or political business It was level, rectangular in form, surrounded by porticoes, basilicas, courts of law, and other public buildings In the laws of the Twelve Tables the word is used of the vestibule of a tomb, in a Roman camp the forum was an open place immediately beside the *praetorium*, and the term was no doubt originally applied generally to the space in front of any public building or gateway In Rome (*q v*) itself forum was almost a proper name, denoting the flat and formerly marshy space between the Palatine and Capitoline hills (also called Forum Romanum), which even during the regal period afforded the accommodation necessary for such public meetings as could not be held within the area Capitolina In early times the Forum Romanum was used for athletic games, and over the porticoes were galleries for spectators, there were also shops of various kinds But with the growth of the city, more than one forum became necessary, and under the empire a considerable number of *civilia* (judicial) and *venalia* (mercantile) fora came into existence In addition to the Forum Romanum, the fora of Caesar and Augustus belonged to the former class; the forum *boarium* (cattle), *holitorium* (vegetable), etc, to the latter The forum Nerva (also called *transitorium* or *pervium*, because a road led through it to the Forum Romanum), and those of Trajan and Vespasian, although intended to facilitate the course of public business, were chiefly erected to embellish the city In Pompeii, at the north-east end of the forum, there was a *macellum* (market) and shops for provisions, and on the east side a cloth-workers' exchange: at Timgad in North Africa (a military colony founded under Trajan) the whole of the south side of the forum was occupied by shops. The forum was paved, and although on festal occasions chariots were driven through, it was not a thoroughfare and was enclosed by gates at the entrances, of which traces have been found at Pompeii. The word *forum* frequently appears in the names of Roman market towns; as, for example, in Forum Appii, Forum Iulii (*Fréjus*), Forum Livii (*Forli*), Forum Sempronii (*Fossombrone*) These were distinguished from mere *vici* by the possession of a municipal organization, which, however, was less complete than that of a prefecture In legal phraseology the word is practically equivalent to "court" or "jurisdiction"

For the *fora* at Rome, *see* ROME *Archaeology*, and works quoted, cf also J. E Sandys, *Companion to Latin Studies* (1921), with useful bibliography.

FORUM APPII, an ancient post station on the Via Appia, 43 m S E of Rome, founded, no doubt, by the original constructor of the road Horace mentions it as the usual halt at the end of the first day's journey from Rome. It was the starting-point of a canal parallel to the road through the Pomptine Marshes and used instead of it at the time of Strabo and Horace (*see* APPIA, VIA) It is mentioned also as a halting place in the account of Paul's journey to Rome (Acts xxviii 15). Under Nerva and Trajan the road was repaired, one inscription records the paving with silex (replacing the former gravelling) of the section from Tripontium, 4 m N W, to Forum Appii. A post station was placed here by Pius VI when the Via Appia was reconstructed

FORUM TRAIANI, an ancient town of Sardinia, on the river Thyrsus (Tirso), and a station on the Roman road through the centre of the island from Carales to Olbia and Turris Libisonis The best preserved of its ruins are the baths, erected over hot mineral springs The tanks for collecting the water and the large central *piscina* are noteworthy The bridge over the Tirso has been to some extent modernized On the opposite bank near the old church of S Lussorio, who is said to have been beheaded here (*see* PISA), are the scanty remains of an amphitheatre Not far off is a group of *nuraghi*, of which that of S Barbara in the commune of Villanova Truscheddu is one of the finest

FOSCARI, FRANCESCO (1373–1457), doge of Venice, belonged to a noble Venetian family, and held many of the highest offices of the republic—ambassador, president of the Forty, member of the Council of Ten, inquisitor, procurator of St Mark, *avvogadore di comun*, etc His first wife was Maria Priuli and his second Maria Nani, of his many children all save one son (Jacopo) died young He was elected doge in 1423, and reigned for 34 years In proclaiming the new doge the customary formula which recognized the people's share in the appointment and asked for their approval—the last vestige of popular government—was finally dropped Through the doge's influence Venice joined the Florentines in their campaign against Milan, which was carried on with varying success for eight years In 1444 began the domestic tragedy by which the name of Foscari has become famous. The doge's son Jacopo was accused of taking bribes He escaped, but was tried in contumacy before the Council of Ten and banished to Treviso (1446). Four years later Ermolao Donato, who had been a member of the Ten at the time of the trial, was assassinated, and Jacopo Foscari was suspected of complicity in the deed. After a long inquiry he was brought to trial for the second time, and was banished to Candia for the rest of his life, with a pension of 200 ducats a year In 1456 he was accused of treasonable correspondence with the duke of Milan and the sultan of Turkey He was tried and condemned to a year's imprisonment, to be followed by a return to his place of exile Jacopo died at Candia, in Jan 1457 The doge was overwhelmed with grief at this bereavement and, incapable of attending to business, he was finally compelled to abdicate, and died two days later (Nov. 1, 1457).

Legend has added to the story many picturesque though quite apocryphal details, most of them tending to show the iniquity and harshness of Jacopo's judges and accusers, whereas, as we have shown, he was treated with exceptional leniency The most accurate account is contained in S Romanin's *Storia documentata di Venezia*, lib. x cap. iv vii. and x. (Venice, 1855); where the original authorities are quoted, *see* also Berlan, *I due Foscari* (Turin, 1852). Among the poetical works on the subject Byron's tragedy, *The Two Foscari*, is the most famous (1821), and Rogers' poem *Italy* (1821); Giuseppe Verdi

composed an opera on the subject entitled *I due Foscari*

FOSCOLO, UGO (1778–1827), Italian writer, was born at Zante in the Ionian Isles on Jan. 26, 1778. At the university of Padua one of his teachers was the abbé Cesarotti, author of a version of Ossian, who had some influence on Foscolo's literary tastes, his own early knowledge of modern Greek aided his studies in ancient Greek. Foscolo soon began to take an active part in the stormy political discussions provoked by the fall of the republic of Venice He was a prominent member of the national committees, and addressed an ode to Napoleon the liberator, expecting the overthrow of the effete Venetian oligarchy, and the establishment of a free republican government

The treaty of Campo Formio (Oct 17, 1797), by which Napoleon handed Venice over to the Austrians, gave Foscolo a rude shock, reflected in the *Letters of Jacopo Ortis* (1798), a species of political *Werther*—for the hero of Foscolo embodies the mental sufferings and suicide of a disillusioned Italian patriot. Still hoping that his country would be freed by Napoleon, he served as a volunteer in the French army, took part in the battle of the Trebbia and the siege of Genoa, was wounded and made prisoner. When released he returned to Milan, and there gave the last touches to his *Ortis,* published a translation of and commentary upon *Callimachus,* commenced a version of the Iliad, and began his translation of Sterne's *Sentimental Journey* In 1807 appeared his *Carme sui sepolcri;* the mighty dead are summoned from their tombs, as ages before they had been in the masterpieces of Greek oratory, to fight again the battles of their country The apostrophe to Florence in this poem is among the famous passages in Italian poetry In his inaugural lecture on the origin and duty of literature, delivered in Jan 1809 when he was appointed to the chair of Italian eloquence at Pavia, Foscolo urged his young countrymen to study letters, not in obedience to academic traditions, but in their relation to individual and national life and growth Soon afterward Napoleon decreed the abolition of the chair of national eloquence in all the Italian universities The supposed allusions to Napoleon in his tragedy of *Ajace* brought suspicion on the author, and he removed for safety to Florence There he wrote the faultlessly constructed tragedy of *Ricciarda,* the *Ode to the Graces,* left unfinished, and completed his version of the *Sentimental Journey* (1813) He returned to Milan in 1813, until the entry of the Austrians, thence he passed into Switzerland, where he wrote a fierce satire in Latin on his political and literary opponents, and finally he sought refuge in England at the close of 1816

During the eleven years passed by Foscolo in London, he contributed to the *Edinburgh* and *Quarterly Reviews,* wrote dissertations in Italian on the text of Dante and Boccaccio, and English essays on Petrarch He was at one time in prison for debt in London, and the experience embittered him He died at Turnham Green, London, on Oct 10, 1827 Forty-four years after his death, in 1871, his remains were removed to Florence, and reinterred, with much ceremony in the church of Santa Croce. To that solemn national tribute Foscolo was fully entitled. For the originality of his thoughts and the splendour of his diction his country honours him as a great classic author With all his defects of character, and through all his vicissitudes of fortune, he was always a sincere and courageous patriot

His works were edited by F Le Monnier (Florence 1854–1862) For detailed bibliography of his works *see* A Ottolini, *Bibliografia Foscoliana* (Florence 1921). For his life *see* biographies by G Chiarini (Florence, 1910), and by E Donadoni (Milan, 1910), also A Graf, *Foscolo, Manzoni, Leopardi* (1898, new ed 1924–25).

FOSDICK, HARRY EMERSON (1878–), American divine, was born at Buffalo, N Y, on May 24, 1878 He graduated from Colgate university in 1900, and from Union theological seminary, New York city, in 1904 Ordained into the Baptist ministry in 1903, he was pastor of the First church, Montclair, N.J., 1904–15. He rapidly acquired a high reputation as a preacher especially among the universities Becoming instructor in homiletics at Union theological seminary in 1908, he was appointed Morris K Jesup professor of practical theology in 1915. In 1918 he was installed as a special preacher of the First Presbyterian church of New York His plea that the door of Christian fellowship be left open to all who sincerely desired to follow Christ regardless of specific credal belief made him the subject of attack, however, and the judicial commission of the Church decided that Dr Fosdick must take the vows of a Presbyterian or vacate his pulpit Upon his resignation, which took effect in 1925, the Park avenue Baptist church of New York called him to its pastorate, agreeing to open its membership to all Christians without insisting on its traditional ordinance of baptism.

Dr Fosdick's works include *The Second Mile* (1909), *The Manhood of the Master* (1913); *The Assurance of Immortality* (1913), *The Meaning of Prayer* (1915), *The Challenge of the Present Crisis* (1917), *The Meaning of Faith* (1917), *The Meaning of Service* (1920), *Christianity and Progress* (1922), *Twelve Tests of Character* (1923), *The Modern Use of the Bible* (Yale lectures, 1924), *Adventurous Religion* (1926), *A Pilgrimage to Palestine* (1927), *Spiritual Values and Eternal Life* (1927).

FOSS, EDWARD (1787–1870), English lawyer and biographer, was born in London on Oct 16, 1787 He was a solicitor by profession, and spent the last thirty years of his life in the study of legal antiquities His *Judges of England* (9 vols, 1848–1864) is a standard work He was one of the founders of the Incorporated Law Society, of which he was president in 1842 and 1843 He died on July 27, 1870

FOSSA or **FOUSSA** (*Cryptoprocta ferox*), a civet-like mammal peculiar to Madagascar, where it is the largest carnivorous animal It is about twice the size of a cat (5ft from nose to end of tail), with short close fur of nearly uniform pale brown It is nocturnal, frequently attacks and carries off goats, and shows great ferocity when wounded (*See* CARNIVORA)

FOSSANO, a town and episcopal see of Piedmont, Italy, province of Cuneo, 15 m NE of the town of that name by rail, 1,180 ft above sea-level Pop (1921) 8,018 (town), 18,484 (commune) It has an imposing castle with four towers, begun by Filippo d'Acaia in 1314 The place appears as a commune in 1237, but in 1251 had to yield to Asti. It finally surrendered in 1314 to Filippo d'Acaia, whose successor handed it over to the house of Savoy It lies on the main line from Turin to Cuneo, and has a branch line to Mondovì

FOSSANUOVA, an abbey of Italy, province of Rome, near the railway station of Sonnino, 64 m SE of Rome It is the finest example of a Cistercian abbey, and of the Burgundian Early Gothic style, in Italy The church (1187–1208) is closely similar to that of Casamari. The other conventual buildings also are noteworthy. St. Thomas Aquinas died here in 1274

FOSSE (or Foss) **WAY,** the early English name of a Roman road or series of roads in Britain, used later by the English, running from Lincoln by Leicester and Bath to Exeter Almost all the Roman line is still in use as modern road It passes from Lincoln through Newark and Leicester (the Roman *Ratae*) to High Cross (*Venonae*), where it intersects Watling Street at a point often called "the centre of England" Hence it runs to Moreton-in-the-Marsh, Cirencester, Bath and Ilchester, crosses the hills near Chard, Axminster and Honiton, and enters Exeter (*See* further under ERMINE STREET)

FOSSICK (probably an English dialectical expression, meaning fussy or troublesome), a term applied by the gold diggers of Australia to the search for gold by solitary individuals, in untried localities or in abandoned diggings A "fossicker," or pocket miner, is one who buys up the right to search old claims, in the hope of finding gold overlooked by previous diggers He is comparable with the "chlorider" of the United States

FOSSIL CYCAD NATIONAL MONUMENT is a reservation (320 ac in area) situated only a few miles south of Hot Springs in Fall River county, South Dakota, U S A. Within its bounds are found unusual deposits of fossil plants

FOSSIL PLANTS: *see* PALAEOBOTANY

FOSSOMBRONE, a town and episcopal see of the Marches, Italy (anc *Forum Sempronii*), province of Pesaro and Urbino, 11 m. ESE of the latter by road, 394 ft above sea-level Pop (1921) town, 3,933, commune, 10,259 The town is in the valley of the Metauro, at the meeting-point of roads to Fano, to the

Furlo pass and Fossato di Vico (the ancient Via Flaminia), to Urbino and to Sinigaglia, the last crossing the river by a fine bridge Above the town is a mediaeval castle Silk throwing is carried on

The ancient Forum Sempronii lay about 2 m to the N E at S. Martino al Piano, where remains have been found It was a station on the Via Flaminia Excavations have led to the discovery of houses and of other buildings on the ancient road It already had a bishop in the years 499–502

FOSSOMBRONI, VITTORIO, COUNT (1754–1844), Tuscan statesman and mathematician, was born at Arezzo. In 1796 he was made minister for foreign affairs, but on the French occupation of Tuscany in 1799 he fled to Sicily On the erection of the grand duchy into the ephemeral kingdom of Etruria, under the queen-regent Maria Louisa, he was appointed president of the commission of finance In 1809 he went to Paris as one of the senators for Tuscany to pay homage to Napoleon He was president of the legislative commission on the restoration of the grand duke Ferdinand III in 1814, and was prime minister for thirty years until his death in 1844 He was the real master of Tuscany, and the bases of his rule were equality of all subjects before the law, honest administration of justice and toleration of opinion

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FOSTER, JOHN: *see* ORIEL, JOHN FOSTER, *Baron*

FOSTAT. The first Muslim capital of Egypt, founded by Amr, the Persian conqueror of Egypt in A D 641 Fostat signifies "the tent," being built on the site where Amr pitched his tent when besieging Babylon It later became known as Masr or Misr, this being also the Arabian name for Cairo, later for Egypt, and was the residence of the náïbs or lieutenants At the present time it is represented by Masr-el-Atika or "Old Cairo." *See* CAIRO, EGYPT, and ARABIA

FOSTER, SIR GEORGE EULAS (1847–), Canadian statesman, was born in New Brunswick Sept 3, 1847 Educated in New Brunswick, Edinburgh and Heidelberg, he took up teaching in Canada In 1882 he entered the Canadian Parliament as Conservative member for New Brunswick, and in 1885 became Minister of Marine and Fisheries From 1888–96 he was Minister of Finance In the Borden administration of 1911 he was Minister of Trade and Commerce, retaining the portfolio in the Union Govt. of 1917, in which year he was summoned to the Senate. He was a great advocate of preferential trade within the Empire, and in 1903 made a series of speeches in England in support of Mr Chamberlain's policy Sworn of the Imperial Privy Council in 1916, he was in the same year appointed one of Great Britain's four representatives at the Economic Conference at Paris In 1918 Foster was created K C M G., and he represented Canada at the Peace Conference, 1919, at the first assembly of the League of Nations in 1921, when he was elected a vice-president, and again at the seventh assembly in 1926

FOSTER, SIR MICHAEL (1836–1907), English physiologist, was born at Huntingdon on March 8, 1836, the son of a surgeon After a brilliant career at University college, London, he studied for some time in Paris, and then taught physiology for two years at University college. In 1870 he was appointed by Trinity college, Cambridge, to its praelectorship in physiology, and 13 years later he became the first occupant of the newly-created chair of physiology in the university, holding it till 1903 He had a very large share in the organization and development of the Cambridge biological school. From 1881 to 1903 he was biological secretary of the Royal Society. In 1899 he was created K C B , and was returned as a Unionist for London university in 1900, but crossed the floor of the House in 1902. In 1906 he stood as a Liberal, and was defeated. His chief writings were a *Textbook of Physiology* (1876), which became a standard work, and *Lectures on the History of Physiology in the 16th, 17th* and *18th Centuries* (1901), lectures delivered at the Cooper Medical college, San Francisco, in 1900 He died in London on Jan 29, 1907

FOSTER, MYLES BIRKET (1825–1899), English painter, was born at North Shields, and is said to have been able to draw before he could speak At the age of 16 he entered the workshop of Ebenezer Landells, a wood engraver, with whom he worked for six years as an illustrative draughtsman, devoting himself mainly to landscape About 1861 he abandoned illustration for painting, his subjects, executed chiefly in water colours, being landscapes and rustic scenes, with figures, mainly of children. He was elected in 1860 associate and in 1862 full member of the Royal Society of Painters in Water Colours He died at Weybridge on March 27, 1899

See H M Cundall, *Birket Foster, R W S.* (1906).

FOSTER, STEPHEN COLLINS (1826–1864), American composer, was born July 4, 1826 at Pittsburgh, Pa In 1852 he "concluded . . . to pursue the Ethiopian business without fear or shame" and "to establish my name as the best Ethiopian songwriter" This he said to E P Christy, who, with Foster's consent, originally figured as author and composer of "The Old Folks at Home," and whose minstrel troupe helped to popularize Foster's songs in America and Europe, among persons of all classes and qualities alike

He was born of prosperous middle-class parentage of mainly Scotch-Irish stock With the exception of two years spent at Athens Academy, some restless months at Jefferson college, and the period (1846–50) when he was employed as a bookkeeper in Cincinnati, he spent most of his life in Pittsburgh In July 1860, he finally took up his residence in New York city, where his death, due to an accident, occurred on Jan 13, 1864.

His musical inclinations appeared at the age of six His first recorded attempt at composition ("Tioga Waltz" for an ensemble of flutes!) occurred about 1840 More promising was the sentimental song "Open thy lattice, love" (1842) Significantly enough, he became the star-performer of a boyish "Thespian Society" in negro-minstrel jingles (in trade jargon called Ethiopian), but Pittsburgh with its meagre fare of better music was sterile soil for higher creative attainments, especially since Foster, though enjoying great music never felt stirred to serious study of composition Nor did his father, who in 1841 commented on Stephen's "strange talent" and "devotion to musick," ever comprehend that Nature beckoned for its serious cultivation Hence, Foster's technical equipment remained very slender, but it sufficed for his purposes and was supported by a keen ear for imperfections in first ideas

Foster invented no new type of song, but with his occasionally magic gift for felicitous turns of melody or phrase, he outshone numerous competitors in his two chosen fields of simple song, then equally in vogue—the sentimentalized drawing-room "ballad" and the "Ethiopian" song To the absurdities of the "Ethiopian" song he contributed freely, for example his once enormously popular "De Camptown Races" (1850), but the best of his negroid songs contain something vitally distinctive In them, to quote his competent biographer H V Milligan, "the negro ceases to be a caricature and becomes a human being . . . In this type of song, universal in the appeal of its naive pathos, he has never had an equal . . . This is not the negro of 'Jump Jim Crow' and 'Zip Coon' but of *Uncle Tom's Cabin.*"

By 1850 the popularity of his songs prompted Foster to derive a living from professional song-writing During the next four years his vogue spread with incredible rapidity, but also by then he had practically sung his song, though half of his 175 compositions, generally to his own words, were yet to come They yielded substantial royalties, but after 1860 Foster apparently preferred to sell his songs outright for a few dollars This trapped him into song-factory methods; for instance, almost all of his 40 odd compositions of 1863 are pot-boilers Most of his songs merely humoured the market and became historically negligible Among the exceptions, however, the following possess the power and function of imperishable American folk-songs "Uncle Ned" (1848), "Nelly Bly" (1849), "Swanee River" or "The Old Folks at Home" (1851), "Massa's in the cold, cold ground" (1852), "My Old Kentucky Home" (1853), "Old Dog Tray" (1853) and "Old Black Joe" (1860) (O G So)

FOSTORIA, a city of northern Ohio, U S A , 35m S by E of Toledo, in Seneca and Hancock counties. It is on Federal highway 23, and is well served by the Baltimore and Ohio, the Hocking Valley, the New York Central and Electric railways. The population was 9,987 in 1920 (94% native white) and was estimated locally at 12,000 in 1928. It is in a rich agricultural and oil-producing region, and has a variety of important manufacturing industries In 1832 two towns, Rome and Risdon, were founded on the site After a period of bitter rivalry they were merged, and the city (chartered in 1854) was named after Charles W Foster, whose son, Charles Foster (1828–1904), was governor of the State, 1880–84, and secretary of the Treasury, 1891–93

FOTHERGILL, JOHN (1712–1780), English physician, was born of a Quaker family on March 8, 1712, at Carr End in Yorkshire His pamphlet entitled "Account of the Sore Throat attended with Ulcers" (1748) contains one of the first descriptions of diphtheria in English, and was translated into several languages He died in London on Dec 26, 1780

FOTHERINGHAY, a village of Northamptonshire, England, picturesquely situated on the left bank of the river Nen, 3½ m N N E of Oundle Pop of civil parish (1921) 208 The castle, of which nothing but the earthworks and foundations remain, is famous as the scene of the imprisonment of Mary Queen of Scots from September 1586 to her trial and execution on Feb 8, 1587 The earthworks, commanding a ford of the river, are apparently of very early date, and probably bore a castle from Norman times It became an important stronghold of the Plantagenets from the time of Edward III , and was the birthplace of Richard III in 1452 The church of St Mary and All Saints, originally collegiate, is Perpendicular, the nave with aisles, and the tower surmounted by an octagon, are in the best style of the period Of the Plantagenets, Edward, second duke of York, who was killed at the battle of Agincourt in 1415, Richard, the third duke, and his duchess, Cecily (d 1495), also his son the earl of Rutland, who with Richard himself, fell at the battle of Wakefield in 1460, are buried in the church Their monuments were erected by Queen Elizabeth, who found the choir and tombs in ruins

FOUCAULT, JEAN BERNARD LÉON (1819–1868), French physicist, was the son of a publisher at Paris, where he was born on Sept 18, 1819 After studying medicine he became interested in experimental physics With A H L Fizeau (*q v*) he carried on a series of investigations in light and heat By the use of a revolving mirror, similar to that used by Sir Charles Wheatstone for measuring the rapidity of electric currents, he was able in 1850 to establish that the velocity of light in different media varies inversely as the refractive indices of the media, and later to measure the velocity of light in air

For his demonstration in 1851 of the diurnal motion of the earth by the rotation of the plane of oscillation of a freely suspended, long, heavy pendulum, and for his invention of the gyroscope, he received the Copley medal of the Royal Society in 1855, and in the same year he was made physical assistant in the imperial observatory at Paris He discovered the existence of eddy or "Foucault currents" induced in a copper disc moving in a strong magnetic field Foucault invented the polarizer which bears his name, and devised a method of giving to the speculum of reflecting telescopes the form of a spheroid or a paraboloid of revolution He also introduced improvements in the electric arc

Foucault received many honours during his life, he died of paralysis on Feb 11, 1868 at Paris From the year 1845 he edited the scientific portion of the *Journal des Débats* His chief scientific papers are to be found in the *Comptes Rendus,* 1847–69

See *Revue cours scient.* vi (1869), pp 484–489, *Proc Roy Soc* xvii (1869), pp. lxxxiii.–lxxxiv , Lissajous, *Notice historique sur la vie et les travaux de Léon Foucault* (1875); P Gilbert *Léon Foucault, sa vie et son oeuvre scientifique* (Brussels 1879).

FOUCHÉ, JOSEPH, Duke of Otranto (1763–1820), French statesman, was born near Nantes on May 21, 1763 He was educated by the Oratorians at Nantes, and in Paris, and afterwards taught in various schools At Arras he had some dealings with Robespierre in 1789

In Oct 1790 he was transferred by the Oratorians to their college at Nantes, where he became a leading member of the local Jacobin club, and on the dissolution of the college in May 1792, Fouché gave up all connection with the church, whose major vows he had not taken In Aug 1792 he was elected as deputy for the department of the Lower Loire to the National Convention His sympathy with the Girondists soon gave way to an enthusiasm for the more violent doctrines of the Jacobins After some preliminary hesitations, he demanded the immediate execution of Louis XVI and denounced those who "wavered before the shadow of a king"

The crisis which resulted from the declaration of war by the Convention against England and Holland (Feb 1, 1793), and a little later against Spain, brought Fouché into notoriety as one of the fiercest of the Jacobins The Convention deputed Fouché with a colleague, Villers, to proceed to the west as commissioners for the crushing of the revolt of "the whites" in La Vendée He soon held the post of commissioner of the republic in the department of the Nièvre With Chaumette, he helped to initiate the atheistical movement, which in the autumn of 1793 aimed at the extinction of Christianity in France In the Nièvre he ransacked the churches, sent their spoils to the treasury and established the cult of the goddess of Reason

Fouché then proceeded to Lyons with Collot d' Herbois (*q v*) to execute the vengeance of the Convention on that city, which had revolted against the Jacobins Toward the end of the Lyons terror Fouché exercised a moderating influence, though outwardly his conduct was marked by the utmost rigour By that time Robespierre had struck down the other leaders of the atheistical party, but early in June 1794, at the time of the "Festival of the Supreme Being," Fouché ventured to mock at the theistic revival which Robespierre then inaugurated, and Robespierre procured his ejection from the Jacobin club (July 14, 1794) Fouché, however, was working with his customary skill and energy, and with Tallien and others, effected the overthrow of Robespierre on Thermidor 10 (July 28), 1794 In the intrigues which followed, a vigorous attack on him by Boissy d'Anglas, on Aug 9, 1795, caused his arrest, but he was released by the amnesty which was passed on the proclamation of the new constitution of 1795

Under the Directory (1795–1799), Fouché established contact with the communists, once headed by Chaumette and now by François N. ("Gracchus") Babeuf (*q v*), whether he betrayed to the director Barras the secret of the Babeuf plot of 1796 is uncertain In 1797 he gained an appointment for the supply of military *matériel* After offering his services to the royalists, whose movement was then gathering force, he again decided to support the Jacobins and the director Barras (*q v*) In the *coup d'état* of Fructidor 1797 he made himself useful to Barras, who in 1798 appointed him to be French ambassador to the Cisalpine republic At Milan he carried matters with so high a hand that he was removed Early in 1799 he returned to Paris, and after serving as ambassador at The Hague, he became minister of police at Paris (July 20, 1799) The newly elected director, Sieyès (*q v*), desired to repress the Jacobins, who had recently reopened their club Fouché closed the Jacobin club and hunted down the pamphleteers and editors, whether Jacobins or royalists, who were obnoxious to the government, so that at the time of the return of Bonaparte from Egypt (October 1799) the ex-Jacobin was one of the most powerful men in France

Fouché now lent himself to the schemes of Bonaparte and Sieyès for their overthrow of the directors, and furthered the *coup d'état* of Brumaire 18–19 (Nov 9–10), 1799 During the Consulate (1799–1804) Fouché was careful to temper as far as possible the arbitrary actions of Bonaparte In this difficult task he acquitted himself with so much skill as to earn at times the gratitude even of the royalists, and he tried to save the Jacobins from the vengeance of the First Consul, especially in the "Plot of the Placards" in the spring of 1802 In any case Bonaparte resolved to rid himself of a subordinate who had too much power and skill in intrigue On the proclamation of Bonaparte as First Consul for life (Aug 1, 1802) Fouché was deprived of his office; the ministry of police was suppressed, and most of its duties

handed over to an extended ministry of justice Fouché became a senator, and received half of the reserve funds of the police which had accumulated during his tenure of office The information gained by his spies was so valuable to Napoleon at the time of the Cadoudal-Pichegru conspiracy (February–March 1804), that he now brought back Fouché to the re-constituted ministry of police (July 1804) Fouché later on became minister of the interior. His police agents were ubiquitous, and the terror which Napoleon and Fouché inspired, partly accounts for the absence of conspiracies after 1804 After Austerlitz (Dec 1805) Fouché uttered the *mot* of the occasion "Sire, Austerlitz has shattered the old aristocracy, the boulevard St Germain no longer conspires"

While engaged in the campaign of Spain, the emperor heard rumours that Fouché and Talleyrand, once bitter enemies, were having interviews at Paris in which Murat, king of Naples, was concerned Napoleon hurried to Paris, but found nothing to incriminate Fouché, who now became duke of Otranto. During the absence of Napoleon in Austria in the campaign of 1809, the British Walcheren expedition threatened for a time the safety of Antwerp Fouché thereupon issued an order to the prefects of the northern departments of the empire for the mobilization of 60,000 National Guards, in which he gave offence by the words "Let us prove to Europe that although the genius of Napoleon can throw lustre on France, his presence is not necessary to enable us to repulse the enemy" The next months brought further causes of friction between emperor and minister Napoleon found that Fouché had forestalled him in making overtures for peace to the British ministry in 1809 Fouché was dismissed (June 3, 1810), but was made governor of Rome Hearing of the emperor's anger at his refusal to give up certain documents of his former ministry, he prepared, soon after his arrival at Florence, to sail for the United States But he found a mediator in Elisa Bonaparte, grand duchess of Tuscany, and was allowed to settle at Aix and finally to return to his domain at Point Carré In 1812 he sought vainly to dissuade Napoleon from invading Russia, and on the return of the emperor to Paris at the close of that year, Fouché was suspected of complicity in the conspiracy of General Malet From this suspicion he cleared himself and Napoleon sent him to administer the Illyrian provinces On the break-up of the Napoleonic system in Oct. 1813 Fouché was ordered to Naples, to watch the movements of Murat Before he arrived at Naples Murat threw off the mask and invaded Roman territory Fouché returned to Paris on April 10, 1814, when Napoleon was being constrained by his marshals to abdicate

At this crisis Fouché tried to gain favour with the new régime without compromising himself too deeply When he found that there were no hopes of advancement, he entered into relations with Lafayette and Davout Shortly before the return of Napoleon to Paris (March 19, 1815) Louis XVIII offered Fouché the ministry of police, which he declined, saying, "It is too late; the only plan to adopt is to retreat." On the arrival of Napoleon he received for the third time the portfolio of police Nevertheless he entered into secret relations with Metternich at Vienna, his aim being, as always, to prepare for all eventualities Meanwhile he used all his powers to induce the emperor to popularise his rule, and is said to have caused the insertion of the words "The sovereignty resides in the people; it is the source of power" in the declaration of the council of state. On June 22 Napoleon abdicated for the second time, and Fouché was elected president of the commission which provisionally governed France Already he was in touch with Louis XVIII, then at Ghent While ostensibly working for the recognition of the duc de Reichstadt, he facilitated the success of the Bourbon cause. But he could not conciliate royalists who remembered his vote as regicide and his terrorist record He resigned office, and after acting for a time as ambassador at Dresden, he retired to Prague Finally he settled at Trieste, where he died on Dec. 25, 1820. He had accumulated great wealth

In Fouché the enthusiasm of the revolutionary period appeared as a cold, selfish and remorseless fanaticism; in him the bureaucracy of the period 1795–1799 and the autocracy of Napoleon found their ablest instrument Yet he was never a mere tool He multiplied the means of resistance even to Napoleon, so that though removed from office, he was never wholly disgraced. While appearing to be the servant of the victors, present or prospective, he never gave himself to any one party. In this versatility he resembles Talleyrand, of whom he was a coarse replica. Both professed, under all their shifts and turns, to be desirous of serving France Talleyrand certainly did so in the sphere of diplomacy; Fouché may occasionally have done so in the sphere of intrigue

BIBLIOGRAPHY.—Fouché wrote some political pamphlets and reports, the chief of which are *Réflexions sur le jugement de Louis Capet* (1793), *Réflexions sur l'éducation publique* (1793), *Rapport et projet de loi relatif aux collèges* (1793), *Rapport sur la situation de Commune-Affranchie* [Lyons] (1794); *Lettre aux préfets concernant les prêtres*, etc (1801), also the letters of 1815 noted above, and a *Lettre au duc de Wellington* (1817) The best life of Fouché is that by L Madelin, *Fouche* (2 vols, 1901) The so-called *Fouché Memoirs* are not genuine, but they were apparently compiled, at least in part, from notes written by Fouché, and are often valuable, though their account of events (*e g* of the negotiations of 1809–1810) is not seldom untrustworthy For those negotiations *see* Coquelle, *Napoléon et l'Angleterre* (1903, Eng. trans, 1904) For the plots with which Fouché had to deal *see* E Daudet, *La Police et les Chouans sous le Consulat et l'Empire* (1895), P M C Desmarest, *Témoignages historiques, ou quinze ans de haute police* (1833, 2nd ed, 1900); É Picard, *Bonaparte et Moreau* (1905), G A Thierry, *Conspirateurs et gens de police, le complot de libelles* (1903, Eng trans, 1903), H Welschinger, *Le Duc d'Enghien* (1888), E Guillon, *Les Complots militaires sous le Consulat et l'Empire* (1894), and d'Hauterive, *La police secrète du premier Empire* (1908)

FOUGÈRES, town of north-western France, capital of an arrondissement in the department of Ille-et-Vilaine, 30 m N E of Rennes by rail Pop (1926) 20,407 Fougères frequently figures in Breton history from the 11th to the 15th century It was taken by the English in 1166, and again in 1448 In 1488 it was taken by the troops of Charles VIII In the middle ages Fougères was a lordship of some importance, which in the 13th century passed into the possession of the family of Lusignan, and in 1307 was confiscated by the crown and afterwards changed hands many times In 1793, during the wars of the Vendée, it was occupied by the insurgents It was formerly on the frontier towards Normandy, and, of its mediaeval fortifications, the 15th century Porte St Sulpice still exists The castle, situated in the lower part of the town, overlooking the Nançon, is now in ruins, but its ruined towers and outworks give evidence of its strength The finest of the towers was erected in 1242 by Hugues of Lusignan, and named after Mélusine, the mythical foundress of the family The churches of St Léonard and St. Sulpice both date, partly at least, from the 15th century An hôtel de ville and a belfry, both of the 15th century, are of architectural interest, and the town possesses many curious old houses Fougères is the seat of a subprefect, and has a tribunal of first instance, a chamber of commerce It manufactures boots and shoes, tanning and leather-dressing and the manufacture of sail-cloth and other fabrics are also important Trade is in butter and salted goods and in the granite of the neighbouring quarries.

FOUILLÉE, ALFRED JULES EMILE (1838–1912), French philosopher, was born at La Pouèze on Oct 18, 1838 From 1864 he was successively professor of philosophy at the lycées of Douai, Montpellier and Bordeaux, and from 1872 to 1875 at the École Normale Great success attended his early works *La Philosophie de Platon* (1869), *La Philosophie de Sarate* (1874), *Hist de la Phil* (1875) and *La Liberté et le déterminisme* (1883) Fouillée's philosophy is a speculative eclecticism He endeavours to reconcile metaphysical idealism with the naturalistic and mechanical standpoint of science by means of his *idées-forces* In *L'Évolutionnisme des idées-forces* (1890), *La Psychologie des idées-forces* (1893), and *La Morale des idées-forces* (1907), he elaborates his doctrine of *idées-forces*, or of mind as efficient cause through the tendency of ideas to realize themselves in appropriate movement.

See A Guyan, *La Phil et la Sociol. d'A. Fouillée* (1913).

FOULARD. A light silk fabric, having a distinctive soft finish and of the plain or simple twill weave. It is said to come originally from the Far East In French, the word "foulard" signifies a silk handkerchief The fabric is figured with a pattern printed in various colours, and used for dress material, handker-

chiefs, scarves and neckties Fine cotton textures of good quality and produced from yarn spun from superior grades of cotton (as Egyptian and Sea Islands), are also sold as "foulard." Cotton foulard, which is usually of the plain calico or simple twill weave, is mercerized, and printed with patterns in styles and colourings similar to those of silk foulard, and employed for similar purposes

FOULD, ACHILLE (1800–1867), French banker and politician, was born in Paris on Nov 17, 1800. He belonged to a Jewish family of bankers, and as minister of finance under Louis Napoleon (as president and as Napoleon III), from 1849 to 1852, and again from 1861 to 1867, carried out important financial and administrative reforms He died in Tarbes on Oct 5, 1867

FOULGNES DE NEUILLY (d. 1202), crusade preacher, was born at Neuilly, and after a dissolute life and a sudden conversion, went to Paris to study There he began to preach about 1195, and later acquired fame by his eloquence in Normandy, Burgundy and Picardy He declared that he had persuaded over 200,000 men to go on the fourth crusade. When his success began to decline, he retired to his native town, where he died in March 1202

FOULIS, ANDREW (1712–1775) and **ROBERT** (1707–1776), Scottish printers and publishers, were the sons of a Glasgow maltman Robert was apprenticed to a barber; but his ability attracted the attention of Dr Francis Hutcheson, who strongly recommended him to establish a printing press He started business in 1741 in Glasgow, and in 1743 was appointed printer to the university In this same year he brought out *Demetrius Phalereus de elocutione*, in Greek and Latin, the first Greek book ever printed in Glasgow, and this was followed in 1774 by the famous 12mo edition of Horace which was long believed to be immaculate though the successive sheets were exposed in the university and a reward offered for the discovery of any inaccuracy, six errors at least, according to T F Dibdin, escaped detection. Soon afterwards Robert went into partnership with Andrew, who had been educated for the church, and they continued for about thirty years to issue carefully corrected and beautifully printed editions of classical works in Latin, Greek, English, French and Italian They printed more than five hundred separate publications, among them the small editions of Cicero, Tacitus, Cornelius Nepos, Virgil, Tibullus and Propertius, Lucretius and Juvenal, a beautiful edition of the Greek Testament, in small 4to, Homer (4 vols fol , 1756–58); Herodotus, Greek and Latin (9 vols 12mo, 1761); Xenophon, Greek and Latin (12 vols 12mo, 1762–67); Gray's poems; Pope's works, Milton's poems. The Homer, for which Flaxman's designs were executed, is perhaps the most famous production of the Foulis press The brothers spared no pains, and Robert went to France to procure manuscripts of the classics, and to engage a skilled engraver and a copper-plate printer Unfortunately it became their ambition to establish an institution for the encouragement of the fine arts Their countrymen were not ripe for such an attempt, and the "Academy" involved the projectors in ruin Andrew died on Sept. 18, 1775, and Robert on June 2, 1776 Robert was the author of a *Catalogue of Paintings with Critical Remarks* The business was afterwards carried on under the same name by Robert's son Andrew.

See W. J. Duncan, *Notices and Documents illustrative of the Literary History of Glasgow*, printed for the Maitland Club (1831), which *inter alia* contains a catalogue of the works printed at the Foulis press, and another of the pictures, statues and busts in plaster of Paris produced at the "Academy" in the University of Glasgow *See* also J. Ferguson, *The Brothers Foulis and early Glasgow Printing* (1889); D. Murray, *Robert and Andrew Foulis and the Glasgow Press* (Glasgow, 1913), *Letters of Robert Foulis* (Glasgow, 1917).

FOULLON, JOSEPH FRANÇOIS (1717–1789), French administrator, was born at Saumur During the Seven Years' War he was intendant-general of the armies, and intendant of the army and navy under Marshal de Belle-Isle. In 1771 he was appointed intendant of finances. The farmers-general detested him on account of his severity, the Parisians on account of his wealth; he was reported, probably quite without foundation, to have said, "If the people cannot get bread, let them eat hay" After the fall of the Bastille in 1789 he fled from Paris, but was seized, brought to the hôtel de ville, and, in spite of the intervention of Lafayette, was dragged out by the people and hanged to a lamp-post on July 22, 1789.

See Eugène Bonnemère, *Histoire des paysans* (4th ed , 1887), tome iii , C L Chassin, *Les Élections et les cahiers de Paris en 1789* (Paris, 1889), tomes iii. and iv.

FOUNDATION, the act of building, or instituting on a permanent basis, the establishing of any institution by endowing it with funds for its continual maintenance, and hence the institutions so established. The terms "on the foundation," or "foundationer," are used of members of a college or society who enjoy, as fellows, scholars, etc , the benefits of the endowment Formerly "foundation" also meant the charter or incorporation of any such institution or society, and it is still applied to the funds used for their endowment. (*See* PHILANTHROPIC ENDOWMENTS)

The terms "old foundation" and "new foundation" used of English cathedral chapters have no reference to the age of the cathedrals (*see* CATHEDRAL.)

"Foundation" also means the base (natural or artificial) on which any erection is built, generally made below the level of the ground (*see* FOUNDATIONS) A foundation-stone is one of the stones at the base of a building, generally a corner-stone, frequently laid with a public ceremony In gem-cutting the "foundation-square" is the first of eight squares round the edges of a brilliant made in bevel planes and from which the angles are all removed to form three-corner facets

FOUNDATIONS, as referred to building and construction, is appropriately applied to all those portions of the structure below the footings of walls, piers and columns Foundations are designed to transmit the weight of the superstructure to that portion of the earth's surface on which it rests and which may be called the *foundation bed* Foundation beds vary in *bearing capacity* All are compressible, hence the erection and loading of any superstructure is accompanied by settlement, though the amount for solid rock is negligible. The object of foundations is to transmit the entire load to the foundation bed at a safe pressure and with small and uniform settlement

Foundation Beds.—Corresponding geological surface formations may show marked local variations, hence, though foundation beds may be scientifically classified, practical experience of a locality often decides the ultimate treatment

Rock—In some districts massive rock formations may occur near the surface, in others they may be exposed by excavation or otherwise reached Massive rocks provide good foundation beds Igneous rocks, dense limestones and sandstones can easily bear pressures of 15 tons per square foot, but on softer rocks the limit may be 8 tons Many foundation beds are products of rock-disintegration, these include gravel, sand, clay, silt, etc

Gravel—Gravel consists of water-worn rock fragments varying much in size. Well-compacted gravel overlying a strong substratum, offers a dependable foundation bed which will support at least 4 tons per square foot

Sand consists of fine rock particles, from ¼ in downwards in diameter. Sand foundations need protection from running water, to prevent lateral escape Confined sand may support from 2 to 4 tons per square foot

Clay—This term embraces cohesive soils, in which the characteristics vary with the composition. Pure clay contributes to plasticity, sand reduces it Clay becomes plastic with moisture and changes in volume with plasticity; the moisture-content of clay should, therefore, be kept low and uniform; actual contact with water is to be avoided Drainage of and diversion of water from the site are the usual precautions Clay foundations need protection from seasonal variations of temperature and humidity, otherwise changes in volume may lead to structural fractures Such foundations should be 3 to 4 ft below ground. Bearing pressures on dry yellow clays are usually limited to 2 tons per square foot and on blue clays to 4 tons per square foot

Made or Filled Ground; Silt—Depressions and excavations are often filled artificially "Filled" ground continues to consolidate over many years Building over such ground requires excavation

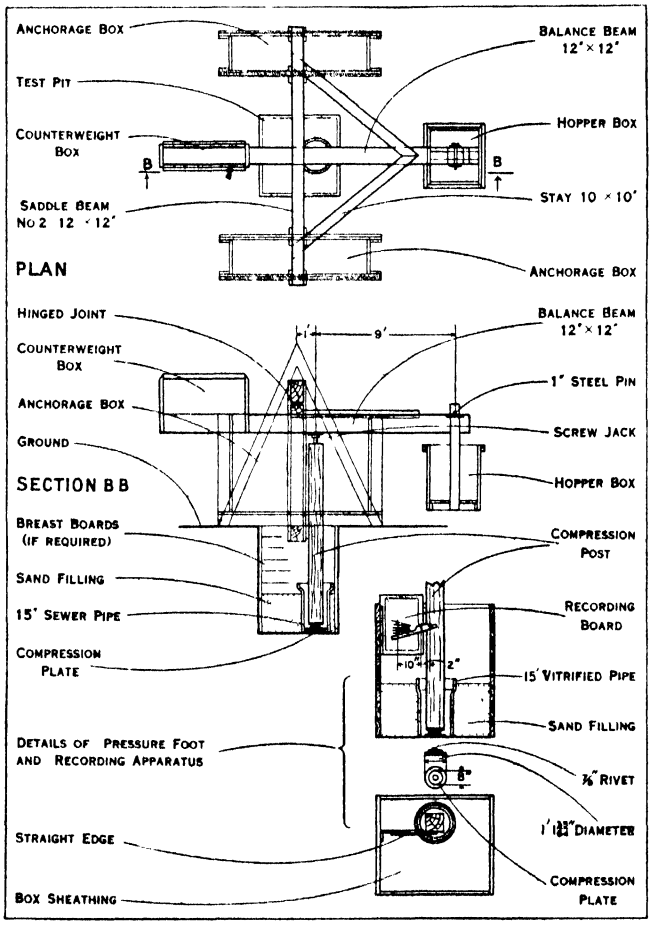
or penetration of the filling to a solid bed, and sites with a soft overlying bed may be similarly treated On low-lying soft ground, buildings may be "floated" on "rafts," *i.e.*, timber or reinforced concrete slabs continuous over the site Settlement is thus controlled and rendered uniform

Other foundation beds may be mixtures of materials and will possess intermediate characteristics

Protection of Foundation Beds.—Lateral support and protection are often required Friable earths crumble on upright faces and soft rocks disintegrate These may be protected by retention walls Underlying streams of water should be enclosed in a culvert Where "ground water" is freely rising and falling basements should be constructed as watertight tanks to resist external hydrostatic pressure and prevent the incursion of water

Bearing Capacity—Before planning the foundations of an important building an investigation of the site is usually necessary; experience of adjacent sites will assist the investigation If examination of the underlying strata is found necessary a trial pit would be sunk, or "boring" adopted, and samples of the strata raised to the surface and examined

Allowable bearing capacities for foundation beds in any one locality are often scheduled as in the London Steel Framed Buildings Act of 1909 Many American building codes include similar schedules In doubtful cases experiments may have to be employed to determine the bearing capacity



FROM HOOLE AND KINNE, FOUNDATIONS" (MCGRAW HILL)

FIG 1—LOAD-TESTING APPARATUS FOR FOUNDATION SOILS

British regulations do not impose bearing tests, but the Building Code of New York City details a test to be conducted on a minimum area of 4 sq ft and after four days 50% more pressure than the proposed bearing capacity must not produce settlement. Fig 1 shows the apparatus designed for this test by the American Society of Civil Engineers.

Loads Carried—The constant load is the weight of the structure; its magnitude and distribution are readily determinable

The movable load fluctuates with occupancy and use, with wind-pressure and snow, and varies from zero to a maximum value It is difficult to estimate designing loads on foundations but usually when the movable load forms a substantial part of the possible foundation load, the foundations may be designed to carry about 60% of the sum of the loads for which the structural units have been designed This percentage is specified, with qualifications, for certain types of American buildings

Types of Foundations.—There are two general classes (a) *spread foundations*, constructed near the surface and having a base area proportional to the load, and (b) *deep foundations*, excavated or driven to considerable depth, the horizontal area occupied having little relation to the load carried Cement concrete (*see* CONCRETE) is used almost universally for foundations It is strong and conforms to the inaccuracies of the foundation bed

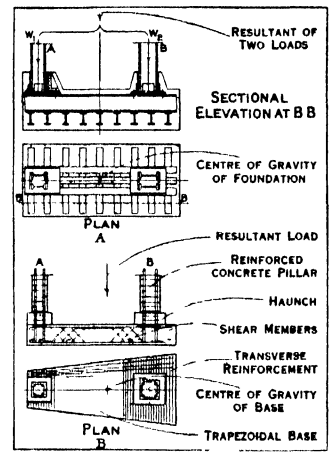


FIG 2—SPECIAL FOUNDATIONS

(A) Compound steel grillage foundation, parallel base; (B) Compound reinforced concrete foundation, trapezoidal base These methods are applicable where projection beyond the external pillar (A) is strictly limited

Grillage Foundations—Projections in foundation concrete may be reinforced with steel, the thickness being then reduced, or steel may be employed as the principal material In the latter type, steel beams are used to form a "grillage" in two or more tiers The load is transmitted through a steel or cast iron base to the tiers of the beams, which are bound together transversely by steel sections or by metal packings and bolts

The foundation steelwork is bedded upon and encased in concrete

Reinforced Concrete Foundations—A foundation having the same function as the steel grillage is also shown in fig 2 Reinforced concrete is employed (*see* REINFORCED CONCRETE)

Cantilevered Foundations—When a large pillar occurs at a boundary adjoining an existing building, and an ordinary foundation is impossible, an external pillar is linked with an internal one by a heavy beam, having one end projecting as a cantilever The outer foundation is well within the boundary Load from the external pillar is transferred to the cantilever, which bears on the foundation and is balanced by the load on the internal pillar. The foundation is designed to exert uniform pressure on the bed when fully loaded

In another method two pillars may have a common foundation The base may be parallel or trapezoidal, and so arranged that the resultant of the two loads lies over the centre of gravity of the base The trapezoidal base is more suitable for reinforced concrete construction (*See* also STRUCTURAL ENGINEERING.)

Stepped Foundations.—Changes in foundation level should be made in small "steps" to avoid (*a*) the diagonal shearing of the foundation bed between levels, and (*b*) fracture at the vertical junction of the higher and lower sections The concrete bed should be stepped and made continuous by vertical "ramps."

Deep Foundations.—Extensive foundation beds, otherwise good, may reveal soft pockets, which can be bridged over by beams or arches Foundations on soft strata or filled material may be supported on brick or concrete piers erected in deep excavations, on a firm bed The piers are connected by arches or beams.

Pile Foundations—A stout pillar of any material driven into the ground is known as a pile. It is generally more economical to use piles than piers, and they may be of round timber, or of square timber shod and banded with iron Piles may be driven by mechanical devices worked either by man or steam power. Steam hammers for rapid driving, give light and quick blows, so reducing damage to the head of the pile. Piles are conveniently grouped

to support concentrated loads as at bridge abutments, or under columns in a building. They may be driven until either (*a*) their points are embedded in a firm substratum (*bearing piles*), or (*b*) the friction on their sides is sufficient to provide resistance (*friction piles*). To distribute the load, timber frames or masses of concrete are laid on the piles

Concrete Piles.—Concrete piles are mainly of two kinds, viz (*a*) *pre-cast* and (*b*) *cast in-situ* The former have vertical steel bars, bent in at the point, hooped transversely and diagonally and enveloped in concrete Reinforcement adds to the compressional strength and provides resistance to end blows and to possible side bending when driving The points are shod with steel or cast iron Modern rapid-hardening cement permits of moulding and driving in a few days The "cast in-situ" piles have marked advantages over those pre-cast, space for moulding is not required, work is rapid and piles can be loaded soon after driving This type may be classified into (*a*) systems in which a tapered tube is driven, withdrawn, and the space filled with concrete, or in which a mandrel and sheath are driven, the mandrel being withdrawn and the sheath left and filled with concrete, (*b*) systems in which a parallel tube, shod with solid metal, is driven, the tube being gradually withdrawn and concrete poured to fill the hole and enclosing a frame of reinforcement if desired, (*c*) systems designed for enlarged bases to increase the load capacity, and (*d*) systems in which tubes are sunk into the ground, the earth withdrawn from the inside, and the tubes filled with concrete In one patent form, the tube employed is vibrated on withdrawal to assist the consolidation of the concrete

The supporting power of piles is a difficult and controversial subject and cannot be included here

Special Foundations.—Exceptional forms of foundation occur in large and heavy structures, bridge piers, dock walls and harbour work, in which large excavations may cover an entire building site The vertical sides of the cutting must usually be maintained by temporary supports provided by shoring (*see* SHORING)

Deep Foundations for Piers.—Timber is usually employed to strut the sides of deep excavations for piers, the timber being inserted in short stages In the U S A a circular excavation is often made and the sides supported by short vertical poling boards wedged against cast iron circular frames

The Open Caisson.—Danger to property may occur if adjacent excavations cause withdrawal of running sand, hence for excavations through wet strata, water and fine sand must be kept out of the cutting In vertical shafts the sides may be supported by steel or concrete linings added in short lengths at the top, as the excavation proceeds An enlarged base is usually formed to increase the bearing area, and the lining is filled with concrete upon which the surface foundation is laid

The Pneumatic Caisson.—For preventing the incursion of water to excavations in wet strata and in river beds, the pneumatic caisson is employed, this being a cylinder of steel or reinforced concrete of the same size as the foundation The caisson is a rigid casing without base and having cutting edges Units are added above water level as the caisson sinks A working chamber is formed in the base, isolated by an "air-lock" The men work in compressed air, which must resist the incursion of water To admit and withdraw men and materials the air-lock chamber has two doors at different levels The air pressure is maintained by re-sealing one door before opening the other, at the required depth the space of the working chamber is sealed with concrete. Steel caissons are usually filled or lined with concrete, and reinforced concrete shells are bridged over to receive the superstructure

Sheet Piling.—One function of sheet piling is to support laterally foundation beds which would spread under pressure; sites are occasionally *surrounded* by sheet piling. It also gives continuous support to very soft ground, as in water-bearing strata, where shallow excavations and conditions do not make a closed caisson imperative For much ordinary work timber sheet piles are used, driven between horizontal walings secured to square guide piles Sheet piles formed by special sections of rolled steel are in common use, and various forms of reinforced concrete sheet pile are also employed

A patented type of reinforced square pile has two wings. Driven edge to edge these piles may be used as sheeting or for retaining "made" earth, assisted by reinforced ties anchored to the earth behind the wall The piles are designed to resist the consequent bending moments Sheet piles have the feet splayed to induce the entering pile to close against the edge of its neighbour.

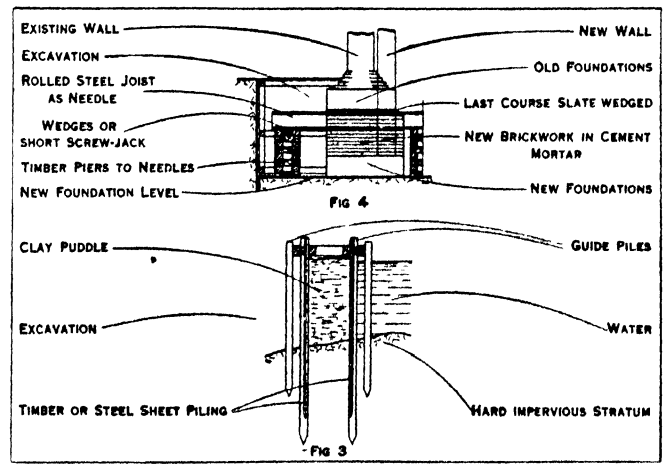
The Coffer Dam is a substantial temporary dam, used where the hydrostatic head is considerable and simple sheet piling is inadequate A coffer dam may surround an enclosure for the removal of water and soil and the insertion of a foundation or, for quay walls, may be on the water side only In modern practice two rows of close piling are used, 5 ft and upwards apart, driven to impervious ground The space within the piles is cleared and filled with puddled clay On completion the water is pumped from the enclosure and excavation or construction may proceed For deep interior excavation after withdrawal of water the coffer dam is supported by transverse strutting or by inclined shoring

PROTECTION OF ADJOINING STRUCTURES

When inserting foundations for new buildings the foundations of adjoining structures must not be disturbed Most laws recognize the rights of adjoining owners, and impose penalties for damages to existing property The upper portions of existing structures must be supported by shoring while adjacent excavations are in progress (*see* SHORING)

If the new foundations are to be lower, to admit of deeper basements, then the old structure must be re-supported at the lower level The process of inserting new supports is known as under-pinning

Under-pinning.—The problem in under-pinning is to place solid supports underneath the old foundations and to avoid settlement of the existing building in the process Methods of under-pinning cannot be standardized, fig 3 shows one method in which short lengths of foundation are exposed by pits sunk to the new level In heavy structures, dead shoring is required which consists of "needles" passed beneath the foundations and supported on short uprights or from the adjacent ground The excavations are then extended and *portions* of the new foundations



FROM "THE STRUCTURAL ENGINEER"

FIG 3.—COFFER DAM, SUPPORTING WATER PRESSURE ON ONE SIDE
FIG 4.—USUAL METHOD OF UNDERPINNING OLD FOUNDATIONS

erected For brickwork, cement mortar is used and the last joint wedged with slate If in concrete the top clearance is grouted solid with cement When the new work may receive load the intervening portions of foundation are inserted For small buildings, on firm ground, under-pinning can sometimes be done without temporary support

Pre-test Piles.—A method of pile under-pinning has been patented in America (1917) and in England known as "pre-test" piling Pre-test piles may also be used for new buildings For the purpose of under-pinning, short lengths of the old foundations

porousness, which is artificially increased by venting or pricking the sand with a wire to within a short distance of the pattern after ramming the mould

Moulding Boxes.—Moulding boxes are essentially rigid frames, generally of cast iron, for carrying and supporting sand In form they may be round, square, rectangular or, in special cases, of the contour of the patterns to be moulded in them Sizes may range from a few inches square up to any extent within the crane lifting facilities of the foundry Fig 1 shows one half of a two-part moulding box, such a box will evidently offer only one joint, but some patterns may require two or more in order to draw them from the sand without tearing the mould In such cases multiple boxes are used, and a typical "nest" is shown in fig 4 Any number of units may be used and the depths of each unit made to suit the requirements of the pattern Beyond a certain size, say 14 in sq , it becomes necessary to introduce cross bars in the box in order to carry the sand; such a box is shown in fig 5 The range in design is as wide as the variety of castings produced, and the general rule is to adapt the shape of the boxes to the contour of the patterns to be moulded

The sphere of fig 2, jointed in the centre, represents a clear draw, but there are cases where simple division is insufficient to ensure the clean withdrawal of each half pattern, and subdivision then becomes essential Fig 6 shows a type of recess met with in many castings Owing to the taper a clean parting of solid pattern from sand would be impossible, so the pattern is made in three parts, the two loose pieces forming the inside taper being temporarily held in position by pegs as shown The mould is made by placing the pattern flat side down on a turning-over board and laying the bottom half of the moulding box in position The recess is rammed with sand, the pegs are withdrawn from the outer edge of the pattern, and the ramming completed, the bottom-half box is turned over on to a sand bed and the joint made, the top part with runner-pegs is rammed up and lifted off, runners are cut, and the main part of the pattern withdrawn, leaving the two loose strips remaining in the sand The space provided by the removal of the pattern is sufficient to allow the strips to be drawn away horizontally until they clear the overhanging sand and can be removed vertically Any projecting piece can be treated as a "loose piece," provided the space left after drawing the pattern is sufficient to admit of a side draw and then a straight lift for the removal of the loose piece

The splitting of a cylinder into two halves would result in the same process of moulding as sketched in figs 1 and 3 If the plain cylinder is replaced by a fluted column then a division of the pattern along its length would not give two halves admitting of clear drawing from the top and bottom boxes respectively In such a case each half pattern would be split into three sections as shown in fig 7 Moulding is carried to the stage of both half patterns being ready for drawing On drawing the central part of each half pattern two side pieces remain in each half mould These are removed in a direction suitable to the contour of the fluting so as not to break the sand forming the flutes This method of pattern division is largely applied to ornamental and engineering castings

Up to this point only the production of the external form of a casting has been considered; but in practice very few are solids, the majority having an internal form This may be simply for lessening weight or, as is more usual, for some utilitarian purpose The household kettle is a ready example of a casting in which the interior is required for service, and utility of the interior of a casting is well shown in the cylinders of a steam-engine or motor-car

The "Core" to Form Internal Space.—As with externals so with internals; both are formed with sand shaped to desired contour; in the latter case the term "core" is used to denote that part of shaped sand forming an internal part of a casting. The requirements demanded from a "core" are that it shall resist the washing action of a stream of metal, admit of the free escape of gases, and impart the internal contour required. These fundamentals are intensified by the fact that in many cases the core may be almost wholly surrounded by molten metal, enhancing the necessity of providing egress for the gases generated within For this reason, and for the additional one of securing stability when handling, cores are dried in a stove before placing in the moulds

Core boxes are built in sections in order to allow the removal of the core when made The division of a round or square straight-length core box is shown in fig 8 The two half boxes are fastened together, a strengthening piece of wire or iron rod placed in the centre, and core sand evenly rammed to the top A hole is pierced through the length by means of a vent wire, the box unfastened, one half lifted off, and the core is ready for removal As the core is "green" it will not admit of free handling, therefore on removal of the half box a layer of floor sand is spread evenly over the exposed half core and a level surface formed on which an iron plate is laid The whole is turned over plate downwards and the remaining half box lifted away, leaving the core sitting in a sand bed The plate is lifted into a drying stove, and the core when dry may be freely handled The purpose of the strengthening wire or rod is evident, and the vent hole pierced through serves as a channel for the escape of gases when the core placed in the mould is surrounded by molten metal except at its two ends

The principle of loose pieces applied to core boxes is shown in fig 9 The core box is so built that on removing one half box the loose strips remain in the core and may be withdrawn laterally

Cores may take a more or less curved form A half core box for an elbow pipe is shown in fig 10, and in this instance the method, though not the principle, of making the core will vary Each half box is packed with sand and a strengthening iron bent to the required curve is bedded in one half Both half boxes are strickled level and a coat of clay water pasted over the sand in each half to ensure sticking Two strings are laid on one half so that their ends slightly overlap at the bent portion, the two half boxes brought together and tapped The removal of the strings from each end of the box will leave a clear passage through the core Instead of string flexible wax vents may be bent to the required contour and left in the core, on drying the wax is absorbed by the sand and a clear passage remains With large cores the most effective channels are formed by "ash vents," which are made by ramming and strengthening as usual and then cutting central channels in the sand The cut portions are filled with small coke and the core finished off as usual With large cores this type of vent offers the most effective route for the escape of gases

Patterns are provided with core prints and when the cores are placed in the resulting imprints alignment is assured Taking a flanged pipe as an example the core prints remaining in the half mould are shown in fig 11, and the core when laid in these prints will leave a space in the mould as shown by the dotted lines If the top half of the mould be fitted on with the core in position then the closed mould will offer the requisite space for filling with fluid metal to give a replica of the pattern plus the desired central hole.

The principles underlying the art of founding have been indicated in their technical significance As with all technical subjects, extension of principle is possible While a complete pattern and core boxes are essential to economical production of standard castings elasticity is possible in the production of odd castings Skeleton or outline patterns are used and the extra time taken in making a mould from a guide pattern is, in the case of a few castings only, balanced by the time saved in making a complete pattern

Circular Castings.—These are made by scribing the circle of the diameter required on a prepared level sand bed and setting cores, made as a segment of the circle, to the circumference so marked. A flat top part will complete the mould. Carrying this a stage further, a mould may be formed by sweeping or "strickling" sand into required form. Sweeping is effected by means of a vertical spindle set in a level socket as in fig 12; the rotation over a bed of rammed sand of a horizontal straight edge bolted to the vertical spindle will sweep a level surface. Applying this principle to the making of a mould for a wheel, the first stage will

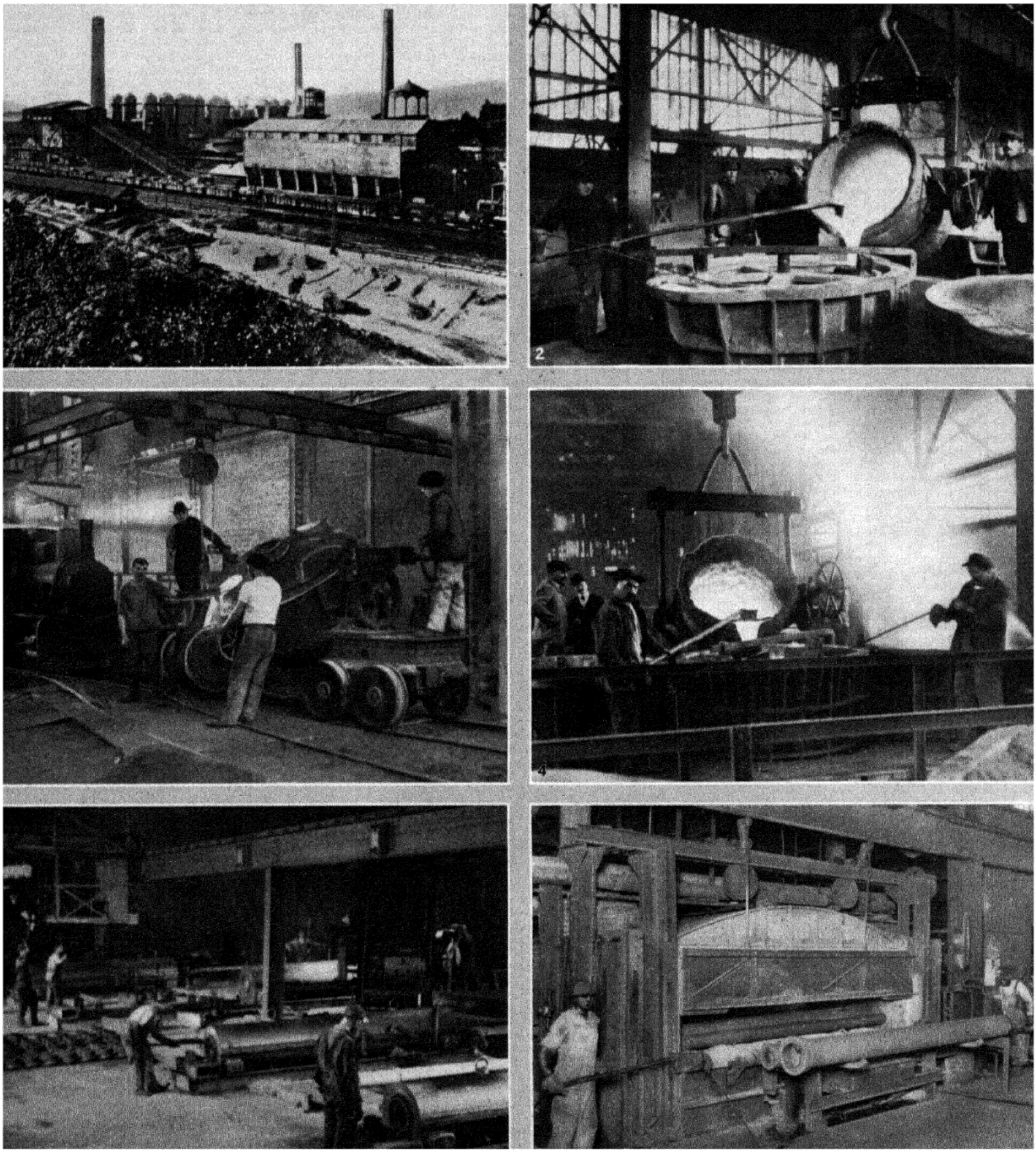


BY COURTESY OF THE GERMAN TOURIST INFORMATION OFFICE

STEEL CASTING

A steel casting, one of the frames of a large riveter, made in the Krupp works at Essen, Germany Castings of this size and larger are made for the framework of ships and for large machinery The white marks on the casting indicate where rough edges have been chipped off by means of a pneumatic riveter At the upper left is a section of the overhead crane which supports the casting

FOUNDING



BY COURTESY OF (1, 2, 3, 4) A. HAUTS FOURNEAUX ET FONDERIES DE PONT A MOUSSON (5, 6) THE U. S. CAST IRON PIPE AND FOUNDRY CO.

FOUNDRY AND FURNACE METHODS IN THE MANUFACTURE OF CAST IRON PIPE

1. Blast furnaces and foundries at Pont-à-Mousson, France. Railway cars containing ore are unloaded at elevator (right) from which the ore is carried up inclined track to the mixing bins (left). Here it is mixed with limestone and coke and charged into the bell-topped blast furnaces (centre)
2. Pouring a section of 36" cast iron pipe. workman at left holds the long puddling shovel with which the molten iron is worked to attain the correct texture. Empty mould at right shows form of flange or rim of the pipe
3. Liquid iron being poured from large ladle, mounted on trucks, into smaller ladle from which it is poured into moulds (figs. 2 & 4)
4. Pouring cast iron into one of a series of large moulds for iron pipe. Mould at right has been filled and is cooling, escaping gases from the cooling metal pass off through porous sand and clay composing mould
5. Casting lengths of iron pipe by centrifugal process. The horizontal cylinders are filled with molten iron, then rotated to obtain an even consistency throughout length of pipe; mould is then chilled or hardened by water in a surrounding jacket. Flange of pipe seen at end
6. Annealing centrifugally cast pipe. After chilling (fig. 5) pipe is placed in the annealing furnace (centre) and heated for $\frac{1}{2}$ to $\frac{3}{4}$ hour at a temperature of 600° C. or more. This process strengthens the pipe and removes any strain caused by rapid cooling

'.e evident from fig. 13. The bracket carrying the sweeping board is removed and a core print with a central hole fitting the spindle is passed over the latter and bedded in position in the ..d forming the bottom face. This gives a central print for ..e boss core, and the spindle and print are removed. The arms of the wheel are formed by dried sand cores which also give the inner walls of the rim and the outer walls of the boss. The cores are set in position by means of distance pieces cut to give rim and arm thicknesses. The boss core is set into the print formed and this completes the bottom half of the mould. A flat covering top part will complete the full mould. The outer rim may be formed by segmental cores instead of being swept as shown in fig. 13. Assuming a spur wheel to be required then the finishing of the bottom part of the mould is shown in fig 14, where are also seen the method of placing the outer cores to form the teeth and the spacing of the cores to form the arms and boss.

Loam Moulding.—This is a distinct section of the foundry industry. Loam represents clayey mixtures of sand worked at about the consistency of stiff slurry. The moulds are built up of brick carried on plates to suit the contour of the castings and faced with loam In general the loam is swept to required contour as in the case of sand, brackets or irregular shapes being formed by building in loose wooden patterns Complete or skeleton patterns are also used in loam moulding, the respective joints for separating the mould being carried on plates or rings The built up or swept moulds are partly dried before separating the respective sections for withdrawing patterns and finishing the mould faces and each section is completely dried before final assembly On final closing with all cores in position the various plates forming the mould structure are bolted together and the mould firmly tied in order to resist the pressure of the molten metal. Rapid moulding of repeat castings is ensured by labour saving devices.

Plate Moulding.—The first mechanical aid to note is that of plate moulding. A plate with projecting snugs drilled to fit the moulding box pins is mounted with patterns and runners to form the complete mould; true alignment of patterns on each side of the plate is essential, and the method follows the usual sand ramming, lifting off the top box and drawing the plate. The plate forms the mould joint and, with runners in the form of patterns, moulding time is reduced A number of patterns may be mounted on one plate and in repetition castings large outputs follow. The next step in advance is to ram the mould mechanically, effected in practice by pressure from a hand lever or hydraulic or compressed air rams. Various types of machines are available all having the common principle of a mounted pattern plate but differing in the method of feeding and ramming the sand and automatically separating the top and bottom boxes from the plate. A promising method lately developed is "sand slinging," or blowing the sand into the box by means of compressed air, a method which offers possibilities of general application.

Nonferrous alloy castings may be made in permanent metal moulds; research in this branch of die casting is proceeding and promising results have already been obtained. In other directions, notably with cast-iron water pipes, centrifugal casting in rotating metallic moulds is proving successful.

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(P. Lo.)

FOUNDLING HOSPITALS. It is significant that these institutions are gradually becoming things of the past, and that there are few countries left in which hospitals are found which exist solely for the purpose of receiving "foundlings," *i.e.*, children who have been abandoned or exposed, and left for the public to find and save. Definite institutions for the care of foundlings were established during the 7th and 8th centuries in Trèves, Milan and Montpellier, followed by others in Venice during the 14th and in Paris and Lyons during the 17th centuries. The celebrated Foundling Hospital of London was established by Captain Coram in 1739 and has since completely changed its original character.

The modern method of dealing with illegitimate children—and nearly all those who were placed in Foundling Hospitals were born out of wedlock—is based on the proved advantage both to the mother and child of keeping them together, at any rate for the first year, thereby greatly reducing the infant mortality rate, strengthening the natural ties and lessening the chance of the mother erring a second time. There is also an increasing reluctance, owing to the great risk of infection, to herd very young children together in large institutions so that the boarding-out, or foster-mother system of caring for these children is being more and more employed in all countries.

At first the London Foundling Hospital admitted any child under two months of age who was free from certain specified diseases, without any questions being asked or any attempt made to identify its parents Grants were made by Parliament to the Hospital from 1756 onwards, £10,000 being paid to the governors in that year, on condition that all children offered under 2 months, subsequently increased to one year, were received In 1757 no fewer than 3,727 children were admitted and branch hospitals at Ackworth, Shrewsbury, Westerham, Aylesbury and Barnet were opened, to cope with the number of children for whom admission was sought, the cost of establishing these country hospitals amounting to over £40,000 This general admission was soon found to be a serious error, for the social evils surrounding the conditions of illegitimate birth received no check, and of the 14,-934 children received during the 3 years and 10 months it was in force, no less than 10,389 died in early infancy. Parents even brought dying children for the purpose of having them buried at the expense of the Hospital, and strangers were employed by parents to bring their children from the country to the Hospital in Bloomsbury, London, at so much per head, many such children, through the brutality or criminal negligence of those to whom they were entrusted, never reached their destination alive.

By 1760 the House of Commons decided that the indiscriminate admission of children should cease, and State aid came to an end in 1771. From that time onwards the Hospital has had to depend on private philanthropy for its funds, and has gradually amended the conditions under which children are admitted. The following are the present rules for admission.—

Children can only be received upon the personal application of the mothers. The children of married women and widows are not received. Petitions must set forth the true state of the mother's case, and if any deception is used the petition will be rejected No application can be received previous to the birth of the child, nor after it is 12 months old. No child can be admitted unless the committee is satisfied, after due enquiry, of the previous good character and present necessity of the mother, and that both mother and child have been deserted by the father.

The children are placed out to nurse with cottagers in the country, under the superintendence of medical officers, and are returned to the Hospital about the age of six. The 56 acres comprising the estate of the Hospital, purchased in 1741 for £6,500, had enhanced so much in value by 1926 that the Governors decided that it would be in the best interests of the institution to sell the site and remove to new premises in the country. The sale of the estate and buildings realized £1,650,000 and the children were housed in temporary premises at Redhill, pending the erection of suitable new premises elsewhere. Over 500 children are maintained annually by the institution.

Continent of Europe.—In Germany there have never been many foundling hospitals as distinguished from orphanages. There is, however, a German Society for modern foundling hospitals, which seeks to found new institutions of this sort and which maintains one such home at Unterhaching, near Munich, where deserted children are cared for up to two years of age Illegitimate children are kept with their mothers as far as possible during infancy, but as there are only about 100 homes for unmarried mothers with their babies throughout the country, the provision is obviously inadequate.

In Russia, according to a report furnished in 1927 by the Red Cross Society of the U S.S.R , the number of homes for children had increased from 7 in 1917 to 720 by the end of 1925. All

maternity and child welfare work under the People's Commissariat of Health is maintained out of a special fund for this purpose, as well as by local health authorities and philanthropic and other bodies Out of certain funds set aside for the prevention of child vagrancy, homes for married and unmarried mothers with children are provided and premiums given to nursing mothers, with a view to preventing child desertion The establishment of village nurseries, of which there were 4,052 in 1927, where mothers who have to work, especially in the fields during the summer months, can temporarily leave their children, has also helped to solve the problem of the deserted child

In Roumania there are very few foundling hospitals that are not at the same time orphanages One such institution, the *Alinarea* at Galatz, combines the functions of an emergency home for babies with those of a foundling home and orphanage, for it accepts babies temporarily while their mothers are ill, or, if the latter die in childbirth, till the babies are old enough to be cared for in their own homes by the father or other relation This home, founded in 1901, was the first in the country to receive Government recognition The mortality rate among the foundlings was high, as much as 80% in some years, due to exposure to cold before they are found deserted in the streets and to certain specific diseases There are altogether eight foundling hospitals in Roumania. Much of the money spent by the State in aiding institutions of this kind is derived from the sale of the special Assistenta Sociala postage stamp, value 25 bani, which it is obligatory to add to the ordinary stamps on all letters conveyed from one part of the country to another, as well as on all public documents (J Ha)

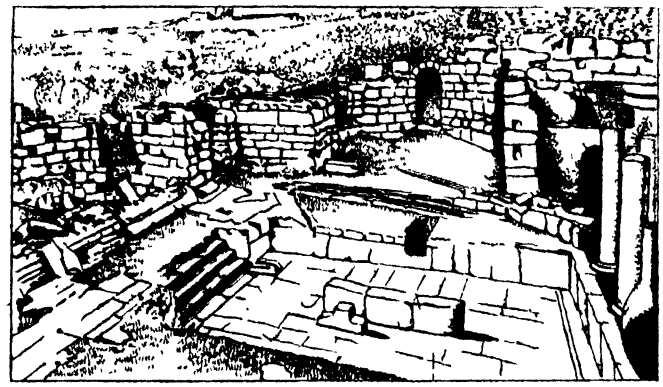
United States.—Foundling hospital and foundling are terms no longer common in the United States despite the continued existence of a number of institutions for abandoned and deserted children The use of these words is practically restricted to the groups specifically concerned with social service That they are falling into disuse is due to the newer welfare methods of organized charity which discover family ties, which enable mother and child to be kept together and out of which the system of child placement has arisen

The foundling hospital in America was instituted about 1850–60 by Catholic nuns, Protestant churches or private individuals such as Dr George E. Shipman in Chicago and Dr John S. Parry in Philadelphia, doctors appalled at the high mortality among exposed infants, records covering a period of 20 years in one hospital show that of a yearly average of 52 admittances there were 35 deaths The first institution designated for foundlings seems to have been St Vincent's Infant asylum (448 children), established by the Sisters of Charity (St Vincent de Paul) in Baltimore, Md, in 1856 Between 1860–73 six others were founded: two in Washington, D C, and one each in San Francisco, New York, Chicago and Cleveland

Of 1,151 institutions for the care of children, according to the 1910 census—the only one with such a classification—28 are described for foundlings and for "abandoned" or "deserted" children as well as for dependents and orphans in the District of Columbia, California, Florida, Georgia, Illinois, Indiana, Louisiana, Maryland, Michigan, Missouri, New Jersey, New York, Ohio, Pennsylvania, Tennessee, Virginia and Wisconsin The present New York Foundling hospital under the Sisters of Charity is the largest (700) Foundlings and deserted children in New York city and mothers with their infants if they are willing to act as nurses are received There is a country home supported by voluntary contributions and a per caput allowance from the city connected with this institution at St Joseph's-by-the-Sea, near Huguenot, Staten Island.

FOUNTAIN, a term applied equally to simple arrangements for letting water gush into an ornamental basin and to more elaborate ones by which water is mechanically forced into high jets, to the ornamental receptacle and to the jet of water itself A very early extant example is preserved in the carved Babylonian basin (*c.* 3000 B C.) found at Tello, the ancient Lagash, and Layard mentions an Assyrian fountain, found by him in a gorge of the river Gomel, which consists of a series of basins cut in the solid rock and descending in steps to the stream. (A. H Layard, *Discoveries Among . . . Ruins of Nineveh and Babylon,* p. 182; 1853) The water had originally been led from one to the other by small conduits, the lowest of which was ornamented by two rampant lions in relief

Greek.—During the Aegean civilization, as in later Hellenic Greece, springs were frequently considered sacred and shrines were built round them, the water often emerging into artificial



BY COURTESY OF THE "JOURNAL OF AMERICAN ARCHAEOLOGY"

QUADRANGULAR BASIN OF THE FOUNDATION DEDICATED TO THE NYMPH PIRENE AT CORINTH THE WATER WAS RECEIVED IN THIS ENCLOSURE AFTER FLOWING THROUGH A NUMBER OF CELLS

basins In historic Greece, such fountains, more highly developed, with cut stone openings and marble basins, were common, and both literary references and excavated remains abound Frequently the fountain proper was surrounded by a wall and occasionally small rooms, used for shrines or for *ex-voto* offerings, stood near by Some were surrounded by columns, as at Lerna Groves were sometimes planted in connection with the fountain shrines The city of Corinth was particularly noted for its fountains, the most famous being that dedicated to the nymph Pirene, whose tears, in bewailing her sons, slain by Artemis, were claimed by myth as the origin of the spring

Roman.—In Roman civilization water was distributed from each terminal reservoir, or *castellum,* not only to baths and to large houses, but also to many public fountains from which the poorer people drew their supply In many cases these fountains, usually at street corners, were decorated with human, animal or grotesque heads, from whose mouths the water issued Several such public fountains have been uncovered at Pompeii. A characteristic example, standing on a street corner near the house of Pansa, consists of a rectangular basin on the edge of the curb with a small carved pedestal rising behind it and a small sinkage at the front of the basin, which acted as an overflow. In addition to these small public fountains, great monumental structures known as *nymphaea* (*see* NYMPHAEUM) were constructed for purely decorative purposes These structures, like the Greek fountains, were considered shrines to nymphs, and often took the shape of an *exedra* (*q v*) covered by a half dome, and in Roman imperial times were richly decorated A good example exists near the agora at Ephesus Fountains were much used as garden decorations by the Romans Three forms are found In the first the water gushes from a statue or mass into a basin, and from that trickles down into lower and wider basins. The second resembles a miniature *nymphaeum* and consists of a decorative niche containing the fountain proper. Two charming examples of this type have been found in Pompeii with the niches decorated by mosaics, predominantly blue, and ornamented with bands of small sea shells. The third type is that known to-day as the *jet d'eau* in which water under a considerable head or pressure, is led to a small vertical orifice from which it spouts high in the air. Wall paintings from Pompeii and in the Museo delle Terme at Rome show the type clearly.

Mediaeval.—During the earlier middle ages, although occasional architectural treatments of natural springs are found, fountains elsewhere passed out of use; wells furnished the greater part of the necessary water. From the 12th century, however, public fountains began to reappear, and the spring fountains re-



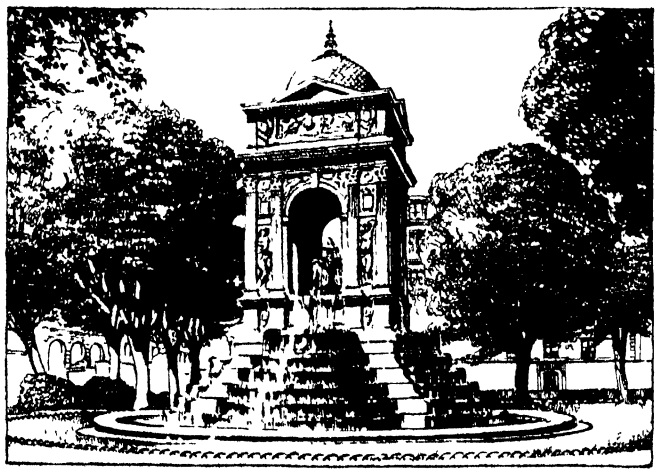
BY COURTESY OF (8) TALBOT F. HAMLIN. PHOTOGRAPHS (1, 2) EWING GALLOWAY, (3, 9) BURTON HOLMES FROM EWING GALLOWAY, (4) ANDERSON, (5) PUBLISHERS PHOTO SERVICE, (6) DONALD MCLEISH, (7) UNDERWOOD AND UNDERWOOD

EUROPEAN AND AMERICAN FOUNTAINS

1 Fountain at Piana del Greci, Sicily; Italian Baroque, 17th century 2 Fountain of the Lions, The Alhambra, Granada; Moorish, 14th century 3 Fountain in the Gardens at Versailles; French, Period of Louis XIV 4 Water-organ Fountain, Villa d'Este, Tivoli (Ligorio, architect); Italian Baroque, 17th century 5 The Buckingham Fountain, Chicago (Bennet, Parsons and Frost, and J. A. Lambert, architects), modern American 6 House of the Great Fountain, Pompeii, ancient Roman, 1st century 7 Fountain in the Peterhof palace, Leningrad; Russian Rococo 8 Turkish fountain in Constantinople, 18th century 9 Fountain in the Piazza of St. Peter's, Rome (Bernini, architect), Italian Baroque, 17th century

ceived a more highly developed architectural treatment. The usual form of the latter consisted of a large basin reached by a descending stairway and covered over with a vault, sometimes enclosed and sometimes supported only on piers. At Poitiers, the *Fontaine Joubert* (14th century, restored 1597) was originally of this type. Other crude examples are common in Brittany. The public fountains of the mediaeval towns usually had a polygonal or circular basin, occasionally lobed, in the centre of which rose a column or pier carrying a series of spouts. The architectural details are of infinite variety. From the simple hexagonal vase and column of the 12th century fountain at Provins to the elaborate richness of the 15th century fountains of south Germany, every kind of Gothic detail is found. Particularly noteworthy is the Schone Brunnen at Nuremburg (1385–96), distinguished by its high, rich, Gothic spirelet, with many statues, and the iron railing which surrounds it

Renaissance.—With the coming of the early Renaissance in Italy, a new phase of fountain design, in which sculpture played an ever increasing part, began. The earlier examples consist, usually, of a series of basins, frequently circular, one above the other, the smallest at the top, the whole crowned by the fountain figure, from which the water spouts Later the complexity of basin and water treatment was increased and many figures, instead of one, were sometimes used, as in Bernini's famous fountain in the Piazza di Navona in Rome, where Tritons and river gods decorate a mass of rustic masonry in the centre. Equally well known are the fountains that he added to the piazza in front of S Peter's, as simple as the former is complex. In each of these a single enormous vertical jet of water falls into a simple upper basin and from that into a larger lower basin. The same Baroque period saw the addition of monumental fountains more allied to the Roman *nymphaea*, in which the water was hardly more than an incident in a vast architectural composition Such are the Aqua Paola and the fountain of Trevi, both at Rome, the former,

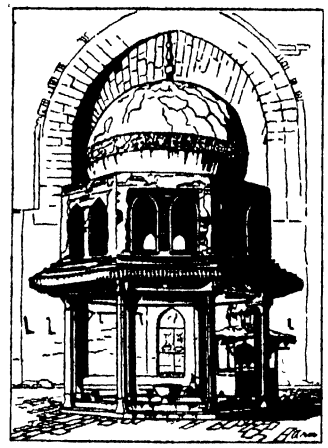


BY COURTESY OF THE METROPOLITAN MUSEUM OF ART, N Y

FOUNTAIN OF THE INNOCENTS. THE EARLIEST ORNAMENTAL FOUNTAIN ERECTED AT PARIS THE BAS-RELIEFS AND DECORATIONS ARE BY JEAN GOUJON (1520–1566)

by Fontana and Della Porta (*c.* 1600) and the latter built in the 18th century from designs probably by Bernini. In addition to these public fountains, the Baroque period in Italy produced an enormous number of villa fountains of all types, frequently of the most fantastic design, like the water organ of the Villa d' Este, Tivoli, controlled by elaborate mechanical devices so as to play only when certain pavement stones were stepped on, etc., as in the small terrace fountains of the same villa.

French fountains often follow Italian precedent, although the Fontaine des Innocents, in Paris, by Jean Goujoun (early 16th century) is an original work of much charm, but in general, city fountains of north and west Europe are merely variations of types already set in Rome. Characteristically naïve and fantastic in its use of sculpture is the famous little fountain in Brussels known as the Mannikin, by Duquesnoy, 1619, upon which Louis XV. is supposed to have conferred the Cross of St Louis. A remarkable example of the architectural niche type is the lovely Medici fountain in the Luxembourg Gardens in Paris, by de Brosse, early in the 17th century The great group of fountains at Versailles, with its magnificent combination of jets of water and sculpture is only a fantastic development on an enormous scale of ideas originally developed in the Italian Baroque villas.



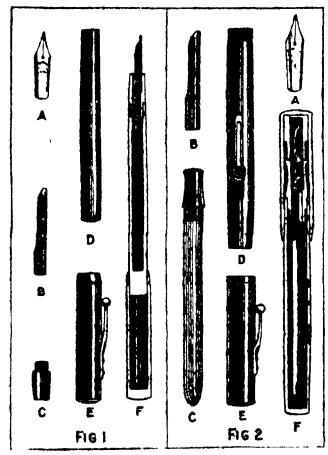
BY COURTESY OF THE METROPOLITAN MUSEUM OF ART, N Y

ONE OF THE SEVERAL HUNDRED DRINKING FOUNTAINS OR "SEBEELS" AT CAIRO

Mohammedan.—The fountains of Muslim countries are of great interest and beauty. They usually take the form of small square buildings, richly decorated, on the sides of which are the spouts and basins, but simpler forms of great beauty in which the spout and basin are merely enclosed within a graceful niche exist

Modern.—In modern times the practical necessity of fountains has largely disappeared Horse troughs and small drinking fountains are, however, still plentiful in most cities. In general, these are of the simplest design, and the most recent are of the so-called bubbling type, in which the water is drunk directly from the jet without a cup. For decorative and monumental use, however, fountains are more common than ever. In the smaller types modern sculpture has found one of its most congenial outlets A magnificent example of the modern monumental fountain is the Buckingham Memorial Fountain at Chicago (1927) by Jacques Lambert, of Paris, and Bennet, Parsons and Frost, of Chicago (T F. H)

FOUNTAIN PEN. A pen with a reservoir of ink which automatically feeds the nib when the instrument is in use In its practical form, it dates back only to the eighteen-eighties.



DETAILS OF THE FOUNTAIN PEN SHOWING ORDINARY TYPE (FIG 1) AND SELF-FILLING TYPE (FIG 2) A. nib; B. feed bar; C. connection between feed bar and barrel; D. barrel; E. cap; F. showing how parts fit together. In Fig. 2. C is a flexible rubber sac, acting as the ink reservoir, which is filled by operating the lever on D

The modern fountain pen is a simple contrivance In the first example shown (fig. 1), there are only five parts. the barrel to hold the ink, a feed bar to regulate the flow of ink (B), a nib (A), a small section which screws into the barrel and carries the feed bar and the nib, and a cap to cover the nib when the pen is not in use (E)

One of the most important parts of a fountain pen is the feed. This is the device which controls the passage of ink from the barrel to the nib The feed shown in the illustration is extremely simple. A channel about $\frac{1}{16}''$ wide is grooved along the top of the feed, and in this channel are the capillary fissures which convey the ink from the barrel to the point of the nib, the air being drawn into the reservoir along the channel On each side of this channel are three pockets or recesses These are designed to collect any surplus ink and hold it in readiness to meet the requirements of the writer Thus is secured a regular flow of ink to the point of the nib, automatically controlled by the writer's own action: the release being exactly in accordance with the pressure

The barrel of this type of pen is entirely devoted to the storage of ink The filling is done by means of a glass tube with rubber bulb, the point section being easily detached and the ink conveyed

straight into the barrel, which will hold enough to form several thousand words This pen should, when carried, be upright

Safety Type.—But there is a "Safety" type which can be carried in any position without risk of leakage

In this case spiral grooves are cut inside the barrel, and a rod extending right across its internal diameter and working in these grooves carries the nib into position for writing and the reverse action draws the nib down into the barrel when not required The rod is operated very easily, the best way being to place the cap firmly on the end of the pen and then turn it until the nib is in the writing position It is necessary when closing the pen to hold it upright because directly the nib is even slightly withdrawn from the writing position there is nothing to prevent the ink flowing out until the cap is replaced It is like a bottle with the cork out This cap is fitted with a plug which completely seals the barrel and because of this plug it is necessary that the nib should be below the level of the top end of the barrel, otherwise it will be broken

Self-fillers.—There have been many inventions designed to fill the pen by suction instead of by the use of a glass filler. Fig 2 shows a self-filling type In this case the ink is carried in a flexible rubber sac inside the barrel The sac (C) fits closely on the inner end of the point section and a lever, operating at the side, fills the pen by suction when, with nib immersed in ink, the lever is lowered

Though the modern high grade fountain pen has rightly been described as a simple contrivance, its manufacture is a most elaborate and costly process Over 200 distinct and separate operations are required to make the pen which is illustrated in this article, and the materials used come from all parts of the world

The barrel is made of vulcanised rubber but, in certain pens, of compounds variously known as radite, pyroxilin and permanite, in a great variety of colours The nib is made of gold, and the point is tipped with an even more costly metal, iridium, which, being very much harder than gold gives the nib the necessary durability

FOUQUÉ, FERDINAND ANDRÉ (1828–1904), French geologist and petrologist, was born at Mortain, La Manche, on June 21, 1828 In 1877 he became professor of natural history at the Collège de France, in Paris As a stratigraphical geologist he rendered much assistance on the Geological Survey of France, and he was the first to introduce modern petrographical methods into France Fouqué died on March 7, 1904 His chief publications were *Santorin et ses éruptions* (1879), with A Michel Lévy *Minéralogie micrographique, Roches éruptives françaises* (2 vols, 1879), and *Synthèse des minéraux et des roches* (1882).

FOUQUÉ, FRIEDRICH HEINRICH KARL DE LA MOTTE, Baron (1777–1843), German romantic writer, was born on Feb. 12, 1777 at Brandenburg. Fouqué owed his introduction to literature to A. W Schlegel, who published his first book, *Dramatische Spiele von Pellegrin* in 1804 His next work, *Romanzen vom Tal Ronceval* (1805), showed more plainly his allegiance to the romantic leaders, and in the *Historie vom edlen Ritter Galmy* (1806) he versified a 16th-century romance of mediaeval chivalry *Sigurd der Schlangentoter, ein Heldenspiel* (1808), the first modern German dramatization of the *Nibelungen* saga, attracted attention to him, and influenced considerably subsequent versions of the story

Between 1810 and 1815 the romances and novels, plays and epics, which Fouqué turned out with extraordinary rapidity, appealed exactly to the mood of the hour The earliest of these are the best—*Undine* (1811), being, indeed, one of the most charming of all German *Marchen* and the only work by which Fouqué's memory still lives to-day A more comprehensive idea of his powers may, however, be obtained from the two romances *Der Zauberring* (1813) and *Die Fahrten Thiodulfs des Isländers* (1815). From 1820 onwards the quality of Fouqué's work rapidly degenerated He died in Berlin on Jan 23, 1843.

Fouqué's *Ausgewahlte Werke*, edited by himself, appeared in 12 vols (1841), a selection, edited by M. Koch, will be found in Kurschner's *Deutsche Nationalliteratur*, vol 146, part ii. (Stuttgart, 1893), *Undine, Sintram*, etc, in innumerable reprints Bibliography in Goedeke's *Grundriss zur Geschichte der deutschen Dichtung* (2nd ed, vi pp 115 ff, Dresden, 1898) Most of Fouqué's works have been translated, and the English versions of *Aslauga's Knight* (by Carlyle), *Sintram and his Companions* and *Undine*, have been frequently republished For Fouqué's life to the year 1813 *see* his autobiography, *Lebensgeschichte des Baron Friedrich de la Motte Fouqué* (Halle, 1840) For criticism, *see* Jenthe, *Fouqué als Erzahler* (1910), Th Kramer, *Das romantische Ritterepos bei Fouqué* (1913), G Mehlis, *Die deutsche Romantik* (Munich, 1922), J. Haupt, *Elementargeister bei Fouqué, Immermann und Hoffmann* (Leipzig, 1923).

FOUQUET, JEAN or **JEHAN** (*c* 1415–1485), French painter, born at Tours, is the most representative and national French painter of the 15th century He was in Italy about 1437, where he executed the portrait of Pope Eugenius IV, and upon his return to France, whilst retaining his purely French sentiment, he grafted the elements of the Tuscan style, which he had acquired during his sojourn in Italy, upon the style of the Van Eycks, which was the basis of early 15th-century French art, and thus became the founder of an important new school He was court painter to Louis XI Though his supreme excellence as an illuminator and miniaturist, of exquisite precision in the rendering of detail, and his power of clear characterization won for him an eminent position in the art of his country, his importance as a painter was only realized when his portraits and altarpieces were for the first time brought together in 1904, at the exhibition of the French Primitives held at the Bibliothèque Nationale in Paris One of Fouquet's most important paintings is the diptych, formerly at Notre Dame de Melun, of which one wing, depicting Agnes Sorel as the Virgin, is now at the Antwerp Museum and the other, representing Etienne Chevalier, the Lord High Treasurer of France, in the Berlin Gallery The Louvre has his oil portraits of Charles VII, and of Jouvenal des Ursins, besides a portrait drawing in crayon The Museum at Chantilly contains 40 miniatures from a Book of Hours, painted before 1461 for Etienne Chevalier From Fouquet's hand again are 11 out of the 14 miniatures illustrating a translation of Josephus at the Bibliothèque Nationale Two further works in the same library are ascribed to him the "Statutes of the Order of St Michael," and the "Chronique de France" A Boccaccio at Munich is also believed to be by him

See A de Champeaux and P Gauchery, *Oeuvres d'art exécutées pour le duc de Berry*, "Facsimiles of two histories by Jean Fouquet" from vols. i and ii of the *Anciennetés des Juifs* (London, 1902), and Georges Lafenestre, *Jehan Fouquet* (1905) P. Durrieu *Les antiquités judaiques* (1908), A Gruyer, *Chantilly* (1897), *Les Quarante Fouquet* (1900); Hulin, *L'exposition des prim franc* (1904); Yates Thomson, "The Romance of a Book," *Burlington Magazine* (1906), Max Friedlander, "Die Votivtafel des Etienne Chevalier," *Jahrbuch der Konigl Preuss Kunstsammlungen* (1896), L M Richter, *Chantilly* (1913)

FOUQUET (or Foucquet), **NICOLAS** (1615–1680), viscount of Melun and of Vaux, marquis of Belle-Isle, superintendent of finance in France under Louis XIV, was born in Paris in 1615 He belonged to an influential family of the *noblesse de la robe*, and was admitted as *avocat* at the parlement of Paris at the age of 13 In 1636 he bought the post of *maître des requêtes* From 1642 to 1650 he held various intendances at first in the provinces and then with the army of Mazarin, and, coming thus in touch with the court, was permitted in 1650 to buy the important position of *procureur général* to the parlement of Paris. During Mazarin's exile Fouquet shrewdly remained loyal to him, protecting his property and keeping him informed of the situation at court

Upon the cardinal's return, Fouquet demanded and received as reward the office of superintendent of the finances (1653). The appointment was a popular one with the moneyed class, for Fouquet's great wealth had been largely augmented by his marriage in 1651 with Marie de Castille, who also belonged to a wealthy family of the legal nobility His own credit, and his unfailing confidence in himself, strengthened the credit of the government, while his high position as *procureur général* secured financial transactions from investigation. As minister of finance, he soon had Mazarin almost in the position of a suppliant. The long wars, and the greed of the courtiers, made it necessary at times for Fouquet to borrow upon his own credit, but he soon

turned this confusion of the public purse with his own to good account The disorder in the accounts became hopeless; fraudulent operations were entered into with impunity, and the financiers were kept in the position of clients by official favours and by generous aid whenever they needed it. Mazarin was too deeply implicated in similar operations to interfere, and was obliged to leave the day of reckoning to his agent and successor Colbert Upon Mazarin's death Fouquet expected to be made head of the government, but Louis XIV decided otherwise In August 1661 Louis XIV, already set upon his destruction, was entertained at Fouquet's great house at Vaux with a *fête* rivalled in magnificence by only one or two in French history The splendour of the entertainment sealed Fouquet's fate Three weeks after his visit to Vaux the king took Fouquet with him to Nantes and had him arrested on the charge of embezzlement His trial lasted almost three years, and violated the forms of justice Public sympathy was strongly with Fouquet, and Lafontaine, Madame de Sévigné and many others wrote on his behalf, but when Fouquet was sentenced to banishment, the king, disappointed, "commuted" the sentence to imprisonment for life He was sent at the beginning of 1665 to the fortress of Pignerol, where he died on March 23, 1680 A report of his trial was published in Holland, in 15 volumes, in 1665–1667, in spite of the remonstrances which Colbert addressed to the States General A second edition under the title of *Oeuvres de M Fouquet* appeared in 1696

See Chéruel, *Mémoires sur la vie publique et privée de Fouquet . . d'après ses lettres et des pièces inedites* (2 vols, 1864), J Lair, *Nicolas Foucquet*, (2 vols, 1890), U V Châtelain, *Le Surintendant Nicolas Fouquet . .* (1905)

FOUQUIER-TINVILLE, ANTOINE QUENTIN (1746–1795), French revolutionary, was born at Hérouel, Aisne Originally a *procureur* attached to the Chatelet at Paris, he sold his office in 1783, and became a clerk under the lieutenant-general of police He was public prosecutor to the Revolutionary Tribunal of Paris (March 10, 1793 to July 28, 1794) His function was not so much to convict the guilty as to see that the proscriptions ordered by the faction for the time being in power were carried out with a due regard to a show of legality. He was as ruthless and as incorrupt as Robespierre himself, he could be moved from his purpose neither by pity nor by bribes His passionless detachment made him an effective instrument of the Terror He had no forensic eloquence, but the cold obstinacy with which he pressed his charges was more convincing than any rhetoric, and he seldom failed to secure a conviction

His horrible career ended with the fall of Robespierre and the Terrorists on the 9th Thermidor. On Aug 1, 1794, he was imprisoned by order of the Convention and brought to trial His defence was that he had only obeyed the orders of the Committee of Public Safety, but, after a trial which lasted 41 days, he was condemned to death, and guillotined on May 7, 1795

See the documents relating to his trial enumerated by M Tourneux in *Bibliographie de l'histoire de Paris pendant la Révolution Française*, vol. i Nos 4445–4454 (1890); also F Dunoyer, *Fouquier-Tinville . .* (1913).

FOUR-CENTRED ARCH, in architecture, a pointed arch described from four centres, the smaller radius usually being nearer the spring (*see* ARCH).

FOURCHAMBAULT, a town of central France in the department of Nièvre, on the right bank of the Loire, 4½ m N.W. of Nevers, on the Paris-Lyon railway Pop (1926) 4,659. It has large iron-works, established in 1821, which produce engineering material for railway, military and other purposes Among the more remarkable *chefs-d'oeuvre* of the town are the metal portions of the Pont du Carrousel, the iron beams of the roof of Chartres cathedral, and the vast spans of the bridge over the Dordogne at Cubzac. A small canal joins the works to the Lateral canal of the Loire.

FOURCROY, ANTOINE FRANÇOIS, COMTE DE (1755–1809), French chemist, the son of an apothecary in the household of the duke of Orleans, was born at Paris, on June 15, 1755. He took up medical studies on the advice of the anatomist Félix Vicq d'Azyr (1748–94), and after many difficulties, due to poverty, obtained his doctor's diploma in 1780. His attention was specially turned to chemistry by J. B M Bucquet (1746–80), professor of this subject at the Medical School of Paris, and in 1784 he was appointed lecturer in chemistry at the college of the Jardin du Roi. Fourcroy proved himself to be a teacher and an organizer rather than an original investigator, and his published papers, though numerous, are not important He was one of the earliest converts to the views of Lavoisier (*q v*). Fourcroy died in Paris on Dec 16, 1809, the very day on which he had been created a count of the French empire

FOUR HUNDRED, in the United States, the expression popularly used to denote the inner circle of highest society The term originally applied to New York city society and is said to have arisen in 1892 when Mrs. William Astor asked Ward McAllister, a celebrated leader of society in New York city, to assist her in cutting down the invitation list of her annual ball to 400 persons as that was as many as her ballroom would accommodate McAllister, who held a unique though self-appointed position as directing executive of New York society functions at that time, was heard to remark afterward at one of his clubs that there were really only 400 people living in New York city who had any claim to be called "society" The remark was repeated and spread rapidly until newspapers and magazines were full of discussions on it From that time on the term became commonly used It has, however, lost all meaning in recent years There is no New York society in McAllister's sense of the term There are scores of social groups and levels but no hierarchy.

FOURIER, FRANÇOIS CHARLES MARIE (1772–1837), French socialist writer, was born at Besançon, Franche-Comté, on April 7, 1772 After completing his studies in his native town he travelled for some time in France, Germany and Holland Fourier entered the army, but after two years' service as a chasseur was discharged on account of ill-health In 1803 he published a remarkable article on European politics which attracted the notice of Napoleon, some of whose ideas were foreshadowed in it Inquiries were made after the author, but nothing seems to have come of them After leaving the army Fourier entered a merchant's office in Lyons, and afterwards earned his living as a broker, devoting his leisure time to study

He had become deeply impressed with the conviction that social arrangements resulting from the principles of individualism and competition were essentially imperfect and immoral He proposed to substitute for these principles co-operation or united effort, by means of which full and harmonious development might be given to human nature. The scheme, worked out in detail in his first work, *Théorie des quatre mouvements* (2 vols, Lyons, 1808, published anonymously), has for foundation a particular psychological proposition and a special economical doctrine Psychologically Fourier held what may with some laxity of language be called natural optimism,—the view that the full, free development of human nature or the unrestrained indulgence of human passion is the only possible way to happiness and virtue, and that misery and vice spring from the unnatural restraints imposed by society on the gratification of desire This principle of harmony among the passions he regarded as his grandest discovery. Throughout his works, in uncouth, obscure and often unintelligible language, he demonstrates the fundamental harmony to be found in the four great departments,—society, animal life, organic life and the material universe. In order to give effect to this principle and obtain the resulting social harmony, society should be reconstructed; for, in the existing organization of society innumerable restrictions are imposed upon the free development of human desire. As practical principle for such a reconstruction Fourier advocated co-operative or united industry But the full realization of his scheme demanded much more than the mere admission that co-operation is economically more efficacious than individualism Society as a whole must be organized on the lines requisite to give full scope to co-operation and to the harmonious evolution of human nature.

Society, on his scheme, is to be divided into departments or *phalanges*, each *phalange* numbering about 1,600 persons Each *phalange* inhabits a *phalanstère* or common building, and has a

certain portion of soil allotted to it for cultivation. The *phalanstères* are built after a uniform plan, and the domestic arrangements are laid down very elaborately The staple industry of the *phalanges* is, of course, agriculture, but the various *séries* and *groupes* into which the members are divided may devote themselves to such occupations as are most to their taste; nor need any occupation become irksome from constant devotion to it Any member of a group may vary his employment at pleasure, may pass from one task to another The tasks regarded as menial or degrading in ordinary society can be rendered attractive if advantage is taken of the proper principles of human nature It is not, on Fourier's scheme, necessary that private property should be abolished, nor is the privacy of family life impossible within the *phalanstère* Each family may have separate apartments, and there may be richer and poorer members But the rich and poor are to be locally intermingled, in order that the broad distinction between them, which is so painful a feature in actual society, may become almost imperceptible. Out of the common gain of the *phalange* a certain portion is deducted to furnish to each member the minimum of subsistence; the remainder is distributed in shares to labour, capital and talent,—five-twelfths going to the first, four-twelfths to the second and three-twelfths to the third Upon the changes requisite in the private life of the members Fourier was in his first work more explicit than in his later writings The institution of marriage is of necessity abolished; a new and ingeniously constructed system of licence is substituted

The scheme thus sketched attracted no attention when the *Théorie* first appeared, and for some years Fourier remained in his obscure position at Lyons In 1812 the death of his mother put him in possession of a small sum of money, with which he retired to Bellay in order to perfect his second work The *Traité de l'association agricole domestique* was published in 2 vols at Paris in 1822, and a summary appeared in the following year. After its publication the author proceeded to Paris in the hope that some wealthy capitalist might be induced to attempt the realization of the projected scheme Disappointed in this expectation he returned to Lyons In 1826 he again visited Paris, and as a considerable portion of his means had been expended in the publication of his book, he accepted a clerkship in an American firm. In 1829 and 1830 appeared what is probably the most finished exposition of his views, *Le Nouveau Monde industriel.* In 1831 he attacked the rival socialist doctrines of Saint-Simon and Owen in the small work *Pièges et charlatanisme de deux sectes, St. Simon et Owen.* His writings now began to attract some attention A small body of adherents gathered round him, and the most ardent of them was Victor Considérant (*q v*). In 1832 a newspaper, *Le Phalanstère ou la réforme industrielle* was started to propagate the views of the school, but its success was not great In 1833 it declined from a weekly to a monthly, and in 1834 it died of inanition It was revived in 1836 as *Le Phalange*, and in 1843 became a daily paper, *La Démocratie pacifique* In 1850 it was suppressed.

Fourier did not live to see the success of his newspaper, and the only practical attempt during his lifetime to establish a *phalanstère* was a complete failure. In 1832 M. Baudet Dulary, deputy for Seine-et-Oise, who had become a convert, purchased an estate at Condé-sur-Vesgre, near the forest of Rambouillet, and proceeded to establish a socialist community. The capital supplied was, however, inadequate, and the community broke up in disgust. Fourier was in no way discouraged by this failure, and till his death, on Oct 10, 1837, he lived in daily expectation of the realization of his scheme

Several experiments on the lines laid down by Fourier were made in the United States by American followers of Fourier, whose doctrines were introduced there by Albert Brisbane (1809–1890). Indeed, in the years between 1840 and 1850, during which the movement waxed and waned, no fewer than 41 *phalanges* were founded, of which some definite record can be found. The most interesting of all the experiments, not alone from its own history, but also from the fact that it attracted the support of many of the most intellectual and cultured Americans was that of Brook Farm (*q v*)

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FOURIER, JEAN BAPTISTE JOSEPH (1768–1830), French mathematician, was born at Auxerre on March 21, 1768 Left an orphan at eight years old, he was educated at the military school of Auxerre, where he became a teacher of mathematics (1784) He taught at the École Normale at Paris from its institution in 1795, and was later professor of analysis at the École Polytechnique He accompanied Bonaparte to Egypt in 1798, and was made governor of Lower Egypt; he organized munitions workshops when the English fleet cut off supplies He contributed many papers on mathematics to the Institut du Caire, founded by Napoleon to strengthen French influence in the Levant Returning to France in 1801, he became, in 1802, prefect of Isère, and in 1808 baron and chevalier of the Legion of Honour At Grenoble he carried on elaborate investigations into the conduction of heat He settled in Paris in 1816, and in 1822 he became joint secretary of the Académie des Sciences with Cuvier In 1827 Fourier succeeded Laplace as president of the council of the École Polytechnique He died in Paris on May 16, 1830

Fourier's *Théorie Analytique de la Chaleur* (1822, trans A Freeman, 1872) marked an epoch in the history of mathematical physics (*see* below, FOURIER SERIES) Navier completed and published his unfinished *Analyse des équations déterminées* (1831) This work contained the development of an early paper of his on the resolution of numerical equations, and also "Fourier's theorem" on the real roots of an equation between two limits

A list of Fourier's publications is given in the *Catalogue of Scientific Papers of the Royal Society of London*, a selection of his works was edited by Gaston Darboux, *Oeuvres de Fourier* (Paris, 1880–90) *See* also Arago, "Joseph Fourier," in the *Smithsonian Report* (1871)

FOURIER SERIES, which are also called *trigonometric series*, take their name from Jean Baptiste Joseph Fourier (*see* above), author of *La théorie analytique de la chaleur* (1822) A great many problems of analytical physics, notably those which relate to the radiation of heat, are easily solved when the initial state is represented by a simple periodic function, as the sine or cosine of the variable or of an integral multiple of the variable When the initial conditions are entirely arbitrary, it is natural to attempt to represent it by the sum of a finite or infinite number of such simple periodic functions, *i e*, by a trigonometric series. The problem had already been stated by Euler, but before Fourier's time mathematicians had not thought such a representation possible, except for those functions called by Euler *continuous functions, i e*, those which may be represented geometrically by a unique continuous curve The great discovery of Fourier was the representation of any discontinuous function by a trigonometric series, *i.e*, by a series of continuous functions. The simplest type of such a discontinuous function is one which is equal to zero in certain intervals and to one in certain other intervals. In this way problems in mathematical physics can be solved for any initial conditions when one knows how to solve for the simple periodic initial conditions.

In his *Théorie analytique de la chaleur* Fourier indicates also, with respect to the radiation of heat in a sphere, how an arbitrary function might be developed in a series in which the terms are proportional, not to the sines and cosines of the integral multiples of the variable, but to the sines and cosines of the products of the variable and the roots of a certain transcendental equation. One sees in Fourier's work the origin of the theory of orthogonal

functions which were further developed at the beginning of the 20th century by Fredholm in his well-known work on the theory of integral equations Fourier's discoveries dominate the whole of mathematical physics; the applications and generalizations derived from his methods are far reaching

The theory of the Fourier series has proved to be no less important in mathematical analysis than in physics. The history of its development during the past century is closely knit with the development of the theory of functions of a real variable Fourier did not give a rigorous demonstration of his results; as was the custom of the time, they were based upon expansions of a purely formal value In 1837, however, Lejeune Dirichlet gave a demonstration of Fourier's results that was thoroughly rigorous. Dirichlet's essential accomplishment consisted in introducing the idea of uniform convergence of a series, an idea of capital importance in analysis Following Lejeune Dirichlet, the greatest geometricians of the 19th century occupied themselves with perfecting the theory of the trigonometric series, *i.e.*, of defining exactly the necessary and sufficient conditions that an arbitrary function must satisfy if it can be developed in a series of this nature, the coefficients being furnished by the very same formulae stated by Fourier One important development is due to Riemann, who demonstrated that the convergence of Fourier's series for a given value of a variable depends only on the behaviour of the function in the immediate vicinity of that value Riemann's theorem reduces the general problem of Fourier's series to the study of the behaviour of a function in the immediate vicinity of a point.

The latest development of the theory of trigonometric series can only be realized by a deeper study of the idea of an aggregate (*ensemble*) of points (*see* AGGREGATES, THEORY OF; POINT SETS) In the same way that Lejeune Dirichlet was inspired by the study of Fourier's series, to perfect his own theory of the continuity and uniform convergence of certain series, Georg Cantor, to complete this study, created and perfected the theory of point sets He describes the aggregates, or sets of points, derived from different orders of a given aggregate or set, and explains that the numbering of these derived sets creates a new type of numbers, to which he gives the name *transfinite numbers* Finally, he shows that, if one of these derived sets from the ensemble of discontinuities of the function comprises a finite number of terms, the trigonometric development is certainly unique. The works of Georg Cantor on the theory of aggregates had an important indirect repercussion on the theory of Fourier's series. They also suggested an exceedingly important question, that of the measure of a linear set of points This problem of measurement was solved, precisely and definitely, by Emile Borel in 1897, when he described certain aggregates as "measurable aggregates" (*ensembles mesurables*) and which Henri Lebesgue later called *ensembles mesurables B.* This definition of measurable aggregates, or sets of points, has, as a consequence, the idea of aggregates, or sets of points, of zero measure M Henri Lebesque has proposed to call a property "almost everywhere true" (*vert presque partout*) when it is true of all the prints excluding those prints of an aggregate of zero measure This idea of an "almost everywhere true" property has been important in the recent development of certain trigonometric series.

It is chiefly Lebesgue's idea of the integral, an idea which directly attaches itself to the measurement of aggregates, that has originated the latest refinements in the theory of Fourier's series. The coefficients of the series are in fact determined by the definite integrals in which the differential element is equal to the product of the function which is to be represented and the sine or cosine. By replacing integrals according to Riemann's definition by the integrals as defined by Lebesgue, the field of continuous or discontinuous functions which can be described by trigonometric series is considerably extended These works on the trigonometric series which have their origin in the integral of Lebesgue are too technical and too numerous to be discussed here. A very important work by Arnaud Denjoy, however, deserves attention. Thanks to a new generalization of the idea of the integral, which he has named "totalization," Denjoy has been able to solve the problem of the determination of coefficients of a trigonometric series in a complete and definitive manner At the moment that the series exists and represents a function, the coefficients can be obtained in every case by Fourier's formulae, on condition that the integrals figuring in these formulae are interpreted in the sense given them by Denjoy This beautiful result definitely closes a series of researches which has extended over more than a century. More recent investigations on a summation of Fourier's series, in a case where the series are divergent, are based for the most part on the methods and the generalizations of Cesáro. For a more detailed study of these researches, *see* the memoir by Plancherel and the book by Emile Borel, *Leçons sur les séries divergentes.*

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(E. Bo)

FOURMIES, a town of northern France, in the department of Nord, on an affluent of the Sambre, 39 m. S.E of Valenciennes by rail Pop (1926) 13,122. Wool combing and spinning are important, and a great variety of cloths is produced The glassworks of Fourmies date from 1599, and were the first established in the north of France. Iron is worked in the vicinity, and there are important forges and foundries. Enamel-ware is also manufactured

FOURNIER, PIERRE SIMON (1712–1768), French engraver and typefounder, was born at Paris on Sept. 15, 1712. He designed many new characters, and his foundry became celebrated not only in France, but in foreign countries. His *Table des proportions qu'il faut observer entre les caractères* (1737) was followed by several other technical treatises. His principal work, however, was the *Manuel typographique* (2 vols. 1764), the first volume treating of engraving and type-founding, the second of printing, with examples of different alphabets. He died in Paris on Oct 8, 1768

FOURTEEN POINTS, THE. On Jan 8, 1918, President Woodrow Wilson, in his address to the joint session of Congress, formulated under 14 separate heads his ideas of the essential nature of a post-war settlement. Before the delivery of his address he had received from a committee of inquiry, set up by Col. House in Sept. 1917, a report upon the territorial settlement that should follow the conclusion of the war. It has been stated that no fewer than six, and these the territorial points, of Wilson's Fourteen Points were "directly framed" upon the recommendations contained in the report It has also been stated that the report was drawn up by Dr. S. Mezes, D H. Miller, and Walter Lippmann.[1]

The Fourteen Points were —

1. Open covenants of peace openly arrived at, after which there shall be no private international understandings of any kind, but diplomacy shall proceed always frankly and in the public view.

2 Absolute freedom of navigation upon the seas outside territorial waters alike in peace and in war, except as the seas may be closed in whole or in part by international action for the enforcement of international covenants.

3 The removal, so far as possible, of all economic barriers and the establishment of an equality of trade conditions among all the nations consenting to the peace and associating themselves for its maintenance.

4. Adequate guarantees given and taken that national armaments will be reduced to the lowest point consistent with domestic safety

5. A free, open-minded and absolutely impartial adjustment of all colonial claims based upon a strict observance of the principle that in determining all such questions of sovereignty the interests of the populations concerned must have equal

[1] R. S. Baker, *Woodrow Wilson*, vol. i., pp. 110–111.

weight with the equitable claims of the Government whose title is to be determined

6 The evacuation of all Russian territory, and such a settlement of all questions affecting Russia as will secure the best and freest co-operation of the other nations of the world in obtaining for her an unhampered and unembarrassed opportunity for the independent determination of her own political development and national policy, and assure her of a sincere welcome into the society of free nations under institutions of her own choosing, and more than a welcome, assistance also of every kind that she may need and may herself desire The treatment accorded Russia by her sister nations in the months to come will be the acid test of their good will, of their comprehension of her needs as distinguished from their own interests, and of their intelligent and unselfish sympathy

7. Belgium, the whole world will agree, must be evacuated and restored without any attempt to limit the sovereignty which she enjoys in common with all other free nations No other single act will serve as this will serve to restore confidence among the nations in the laws which they have themselves set and determined for the government of their relations with one another Without this healing act the whole structure and validity of international law is for ever impaired

8 All French territory should be freed, and the invaded portions restored, and the wrong done to France by Prussia in 1871 in the matter of Alsace-Lorraine, which has unsettled the peace of the world for nearly 50 years, should be righted in order that peace may once more be made secure in the interest of all

9 A readjustment of the frontiers of Italy should be effected along clearly recognisable lines of nationality

10 The peoples of Austria-Hungary, whose place among the nations we wish to see safeguarded and assured, should be accorded the freest opportunity of autonomous development

11 Rumania, Serbia and Montenegro should be evacuated, occupied territories restored, Serbia accorded free and secure access to the sea, and the relations of the several Balkan States to one another determined by friendly counsel along historically established lines of allegiance and nationality, and international guarantees of the political and economic independence and territorial integrity of the several Balkan States should be entered into.

12 The Turkish portions of the present Ottoman empire should be assured a secure sovereignty, but the other nationalities which are now under Turkish rule should be assured an undoubted security of life and an absolutely unmolested opportunity of autonomous development, and the Dardanelles should be permanently opened as a free passage to the ships and commerce of all nations under international guarantees

13 An independent Polish State should be erected which should include the territories inhabited by indisputably Polish populations, which should be assured a free and secure access to the sea, and whose political and economic independence and territorial integrity should be guaranteed by international covenant

14 A general association of nations must be formed under specific covenants for the purpose of affording mutual guarantees of political independence and territorial integrity to great and small States alike

President Wilson developed his theories during 1918 in a series of speeches, to which reference was subsequently made during the Armistice negotiations These are as follows —

The Four Principles.—In the "Four Principles" speech in Congress, Feb 11, 1918, he declared·—

1. That each part of the final settlement must be based upon the essential justice of that particular case and upon such adjustments as are most likely to bring a peace that will be permanent;

2 That peoples and provinces are not to be bartered about from sovereignty to sovereignty as if they were chattels or pawns in a game, even the great game, now for ever discredited, of the balance of power, but that

3 Every territorial settlement involved in this war must be made in the interest and for the benefit of the populations concerned, and not as a part of any mere adjustment or compromise of claims amongst rival States; and

4. That all well-defined national aspirations shall be accorded the utmost satisfaction that can be accorded them without introducing new or perpetuating old elements of discord and antagonism that would be likely in time to break the peace of Europe, and consequently of the world.

The Four Ends.—In the "Four Ends" speech of July 4, 1918, occurs the following passage —

These are the ends for which the associated peoples of the world are fighting and which must be conceded them before there can be peace.—

1 The destruction of every arbitrary power anywhere that can separately, secretly, and of its single choice disturb the peace of the world, or, if it cannot be presently destroyed, at the least its reduction to virtual impotence

2 The settlement of every question, whether of territory or sovereignty, of economic arrangement, or of political relationship, upon the basis of the free acceptance of that settlement by the people immediately concerned, and not upon the basis of the material interest or advantage of any other nation or people which may desire a different settlement for the sake of its own exterior influence or mastery

3 The consent of all nations to be governed in their conduct towards each other by the same principles of honour and of respect for the common law of civilised society that govern the individual citizens of all modern States, and in their relations with one another, to the end that all promises and covenants may be sacredly observed, no private plots or conspiracies hatched, no selfish injuries wrought with impunity, and a mutual trust established upon the handsome foundation of a mutual respect for right

4 The establishment of an organization of peace which shall make it certain that the combined power of free nations will check every invasion of right and serve to make peace and justice the more secure by affording a definite tribunal of opinion to which all must submit and by which every international readjustment that cannot be amicably agreed upon by the peoples directly concerned shall be sanctioned These great objects can be put into a single sentence *What we seek is the reign of law, based upon the consent of the governed and sustained by the organised opinion of mankind*

The Five Particulars.—The "Five Particulars" (speech of Sept. 27, 1918) were —

1 The impartial justice meted out must involve no discrimination between those to whom we wish to be just and those to whom we do not wish to be just It must be a justice that plays no favourites and knows no standards but the equal rights of the several peoples concerned

2 No special or separate interest of any single nation or any group of nations can be made the basis of any part of the settlement which is not consistent with the common interest of all

3 There can be no leagues or alliances or special covenants and understandings within the general and common family of the League of Nations

4 And, more specifically, there can be no special selfish economic combinations within the League and no employment of any form of economic boycott or exclusion, except as the power of economic penalty, by exclusion from the markets of the world, may be vested in the League of Nations itself as a means of discipline and control.

5 All international agreements and treaties of every kind must be made known in their entirety to the rest of the world. Special alliances and economic rivalries and hostilities have been the prolific source in the modern world of the plans and passions that produce war. It would be an insincere as well as an insecure peace that did not exclude them in definite and binding terms.

BIBLIOGRAPHY.—H W. V. Temperley, *History of the Peace Conference of Paris,* vol i, pp. 431–435 (1920); The text of the fourteen points will be found in C. Seymour, *Woodrow Wilson and the World War,* vol iii, pp. 43–45 (1921) *See* also R. S. Baker, *Woodrow Wilson and World Settlement* (1923).

FOURTOU, MARIE FRANÇOIS OSCAR BARDY DE (1836–1897), French politician, born at Ribérac (Dordogne) on Jan 3, 1836, represented Dordogne in the National Assembly after the Franco-German War He was minister of public works (1872), of religion (1873) and of education (1874) As minister of the interior in Broglie's cabinet in 1877 he resumed the administrative methods of the Second Empire In the general elections of that year he used the whole weight of officialdom to secure a majority for the Right, to support a clerical and reactionary programme In spite of these efforts the cabinet fell, and a commission was appointed to inquire into their unconstitutional abuse of power Fourtou was unseated in consequence of the revelations made In the Chamber of Deputies Gambetta gave the lie direct to Fourtou A duel was fought in consequence, but neither party was injured Fourtou died in Paris on Dec 5, 1897

His works include *Histoire de Louis XVI* (1840), *Histoire de Saint Pie V.* (1845), *Mme Swetchine, sa vie et ses oeuvres* (2 vols, 1859), *La Question italienne* (1860), *De la contre-révolution* (1876), and *Mémoires d'un royaliste* (2 vols, 1888)

FOWEY (usually pronounced *Foy*), a seaport and town in Cornwall, England, 264¼ m W S W of London on a branch of the G W R from Lostwithiel, 25 m by sea W of Plymouth Pop (1921) 2,170 It lies on the estuary of the river Fowey, sheltered by a screen of hills The 14th century church of St Nicholas, on the site of an older edifice dedicated to St Finbar of Cork, has many beautiful features Place house, adjacent, is a Tudor building of the time of Henry VII Some old houses remain in the town Deep-sea fishing is carried on, and there is a staple trade in the export of china clay Fowey harbour will admit large vessels and affords protection from the south-west gales The ruin of St Catherine's fort stands at the harbour's mouth Connected with the town by ferry, is Polruan village, where there is an ancient roodstone, and the remains of Hall House, which was garrisoned during the Civil War

Fowey (Fawy Vawy, Fowyk) held a leading position amongst Cornish ports from the reign of Edward I to the days of the Tudors The numerous references to the privateering exploits of its ships in the Patent and Close Rolls and the large number of them (over 40) at the siege of Calais in 1346 testify to its importance A charter of incorporation was granted by James II and extended by a second charter in 1690 In 1316 the prior of Tywardreath, as lord of the manor, obtained the right to hold a Monday market and two fairs, which by the charter of 1690 were altered to a Saturday market and three fairs that continue to be held

FOWL, originally used to mean any bird, this term has now become (except in combination, as sea-fowl, wildfowl) almost restricted to *Gallus bankiva*, its domestic races and its wild allies (For domestic fowls, *see* POULTRY) The wild *G bankiva* inhabits N India, Burma, Cochin China, the Malay peninsula and neighbouring islands It resembles in plumage the domestic "black-breasted game" breed It inhabits forests, thickets and bamboo jungles, dwelling in small parties The crow of the cock is like that of a bantam The creamy-white eggs, eight to 12 in number, are laid on the ground

The grey jungle-fowl (*G sonneratii*) occupies much the same area, but is only found in the south in India The cock has the shaft of the neck-hackles dilated and his crow is more like a cackle The Sinhalese species (*G stanleyi*) is peculiar to Ceylon; the cock has a yellow comb with a red edge and is red beneath The fourth species (*G varius*) inhabits the Malay islands from Java to Flores It does not possess hackles and the cock has a large unserrated comb All the species will interbreed with domestic poultry and with the wild *G bankiva,* but the hybrids are sterile

FOWLER, CHARLES (1792–1867), English architect, was born at Cullompton, Devon, on May 17, 1792, and died at Great Marlow on Sept 26, 1867 After an apprenticeship of five years at Exeter, he worked in the office of David Laing in London from 1814 until he began to practise alone His first important work was the court of bankruptcy in Basinghall street (1821) In 1822 he gained first premium for a design for London bridge, which, however, was not used Among Fowler's designs for bridges was one erected across the Dart at Totnes He also designed the markets of Covent Garden, Hungerford, Gravesend and Exeter (lower market), several churches, the Devon lunatic asylum (1845), the London fever hospital (1849) and the hall of the Wax Chandlers' company, Gresham street (1853) He was honorary secretary and a vice-president of the Institute of British Architects

FOWLER, SIR JOHN (1817–1898), English civil engineer, was born on July 15, 1817 at Wadsley Hall, near Sheffield, where his father was a land-surveyor He was engaged in railway construction from an early age, and when he set up in business for himself in 1844 he was engaged in laying out the small railway systems which eventually were amalgamated under the title of the Manchester, Sheffield and Lincolnshire railway Fowler was engineer of the London Metropolitan railway, the pioneer of underground railways, and noteworthy in that it was mostly made, not by tunnelling, but by excavating from the surface and then covering in the permanent way, and he lived to be one of the engineers officially connected with the deep tunnelling "tube" system extensively adopted for electric railways in London He was also engaged in the making of railways in Ireland, and in 1867 he served on a commission to consider a state-purchase of the Irish railway system He also carried out considerable works in relation to the Nene Valley drainage and the reclamation of land at the Norfolk estuary

In 1865 he was elected president of the Institution of Civil Engineers, the youngest president who had ever sat in the chair. He was strongly opposed to the project of a Channel tunnel to France, and in 1872 he endeavoured, in vain, to obtain the consent of parliament to a Channel ferry scheme For eight years from 1871 he acted as general engineering adviser in Egypt to the Khedive Ismail He projected a railway to the Sudan, and also the reparation of the barrage These and many other plans came to an end owing to financial reasons But the maps and surveys for the railway were given to the war office, and proved most useful to Lord Wolseley in his Nile expedition For his service Fowler was made K C M G (1885) He was created a baronet in 1890 on the completion of the Forth bridge, of which with his partner Sir Benjamin Baker he was joint engineer He died at Bournemouth on Nov 20, 1898

FOWLER, JOHN (1826–1864), English inventor, was born at Melksham, Wilts, on July 11, 1826 He invented, about 1850, a mechanical system for the drainage of land In 1852 he began experiments in steam cultivation, and in 1858 the Royal Agricultural Society awarded him the prize of £500 for a steam-cultivator that should be an economic substitute for the plough or the spade In 1860 he founded at Hunslet, Leeds, the firm of Fowler and Co, manufacturers of agricultural machinery, traction engines, etc He died at Ackworth, Yorkshire, on Dec 4, 1864

FOWLER, THOMAS (1832–1904), English philosopher, was born on Sept 1, 1832, at Burton-Stather, Lincs, and was educated at Merton college, Oxford In 1855 he was ordained, and became fellow and tutor of Lincoln college, in 1873 professor of logic, in 1881 president of Corpus Christi college, and in 1899 vice-chancellor of the university, an office which he held for two years. He died at Oxford on Nov 20, 1904

Fowler's chief works are. *The Elements of Deductive Logic* (1867, 10th ed, 1892); *The Elements of Inductive Logic* (1870; 6th ed, 1892); *Locke* in "Eng. Men of Letters" series (1880); *Bacon's Novum Organum* (1889); *Locke's Conduct of the Understanding* (3rd ed, 1890); *Francis Bacon* (1881); *Shaftesbury and Hutcheson* in "Eng. Philosophers" series (1882); *History of Corpus Christi College* (1898), and *Principles of Morals* (1885–87) with J M Wilson

FOWLER, WILLIAM (*c.* 1560–1614), Scottish poet, attended St Leonard's college, St Andrews, between 1574 and 1578, and in 1581 was in Paris studying civil law In that year he issued a pamphlet against John Hamilton and other Catholics, who had, he said, driven him from his country He subsequently (about 1590) became private secretary and Master of Requests

to Anne of Denmark, wife of James VI., and was renominated to these offices when the queen went to England In 1609 his services were rewarded by a grant of 2,000 acres in Ulster. His sister Susannah was mother of the poet William Drummond of Hawthornden. A ms. collection of 72 sonnets, entitled *The Tarantula of Love*, and a translation (1587) from the Italian of the *Triumphs of Petrarke* are preserved in the library of the University of Edinburgh, in the collection bequeathed by his nephew, William Drummond Two other volumes of his manuscripts are preserved among the Drummond mss, now in the library of the Society of Antiquaries of Scotland Specimens of Fowler's verses were published in 1803 by John Leyden in his *Scottish Descriptive Poems* Fowler contributed a prefatory sonnet to James VI.'s *Furies*, and James, in return, commended, in verse, Fowler's *Triumphs*.

FOX, CHARLES JAMES (1749–1806), British statesman and orator, was born at 9 Conduit Street, Westminster, on Jan 24, 1749, third son of Henry Fox, 1st Lord Holland, and his wife, Lady Caroline Lennox, eldest daughter of Charles Lennox, 2nd duke of Richmond The father, who treated his children with extreme indulgence, allowed him to choose his school, and he elected to go to one kept at Wandsworth by a French refugee, named Pampelonne. Then the boy asked to be sent to Eton, where he was entered in the autumn of 1758. During the six years he spent at Eton he acquired the love and knowledge of the classics in which he found refreshment and solace all through life Lord Holland treated his children and in particular Charles, as friends and companions in pleasure from the first. In 1763 he took Charles to Paris and to Spa, and encouraged him in dissipation and in gambling In spite of this extraordinary interlude in his studies, Fox read hard from natural inclination. After he went up to Hertford College, Oxford, in 1764, he made repeated visits to France and Italy during the vacations. He became a good French and Italian scholar, with a keen appreciation of Italian literature and art

If Fox's youth was disorderly, it was never indolent He was incapable of half doing anything which he did at all He was as energetic in sport as in learning At a later period when he had grown fat he accounted for his skill in taking "cut balls" at tennis by saying that he was a very "painstaking man" He was all his life a great and steady walker.

In 1768 Lord Holland bought the pocket borough of Midhurst for him, and he entered on his parliamentary career, and on London society, in 1769 Within the next few years Lord Holland reaped to the full the reward for all that was good, and whatever was evil, in the training he had given his son The affection of Charles Fox for his father was unbounded, but the passion for gambling which had been instilled in him as a boy proved the ruin of the family fortune He kept racehorses, and bet on them largely On the racecourse he was successful, and it is another proof of his native thoroughness that he gained a reputation as a handicapper It is said that he won more than he lost on the course. At the gaming table he was unfortunate, and he was fleeced both in London and in Paris by unscrupulous players Fox took his losses and their consequences with an attractive gaiety He called the room in which he did business with the Jew moneylenders his "Jerusalem chamber" When his elder brother had a son, and his prospects were injured, he said that the boy was a second Messiah, who had appeared for the destruction of the Jews. "He had his jest, and they had his estate" In 1774 Lord Holland had to find £140,000 to pay the gambling debts of his sons. For years Charles lived in pecuniary embarrassment, and during his later years, when he had given up gambling, he was supported by the contributions of wealthy friends, who in 1793 formed a fund of £70,000 for his benefit.

Early Years in Parliament.—In the House of Commons he began by supporting the court, and in 1770, when only 21, he was appointed a junior lord of the admiralty with Lord North. During the violent conflict over the Middlesex election (*see* WILKES, JOHN) he took the unpopular side, and vehemently asserted the right of the House of Commons to exclude Wilkes. In 1772 during the proceedings against Crosby and Oliver—a part of the "Wilkes and liberty" agitation—he and Lord North were attacked by a mob and rolled in the mud. But Fox's character was incompatible with ministerial service under King George III The king, himself a man of orderly life, detested him as a gambler and a rake. And Fox was too independent to please a master who expected obedience In Feb 1772 he threw up his place to be free to oppose the Royal Marriage Act, on which the king's heart was set. He returned to office as junior lord of the treasury in December. But he was insubordinate; his sympathy with the American colonies, which were now beginning to resist the claims of the mother country to tax them, made him intolerable to the king and he was dismissed in Feb. 1774. The death of his father on July 1, of that year removed an influence which tended to keep him subordinate to the court, and his friendship for Burke drew him into close alliance with the Rockingham Whigs From the first his ability had won him admiration in the House of Commons. He had prepared himself as an orator by the elaborate cultivation of his voice, which was naturally harsh and shrill His argumentative force was recognized at once, but the full scope of his powers was first shown on Feb 2, 1775, when he made a remarkable speech (unfortunately lost) on the disputes with the colonies. "Taking the vast compass of the question before us," says Gibbon, "he discovered powers for regular debate which neither his friends hoped nor his enemies dreaded" When parliament met on Oct 26, Fox supported the amendment to the Address censuring ministers for increasing the discontent in America "Ministers," he said, "have reason to triumph Lord Chatham, the King of Prussia, nay, Alexander the Great, never gained more in one campaign than the noble lord [North] has lost—he has lost a whole continent" Next year, speaking again on the amendment to the Address (Oct. 31, 1776) he maintained that if the choice lay between conquering and abandoning America he was for abandoning it, the advantages of the connection arose from trade and from relationship with a people of the same ideas and sentiments These would be cut off by war, and the army there would oppress the people and be dangerous to liberty at home.

Fox's great political career is unique among the careers of British statesmen of the first rank, for it was passed almost wholly in opposition Except for a few months in 1782 and 1783, and again for a few months before his death in 1806, he was out of office. He declared, indeed, that he had "totally subdued" ambition, and was content with his life, yet it was certainly a cause of bitter disappointment to him that he had to stand by while the country was in his opinion not only misgoverned, but led to ruin. His reputation as an orator and a political critic, which was great from the first and grew as he lived, most assuredly did not console him for his impotence as a statesman.

During the eight years between his expulsion from office in 1774 and the fall of Lord North's ministry in March 1782 he planted the seed of the modern Liberal party as opposed to the pure Whigs. He became a member of the Rockingham party and worked in alliance with the marquis and with Burke In opposing the attempt to coerce the American colonists, and in assailing the waste and corruption of Lord North's administration, as well as the undue influence of the crown, he was at one with the Rockingham Whigs. During the agitation against corruption, and in favour of honest management of the public money, which was very strong between 1779 and 1782, he and they worked heartily together. It had a considerable effect, and prepared the way for the reforms begun by Burke and continued by Pitt. But if Fox learnt much from Burke he learnt with originality. He declined to accept the revolution settlement as final, or to think with Burke that the constitution of the House of Commons could not be bettered. He believed that, if the House was to be made an efficient instrument for restraining the interference of the king and for securing good government, it must cease to be filled to a very large extent by the nominees of boroughmongers and the treasury. He became a strong advocate for parliamentary reform. He was the ardent advocate of what have in later times been known as "Liberal causes," the removal of all religious disabilities and tests, the suppression of private interests which

hampered the public good, the abolition of the slave trade, and the emancipation of all classes and races of men from the strict control of authority

A detailed account of his activity from 1774 to 1782 would entail the mention of every crisis of the American War of Independence and of every serious debate in parliament Throughout the struggle Fox was uniformly opposed to the coercion of the colonies and was the untiring critic of Lord North While the result must be held to prove that he was right, he prepared future difficulties for himself by the fury of his language He was the last man in the world to act on the worldly-wise maxim that an enemy should always be treated as if he may one day be a friend, and a friend as if he might become an enemy At the opening of the autumn session in 1779 Fox, who was convinced that the king was responsible for North's continuance of the American War, stated plainly that the doctrine that the king could be his own minister was entirely unconstitutional and drew attention to the fate of Charles I. and James II. He denounced William Adam, a supporter of Lord North's, and in a duel which followed (Nov 29) Fox was wounded He assailed Lord North with unmeasured invective, directed not only at his policy but at his personal character, though he knew that the prime minister remained in office against his own wish, in deference to the king who appealed to his loyalty

When the disasters of the American war had at last made a change of ministry necessary, and the king applied to the Whigs, through the intermediary of Shelburne, Fox made a very serious mistake in persuading Rockingham not to insist on dealing directly with the sovereign The result was the formation of a cabinet (March 1782) belonging, in Fox's own words, partly to the king and partly to the country—that is to say, partly of Whigs who wished to restrain the king, and partly of the king's friends, represented by Shelburne, whose real function was to baffle the Whigs Dissensions were acute between Shelburne and Fox, the two secretaries of state The old division of duties by which the southern secretary had the correspondence with the colonies and the western powers of Europe, and the northern secretary with the others, had been abolished on the formation of the Rockingham cabinet All foreign affairs were entrusted to Fox Lord Shelburne, as secretary for the colonies, claimed a right to interfere in the negotiations for the peace at Paris, and fundamental differences arose Fox thought the independence of America should be unconditionally acknowledged, Shelburne wished it to be the price of peace. The majority in the cabinet sided with Shelburne Fox was about to resign, but resignation was deferred by the illness of Rockingham, who died on July 1, 1782 The king offered the premiership to Shelburne, Fox resigned, and was followed by a part of the Rockingham Whigs

The 1783 Coalition.—Fox's next step was ruinous On Feb 14, 1783, he formed a coalition with Lord North, based as they declared on "mutual goodwill and confidence" Fox maintained that the original cause of quarrel, the American War, being over, there was no longer any serious ground of difference But to the country at large this union, formed with a man whom he had denounced for years, had the appearance of an unscrupulous conspiracy In the House of Commons the coalition was strong enough to drive Shelburne from office on Feb 24 The king made a prolonged resistance to the pressure put on him to accept Fox and North as his ministers (*see* PITT, WILLIAM). On April 2, he was constrained to submit In the new ministry the duke of Portland was prime minister and Fox and North were secretaries of state The new administration was ill liked by some of the followers of both Fox increased its unpopularity both in the House and in the country by consenting against the wish of most of his colleagues to ask for the grant of a sum of £100,000 a year to the prince of Wales The introduction by Fox of the India bill in Nov 1783 offended the king by the provision which gave the patronage of India to a commission to be named by the ministry and removable only by parliament. The coalition, and Fox in particular, were assailed in a torrent of most telling invective and caricature George III. gave it to be understood that he would not look upon any member of the House of Lords who voted for the India bill as his friend The bill was thrown out in the upper House on Dec. 17, and next day the king dismissed his ministers

Fox now went into opposition again The remainder of his life may be divided into four portions—his opposition to Pitt during the session of 1784; his parliamentary activity till his secession in 1797, his retirement till 1800, his return to activity and his short tenure of office before his death in 1806 During the first of these periods he deepened his unpopularity by assailing the undoubted prerogatives of the crown, by claiming for the House of Commons the right to override not only the king and the Lords but the opinion of the country, and by resisting a dissolution. This last pretension came very ill from a statesman who in 1780 had advocated yearly elections He lost ground daily before the steady good judgment and unblemished character of Pitt When parliament was dissolved at the end of the session of 1784, the country showed its sentiments by unseating 180 of the followers of Fox and North The defeated candidates were known as "Fox's martyrs"

Fox himself was elected for Westminster with fewer votes than Admiral Lord Hood, but with a majority over the ministerial candidate, Sir Cecil Wray The election was marked by an amazing outflow of caricatures and squibs, by weeks of rioting in which Lord Hood's sailors fought pitched battles in St James's Street with Fox's hackney coachmen, and by the intrepid canvassing of Whig ladies. The beautiful duchess of Devonshire (Georgiana Spencer) is said to have won at least one vote for Fox by kissing a shoemaker who had a romantic idea of what constituted a desirable bribe The high bailiff refused to make a return, and the confirmation of Fox's election was delayed by the somewhat mean action of the ministry He had, however, been chosen for Kirkwall, and could fight his cause in the House. In the end he recovered damages from the high bailiff In his place in parliament he sometimes supported Pitt and sometimes opposed him with effect. His criticism on the ministers' bill for the government of India was sound in principle, though the evils he foresaw did not arise His support of Pitt's Reform Bill was qualified by a just dislike of the ministers' proposal to treat the possession of the franchise by a constituency as a property and not as a trust His unsuccessful opposition to the commercial treaty with France in 1787 was unwise and most injurious to himself He committed himself to the proposition that France was the natural enemy of Great Britain, a saying often quoted against him in coming years It has been excused on the ground that when he said France he meant the aggressive house of Bourbon

In 1788 Fox travelled in Italy, with his faithful companion, Mrs Armistead (Elizabeth Cane), but returned in haste on hearing of the illness of the king Fox supported the claim of the prince of Wales to the regency as a right, a doctrine which provoked Pitt into declaring that he would "unwhig the gentleman for the rest of his life" The friendship between him and the prince of Wales (*see* GEORGE IV) was always injurious to Fox In 1787 he was misled by the prince's ambiguous assurances into denying the marriage with Mrs Fitzherbert. On discovering that he had been deceived he broke off all relations with the prince for a year, but their alliance was renewed During these years he was always in favour of whatever measures could be described as favourable to emancipation and to humanity He actively promoted the impeachment of Warren Hastings, which had the support of Pitt. He was always in favour of the abolition of the slave trade (which he actually effected during his short tenure of office in 1806), of the repeal of the Test Acts, and of concessions to the Roman Catholics, both in Great Britain and in Ireland

The French Revolution affected Fox profoundly. Together with almost all his countrymen he welcomed the meeting of the states-general in 1789 as the downfall of a despotism hostile to Great Britain. On hearing of the fall of the Bastille he wrote to Fitzpatrick: "How much the greatest event it is that ever happened in the world! and how much the best!" He continued to adhere stoutly to his opinion that the Revolution was essentially

just and ought not to be condemned for its errors or even for its crimes As a natural consequence he was the steady opponent of Pitt's foreign policy, which he condemned as a species of crusade against freedom in the interest of despotism. Between 1790 and 1800 his unpopularity reached its height. He was left almost alone in parliament, and was denounced as the enemy of his country On May 6, 1791, occurred the painful scene in the House of Commons, in which Burke renounced his friendship In 1792 there was some vague talk of a coalition between him and Pitt, which came to nothing The scene with Burke took place in the course of the debate on the Quebec Bill, in which Fox displayed real statesmanship by criticizing the division of Upper from Lower Canada, and other provisions of the bill, which in the end proved so injurious as to be unworkable In this year he carried the Libel Bill In 1792 his ally, the duke of Portland, and most of his party left him In 1797 he withdrew from parliament, and only came forward in 1798 to reaffirm the doctrine of the sovereignty of the people at a great Whig dinner On May 9 he was dismissed from the privy council

The interval of secession (he and his friends ceased to attend parliament in 1797) was perhaps the happiest in his life In company with Mrs Armistead he established himself at St Anne's Hill near Chertsey in Surrey. In 1795 he married her privately, but did not avow his marriage till 1802 Fox's time at St Anne's was largely spent in gardening, in the enjoyment of the country, and in correspondence on literary subjects with his nephew, the 3rd Lord Holland, and with Gilbert Wakefield, the editor of Euripides Greek and Italian were his first favourites, but he was well read in English literature and in French, and acquired some knowledge of Spanish His favourite authors were Euripides, Virgil and Racine, whom he defends against the stock criticisms of the admirers of Corneille with equal zeal and insight.

Fox reappeared in parliament (Feb 3, 1800) to take part in the vote of censure on ministers for declining Napoleon's overtures for a peace The fall of Pitt's first ministry and the formation of the Addington cabinet, the peace of Amiens, and the establishment of Napoleon as first consul with all the powers of a military despot, seemed to offer Fox a chance of resuming power in public life The struggle with Jacobinism was over, and he could have no hesitation in supporting resistance to a successful general who ruled by the sword, and who pursued a policy of perpetual aggression During 1802 he visited Paris

The death of Pitt (1806) left Fox so manifestly the foremost man in public life that the king could no longer hope to exclude him from office The formation of a ministry was entrusted by the king to Lord Grenville, but when he named Fox as his proposed secretary of state for foreign affairs George III accepted him without demur Indeed his hostility seems to a large extent to have died out A long period of office might now have appeared to lie before Fox, but his health was undermined Had he lived it may be considered as certain that the war with Napoleon would have been conducted with a vigour which was much wanting during the next few years In domestic politics Fox had no time to do more than insist on the abolition of the slave trade. He, like Pitt, was compelled to bow to the king's invincible determination not to allow the emancipation of the Roman Catholics When a French adventurer calling himself Guillet de la Gevrillière, whom Fox at first "did the honour to take for a spy," came to him with a scheme for the murder of Napoleon, he sent a warning on Feb 20, to Talleyrand The incident gave him an opportunity for reopening negotiations for peace A correspondence ensued, and British envoys were sent to Paris But Fox was soon convinced that the French ministers were playing a false game. He was resolved not to treat apart from Russia, then the ally of Great Britain, nor to consent to the surrender of Sicily, which Napoleon insisted upon, unless full compensation could be obtained for King Ferdinand The later stages of the negotiation were not directed by Fox, but by colleagues who took over his work at the foreign office when his health began to fail in the summer of 1806. After carrying his motion for the abolition of the slave trade on June 10, he was forced to give up attendance in parliament, and he died (of dropsy) in the house of the duke of Devonshire, at Chiswick, on Sept. 13, 1806. His wife survived him till July 8, 1842. No children were born of the marriage. Fox is buried in Westminster Abbey by the side of Pitt.

The striking personal appearance of Fox has been rendered very familiar by portraits and by innumerable caricatures. The latter were no doubt deliberately exaggerated, and yet a comparison between the head of Fox in Sayer's plate "Carlo Khan's triumphal entry into Leadenhall," and in Abbot's portrait, shows that the caricaturist did not depart from the original Fox was twice painted by Sir Joshua Reynolds, once when young in a group with Lady Sarah Bunbury and Lady Susan Strangeways, and once at full length A half-length portrait by the German painter, Karl Anton Hickel, is in the National Portrait Gallery, where there is also a terra-cotta bust by Nollekens

See Earl Russell, *Memorials and Correspondence of Charles James Fox* (1853–57), and *Life and Times of C J Fox* (1859–66); G O Trevelyan, *Early History of C J Fox* (1880), and *The American Revolution* (4 vols 1909), J L Hammond, *Charles James Fox, a Political Study* (1903), Lloyd Sanders, *The Holland House Circle* (1908), John Drinkwater, *Charles James Fox* (1928) *See* also the general literature of the period indicated *s v.* GEORGE III

(D. H , X)

FOX, EDWARD (*c* 1496–1538), bishop of Hereford, was born at Dursley, Gloucestershire, he is said on very doubtful authority to have been related to Richard Fox (*q v*) From Eton he proceeded to King's College, Cambridge, and after graduating was made secretary to Wolsey In 1528 he was sent with Gardiner to Rome to obtain from Clement VII a decretal commission for the trial and decision of the case between Henry VIII and Catherine of Aragon On his return he was elected provost of King's College, and in Aug 1529 conveyed to the king Cranmer's historic advice that he should apply to the universities of Europe rather than to the pope After a brief mission to Paris in Oct 1529, Fox in Jan 1530 befriended Latimer at Cambridge, and took an active part in persuading that university and Oxford to decide in the king's favour He was sent to employ similar methods of persuasion at the French universities in 1530–31, and was also engaged in negotiating a closer league between England and France In April 1533 he was prolocutor of convocation when it decided against the validity of Henry's marriage with Catherine, and in 1534 published his treatise *De vera differentia regiae potestatis et ecclesiae* (2nd ed. 1538, Eng tr 1548) He received the archdeaconry of Leicester (1531) and the bishopric of Hereford (1535). In 1535–36 he was sent to Germany to discuss the basis of a political and theological understanding with the Lutheran princes and divines, and had several interviews with Luther, who could not be persuaded of the justice of Henry VIII 's divorce Bucer dedicated to him in 1536 his *Commentaries on the Gospels*, and Fox's Protestantism was also illustrated by his patronage of Alexander Aless, whom he defended before Convocation Fox died on May 8, 1538 He was the most Lutheran of Henry VIII 's bishops, and was largely responsible for the Ten Articles of 1536

FOX, GEORGE (1624–91) was born in 1624 at Drayton in Leicestershire, the son of a weaver As a child he was unusually serious and sensitive to right and wrong His relatives thought of educating him as a clergyman, but he was eventually apprenticed to a shoemaker and grazier After a time he felt that the command of God was for him to leave his family and friends and go forth alone and he went on a series of journeys visiting preachers in search of spiritual guidance

The influence of his remarkable personality soon made itself felt The mysticism of Fox was positive and practical; leading him at the outset of his ministry to denounce all kinds of social evils.

In 1647 he began a peripatetic ministry which continued till the closing years of his life, broken by intervals of imprisonment. He was first imprisoned in 1649 at Nottingham, for interrupting a sermon by an impetuous appeal from the Scriptures to the Holy Spirit as the authority and guide In 1650 he was committed to Derby gaol as a blasphemer, and at Derby, the nickname of Quakers was given to Fox and his friends by Justice Gervase Bennett. But Fox won such esteem that while still in gaol he was

offered a captaincy in the Parliamentary army which he declined

He bore his frequent sufferings and hardships with great courage and found a wide response to his appeal, especially in the north-west of England, among companies of "Seekers." By 1651 other Quaker preachers joined him in his service The centre of the movement was for some years at Swarthmore Hall, near Ulverstone, the home of Judge Fell, Cromwell's chancellor of the duchy of Lancaster, who was friendly to the Quakers, while his wife, Margaret, joined them.

He spent six years in various prisons, at Nottingham (1649), Derby (1650–51), Carlisle (1653), Launceston (1656), Lancaster and Scarborough (1664–66) and Worcester (1673–75), sometimes amid terrible conditions. Throughout his active ministry he found time to issue numerous books and pamphlets His style was uncouth, his grammar and spelling often faulty, but amid occasional obscurities and repetitions pregnant phrases occur, while his *Journal* often shows striking power of narrative Recent research has shown that he was more widely read than has been supposed. But it was his presence and spoken words which made the deep impression vividly portrayed in Penn's preface to his *Journal,* winning universal respect, affection and attention

By 1666 his strong frame was shattered by severe imprisonment, and henceforth much of his time was given to building up the Quaker community in a church order, which offered freedom of service to men and women and at the same time gave expression to the group spirit Fox also took care to institute careful provision for the poor and for the accurate registration of births, deaths and marriages

In 1669 he married Margaret, the widow of Judge Fell, but continued his travelling mission, visiting the West Indies and America in 1671–72, Holland and north Germany in 1677, and Holland again in 1681 After his long imprisonment at Worcester, he stayed to recuperate at Swarthmore Hall (1675–77), and resided there once again in 1678–80, making use of this time to arrange his papers and prepare his *Great Journal* But feeling still the call to a wider service, he went south again, his later years being passed chiefly in and around London, where his wife came at intervals to stay with him

Notwithstanding failing health he still kept at work, visiting Quaker meetings and families, promoting the establishment of schools, corresponding with the Quaker communities abroad, advising his fellow Quakers in difficulties great and small and even interviewing members of parliament to help in the framing of the Toleration Act He died on Jan 13, 1691

Fox's *Journal,* the work by which he is principally known, was printed in 1694, being edited from his papers by Ellwood The complete *Journal* was edited verbatim in 1911 by Norman Penney, and the *Short Journal* and itinerary journals in 1925 Folio volumes of Fox's epistles and doctrinal works were issued in 1698 and 1706 In 1852 an edition of his works in eight volumes was published in Philadelphia, but no complete collection has yet been printed

For Fox's life *see* Thos Hodgkin's *George Fox* (1896) and A. N. Brayshaw's *The Personality of George Fox* (1919). (T. E. H)

FOX, RICHARD (*c.* 1448–1528), successively bishop of Exeter, Bath and Wells, Durham and Winchester, lord privy seal, and founder of Corpus Christi College, Oxford, was born about 1448 at Ropesley, near Grantham, Lincolnshire His parents belonged to the yeoman class, and there is some obscurity about Fox's early career He probably studied at Magdalen college, Oxford, whence he drew so many members of his subsequent foundation, Corpus Christi He also appears to have studied at Cambridge. In 1484 he was in Paris, where he met the earl of Richmond (the future Henry VII.) and was taken into his service. In January 1485 Richard intervened to prevent Fox's appointment to the vicarage of Stepney on the ground that he was keeping company with the "great rebel, Henry ap Tuddor."

On Henry's accession Fox became the King's principal secretary, and soon afterwards lord privy seal and bishop of Exeter (1487). The ecclesiastical preferment was merely intended to provide a salary not at Henry's expense; for Fox never saw either Exeter or the diocese of Bath and Wells to which he was translated in 1492 His work was political and especially diplomatic In 1487 he negotiated a treaty with James III. of Scotland, in 1492 he helped to conclude the treaty of Étaples, and in 1497 he was chief commissioner in the negotiations for the famous commercial agreement with the Netherlands, the *Magnus Intercursus.*

Meanwhile in 1494 Fox had been translated to the see of Durham, which was of political importance as a palatine earldom and because of its position with regard to the Borders and relations with Scotland. Fox therefore visited and resided in his new diocese, and he occupied Norham castle, which he fortified and defended against a Scottish raid in Perkin Warbeck's interests (1497). But his energies were principally devoted to pacific purposes In that same year he negotiated Perkin's retirement from the court of James IV., and in 1498–1499 he completed the negotiations for that treaty of marriage between the Scottish king and Henry's daughter Margaret which led ultimately to the union of the two crowns in 1603 and of the two kingdoms in 1707 The marriage itself did not take place until 1503

This consummated Fox's work in the north, and in 1501 he was translated to Winchester, then reputed the richest bishopric in England In that year he concluded the negotiations for the betrothal of Prince Arthur to Catherine of Aragon He also arranged the betrothal of the king's younger daughter Mary to the future emperor Charles V In 1500 he was elected chancellor of Cambridge university, and in 1507 master of Pembroke hall in the same university The Lady Margaret Beaufort made him one of her executors, and with Fisher, he was principally responsible for the foundation of St John's college and the Lady Margaret professorships and readerships

His financial work brought him a less enviable notoriety, though a curious freak of history has deprived him of the credit which is his due for "Morton's fork" The invention of that ingenious dilemma for extorting contributions from poor and rich alike is ascribed as a tradition to Morton by Bacon, but the story is told in greater detail of Fox by Erasmus, who says he had it from Sir Thomas More, a well-informed contemporary authority

Under Henry VIII the personnel of the ministry at first remained unaltered The Venetian ambassador calls Fox *alter rex* and the Spanish ambassador Carroz says that Henry VIII trusted him more than any other adviser, although he also reports Henry's warning that the bishop of Winchester was, as his name implied, "a fox indeed" Wolsey's rapid rise in 1511 put an end to Fox's influence The pacific policy of the first two years of Henry VIII 's reign was succeeded by an adventurous foreign policy directed mainly against France, and Fox, who desired peace, complained that no one durst do anything in opposition to Wolsey's wishes Gradually Warham and Fox retired from the government, the occasion of Fox's resignation of the privy seal was Wolsey's ill-advised attempt to drive Francis I out of Milan by financing an expedition led by the emperor Maximilian in 1516. Tunstall protested, Wolsey took Warham's place as chancellor, and Fox was succeeded by Ruthal, who, said the Venetian ambassador, "sang treble to Wolsey's bass" He bore Wolsey no ill-will, and warmly congratulated him two years later when warlike adventures were abandoned at the peace of London But in 1522 when war was again declared he refused to bear any part of the responsibility, and in 1523 he opposed in convocation the financial demands which met with a more strenuous resistance in the House of Commons

He now devoted himself assiduously to his long-neglected episcopal duties His sight failed during the last ten years of his life The crown of Fox's career was his foundation (1515–16) of Corpus Christi college Originally he intended it as an Oxford house for the monks of St Swithin's, Winchester; but he is said to have been dissuaded by Bishop Oldham, who denounced the monks and foretold their fall The scheme adopted breathed the spirit of the Renaissance; provision was made for the teaching of Greek, Erasmus lauded the institution and Pole was one of its earliest fellows The humanist Vives was brought from Italy to teach Latin, and the reader in theology was instructed to follow the Greek and Latin Fathers rather than the scholastic commentaries Fox also built and endowed schools at Taunton and Grantham, and was a benefactor to numerous other institutions. He died at Wolvesey on Oct. 5, 1528; Corpus possesses several portraits and

other relics of its founder

See *Letters and Papers of Henry VII and Henry VIII.*, vols i.–iv.; *Spanish and Venetian Calendars of State Papers;* J. Gairdner, *Lollardy and the Reformation* (1908–13) and *The Eng Church in the 16th Cent* (1899); A F. Pollard, *Henry VIII* (1905), Longman, *Political History,* vol v (1905); other authorities cited in the article by T Fowler (formerly president of Corpus) in the *Dict Nat Biog*

FOX, ROBERT WERE (1789–1877), English geologist, was born at Falmouth on April 26, 1789. He made researches on the internal temperature of the earth, being the first to prove that the heat increased definitely with the depth; his observations being conducted in Cornish mines from 1815 for a period of forty years In 1829 he commenced a series of experiments on the artificial production of miniature metalliferous veins by means of the long-continued influence of electric currents, and his main results were published in *Observations on Mineral Veins* (*Rep Royal Cornwall Polytech Soc*, 1836) He constructed in 1834 an improved form of deflector dipping needle In 1848 he was elected F R S He died on July 25, 1877 (See *A Catalogue of the Works of Robert Were Fox, F R S, with a Sketch of his Life,* by J H Collins, 1878)

His daughter, CAROLINE FOX (1819–1871), born at Falmouth on May 24, 1819, wrote a diary recording memories of many distinguished people, including John Stuart Mill, John Sterling and Carlyle Selections from her diary and correspondence (1835–71) were published under the title of *Memories of Old Friends* (ed by H N Pym, 1881, 2nd ed, 1882) She died on Jan 12, 1871

FOX, SIR STEPHEN (1627–1716), English statesman, born on March 27, 1627, was the son of William Fox, of Farley in Wiltshire, a yeoman farmer At 15 he entered the service of the earl of Northumberland, then he entered the service of Lord Percy, the earl's brother, and was present with the royalist army at the battle of Worcester (Sept 3, 1651) as Lord Percy's deputy at the ordnance board Accompanying Charles II in his flight to the continent, he was appointed manager of the royal household on Clarendon's recommendation He was employed on several important missions, and acted eventually as intermediary between the king and General Monk After the Restoration he was appointed to the lucrative offices of first clerk of the board of green cloth and paymaster-general of the forces He entered parliament in 1661, was knighted (1665), and was a commissioner of the treasury from 1679 to 1702 In 1680 he resigned the paymastership and was made first commissioner of horse In 1684 he became sole commissioner of horse He was offered a peerage by James II, on condition of turning Roman Catholic, but refused In 1685 he was again M P for Salisbury and opposed the bill for a standing army supported by the king During the Revolution he maintained an attitude of decent reserve, but was confirmed in his offices by William III He died on Oct 28, 1716 He contributed £13,000 to Chelsea hospital, the military pensioners' home founded by Charles II He grew rich in the service of the nation without being suspected of corruption, and without forfeiting the esteem of his contemporaries

His elder son by his second marriage, with Christian Hopes, Stephen (1704–1776), was created Lord Ilchester and Stavordale in 1747 and earl of Ilchester in 1756; in 1758 he took the additional name of Strangways, and his descendants, the family of Fox-Strangways, still hold the earldom of Ilchester The younger son, Henry, became the 1st Lord Holland (*q v*)

See *Memoirs of the Life of Sir Stephen Fox, 1st* (1717, reprinted 1807 and 1811), and, for Lord Ilchester, *Letters to Henry Fox, Lord Holland, with a few addressed to his brother Stephen, Earl of Ilchester* (ed. Earl of Ilchester, 1915).

FOX, SIR WILLIAM (1812–93), New Zealand statesman, was born in England on June 9, 1812, and educated at Wadham college, Oxford He was called to the bar in 1842, but immediately emigrated to New Zealand, where, in 1843, he became the New Zealand company's agent for the South Island In 1848 Fox became attorney-general, but gave up the post to join in the agitation for a free constitution In 1850 he came to London as political agent to urge the demands of the Wellington settlers, but the Colonial Office refused to recognise him When government by responsible ministers was initiated in 1856, Fox ousted the first ministry and formed a cabinet, holding office for 13 days. In 1861 he became premier for nearly 13 months, and in 1863 again took office with Sir Frederick Whitaker as premier. Fox's third premiership was from 1869 to 1872, and his fourth for five weeks in March–April 1873 Soon afterwards he left politics, though he led the attack which overthrew Sir George Grey's ministry in 1879 He lost his seat in the dissolution which followed in that year, and did not again enter parliament He was an active champion of self-government for the New Zealand colonists, and laboured to secure their just rights for the Maori races, and to establish peace among the tribes Sir William Fox was made K C M G in 1880 He died on June 23, 1893.

He published *The Six Colonies of New Zealand* (1851); and *The War in New Zealand* (1860, later ed, 1866).

FOX (female, vixen), primarily the popular name for the European species of the dog-family (*Canidae*) which by Linnaeus was named *Canis vulpes;* but by modern zoologists this species and others related to it are assigned to the genus *Vulpes,* because the nasal passages do not open into hollow spaces of the frontal bones as they do in *Canis* and its allies, and the postorbital processes are flat or hollowed instead of convex

The typical fox (*Vulpes vulpes*) differs from other foxes in having a white "tag" to the tail combined with black on the backs of the ears—as thus defined the species has a wide geographical range, embracing practically the whole of Europe, Africa north of the Sahara, the whole of temperate Asia and North America as far south as Mexico It has adapted itself to the most varied physical conditions and has become differentiated into a large number of local races or subspecies differing in size, colour, thickness of coat and other respects There are too many to mention in detail, but the little fox (*V v leucopus*) of the plains of north-west India is of interest as illustrating the general principle that the southern races are smaller than the northern, the Himalayan fox (*V v montana*) and the Egyptian fox (*V v aegyptiaca*) being intermediate in size between it and the European race In the matter of coat the finest foxes come from the far north The typical colour of the species is reddish, grizzled with grey or buff, desert forms being paler than others, but the prevalent tint varies from fiery red to black, melanism being of frequent occurrence In the North American race (*V v fulva*) for instance, there are three main varieties, the red, the cross and the silver, the cross fox being intermediate between the other two The silver, a black fox sprinkled with white, provides valuable furs; but the price is likely to decline owing to the success that is being achieved by breeding these animals in fox farms Most of the red fox skins on the market come from Australia where European foxes were introduced years ago to check the rabbit plague.

Habits of the Fox.—So far as is known the habits of the common fox vary in no important respect wherever it is found. It is a predacious, mostly nocturnal animal, feeding principally upon small birds and mammals but taking frogs, shell-fish, insects and even fruit at times The sexes live apart except at the pairing season, which occurs early in the year; and, after a gestation period of about 63 days, the vixen brings forth her litter of four or a few more young in a burrow or natural crevice, in the spring Only one litter is produced in the year and the young, which are blind for about ten days, are able to shift for themselves by the autumn and become adult when about a year old Foxes do not hibernate and are as active in winter as in summer even in the coldest latitudes Accounts of hybrids between dogs and foxes have often been published; but there is no authenticated case known and specimens never come to hand for expert examination when demanded.

Foxes are noted for the cunning they evince in the avoidance of traps and, in countries where they are hunted by hounds, for the methods they adopt in breaking the line of scent left by their footfall on the soil, even by leaping on to the backs of sheep Since foxes have no natural enemies other than man to trap and pursue them in that way, it has been suggested that their devices are due to instinct engendered by man's persecution continued generation after generation. But all the indications of the cleverness of foxes cannot be explained in that way. The means

ey adopt to rid themselves of fleas is a case in point Taking his mouth a tuft of wool or a piece of wood, a fox will slowly ık himself, tail first, into a pond and thus gradually drive the as forward until their last refuge is the wool or wood on the rface of the water. The fox then sets this adrift teeming with e parasites and keeping clear of it lands on the bank and makes f. The origin of this habit, which can hardly be regarded as of rvival value, is at present beyond our understanding.

No other species of Vulpes has a range comparable in extent that of the species just described A few only occur in the me latitudes, namely the small corsac fox (*V corsac*) of Amurad, the tiny little fox (*V. cana*) of Baluchistan, the peculiar betan fox (*V ferrilatus*), which has short ears and round pupils, d the kit fox (*V velos*) of the United States Most are more uthern in their range, such as the common Indian fox (*V venlensis*), the fennecs (*V famelica* and *V zerda*) of the Sahara d the South African fox (*V. chama*). There are no foxes in uth-eastern Asia, south of China; and the only animal in ntral America and the northern part of South America that serves the name is the grey fox (*Urocyon cinereo-argenteus*), aced in a different genus on account of certain cranial peculiares and the presence of an erectile crest along the spine The her so-called South American foxes have the characteristics of *ıus* not of *Vulpes;* and the South African Delalande's fox *)tocyon megalotis*) differs entirely in dentition from both these nera Mainly to the north of the distributional area of the pical fox but overlapping it in parts of its range occurs the ·cumpolar Arctic fox (*Alopex lagopus*) which is represented by ıny local races This species has the cranial characteristics of *ılpes* but in some other respects is intermediate between that nus and *Canis* One of the colour phases of this fox, known the fur trade as the "blue" fox, is a permanent melanic variety ıch does not turn white in winter The normal variety turns ite like the Arctic hare, at that season, but is grizzled brown th white under parts in summer (*See* CARNIVORA.)

(R I P)

FOXE, JOHN (1516–1587), the author of the famous *Book Martyrs*, was born at Boston, Lincolnshire At the age of 16 he said to have entered Brasenose college, Oxford His authentited connexion at the university is, however, with Magdalen col·ge, of which he became a fellow in 1539, resigning in 1545 Soon :er leaving Oxford he married Agnes Randall After holding two torships he was driven from England by the accession of Mary, d he retired to Strasbourg, where he occupied himself with a tin history of the Christian persecutions, which he had begun the suggestion of Lady Jane Grey This book, dealing chiefly th Wycliffe and Huss, and coming down to 1500, formed the first tline of the *Actes and Monuments* It was printed by Wendelin chelius with the title of *Commentarii rerum in ecclesia gestarum* trasbourg, 1554) In the same year Foxe moved to Frankfort, ıere he found the English colony of Protestant refugees divided o two camps, the Calvinists and the Anglicans, and made a vain .empt to frame a compromise He moved (1555) to Basle, ıere he worked as printer's reader to Johann Herbst or Oporinus : made steady progress with his great book as he received reports from England of the religious persecutions there, and he ued from the press of Oporinus his pamphlet *Ad inclytos ac ıepotentes Angliae proceres . . . supplicatio* (1557), a plea for eration addressed to the English nobility In 1559 he com:ted the Latin edition of his martyrology and returned to Engıd He lived for some time at Aldgate, London, in the house his former pupil, Thomas Howard, now duke of Norfolk, and came associated with John Day the printer, himself once a otestant exile Foxe was ordained priest by Edmund Grindal, hop of London, in 1560, and besides much literary work he :asionally preached at Paul's Cross and other places His work d rendered great service to the Government, and he might have d high preferment in the church but for the Puritan views which consistently maintained. He held, however, the prebend of ipton in Salisbury cathedral, and is said to have been for a ort time rector of Cripplegate.

In 1563 was issued from the press of John Day the first English edition of the *Actes and Monuments of these latter and perillous Dayes . . . by John Foxe,* commonly known as the *Book of Martyrs* Its popularity was immense and signal The Marian persecution was still fresh in men's minds, and the graphic narrative intensified in its numerous readers the fierce hatred of Spain and of the Inquisition which was one of the master passions of the reign Nor was its influence transient For generations the popular conception of Roman Catholicism was derived from its bitter pages Its accuracy was immediately attacked by Catholic writers, notably in the *Dialogi sex* (1566). These criticisms induced Foxe to produce a second corrected edition, *Ecclesiastical History, contayning the Actes and Monuments of things passed in every kynges tyme* in 1750, a copy of which was ordered by Convocation to be placed in every collegiate church Anthony à Wood says that Foxe "believed and reported all that was told him" There is no doubt that he was only too ready to believe evil of the Catholics, and he cannot always be exonerated from the charge of wilful falsification of evidence It should, however, be remembered in his honour that his advocacy of religious toleration was far in advance of his day He pleaded for the despised Dutch Anabaptists, and remonstrated with John Knox on the rancour of his *First Blast of the Trumpet* Foxe was one of the earliest students of Anglo-Saxon, and he and Day published an edition of the Saxon gospels under the patronage of Archbishop Parker He died on April 18, 1587 and was buried at St Giles's, Cripplegate

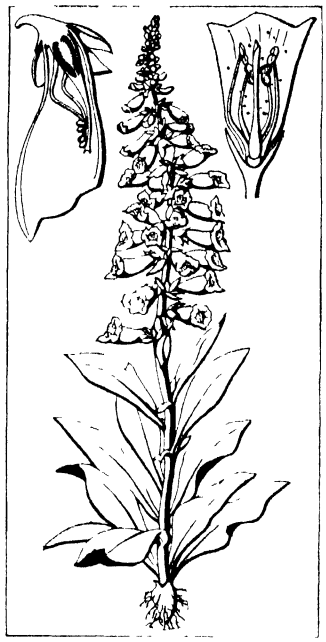
A list of his Latin tracts and sermons is given by Wood, and others, some of which were never printed, appear in Bale. Four editions of the *Actes and Monuments* appeared in Foxe's lifetime The 8th edition (1641) contains a memoir of Foxe purporting to be by his son Samuel, the ms of which is in the British Museum (Lansdowne ms 388). Samuel Foxe's authorship is disputed, with much show of reason, by Dr S. R. Maitland, *On the Memoirs of Foxe ascribed to his Son* (1841) The best-known modern edition of the Martyrology is that (1837–41) by the Rev Stephen R Cattley, with an introductory life by Canon George Townsend The numerous inaccuracies of this life and the frequent errors of Foxe's narrative were exposed by Dr Maitland in a series of tracts (1837–42), collected (1841–42) as *Notes on the Contributions of the Rev George Townsend, M A to the New Edition of Foxe's Martyrology* The criticism lavished on Cattley and Townsend's edition led to a new one (1846–49) under the same editorship A new text prepared by the Rev Josiah Pratt was issued (1870) in the "Reformation Series" of the *Church Historians of England,* with a revised version of Townsend's *Life* and appendices giving copies of original documents. Later edition by W Grinton Berry (1907)

Foxe's papers are preserved in the Harleian and Lansdowne collections in the British Museum Extracts from these were edited by J G Nichols for the Camden Society (1859) *See* also W Winters, *Biographical Notes on John Foxe* (1876), J Gairdner, *The English Church in the Sixteenth Century* (1902)

FOXGLOVE, a genus of biennial and perennial plants of the family Scrophulariaceae and known botanically as *Digitalis.* It contains 25 species found in Europe, western Asia and the Canary Islands The common or purple foxglove, *D purpurea,* is common in dry hilly pastures and rocky places and by road-sides in various parts of Europe, it ranges in Great Britain from Cornwall and Kent to Orkney, and is sparingly naturalized in North America It flourishes best in siliceous soils, and is not found in the Jura and Swiss Alps Its characters are stem erect, roundish, downy, leafy below, and from 18 in to 5 ft or more in height; leaves alternate, ovate or elliptic oblong, and dull green, with the under surface downy and paler than the upper, root of numerous, slender, whitish fibres; flowers 1¼–2½ in. long, pendulous, on one side of the stem, purplish crimson, and hairy and marked with eye-like spots within; corolla bell-shaped with a broadly two-lipped obtuse mouth, the upper lip entire or obscurely divided; stamens four, two longer than the other two (*didynamous*); capsule ovate and pointed, and seeds numerous, small It normally flowers in July, and ripens its seed in August, but may occasionally be found in blossom as late as September Many varieties have been raised by cultivation, with flowers varying in colour from white to deep rose and purple

The foxglove, probably from folk's-glove (*i e*, fairies' glove), is known by a great variety of popular names in Britain In the south of Scotland it is called bloody fingers, farther north, dead-

men's-bells, and on the eastern borders, ladies' thimbles, wild mercury and Scotch mercury. In Ireland it is generally known as fairy thimble Among its Welsh synonyms are *menyg-ellyllon* (elves' gloves), *menyg y llwynog* (fox's gloves), *bysedd cochion* (redfingers) and *bysedd y cwn* (dog's fingers) In France its designations are *gants de notre dame* and *doigts de la Vierge* The German name *Fingerhut* (thimble) suggested to Fuchs, in 1542, the employment of the Latin adjective *digitalis* as a designation for the plant. Other species of *Digitalis* although found in botanical collections are not generally grown For medicinal uses *see* DIGITALIS



THE PURPLE FOXGLOVE, A WILD FLOWER COMMON IN ROCKY PLACES THROUGHOUT EUROPE
Small figures show vertical section through flower, and flower with part of corolla removed

FOX-HUNTING: *see* HUNTING

FOX INDIANS, the name, from one of their clans, of an Algonkin tribe, whose former range was central Wisconsin They call themselves Muskwakiuk, "red earth people" Owing to heavy losses in their wars with the Ojibways and the French, they allied themselves with the Sauk tribe about 1780, the two tribes being now one

FOXTAIL GRASS, the name given to perennial grasses of the genus *Alopecurus,* comprising about 30 species, natives of cool north temperate regions Of these the meadow foxtail (*A pratensis*) is extensively cultivated in Europe as a pasture grass, and is also naturalized in North America. Various species of *Setaria* are likewise called foxtail grass, of which the yellow foxtail (*S glauca*) and the green foxtail (*S. viridis*), widely naturalized from Europe in North America, are often troublesome weeds (*See* GRASSES)

FOX-TROT, a modern dance of smooth, easy movement resembling a walk taken with long, rather springy steps, with knees slightly bent Many variations are introduced The music is in $\frac{4}{4}$ time. (*See* also DANCE)

FOY, MAXIMILIEN SÉBASTIEN (1775–1825), French general and statesman, was born at Ham, Picardy, on Feb. 3, 1775, and educated at the college of Soissons, passing to the artillery school of La Fère. After his first campaign in Flanders (1791–92) he attained captain's rank, and served under Dampierre, Jourdan, Pichegru and Houchard In 1794 he was imprisoned by the Convention, but released on the fall of Robespierre. He distinguished himself in Moreau's campaigns of 1796–97, and in the Swiss campaign of 1798, winning the rank of *chef de brigade* under Masséna in 1799 In 1800 he served in the Marengo campaign Foy's opposition, as a republican, to the rise of Napoleon, and his vote against the establishment of the empire led to his joining the army in Holland In 1807 he took part in the defence of the Dardanelles against the English, and later served throughout the Peninsular War. He won the rank of general under Junot, and served under Soult and Masséna. Napoleon, to whom Masséna sent him on a mission, made him a general of division He won new laurels at Salamanca (1812) and in the Pyrenees, and received a command at the first restoration of the Bourbons He joined Napoleon when the king fled the country, and held a divisional command in the Waterloo campaign (*q v*). He retired from the army at the second restoration, and in 1819 was elected to the chamber of deputies, where he used his considerable influence on the side of the liberal principles of 1789 At this time he began his history of the Peninsular War In 1823 he protested against French intervention in Spain, and after the dissolution of 1824 was re-elected for three constituencies. He died in Paris on Nov. 28, 1825, and the great esteem in which he was held for his maintenance of liberal principles was shown by the vast concourse at his funeral.

The *Histoire de la guerre de la Péninsule sous Napoléon* was published from his notes in 1827, and a collection of his speeches (with memoir by Tissot) appeared in 1826 *See* Cuisin, *Vie militaire, politique, etc, du général Foy;* Vidal, *Vie militaire et politique du général Foy.*

FRAAS, KARL NIKOLAS (1810–1875), German botanist and agriculturist, was born at Rattelsdorf. He studied at Munich, and in 1835 went as inspector of the court garden at Athens, where in 1836 he became professor of botany In 1842 he returned to Germany as teacher at the central agricultural school at Schleissheim. In 1847 he was appointed professor of agriculture at Munich, and in 1851 director of the central veterinary college He died at Munich on Nov. 9, 1875.

His principal works are *Synopsis florae classicae* (Munich, 1845); *Klima und Pflanzenwelt in der Zeit* (Landsh, 1847), *Histor-encyklopad Grundriss der Landwirthschaftslehre* (Stuttgart, 1848), *Geschichte der Landbau und Forstwissenschaft seit dem 16 Jahrh* (Munich, 1865) He also founded and edited a weekly agricultural paper, the *Schranne*

FRACASTORO [FRACASTORIUS], **GIROLAMO** [HIERONYMUS] (1483–1553), Italian physician and poet, was born at Verona. He studied at Padua and became professor of philosophy there in 1502, afterwards practising as a physician in Verona It was by his advice that Pope Paul III, on account of the prevalence of a contagious distemper, removed the Council of Trent to Bologna. Fracastoro's theory of infection was that "infection" was due to the passage of minute bodies, capable of self-multiplication, from the infector to the infected, a theory which bears a superficial resemblance to modern doctrine In 1517, when the builders of the citadel of San Felice (Verona) found fossil mussels in the rocks, Fracastoro took the view—following Leonardo da Vinci—that they were the remains of animals once capable of living in the locality He died at Casi, near Verona, on Aug 8, 1553, and in 1559 the town of Verona erected a statue in his honour.

The principal work of Fracastoro is a kind of medical poem entitled *Syphilidis, sive Morbi Gallici, libri tres* (Verona, 1530), which has been often reprinted and also translated into French and Italian His complete works were published at Venice in 1555, and his poems were collected and printed at Padua in 1728

FRACKVILLE, a borough of Schuylkill county, Pa, U S A, 8m. N of Pottsville It is served by the Pennsylvania and the Reading railways The population was 5,590 in 1920 (85% native white) Anthracite mining is the principal occupation, and there are factories making saws, overalls and shirts

FRACTION, a part of any unit, as a fraction of a pound, of an acre, of an inch, of an hour, or of a group

FIRST IDEAS

Elementary Idea of Fraction.—If we take any two positive integers, say 2 and 3, the quotient $\frac{2}{3}$ is a fraction. More generally speaking, if we take any two positive finite integers, a and b, such that b is not zero, the quotient $\frac{a}{b}$ is integral, if and only if, a is exactly divisible by b If a is not so divisible and is less than b, speaking in the primitive sense $\frac{a}{b}$ is called a *fraction* or, according to relatively late usage, a *proper fraction.* In this expression a and b are called the *terms* of the fraction, a being the *numerator* (numberer) and b the *denominator* (namer). We may also consider this fraction as representing a of the b equal parts of some unit, a being then the "numberer" of the parts and b the "namer" of the parts, as in three-fourths ($\frac{3}{4}$) of a pound. We may also look upon the fraction as representing one bth of a units; for example, $\frac{2}{3}$ may be thought of as representing one-third of two units. These various ideas of a fraction are consistent with one another, as also with the idea that, say, $\frac{3}{4}$ means the ratio of 3 to 4, or the number which, multiplied by 4, becomes 3

Extension of the Idea of Fraction.—These elementary ideas of fraction have been extended from time to time so as to permit of terms that are fractional, irrational, or imaginary, or that represent still other types of number, the denominator b never being zero

The tendency to generalize has led to allowing the numerator

to be le of the denominator, the fraction then becoming 1 or some other integer; or to be any number whatsoever, not only less than but equal to or greater than the denominator Since these two latter generalized cases do not properly represent fractions in the primitive sense ("proper" fractions), they are called *improper fractions*

The fraction $\frac{a}{b}$ may be expressed as a/b, this being a more convenient form for printing or typewriting Since the slanting bar resembles the old symbol for *solidus* (later used in the British 2/6 for 2s 6d.), the form a/b is sometimes called the *solidus form* If a and b are both rational, a/b is called a rational fraction, if both are integers, it is called a *simple fraction;* if either a or b is fractional, a/b is called a *complex fraction* Questions relating to the least (in algebra, *lowest*) common denominator are sufficiently discussed in any elementary text book, where it is also shown that any rational complex fraction can be reduced to a simple fraction

For the study of such continued fractions as

$$a+\frac{b}{c}+\frac{d}{e}+++ \quad \text{or} \quad 2+\frac{1}{3}+\frac{1}{4}$$

see CONTINUED FRACTIONS

Laws of Operations.—In any of these cases the laws governing the fundamental operations with fractions are as follows

$$\frac{a}{b}+\frac{c}{d}=\frac{ad+bc}{bd}, \text{ for example, } \frac{3}{4}+\frac{2}{3}=\frac{9+8}{12}=\frac{17}{12}=1\tfrac{5}{12};$$

$$\frac{a}{b}-\frac{c}{d}=\frac{ad-bc}{bd}, \text{ for example, } \frac{3}{4}-\frac{2}{3}=\frac{9-8}{12}=\frac{1}{12};$$

$$\frac{a}{b}\times\frac{c}{d}=\frac{ac}{bd}, \text{ for example, } \frac{2}{3}\times\frac{3}{4}=\frac{2\times 3}{3\times 4}=\frac{1}{2},$$

$$\frac{a}{b}\div\frac{c}{d}=\frac{ad}{bc}, \text{ for example, } \frac{2}{3}\div\frac{3}{4}=\frac{2\times 4}{3\times 3}=\frac{8}{9};$$

$$\left(\frac{a}{b}\right)^2=\frac{a^2}{b^2}, \text{ for example, } \left(\frac{2}{3}\right)^2=\frac{4}{9},$$

$$\sqrt{\frac{a}{b}}=\frac{\sqrt{a}}{\sqrt{b}}, \text{ for example, } \sqrt{\frac{8}{9}}=\frac{\sqrt{8}}{\sqrt{9}}=\frac{1}{3}\sqrt{8}, \text{ or } \frac{2}{3}\sqrt{2}$$

Reduction.—With respect to the reduction of fractions to higher or lower terms, the following laws are valid for any value of m except zero and infinity

$$\frac{a}{b}=\frac{ma}{mb} \qquad \frac{a}{b}=\frac{a\div m}{b\div m}$$

When all common factors have been removed from both terms of a fraction, the fraction is said to be *reduced to lowest terms,* or to be *irreducible*

It is often possible to reduce a proper fraction a/b to the sum of two or more simpler fractions For example, to perform the following reduction to *partial fractions:*

$$\frac{a^3-6a^2+a+2}{a^2-4a-12}=\frac{a^2}{a+2}+\frac{1}{a-6}.$$

The methods of procedure are given in most intermediate or higher algebras, but the importance of the subject is not seen until the student reaches the calculus

Difficulties Created by Colloquial Expressions.—The colloquial use of a fraction like $\frac{1}{2}$ is so extended as to cause considerable difficulty on the part of a learner. He hears of half of an object, and can easily visualize it; half of a group is a little more difficult, half as large is still more so; and the idea becomes still less distinct when he hears such expressions as "half as long a time," "half as dark," and "half as beautiful" The simplest fraction thus comes, through such colloquial expressions, to be unusually difficult Certain other fractions—notably $\frac{1}{4}$, $\frac{1}{10}$, and $\frac{1}{100}$—are used in the same loose way.

Vicissitudes of the Name.—Since "fraction" (from Lat. *frangere,* to break) means "broken," it was natural for the English writers of the 16th century to speak of "fractions or broken numbers" and of a "broken of broken" (Baker, 1568), meaning a fraction of a fraction The word "fragment" was also occasionally used for "fraction" In the middle ages the word *minuciae* was used as the equivalent of *fractiones,* and not solely with the meaning of "minutes" as in sexagesimal fractions The fact that a fraction is a broken number led to such expressions in the early printed books as *Ein gebrochene zal* (Riese, German, 1522), and *Die ghebroken ghetalen* (Raets, Dutch, 1580) Since the Latin *ruptus* also means "broken," such names as *rotto* (Italian), *rocto* (Spanish), and *roupt* and *nombre rompu* (French) appear in the early printed books

Fundamentally One Type.—We speak of proper fractions, mixed numbers, irrational fractions, and the like, but in view of the gradual extension of meaning, it is legitimate to say that any expression a/b is a fraction It would even be allowable to admit the case of $b=0$, giving an interpretation accordingly, if this were necessary or advisable Moreover, while we speak of common or vulgar fractions, of decimals, and of sexagesimals, these are chiefly differences in symbolism and have little bearing upon the nature of such a fraction as $\frac{1}{2}$, 0 5 (or 0 5), 30^1 (1^0 being the unit), or 2^{-1}, all of which have the same value

VULGAR OR COMMON FRACTIONS

Relation to Compound Numbers.—The ancients had such difficulty in representing fractions that they generally resorted to compound numbers in order to avoid their use Thus the Roman fractions of weight and of value were referred to the *as* A twelfth part of the *as* was an *uncia,* as was also the twelfth part of a foot, whence our words "ounce" and "inch" Since 16 *asses* (in early times, 10 *asses*) made a *denarius,* the Romans were able to avoid speaking of $\frac{1}{2}$ of a *denarius* by referring to 8 *asses,* just as we may refer to 8 ounces instead of to $\frac{1}{2}$ of a pound, avoirdupois To represent $\frac{1}{8}$ of a *denarius* the Roman would say *denarii uncia semuncia,* that is, $\frac{1}{12}$ and $\frac{1}{2}$ of $\frac{1}{12}$ of a *denarius* This use of unit fractions goes back to some of the earliest fraction forms known, appearing in the Rhind (Ahmes) Papyrus of *c* 1650 B C, where the ratio of 2 to 43 is expressed (to use modern symbols) as $\frac{1}{42}+\frac{1}{86}-\frac{1}{129}+\frac{1}{301}$. The same plan was used by Heron (Hero) of Alexandria (possibly *c* 200), in the Akhmim Papyrus (*c* 8th century), by Rabbi Sa'adia ben Joseph el-Fayyumî (*c.* 930), and even, for certain purposes, up to modern times Such compound numbers as 3yd 1ft 6in, instead of $3\frac{1}{2}$yd, and as £2 10s instead of £2½, are late evidences of the desire to avoid fractions whenever possible

Ancient Symbols.—In the Egyptian hieroglyphics the unit fraction was represented by a symbol resembling the outline of an eye, the denominator being represented underneath In hieratic a dot replaced this symbol, $\frac{1}{3}$ appearing in somewhat such form as III The Greeks had various forms, one being two short lines above a numeral, as in Γ^{π} for $\frac{1}{3}$, and Δ'' for $\frac{1}{4}$ The most common of all their fractions, the half, had a special symbol resembling our initial parenthesis (Aristarchus (*c* 260 B C) wrote the word or its initial for the numerator and the numeral for the denominator, as we might write "ten 71st,"—in Greek, ΔΟΪΑ. The Greeks also used the plan of writing the numeral for each term, but doubling it for the denominator, as if we should write $2'3''3''$ for $\frac{2}{3}$

On their coins the Romans commonly represented the half by the symbol S (for *semis*), or the Greek Σ or (; $\frac{1}{3}$ (the triens) was . . . . (that is, $\frac{4}{12}$), and $\frac{1}{6}$ (the sextans) was . . They also used bars instead of dots, as in = — (that is, $\frac{3}{12}$) for $\frac{1}{4}$ (the quadrans)

Modern Symbols.—Our present fractions seem to have had their genesis in India Brahmagupta (*c* 628) and Bhâskara (*c.* 1150) wrote $\frac{2}{3}$ for $\frac{2}{3}$ The Arabs introduced the bar, but they did not make use of it in all cases When Abraham ben Ezra (Rabbi ben Ezra, *c* 1140) adopted the Moorish forms he generally omitted it; but it is commonly found in manuscripts after his time

The Name.—The fractions that were commonly used by merchants in the late middle ages were called *fractiones vulgares,* whence the French use of *fractions vulgaires* (Trenchant, 1566) and the English "vulgare or common Fractions" (Digges, 1572).

The English writers finally adopted the adjective "vulgar," and the early American writers did the same, but about the beginning of the 19th century the latter changed to "common fractions" In English the word numerator (numberer) has given place to such terms as *numerus*, "topterme," "top," *superior*, and *denominato*, the *denominator* having such equivalents as *"base," inferior*, and *denominate*.

SEXAGESIMAL FRACTIONS

Nature and Origin.—Fractions written on the scale of 60 (Latin, *sexaginta*) are called *sexagesimal fractions* (from the Latin *sexagesimus*, 60th) Since the Babylonians wrote their numbers on a combined scale of 10 and 60, in which the character for 1 represented any power of 60, they naturally used 60 as a radix in certain systems of measure, as in the case of 60 *maneh* making a talent The statement that 60 seconds make a minute was probably looked upon quite as our statement that 12 inches make a foot, the idea of sexagesimal fractions, as we have it, not being present The Greek astronomers no doubt received the scale of 60 from the Babylonians or their successors, and it seems to have been they who developed sexagesimal fractions on a large scale When they decided to take 120 units as the length of the diameter of their standard circle (probably because its numerous factors, 2, 3, 4, 5, 6, 10, 12, 15, 20, 30, 40 and 60 made the representation of fractions easy), the circle (using the old value 3 for π) became 360 units To each of these units they gave the name μοῖρα (*moi'ra*), which became (either through the Latin *de-|-gradus*, step, or the Arabic *daraja*, step, scale, ladder) our "degree" They then called $\frac{1}{60}$ of a degree a first part (πρῶτα ἑξηκοστά, *pro'ta hexekostá;* Latin, *pars minuta prima*, first small part), whence our "minute"; and $\frac{1}{3600}$ a second part (δεύτερα ἑξηκοστά, *deu'tera hexekostá;* Latin, *pars minuta secunda*), whence our "second," and so on Since these fractions were used in astronomy, they were called "astronomical fractions" in the middle ages They were also known as "physical fractions," and so we find Gemma Frisius (*c* 1540) writing *De Fractionibus Astronomicis, siue de minutiis Physicis*, to distinguish them from the *fractiones vulgares* He wrote

	s.	g	m.	2.	3.	4.
	1	10.	25.	17	21.	27
for	1 sign (30°),	10°,	25′,	17″,	21‴,	27ᴵᵛ.

To the mediaeval astronomers and their successors in the Renaissance such fractions were probably as significant as our decimal fractions are to us, but the operations beyond subtraction were difficult

DECIMAL FRACTIONS

Forerunners.—The mediaeval computer who wished to find the square root of 7, having no decimal fractions with which to work, first multiplied the number by, say, 10,000, then found the square root of 70,000 to three figures, and then divided the result (246) by 100, obtaining $2\frac{46}{100}$, or $2\frac{23}{50}$. The process was known to the Hindus and the Arabs and is found in Europe as early as the 12th century Even after the decimal fraction was known, such devices remained; this is seen, for example, in the custom of comparatively recent writers in taking the radius of a circle as 10,000,000 so as to avoid the use of decimals in the trigonometric functions. Early in the 15th century al-Kashî, assistant of the prince astronomer, Ulugh Beg of Samarkand, is said to have given the value of π as $\frac{\text{sah-hah}}{3}$ 1415926535898732, where *sah-hah* (modern Turkish *sahih*) means complete or integral If the manuscript of his work now in Constantinople goes back to his time, this is the earliest evidence we have of any precise knowledge of the decimal fraction Pellos (1492) made use of the decimal point in cases like 9537919–70. He first placed a decimal point, 953791·9, then divided by 7, obtaining 136255 with a remainder, and finally wrote the result as $136255\frac{9}{70}$. In Rudolff's *Exempel-Buchlin* of 1530 an example in compound interest is solved by the aid of decimal fractions written in the form 393|75, 413|4375, and so on to 20|6164099697265625000, the operations being carried on as they are to-day The first book devoted solely to these fractions was *De Thiende* (Flemish, there was a French translation, *la Disme*, The Tenth, in the same year), written by Simon Stevin (Stevinus) and published in 1585 In this the decimal 27·847 (English) or 27.847 (American) appears as 27⓪8①4②7③. The first writer to use a decimal point with full understanding of its significance seems to have been Clavius In the columns of differences of his table of sines printed in his work on the astrolabe in 1585, differences like 46·5 are given, this particular one being explained in the chapter "De parte proportionali sinuum, & arcuum" (p 229) as equivalent to $46\frac{5}{10}$. The question as to what kind of decimal point to use has never been settled. The use of a separatrix of some kind was generally agreed upon early in the 17th century, but the precise form or position is still uncertain The decimal (or centesimal) symbol % appears in the 15th century under the form "per c°," the "per" being finally dropped and the c° becoming $\frac{c}{c}$ in the 17th century It is of Italian origin.

Operations.—The operations with decimal fractions are the same as with integers except for the proper placing of the decimal point, a matter of no difficulty as the subject is now taught The rules are easily deduced by first writing each fraction as a common fraction For example, $\frac{3}{10}\times\frac{7}{100}=\frac{21}{1000}$, and hence 0 3×0 07=0 021 (British), or 0 3×0 07=0 021 (American)

Recurring Decimals.—If we reduce $\frac{1}{6}$ to a decimal fraction, we have (using the British decimal point in this discussion) 0 1666, the 6 continually recurring Such a fraction is called a *recurring decimal, circulating decimal*, or *repeating decimal* This fraction may be written 0 1$\dot{6}$, the superposed dot indicating that the 6 is repeated indefinitely We see, by division, that

$$\frac{1}{111}=0\ 144144\cdot\ =0\ 1\dot{4}4,$$

and $\frac{1}{555}=3\ 2303636\ \cdots=3\ 23\dot{6}$,

the dots being placed above the first and last figures of the *repetend*

Considering the last of these cases, 3 23$\dot{6}$, the decimal 0 0$\dot{3}$6 forms an infinitely decreasing geometric series, 0 030+0 00030+ , in which the first term is 0 030, the ratio is $\frac{1}{100}$ and the number of terms is infinite The formula for S, the limit of the sum of this series, is $a/(1-r)$ Substituting

$$S=0\ 036/(1-0\ 01)=0\ 036\div 0\ 99=\tfrac{2}{55},$$

and so $3\ 23\dot{6}=3\ 2+\frac{2}{55}=\frac{1778}{5550}$.

The following rule for the reduction to a common fraction is easily deduced. From the given number (3 23$\dot{6}$), considered as a whole number (3236), subtract the non-recurring part (32) and divide the result (3204) by a number composed of as many 9's as there are figures in the repetend with as many zeros annexed as there are figures between the repetend and the decimal point (that is, by 990) The result is the equivalent common fraction ($3204\div 990=\frac{1778}{5550}$).

There is a considerable amount of theory connected with the recurring decimal, and the subject formerly found place in most of the elementary arithmetics

THE INDEX NOTATION

Origin.—The need which modern science has created for decimal fractions to a large number of decimal places has led to the introduction of a new symbolism based upon the fact that $\frac{1}{10^n}=10^{-n}$, and hence that $\frac{1}{10000000}=10^{-6}$,—a shorter way of expressing the common fraction. For example, instead of saying that a millimicron is 0·000000001 of a meter, we may say that it is 10^{-9}m ; and instead of saying that a square millimeter is 0·00155 of 1 sq in., we may say that it is $1\ 55\times10^{-3}$ sq in or 155×10^{-5} sq in. The index notation is also used in connection with very large numbers, as when we express 750,000,000,000,000 ultra violet waves per second as $7{\cdot}5\times10^{14}$ per second

Advantages of the Index Notation.—The demands of astronomy and physics render it necessary to use numbers to represent such great and such small distances and lengths that the eye has difficulty in detecting their meaning when they are written The index notation not only condenses the statement but it is particularly valuable when logarithms are to be used.

For example, in the case of $1{\cdot}55\times10^{-3}$ we see that the characteristic of the logarithm is -3, and in the case of $7{\cdot}5\times10^{14}$ it is 14. Since a fraction expressed in any one notation can be expressed in any other, it is immaterial what notation is used so far as the general principles of fractions are concerned

BIBLIOGRAPHY —On the general theory of fractions consult E. Combette, *Cours d'Arithmétique* (12th ed., 1904); A Hofler, *Didaktik des mathemgtischen Unterrichts* (Leipzig, 1910) (Foundation principles) On the history of the subject consult J. Tropfke, *Geschichte der Elementar-Mathematik* 2nd ed, 1921, Berlin (de Gruyter), vol i, p 118–49, D. E Smith, *History of Mathematics* (Boston, 1925), vol. ii., pp 208–27, 418–20, 477–93. (General development of the various types of fraction, with facsimiles from early works) (D E S)

FRACTIONAL DISTILLATION: *see* DISTILLATION

FRACTIONATION, in chemistry, consists in separating into fractions materials which differ in rates of crystallization, boiling points or other characteristics, rendering possible a sharp separation Gases may be separated by fractional combustion, as in burning oxygen out of the air to secure the nitrogen (*see* NITROGEN, FIXATION OF) Fractional crystallization requires conditions favourable for the crystallization of one component in a reasonably pure state Further purification is obtained by redissolving and re-crystallization Various conditions, temperature and a choice of solvents are important, as well as a knowledge of the characteristics of the solids to be separated Fractional distillation is dependent upon differences in boiling points, the best example being the concentration of alcohol (*see* ALCOHOL IN INDUSTRY) Here the lower boiling point of the alcohol allows its removal in a high state of purity from the water with which it is admixed Fractionating columns are of various designs, the object in all cases being to concentrate to a high purity with low heat consumption Complex mixtures of liquids are often separated by several distillations, in the course of which one after another is removed, according to predetermined conditions Fractionation may also be applied to precipitation, where one material after another may be thrown out of a mixed solution, depending upon the reagents used

FRACTURES. A fracture is a break, more especially of a bone or cartilage The bone may be broken at the part where it is struck (fracture from direct violence), or may break in consequence of a strain applied to two levels of the bone at some distance apart (fracture from indirect violence) The actual form of the fracture of a long bone is classified in accordance with whether it is transverse, oblique, comminuted or impacted The first two terms explain themselves A comminuted fracture is one in which there is fragmentation of the bone at the site of injury, an impacted fracture is one in which the broken ends are driven together by the causative violence in such a way as to become locked A type known as the greenstick variety is met with in children; the fracture does not extend right across the bone, and angulation is therefore the only possible displacement.

Compound Fractures.—Fractures of all types are subdivided into those which are simple (or closed), or compound (or open) The term simple means that the skin over the fracture remains intact. A compound fracture is one in which the skin is broken, either by protusion of the bones through the skin after the break has occurred, or by the direct action of the violence which caused it; this latter condition is seen as a result of missile injuries and run-over accidents A compound fracture is always a serious condition on account of the possibility of infection of the wound by micro-organisms If germs are introduced into the wound suppuration will occur, and when this process invades the broken surfaces of bone it is a dangerous complication; in its most severe forms it may necessitate amputation in order to stop blood poisoning which may threaten the patient's life. In any case infection will delay union, and very likely lead to the death of fragments of bone in the neighbourhood of the fracture.

The experience of the Great War was largely in relation to fractures of this nature, and a very definite advance was made in the treatment of these cases. It was found that no chemical antiseptic was effective in disinfecting a lacerated wound; the only effective procedure is the clean excision of the wound track, involving the removal of all contaminated tissues. The application of this process of wound excision or *débridement* in severe compound fractures has greatly improved the results and minimized the number of cases of serious infection To have a proper hope of success the procedure should be carried out within twelve hours of infliction of the injury. So long as infection does not occur, or once it has been eradicated, the treatment of a compound fracture is on the same lines as a simple one

Diagnosis.—The diagnosis of a fracture can usually be made on the history of an injury followed by acute pain in a bone and the loss of function of the limb affected In many cases there is gross deformity which can be recognized by comparing the injured limb with the sound side and can be confirmed by measurements taken between known bony points A sensation of grating (crepitus) between the broken bone ends is characteristic in cases which are not impacted Nowadays, however, radiological examination is essential if a full appreciation of the position of the fragments is to be obtained, and few fractures can be treated up to the highest current standard without the aid of this procedure Radiology is also of great value in observing the progress of the case towards repair

Union.—Bones unite by a process of repair comparable to that observed in any other tissue of the body. After the primary effusion of blood and serum which follows the injury the swelling so formed is gradually absorbed and replaced by granulation tissue The granulation tissue laid down about broken bone differs from that in the soft parts in that it becomes calcified, and finally is converted into true bone The term callus is applied to this type of repair tissue Finally, if the bones are in good alignment the normal structure is completely restored The speed of union varies with individual fractures and with individual patients in a way and to a degree which cannot be explained on any simple grounds In general the process is more rapid in children In the adult the age of the patient does not have a very great influence on the process.

Treatment of a fracture in which there is any serious displacement will in the first place involve setting the bones, that is to say, putting the fragments in as nearly normal a position as circumstances permit. This is effected or attempted by manipulation under an anaesthetic In many cases, however, of fractures of long bones in which there is overlap, satisfactory reposition cannot be obtained by this means, and the adjustment of the ends is effected by gradual weight extension or traction which stretches the muscles and tends to draw the bones into their normal alignment

Open Operations.—Should it be impossible to get satisfactory apposition of the fragments by one of these methods, open operation is justifiable and may be the only method of obtaining a first-class result The aim of surgical technique in relation to bone work for which Lane was mainly responsible, has rendered these operations a safe and straightforward proposition. When the fracture has been exposed and adjusted, some method of internal fixation is often employed, the bones being joined together by metal or bone plates, or sutured by wire. There is a tendency at the present day to avoid the use of metal in these open operations and to employ instead slats of bone which may be obtained from the patient or from some other source.

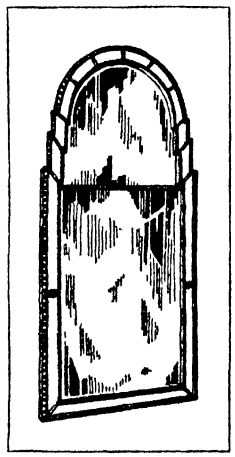
Fixation.—The next step in treatment after reduction of deformity is the maintenance of position of the reduced fragments. This can be effected by various forms of external splintage. Plaster of Paris is the most effective method of fitting a firm splint to a limb, but it can only be applied to a limited group of cases. Wire skeleton splints which are completed by fabric slings are popular for the lower extremity. Aluminium gutter splints are of value in some cases on account of their malleability and translucence to X-rays. The period during which splints are kept applied varies widely in accordance with the nature of each fracture. In general they are not removed till union is so far advanced that their absence does not cause a risk of displacement.

Restoration of Function.—In every fracture the neighbouring muscles, tendons, and very often joints, are damaged in some degree. The disabilities which may follow a fracture are most often the result of these latter injuries, and after-treatment is

directed to the restoration of full function and movement of muscles and joints Massage can be employed from an early stage, though it may be impossible in circumstances in which rigid fixation of the bones has to be maintained It is of value in promoting absorption of swelling, and thereby promotes repair. Passive and active movement of joints near the fracture is carried out as soon as the stability of the broken bone will permit Electrical methods of various kinds are employed to exercise and repair muscles, and have considerable value in properly selected cases In general it may be said that in fractures of the upper extremity the main aim should be to restore full and early movement of joints and muscles, even at the expense of imperfect reposition of the broken bone In the lower extremity perfect alignment of the bones is the first necessity if secondary joint troubles are to be avoided

Delayed or Un-united Fractures.—Delay in the process of union is common enough for several reasons, the commonest being probably the interposition of soft structures between the broken ends The presence of syphilis in the system and certain wasting diseases are also deterrent factors Failure of bones to unite firmly in healthy individuals is rare It is, however, met with in those cases in which a large part of the bone substance has been destroyed or damaged by the primary injury or subsequent infection These cases are now treated in suitable subjects with a high measure of success by bone grafting Fresh bone taken from the patient himself gives the most reliable results. In cases in which the original broken bone ends can actually be brought together, a beef bone and preserved human bone have been employed with some measure of success As to the degree to which the grafted bone replaces normal bone, the consensus of opinion is that the graft acts as a scaffold along which new bone grows, rather than that it becomes a part of the host skeleton At any rate it forms a firm bond about which, under suitable conditions, new bone formation takes place (C M P)

FRAGONARD, JEAN-HONORÉ (1732–1806), French painter, was born at Grasse, the son of a glover He was articled to a Paris notary when his father's circumstances became straitened through unsuccessful speculations, but he showed such talent and inclination for art that he was taken at the age of 18 to Boucher, who, recognizing the youth's rare gifts, sent him to Chardin's *atelier* Fragonard studied for six months under the great luminist, and then returned to Boucher, whose style he soon acquired so completely that the master entrusted him with the execution of replicas of his paintings Though he was not a pupil of the Academy, Fragonard gained the Prix de Rome in 1752 with a painting of "Jeroboam sacrificing to the Idols," but before proceeding to Rome he continued to study for three years under Van Loo In the year preceding his departure he painted the "Christ washing the Feet of the Apostles" now at Grasse cathedral In 1755 he took up his abode at the French Academy in Rome, then presided over by Natoire There he benefited from the study of the old masters such as Pietro da Cortona whom he was set to copy—and a summer sojourn at the Villa d'Este in the company of the abbé de Saint-Non, who engraved many of Fragonard's studies of these entrancing gardens—did more towards forming his personal style than all the training at the various schools. Added to this influence was the deep impression made upon his mind by Tiepolo's works which he had an opportunity of studying in Venice before he returned to Paris in 1761. In 1765 his "Corésus et Callirhoé" (Louvre) secured his admission to the Academy It was made the subject of a pompous eulogy by Diderot, and was bought by the king, who had it reproduced at the Gobelins factory. Hitherto Fragonard had hesitated between religious, classic and other subjects; but now the demand of the wealthy art patrons of Louis XV 's pleasure-loving court turned him definitely towards those scenes of love and voluptuousness with which his name will ever be associated, and which are made acceptable by the tender beauty of his colour and the virtuosity of his facile brushwork—such works as the "Serment d'amour," "Le Verrou," "La Culbute," "La Chemise enlevée" and "The Swing" (Wallace collection), and his decorations for the apartments of Mme du Barry and the dancer Marie Guimard



BY COURTESY OF THE METROPOLITAN MUSEUM OF ART, N Y
AN ENGLISH FRAME OF THE QUEEN ANNE PERIOD (1690–1740)

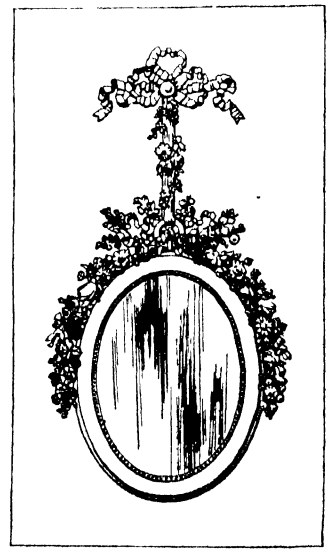
The Revolution put an end to the *ancien régime,* and Fragonard, who was so closely allied to its representatives, left Paris in 1793 and found shelter in the house of his friend Maubert at Grasse, which he decorated with the series of decorative panels known as the "Roman d'amour de la jeunesse," originally painted for Mme. du Barry's pavilion at Louvecienne The panels were in the possession of Mr Pierpont Morgan, and have passed into the Frick Collection in New York Fragonard returned to Paris early in the 19th century, and died there in 1806, neglected and almost forgotten But within the last 30 years he has regained the position among the masters of painting to which he is entitled by his genius.

Besides the works already mentioned, there are four important pictures by Fragonard in the Wallace collection The Louvre contains 13 examples of his art Other works are in the museums of Lille, Besançon, Rouen, Tours, Nantes, Avignon, Amiens, Grenoble, Nancy, Orleans, Marseilles, etc , as well as at Chantilly. Some of Fragonard's finest work is in the collections of the Rothschild family in London and Paris His most important engraving is "L'Armoire" (1778)

See E and J de Goncourt, *L'Art du dix-huitième siècle* (1883); F Naquet, *Fragonard* (1890), R Portalis, *Fragonard* (1899), fully illustrated, V Josz, *Fragonard—moeurs du XVIIIe siècle* (1901), C Mauclair, *Fragonard* (1904), P de Nolhac, *J H Fragonard* (1906); L de Fourcaud, *Fragonard* (1906), Dayot et Vaillet, *L'oeuvre de Chardin et de Fragonard* (1907).

FRÄHN, CHRISTIAN MARTIN (1782–1851), German numismatist, was born at Rostock on July 4, 1782, and settled in Russia as professor of oriental languages at Kazan He then became director of the Asiatic museum in St Petersburg, where he died on Aug 28, 1851 Frahn was a standard authority on Asiatic coins

Frahn wrote over 150 works Among the more important are *Numophylacium orientale Pototianum* (1813), *De numorum Bulgharicorum fonte antiquissimo* (1816), *Numi cufici ex variis museis selecti* (1823), *Notice d'une centaine d'ouvrages arabes, etc, qui manquent en grande partie aux bibliothèques de l'Europe* (1834), and *Nova supplementa ad recensionem Num Muham Acad Imp Sci Petropolitanae* (1855)



BY COURTESY OF THE METROPOLITAN MUSEUM OF ART, N Y
AN 18TH CENTURY MIRROR FRAME IN THE ELABORATE STYLE OF THE LOUIS XVI PERIOD

FRAME, a word employed in many different senses, signifying something joined together or shaped In constructional work it connotes the union of pieces of wood, metal or other material for purposes of enclosure as in the case of a picture or mirror frame Frames intended for these uses are of great artistic interest but comparatively modern origin There is no record of their existence earlier than the 16th century, but the decorative opportunities which they afforded caused speedy popularity, and the Renaissance found in the picture frame a rich and attractive means of expression Fine work was produced in such profusion that great numbers of examples are still extant. Frames for pictures or mirrors are usually square, oblong, round or oval, and, although they have usually been made of wood or composition overlaid upon wood, the richest and most costly materials have often been used. Ebony, ivory and tortoise-shell; crystal, amber and mother-

of-pearl; lacquer, gold and silver, and almost every other metal have been employed for this purpose The domestic frame has in fact varied from the simplest and cheapest form of a plain wooden moulding to the most richly carved examples. The introduction in the 17th century of larger sheets of glass gave the art of frame-making a great impetus, and in the 18th century the increased demand for frames, caused chiefly by the introduction of cheaper forms of mirrors, led to the invention of a composition which could be readily moulded into stereotyped patterns and gilded. This was eventually the deathblow of the artistic frame, and since the use of composition moulding became normal, no important school of wood-carving turned its attention to frames until the revival of interest in the applied arts in the first quarter of the present century.

FRAMINGHAM, a town of Middlesex county, Massachusetts, 21m W by S of Boston; served by the Boston and Albany and the New York, New Haven and Hartford railways. The population was 17,033 in 1920, and estimated locally at 25,000 in 1928. The town occupies 27 sq m of level ground, dotted with lakes and ponds, includes three villages, and has the largest unlimited town meeting in the country It is the seat of the State arsenal and of a State normal school (the oldest in the country), opened in Lexington in 1839 and moved to Framingham in 1852 In South Framingham is the State reformatory for women. The manufactures are numerous and varied, including straw hats, boots and shoes, rubber goods, patent medicines, boilers, shipping tags, stoves, heating apparatus, automobiles and paper specialties The aggregate output in 1925 was valued at $25,432,793, and was estimated at $32,000,000 for 1928 Framingham was settled about 1640 and incorporated in 1700 It was named after the English home (Framlingham) of Governor Danforth, who at one time owned the land The old Boston-to-Worcester turnpike ran through the village of Framingham Center, and in 1834 the Boston and Worcester railway was laid through South Framingham, which then became the most important village of the town

FRAMLINGHAM, a market town in the Eye parliamentary division of East Suffolk, 91 m N E from London on a branch of the L N E R. from Wickham market. Pop of civil parish (1921) 2,397 The church of St Michael is a fine Perpendicular and Decorated building of black flint, surmounted by a tower 96 ft. high In the interior there are a number of interesting monuments, including those of Thomas Howard, 3rd duke of Norfolk (d 1554), and of Henry Howard, the famous earl of Surrey, who was beheaded by Henry VIII The castle forms a picturesque ruin, consisting of the outer walls 44 ft high and 8 ft thick, with 13 towers about 58 ft high, a gateway and some outworks Framlingham college for boys was founded in 1864 as a memorial to Albert, the prince consort Framlingham (Frendlingham, Framalingaham) in early Saxon times was probably the site of a fortified earthwork to which St Edmund the Martyr is said to have fled from the Danes in 870. The Danes captured the stronghold after the escape of the king, but it was won back in 921, and remained in the hands of the crown, passing to William I. at the Conquest. Henry I in 1100 granted it to Roger Bigod, who in all probability raised the first masonry castle Hugh, son of Roger, created earl of Norfolk in 1141, succeeded his father, and the manor and castle remained in the Bigod family until 1306, when in default of heirs it reverted to the crown, and was granted by Edward II. to his half-brother Thomas de Brotherton, created earl of Norfolk in 1312. On an account roll of the castle of 1324 there is an entry of "rent received from the borough," and of a fair and market, and in all probability burghal rights had existed at a much earlier date Town and castle followed the vicissitudes of the dukedom of Norfolk, passing to the crown in 1405, and being alternately restored and forfeited by Henry V., Richard III., Henry VII., Edward VI., Mary, Elizabeth and James I., and finally sold in 1635 to Sir Robert Hitcham, who left it in 1636 to the master and fellows of Pembroke hall, Cambridge

FRAMPTON, SIR GEORGE (1860–1928), English sculptor and craftsman, was born in 1860, and died in London on May 21, 1928. He studied under W S. Frith at Lambeth, in the Academy schools, and in Paris under Mercié. He became A R.A. in 1894, R A in 1902, and was knighted in 1908. Frampton held many English and foreign academic honours, and was one of the foremost figures in the English art world. He first exhibited in 1884, but no really characteristic work by him was shown until 1893, when his first experiment in colour in sculpture was shown, the "Madonna and Child" From that time onward he experimented with decorative sculpture, using many kinds of material, seeking to associate sculpture with the arts and crafts He was at one time "Master" of the Art Workers' guild. He was anti-classical in spirit, and wished to substitute natural forms for architectural devices He executed public monuments in London, Glasgow, Leeds, Calcutta and Winnipeg The most famous are the bronze "Steamship" and "Sailing Ship" on the "Lloyd's Register" building, "Peter Pan," known to all child visitors to Kensington Gardens, London, and the much discussed Edith Cavell memorial at the foot of St Martin's lane, London

FRANC. A French coin current at different periods and of varying values The first coin so called was one struck in gold by John II of France in 1360 On it was the legend *Johannes Dei gracia Francorum rex;* hence, it is said, the name It also bore an effigy of King John on horseback, from which it was called a *franc à cheval,* to distinguish it from another coin of the same value, issued by Charles V on which the king was represented standing upright upon a Gothic dais, this coin was termed a *franc à pied* As a coin it disappeared after the reign of Charles VI, but the name continued to be used as an equivalent for the *livre tournois,* which was worth 20 sols French writers would speak without distinction of so many livres or so many francs, so long as the sum mentioned was an even sum; otherwise livre was the correct term, thus *"trois francs"* but *"trois livres cinq sols"* In 1795 the livre was legally converted into the franc, at the rate of 81 livres to 80 francs, the silver franc being made to weigh exactly five grammes

The franc is now the unit of the monetary system and also the money of account in France, as well as in Switzerland In Italy, until the end of 1927, the lira was nominally equivalent to the franc, and in Greece the drachma is still nominally equivalent. The franc is divided into 100 centimes, and the drachma into 100 lepta Other currencies which are nominally equivalent to the franc are the peseta (Spain), the leu (Rumania), the lat (Latvia), the dinar (Yugoslavia), and the leva (Bulgaria) Until comparatively recently, Belgium used the franc, and even during the post-war depreciation, the two currencies for long fluctuated upon parallel lines In 1926, the Belgian currency was revalued at the rate of frs 175 to the pound sterling, but for the sake of simplicity a new unit, the belga, was introduced for purposes of international exchange. Thirty-five belgas equal one pound at parity, so that one belga is the equivalent of five francs For everyday purposes, the franc is still used internally, but is not equivalent to the French and Swiss franc

At the outbreak of war in 1914, the franc was at its par value of 25 22 to the pound. In common with other Allied currencies, it was "pegged" at parity during the war, but after the Armistice was left to find its natural level The inflation boom of 1919–20, the strain put upon the French finances by the war and the reconstruction of the devastated areas, and the failure and inability of Germany to pay reparations, all in turn contributed to its steady depreciation, only broken from time to time by periods of hectic recovery. Such occurred in 1924, when the Government of the day obtained foreign credits and, by selling dollars and sterling on the Paris Bourse, rapidly drove the exchange from frs.120 to frs 67 to the pound. Subsequently another collapse occurred, caused by the chronic deficit in the French budget, accentuated in April 1925 by the news that the note-issue had surreptitiously exceeded its legal limit

In the middle of 1926, the franc was at last taken in hand. The national finances had been eased since 1926 by the success of the Dawes scheme as a begetter of reparations, and a stable government attained power. Acting on the advice of their Currency Commission, they cleared the ground by the end of 1926 for *de facto* stabilization at just over frs.120 to the pound. This rate was maintained during 1927 with such marked success, that, though the

Government were prepared to sell foreign exchange to prevent a depreciation of the franc, in practice they had to buy far more than their needs in order to stop an appreciation, to the detriment of French trade It was to reduce this plethora of foreign exchange holdings that the French authorities bought gold in 1927, thereby upsetting the world's money markets *See* also CURRENCY

FRANÇAIS, ANTOINE, COUNT (1756–1836), better known as FRANÇAIS OF NANTES, French politician and author, was born at Beaurepaire, Isère, on Jan 17, 1756 He became a member of the legislative assembly (1791), a member of the council of Five Hundred (1798) and one of its secretaries, a member of the council of state, and director-general of the indirect taxes (*droits réunis*) (1804). On the second restoration he retired into private life; but from 1819 to 1822 he was representative of the department of Isère, and after the July revolution he was made a peer of France He died in Paris on March 7, 1836

Français wrote a number of works, *Le Manuscrit de feu M Jérôme* (1825), etc.

FRANÇAIS, FRANÇOIS LOUIS (1814–1897), French painter, was born at Plombières (Vosges) After a few years of hard struggle, during which he made a precarious living by drawing on stone and designing woodcut vignettes for book illustration, he studied painting under Gigoux, and subsequently under Corot, whose influence remained decisive upon Français's style of landscape painting He exhibited first at the Salon in 1837 and was elected to the Académie des Beaux-Arts in 1890 Comparatively few of his pictures are to be found in public galleries, but his painting of "An Italian Sunset" is at the Luxembourg museum in Paris

FRANCAVILLA FONTANA, a town and Episcopal see of Apulia, Italy, province of Lecce, 22 m by rail E by N of Taranto, 460 ft above sea-level Pop (1921) 17,747 (town); 19,612 (commune). It is in a fine situation, and has a massive square castle of the Imperiali family, to whom, with Oria, it was sold by S Carlo Borromeo in the 16th century for 40,000 ounces of gold, which he distributed in one day to the poor.

FRANCE, ANATOLE (1844–1924), whose real name was Jacques Anatole Thibault, French man of letters, was born in Paris on April 16, 1844. For 30 years French literature was dominated in the eyes of all the world by the fame of Anatole France It is true that his influence declined in the last period of his life and that his ideas were questioned, but not his style nor the services rendered by him to the language In his old age he was revered as a genius and a patriarch. No reputation since Voltaire's has been found comparable with his

The son of a bookseller called Thibault, this youth who was to make illustrious the pseudonym of Anatole France started his career quite humbly. He was fond of literature, he was studious and erudite, but negligently preferred reading to writing He composed publishers' puffs and contributed a weekly article signed "Gérôme" to the *Univers Illustré* For his own amusement he wrote verse, *Les poèmes dorés* (1875) and *Les noces corinthiennes* (1876), which showed learning, charm and taste In 1879 he published his first volume of stories, *Jocaste et le chat maigre,* and in 1881 his first novel, *Le crime de Sylvestre Bonnard,* which was acclaimed by the discriminating as delightful

In 1883 he first met Madame Arman de Caillavet, with results that profoundly influenced his career. Mme de Caillavet became his life-long friend. She was clever and active; she had a host of acquaintances and her receptions were attended by the leading figures of literature and politics She laboured for the fame of Anatole France, and she forced him out of his inertia into composition The extracts from her correspondence with him prove the important share she took in his writings, and in the dedication of *Crainquebille* (1904) Anatole France could say: "To Madame de Caillavet, this book which I should not have written without her help, for without her help I should write no books"

For 40 years Anatole France poured out a series of lively, solid, graceful and profound works. There are the pungent and mischievous short stories, *Balthazar* (1889), *L'étui de nacre* (1892), *Le puits de Sainte-Claire* (1895); the meditative and critical books, *Les opinions de Jérôme Coignard* (1893), *La vie littéraire* (4 vol 1883–92); a philosophical novel, *La rôtisserie de la Reine Pédauque* (1893); an historico-philosophic novel, *Thaïs* (1890), describing Alexandria at the beginning of our era and contrasting the ideals of dying paganism with those of nascent Christianity; an admirable novel on the French Revolution and the Terror, *Les dieux ont soif* (1912); a society novel, *Le lys rouge* (1894), a powerful study of jealousy set amid the artistic treasures and lovely vistas of Florence; then the series of political satires, the four volumes of *L'histoire contemporaine—L'orme du mail* (1897), *Le mannequin d'osier* (1897), *L'anneau d'améthyste* (1899), *M Bergeret à Paris* (1901), where Anatole France creates the legendary figure of M. Bergeret and portrays society before and during the Dreyfus affair; novels of a revolutionary tendency, *Sur la pierre blanche* (1903), *L'île des Pingouins* (1908), *La révolte des anges* (1914), a biography of Joan of Arc (1909–10); lastly the reminiscences, *Le petit Pierre* (1918), *La vie en fleur* (1922) Such is the sum of this work admirable in its wealth and variety

The philosophy of Anatole France developed during the course of his career Until 1900 he was primarily a sceptic As Voltaire's spiritual son, he delighted in the play of ideas and observed without pity the stupidity and the silliness of men He probed the past and the present and spared no example of human inconsistency, error or weakness *Les opinions de Jérôme Coignard* gives the reader much pleasure, so witty and mischievous is the author, and gives him, too, a complete lesson in scepticism The same remark may be passed on *Les dieux ont soif,* where Anatole France considers almost exclusively the failures of the French Revolution At this time the author seems to have kept respect for beauty alone, the beauty of natural or artistic forms or of such superior intelligence as was shown in the great Greek and Latin writers. Meanwhile he beamed indulgently upon an imperfect universe. As he believed in nothing, he did not believe in a better or a worse In the writings prior to 1900 may even be found conservative and aristocratic maxims A supreme indifference inclined him to accept what is rather than risk what might be

On the outbreak of the political crisis of 1900, his temper changed He was then seen to show a preference for the progressive parties, and little by little went on to the revolutionary parties, which became honoured by his support. He was no orator, words came slowly, and neither his mind nor his phrases were of the kind likely to be popular The part taken by him at public meetings was undistinguished, being limited to signing manifestos and applauding resolutions, especially those with an international objective. He was more powerful with his pen An opponent of Church and State, he seemed to put his faith in the people and to expect the world to be renewed by some kind of revolution On this point his ideas remained rather vague In one of his books, *Sur la pierre blanche,* he ends the description of future society with a dreadful cataclysm that destroys everything, and here he is nearer to nihilism than to socialism The World War changed the trend of his thoughts As he was too old to serve in the field he wanted at least to show his good will and asked to be employed in a Tours office This great upheaval left him uncertain concerning the destinies of humanity Perhaps extreme scepticism is not for long tolerable, and Anatole France felt the need of escape into a revolutionary faith which he refused to define, leaving it a mere aspiration

What is indisputable is the quality of Anatole France's art. The younger generations, tried by war, and witnessing the consequent political difficulties, ill comprehend the detachment of dilettante M Bergeret. They need more moral discipline, they believe more in virtue and action. But they do not deny the master who charmed their elders with his graceful wit and magic phrases. As a storyteller, in lucidity of thought and form, Anatole France is incomparable. In his style, too, there is a sweetness, an almost voluptuous grace, which distinguishes his phrases from those of any other writer. He owed much to Voltaire, much

to Renan, much to the old French romances, to memoirs and to chronicles. He had read and remembered much, but what he borrowed he made his own; all was changed, and for the better, by his style and interpretation. He translated into a pungent idiom all that could delight or stimulate the intelligence of his cultured contemporaries. He was a deep admirer of classicism, and to the end of his life, when he mentioned Molière, Racine or Stendhal his conversation or his writing attained their richest substance and most pleasant harmonies.

He makes another strong claim on the attention of posterity. He was the finest flower of the Latin genius. His knowledge of antiquity was great, and his work contained the essentials of Greek and Latin wisdom. He portrayed in *Thais* characters who distil the philosophy of the ancients. He put into the mouth of Jérôme Coignard maxims which likewise represent the sum of the meditations and arguments common to antiquity

Lastly, in all periods of his career, whatever his theories, he was a deep student of human nature. He expressed in magic words most of the wisdom that may be acquired from the observation of life and the reading of history. He created characters who persist in the memory—Jérôme Coignard, Jacques Tournebroche, M. Bergeret, Madame Martin Bellème, Catherine, the lace worker, Paphnuce, Nicias, Evariste Gamelin. He described what was comic and evil in mortals. He described, too, what was august in man, sacred in man's labours and sufferings Though he lacked enthusiasm and ardour, his critical intelligence did not prevent him from brooding over human misery, and in the story of Crainquebille he showed his heart While humbling himself before the invincible forces of fate and lust, he dedicated his work now to irony—which brought brightness into his life—and now to pity—which at other times reminded him that life deserves a serious, a solemn attention. And so he became twice fortunate, for he was at once a subtle artist acclaimed by the critics and a universally respected publicist who influenced the simple-minded. He died at Tours, Oct. 13, 1924.

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FRANCE, a country of western Europe, situated between 51° 9′ and 42° 23′ N. and 4° 42′ W. and 8° E Its boundaries on the north-west (the English channel) and west (Bay of Biscay) are the sea, on the south its frontier is a line based upon the main ridge of the Pyrenees, on the south-east it borders the Mediterranean The southern part of the eastern frontier is based upon the crest lines of the Maritime, Cottian and Graian Alps, passing east of Mt Blanc along the eastern scarp of the Chablais to the south shore of the lake of Geneva Leaving to Switzerland Geneva and its district and a strip along the north-western shore of the lake, the frontier goes along the Jura ridge to the Doubs river soon after reaching which it alters its character. The part described thus far is either sea or watershed, allowance being made for a few compromises as regards watershed lines when large valleys have been cut back through the watershed The remainder of the frontier lacks this definite physical character and is a result of many historical processes so complex that the relation to physical geography is often obscured After leaving the Doubs it bends west bringing Switzerland at Porrentruy to the north-western foot of the Jura, bending back again it goes to the vicinity of Basle and then along the Rhine (since the retrocession of Alsace-Lorraine after 1918) to a point east of Lauterburg In this section the Rhine, flowing along the broad valley bottom, has long formed a marked boundary between the communities on either side

Leaving the Rhine the frontier runs west-north-west to the north side of the Strait of Dover. In its course it leaves most of the Saar valley outside, runs along the French side of the Ardennes, bends northward down the Meuse to give France the fortress of Givet, and then cuts across the slopes of Hainault and the Flemish plain to the sea a few miles north-east of Dunkirk; in this last section it runs parallel to and some 20–30 m north of the hills of Artois. France forms a remarkably compact block rather over 600 m from the coast north of Dunkirk to the most distant point of the Pyrenean frontier and somewhat less from the extreme point of Brittany (Cap. St. Mathieu) to the frontier east of Lauterburg The area is now 212,659 sq m., as against 207,170 sq.m. before 1918, the area of Corsica (3,367 sq m.) being included in both totals.

Geology.—Many years ago it was pointed out by Elie de Beaumont and Dufrénoy that the Jurassic rocks of France form upon the map an incomplete figure of 8 Within the northern circle of the 8 lie the Mesozoic and Tertiary beds of the Paris basin, dipping inwards; within the southern circle lie the ancient rocks of the Central Plateau, from which the later beds dip outwards Outside the northern circle lie on the west the folded Palaeozoic rocks of Brittany, and on the north the palaeozoic *massif* of the Ardennes Outside the southern circle lie on the west the Mesozoic and Tertiary beds of the basin of the Garonne, with the Pyrenees beyond, and on the east the Mesozoic and Tertiary beds of the valley of the Rhône, with the Alps beyond.

In the geological history of France there have been two great periods of folding since Archaean times The first of these occurred towards the close of the Palaeozoic era, when a great mountain system was raised in the north running approximately from east to west and another chain arose in the south, running from south-west to north-east Of the former the remnants are now seen in Brittany and the Ardennes; of the latter the Cévennes and the Montagnes Noires are the last traces visible on the surface. The second great folding took place in Tertiary times, and to it was due the final elevation of the Jura and the Western Alps and of the Pyrenees No great mountain chain was ever raised by a single effort, and folding went on to some extent in other periods besides those mentioned There were, moreover, other and broader oscillations which raised or lowered extensive areas without much crumpling of the strata, and to these are due some of the most important breaks in the geological series

The oldest rocks, the gneisses and schists of the Archaean period, form nearly the whole of the Central Plateau, and are also exposed in the axes of the folds in Brittany The Central Plateau has probably been a land mass ever since this period, but the rest of the country was flooded by the Palaeozoic sea. The earlier deposits of that sea now rise to the surface in Brittany, the Ardennes, the Montagnes Noires and the Cévennes, and in all these regions they are intensely folded. Towards the close of the Palaeozoic era France had become a part of a great continent; in the north the Coal Measures of the Boulonnais and the Nord were laid down in direct connection with those of Belgium and England, while in the Central Plateau the Coal Measures were deposited in isolated and scattered basins The Permian and Triassic deposits were also, for the most part, of continental origin; but with the formation of the Rhaetic beds the sea again began to spread and throughout the greater part of the Jurassic period it covered nearly the whole of the country except the Central Plateau, Brittany and the Ardennes Towards the end of the period, however, during the deposition of the Portlandian beds, the sea again retreated, and in the early part of the Cretaceous period was limited (in France) to the catchment basins of the Saône and Rhône—in the Paris basin the contemporaneous deposits were chiefly estuarine and were confined to the northern and eastern rim

Beginning with the Aptian and Albian the sea again gradually spread over the country and attained its maximum in the early part of the Senonian epoch, when once more the ancient massifs of the Central Plateau, Brittany and the Ardennes, alone rose above the waves There was still, however, a well-marked differ-

ence between the deposits of the northern and the southern parts of France, the former consisting of chalk, as in England, and the latter of sandstones and limestones with hippurites During the later part of the Cretaceous period the sea gradually retreated and left the whole country dry

During the Tertiary period arms of the sea spread into France —in the Paris basin from the north, in the basins of the Loire and the Garonne from the west, and in the Rhône area from the south The changes, however, were too numerous and complex to be dealt with here

In France, as in Great Britain, volcanic eruptions occurred during several of the Palaeozoic periods, but during the Mesozoic era the country was free from outbursts, except in the regions of the Alps and Pyrenees In Tertiary times the Central Plateau was the theatre of great volcanic activity from the Miocene to the Pleistocene periods, and many of the volcanoes remain as nearly perfect cones to the present day The rocks are mainly basalts and andesites, together with trachytes and phonolites, and some of the basaltic flows are of enormous extent

GENERAL DESCRIPTIVE GEOGRAPHY

France, situated between the Mediterranean sea on the south-east and the Atlantic and English channel on the west and north furnishes natural routes via the Rhone-Saône over the Côte d'Or scarp to the Seine, and via the Garonne from sea to sea, and thus continues the westward routes of the Mediterranean, a fact of the utmost importance throughout the country's history As, also, the Strait of Dover is the natural westward end of the European plain, France continues southward the routes westward along that plain, and this fact has been of tragic consequence to her The relations of France to both these great routes of civilization and of war gives that country a special function as an intermediary between south and north, between Roman and non-Roman in Europe

The natural units that make up the country include three great river basins, the Paris basin (Somme, Seine and Loire), the Rhône-Saône basin and the Garonne basin, set respectively north, east and south-west of a block of highland (culminating at Puy de Sancy in the Mont Dore, 6,188 ft) that forms barely one-sixth of the total area of France and is called the Central Plateau Whereas on the north the Central Plateau forms the southern framework of the very large Paris basin, while its north-eastward annexe, Le Morvan, contributes to the basin's eastern framework, the southern fringe of the plateau (Montagnes Noires) projects so far towards the Pyrenees that there is left only the narrow gap of Carcassonne The lowlands of south France are thus markedly divided into Mediterranean or Rhône lowlands and Aquitainian or Garonne lowlands, using the river names broadly in each case.

The highland framework partly surrounding the Paris basin is continued beyond the Morvan by the lower Côte d'Or scarp,astride of which stretched the nucleus of Burgundy. Beyond this again the Vosges (4,668 ft) and the Ardennes continue the framework and the changes effected by the treaty of Versailles have removed the frontier from the slopes overlooking the north-east of the basin to slopes at times looking down towards Germany. It is characteristic of the collecting streams of the north-east of the Paris basin, the Meuse and Moselle, that a complex history has diverted them away from the basin northward to cut deep trenches in the Ardennes-Eifel highland block of old rocks To the west the Paris basin is framed by the old rocks of Brittany and Normandy which, unlike those of the Central Plateau, reach above the 1,000-ft contour only in a few places The coasts of Normandy and Brittany show the effects of a sinking movement which has given them long estuaries and fringing islands, Ré, Oléron, Belle Île, Houat, Hoedic, Île de Groix, Îles de Sein, Ouessant, the Channel Islands, etc. This western area of old rocks and maritime activities constitutes a region of France to be added to the four (the three great basins and their frameworks, and the Central Plateau) already mentioned Alsace constitutes a sixth, being on and under the Rhineward slope of the Vosges and thus right beyond the Paris basin; to this region also belong parts at least of Lorraine. Where the mountain framework of a basin is broad, as on the east side of the French Rhône, one might speak of still another region, that of the high mountains. One might also note that the old rocks of the Massif des Maures, and especially their seaward southern slopes, can be named as a small region apart, but these are merely outstanding examples to illustrate the possibilities of indefinite subdivision and complication of any classification

The Rhône-Saône Basin.—The Rhône-Saône basin is a long north-south corridor with the Alps and the Jura on the east, ranged in a line that shows how the mountain folds advancing westward have been stopped by the resistance of the old mass of the Central Plateau and the Morvan The river runs along this corridor near the foot of the steep edge of the Central Plateau The corridor is narrow for a considerable part of the lower course of the Rhône where the Alpine folds come nearest the Central Plateau, and this narrow portion makes a considerable break between Provence and Languedoc towards the delta, and the region above Lyons where the mountain folds of the Jura make a convex curve between the north end of the Central Plateau and the south end of the Vosges The Morvan and the Plateau de Langres are the heights on the west with the Côte d'Or as the limestone scarp under which runs the Saône The feeders of the Rhône-Saône are of course mainly from the east, the Durance and Isère drain mountain areas in the Alps, the Rhône itself comes through from the east between the Jura and the main Alps and the Ain and the Doubs drain the Jura The climate in the lower Rhône is one of summer heat and drought with a winter that is really mild only in places sheltered from the air currents streaming from the plateau (the Mistral winds) or from the mountains to the seasonal low pressure centre over the north-west Mediterranean The spring is delightful apart from the Mistral which, however, does not blow very often at that time. It is a region in which, with wind screens, vines may be grown as field crops and the olive thrives about as far north as Pierrelatte It is possible to grow choice early vegetables and there is pasture for cattle in the winter on the lowlands; many are sent up to the highlands for the summer

The lower Rhône is essentially a region of Mediterranean civilization with cities often of Roman and even pre-Roman heritage—Orange, Avignon, Arles, Nîmes, Marseille, etc. Farther north in the corridor the summer is less hot though again fairly dry, but the winter is too cold for the olive; the climate suits the mulberry about as far north as Lyons, beyond which the broader corridor has on and under its slopes facing south-east some of the choice vineyards of Burgundy It is a region of vine and maize with stock and poultry farming on a good scale east of the Saône (in Bresse) and its forest growth is that of central Europe rather than that of the Mediterranean Its cities are largely determined by their important lines of communication—Lyons, Dijon, Belfort Both the Alps and the Jura have important local capitals within their limits in France, the former Grenoble, the latter Besançon.

The Garonne Basin.—The Garonne-Dordogne basin is south-west France, essentially a triangle framed by the Central Plateau, the Pyrenees and Bay of Biscay The exposure to the sea gives a marked rainfall against the hill frame and this shows its effect in the great tributaries of the Garonne on both flanks, but especially on the left on which side Tarn, Aveyron, Lot and Dordogne have cut back long subparallel valleys. The Adour drains the south-west corner separately. The triangle mentioned above is incomplete, there is a lowland way between the Central Plateau and the sea, the gate of Poitiers as it is often called It has Bordeaux on its south-west side. There is also a narrow lowland way between the southern end of the Central Plateau and the Pyrenees, and this is the gap of Carcassonne with Toulouse on its west, Carcassonne itself at the critical point and Narbonne on the east. These facts concerning communications help to show how it is that this region has two major focal towns, Bordeaux and Toulouse The climate is more moist than in the Rhône-Saône region and slightly less hot in summer; it does not suit the olive, but is famed for vines and maize, the wine being typically less ferruginous than in Burgundy. The chestnut

abounds towards its northern border in the Périgord

The Central Plateau.—In the west the granites give poor, cold soil; its Jurassic limestone areas (Causses) to the south-west and south are for the most part so bare as to be almost desertic, but parts may once have had a natural forest covering and the valleys are often rich The volcanic ranges are often high and bare, but parts of the lands around them are famed for their pastures, while the upper courses of the Loire and Allier form bays in the north side of the plateau, in the beds of ancient lakes, the Allier flowing through the fertile Limagne which gives a site to the focus of a large region, a focus that once was Gergovia and now is Clermont Ferrand On the high plateau it often happens that the river valleys are relatively broad with pastures and beech woods and a good population so long as they remain in the volcanic region, but farther down the river may cut through the hard ancient rocks and there it forms a gorge that is almost uninhabited There are small basins on the high plateau with historic towns that may have castles or churches on sharply outstanding volcanic rocks and the whole region may be said to have received many contributions to its life from the south, though legal and linguistic features have spread a good way up from the northern plain, through hillside foci such as Clermont Ferrand and Limoges.

Apart from the coal area of St Etienne the region is poor, and many of its departments have lost over 10% of their population within the 20th century The wildness of some districts is illustrated by the fact that the wolf still lingers on the Central Plateau The winters are severe on the heights and snow is abundant, the summer is moderate on the heights but hot in the lowlands The contrasts between the olive-vine region below the plateau on the south-east and the mountain valleys, often between limestone hills, is a striking one and is the contrast of the setting of Roman Catholic and Huguenot elements in French religious life, though the psychological contrast has many other contributory factors besides the environmental one

The Paris Basin.—This basin (of Seine and Loire) is floored by a succession of rocks arranged as a nest of saucers so that the successive saucer edges stand out as scarps facing outwards in each case The command of any of these scarps by an army allows it to overlook the inward facing dip slopes The centre is formed of Tertiary rocks including the corn growing calcareous plateau of Beauce (Pliocene) continued southward into the muddy Sologne, full of marshes and lakelets, and north-eastward to the Marne in the Brie, argillaceous save towards the Marne

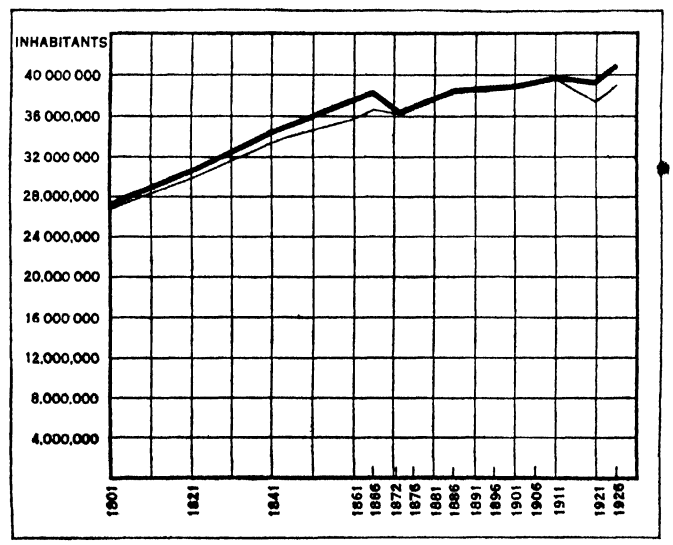
The Eocene beds crop out around the Pliocene and vary in character, but are often sandy and forested, the *forêt de Compiègne* and other forests, which stretch south, east of the Oise and often overlook swamps where these Tertiary beds die out westwards near the Oise, forming a boundary zone of old between Belgica to the north and Celtica to the south Several areas of this formation to the south are fairly barren and may bear a name allied to Gâtine, and this frontier nature of the Eocene country is interesting as a factor of the rise of the French monarchy in the centre of the Paris basin Around this centre comes zone after zone of rock, chalk in dry Champagne, Lower Cretaceous clays, followed by Upper Jurassic limestones and free stones sharply scarped at the Côte d'Or and fairly prominently edged along the west bank of the Moselle The Lower Jurassic or Lias with its less permeable rocks has gathered to itself long stretches of new courses in the north-east Beyond this the framework of the basin varies, with the Ardennes on the north, but a belt of Triassic upland reaching the Vosges on the east Between Ardennes and Vosges the Hunsrück and related heights reach the border of Lorraine, but on either side of these latter are ways to the Rhine that have made of Lorraine a region of transition and of strife This border of the basin has hard winters and hot summers with a good deal of rain. The Vosges are high and wild enough to have wolves

On the southern edge of the Paris basin is the Central Plateau but on the west the succession of outcropping rocks is not nearly so complete as on the east and the old rocks of the Armorican system are reached giving the denuded and dissected plateau of western France with its sunken estuaries and its seaward outlook. Here Brittany stands out, and to the south of it the Loire, draining the south of the Paris basin, cuts through the old rocks before it reaches its estuary below Nantes It thus has a course which it acquired at some stage of its history through diversion and at the critical bend stands Orléans of great historic and strategic importance for that very reason The fine valley to the south-west with its great *châteaux* and its tradition of cultured French speech is *La Touraine.* North of Brittany the west of Normandy is a part of this plateau of old rocks but beyond it the Seine estuary has given opportunities for maritime traditions in a country of the chalk rim of the Paris basin The Seine draining the centre of the basin passes from the Eocene, with a good deal of forest near its border, to the chalk through which it has cut a rather deep trough so that there is an old frontier region along and on either side of the river, Le Vexin français on the Eocene and Le Vexin Normand on the chalk

On the north the Paris basin has a broad zone of chalk with anticlines and synclines that give rise to small scarps and valleys famous in the World War, and beyond lies the plain of Flanders, offering a much easier approach to the Paris basin than do the ways through Lorraine, with the result that Flanders is the greatest battlefield of European history The focusing of the basin on Paris is extraordinarily complete and has contributed much to the centralization so characteristic of French life and organization, but the "ways" into and out of the basin via Flanders, Lorraine and Belfort to the north and east have constrained Paris to maintain centralization in view of the needs of defence The Paris basin, with a rainfall in many parts of only 23–25 in and fairly cold winters, has a sunny summer of moderate warmth admirable for ripening wheat and permitting the growth of the vine in selected spots which accordingly grow choice fruit as at Reims, Epernay and Saumur Towards the west the vine gives place to the apple and cider becomes the beverage, while stock-rearing becomes more prominent in agriculture under the influence of Atlantic rains The Paris basin is essentially a corn-land rich in old market towns and dominated in unique fashion by the city of Paris

POPULATION

The work of Broca and of Collignon in the 19th century was of pioneer importance for the study of physical type in man-



GRAPH SHOWING POPULATION OF FRANCE, 1801–1926 THE HEAVY LINE REPRESENTS POPULATION OF THE POLITICAL UNIT AT EACH CENSUS THE LIGHT LINE FROM 1801 TO 1872 AND FROM 1911 TO 1926 OMITS THE POPULATION OF ALSACE-LORRAINE

kind They showed that the central plateau and parts of the French Alps, together with parts of the surrounding lowlands, especially those south of the Seine and near the Garonne, were characterized by a short, thick-set, brown-haired, broad-headed population, which Broca called Celtic but which have come to be known as Alpine They are a large element in the thrifty,

hardworking peasantry, serious and deeply attached to their fields and villages In the south-west, where the Basque language (*q v*) survives, this type mingles with a long-headed dark element widely distributed around the western Mediterranean and known as the Mediterranean race; this is also found in Languedoc and Provence In Burgundy and the Jura, one finds tall men, often fairly dark, with rather long faces In the north of France the Alpine type is mingled with and influenced by tall fair types from farther north, the Franks being doubtless one of many contributing elements here The Seine entry and the coasts of Normandy and Brittany also have tall, fair types of Scandinavian origin, and on the Breton coasts, for example near Binic and Paimpol, and in the Morbihan are tall, dark, broad-headed people comparable with similar groups found on the coasts of the Iberian peninsula, the west coasts of Great Britain, etc ; these last are apparently descendants of men who spread along the Atlantic coasts in connection with some phase of prehistoric trade (*See* EUROPE, *Ethnology*)

France thus possesses considerable numbers of almost every physical type found in western Europe or, indeed, if the Burgundians be allowed to be related to Dinaric types (*see* EUROPE, *Ethnology*), of almost all those found in Europe save the Arctic north and the Asiatic border Collignon rightly emphasized the survival of types known from the late Palaeolithic, especially in the basin of the Dordogne The contrasts between the stability of the totals of population in France in the 19th century and the phenomenal increase in Great Britain and between the extreme urbanization of population in England and the large rural element in France are commonplace They need to be understood, however, with some reserves, for there has been in France a marked tendency to urbanization, continued and increased of late years In the 20th century also there has been an immense loss of manhood through the World War; the maintenance of the totals is in part due to immigration of, chiefly, Italian, Spanish, Slavonic and Belgian elements The following tables of population illustrate the changes in the 20th century and show that there has been a widespread decrease of population on the Central Plateau and in the east and south-east of the Paris basin as well as in the Garonne basin and the French Alps The departments which show increases are two around Paris, that of the lower Seine with Le Havre and Rouen, those of Nord and Pas de Calais with their industrial developments, that of Meurthe et Moselle with its iron industry, those including Lyons, St Étienne, Bordeaux, Marseille, and most of those on the Mediterranean coast save Gard and Aude. Ports and other cities have grown, the countryside has less people

The recent change in this direction is illustrated by the following table—

	1921	1926
Number of Communes with 5,001–10,000 inhabitants	394	429
Number of Communes with 10,001–20,000 inhabitants	175	207
Number of Communes with 20,001 inhabitants and over	140	159
Number of Towns with over 100,000 inhabitants	15	17

The departments which showed actual decreases in the period 1921–26 were Allier, Basses Alpes, Hautes Alpes, Ardèche, Ariège, Aveyron, Cantal, Charente, Charente Inférieure (slight), Cher, Corrèze, Côtes du Nord, Creuse, Dordogne, Finistère, Indre, Landes, Loir et Cher, Haute Loire, Lot, Lozère, Haute Marne, Mayenne, Morbihan, Nièvre, Haute Saône, Saône et Loire, Sarthe, Deux-Sèvres (slight), Vendée and Vosges These are all rural departments and in several cases are difficult highland country

France has a total population of 40,743,851, or nearly 191·6 per square mile, a relatively low density for a country of old settlement and varied resources like France The total in 1921 was 39,209,766, but of this increase of 1,534,085 no less than 957,176 was due to an increase in the number of aliens from 1,550,459 to 2,507,635 or rather more than 6 1% of the population France has become a country of immigration and the alien element is over 10% in the following departments.—Alpes Maritimes (nearly 30), Ardennes (about 10), Aude (over 10), Bouches du Rhone (over 19), Hérault (over 11), Meurthe et Moselle (over 14), Moselle (about 18), Nord (nearly 12), Pas de Calais (13), Pyrenées Orientales (over 14), Var (over 17). The importance of immigration is further appreciated when it is realized that Alpes Maritimes, Var, Bouches du Rhone, Hérault, Pyrenées Orientales, Meurthe et Moselle, Nord and Pas de Calais are among the small number of departments that show increase of population in the 20th century The situation in France thus is that a very slow increase of native population with a gradual drift to the towns, away from the regions of difficulty, is going on alongside of a considerable movement of immigration, chiefly to industrial centres The figures above are from the official returns of the 1926 census as corrected by a supplementary decree of Feb 8, 1927

The large cities of France in order of population are as follows —

Paris (strict limits)	2,871,429
Greater Paris (Dept of Seine)	4,628,637
Marseille	652,196
Lyons	570,840
Bordeaux	256,026*
Lille	201,921
Saint Etienne	193,737
Nantes	184,509
Nice	184,441
Toulouse	180,771
Strasbourg	174,492
Le Havre	158,022*
Rouen	122,898*
Roubaix	117,209
Toulon	115,120
Nancy	114,491
Clermont Ferrand	111,711
Reims	100,998

*Show small decreases since 1921.

The birth rate was 20 5 per 1,000 for the decade 1901–11 and by 1925 it had fallen only to 19 6, thus contrasting markedly with the British one which in 1927 was only 16 6. The death rate of over 21 per 1,000 in the last decade of the 19th century had declined to 17 6 in 1913, but rose as a result of war dislocation and was 18 1 in 1925 This is much higher than the British death rate has been for a long time The conditions in France, with a still largely rural population, are such as to make care of infants and general sanitation more difficult than they are in general in industrialized Britain and the warm summers tend to make any defects of sanitation more dangerous still

The occupations of the active population were as follows in 1921·—

Agriculture and forestry	8,951,099
Fishing	72,450
Mining and quarrying	317,607
Manufactures	6,181,441
Transport	1,184,414
Commerce, including banks	2,253,529
Liberal professions	590,492
Domestic service	847,506
Public service	1,322,006

The liberal professions show a marked increase and domestic service a marked decrease as compared with the early part of this century, changes that are noticeable in many countries Transport work also occupies many more than it did 25 years ago because of the road motor

Constitution.—On Sept 4, 1870, a republic was proclaimed in France and the main points in the national organization were fixed by the constitutional laws of 1875, with amendments of detail made in 1879, 1884 and 1926. The Constituent National Assembly is formed of the Senate and the Chamber of Deputies (*v inf.*) sitting together at Versailles, and this assembly has charge of the constitution and also meets to elect the president of the republic who is eligible to hold office for seven years and may be re-elected He has to be elected by an absolute majority of votes cast in the National Assembly The president of the council of ministers (*Angl.* "premier") may deputize for the president of

Table indicating movement of population in the 20th century.

Departments	Census of 1901	Census of 1911	Census of 1926	% increase or decrease of 1926 as compared with 1901
Ain	349,205	342,482	317,195	− 9
Aisne	534,204	530,226	488,999	− 8·5
Allier	421,074	406,291	370,562	−12
Alpes, Basses	112,763	107,231	88,347	−22
Alpes, Hautes	106,857	105,083	87,963	−18
Alpes, Maritimes	320,822	356,338	435,253	+36
Ardèche	349,961	331,801	289,263	−17
Ardennes	314,056	318,896	297,448	− 5
Ariège	202,284	198,725	167,498	−17
Aube	245,596	240,755	238,253	− 3
Aude	311,386	300,537	291,951	− 6
Aveyron	377,559	369,448	328,886	−12·5
Bouches du Rhone	737,112	805,532	920,549	+26
Calvados	407,639	396,318	390,492	− 4
Cantal	218,941	223,301	196,999	−10
Charente	344,376	346,424	312,790	− 9
Charente, Inf	446,294	450,871	417,789	− 6·5
Cher	342,889	337,810	298,398	−13
Corrèze	304,718	300,646	269,289	−11
Corse	276,829	288,820	289,890	+ 4·5
Côte d'Or	358,708	350,044	328,881	− 8
Côtes du Nord	597,032	605,523	552,788	− 7 5
Creuse	259,138	266,188	219,148	−15
Dordogne	448,545	437,432	392,489	−12
Doubs	296,957	299,935	296,591	
Drome	294,704	290,894	263,750	−10·5
Eure	331,184	323,651	308,445	− 7
Eure et I oir	272,624	272,255	255,213	− 6
Finistère	763,193	800,771	753,702	− 1
Gard	418,470	413,458	402,601	− 3·5
Garonne, Hte.	439,769	432,126	431,505	− 1·5
Gers	236,204	221,994	196,419	−17
Gironde	820,781	829,095	827,973	+ 1
Hérault	488,285	480,484	500,575	+ 2 5
Ille et Vilaine	611,477	608,098	561,688	− 7·5
Indre	286,961	287,673	255,095	−11
Indre et Loire	334,073	341,205	334,486	
Isère	563,813	555,911	558,079	− 1
Jura	259,212	252,713	230,685	−11
Landes	291,657	288,902	263,111	−10
Loir et Cher	274,836	271,231	248,099	−10
Loire	644,532	640,549	669,216	+ 4
Loire, Hte	306,671	303,838	260,610	−12
Loire, Inf	656,998	669,920	651,487	−10
Loiret	363,812	364,061	341,225	− 6
Lot	223,736	205,769	171,776	−23
Lot-et-Garonne	276,607	268,083	246,609	−11
Lozère	124,049	122,738	104,733	−15
Maine et Loire	513,208	508,149	477,741	− 7
Manche	488,361	476,119	431,367	−12
Marne	432,850	436,310	397,773	− 8
Marne, Hte	224,888	214,765	195,370	−13
Mayenne	311,207	297,732	259,934	−16
Meurthe et Moselle	484,002	564,730	552,087	+14
Meuse	283,136	277,955	218,131	−23
Morbihan	556,934	578,400	543,175	− 2
Nièvre	319,506	299,312	260,502	−18
Nord	1,877,647	1,961,780	1,969,159	+ 5
Oise	405,642	411,028	405,971	
Orne	325,445	307,433	277,037	−15
Pas de Calais	949,068	1,068,155	1,171,912	+23
Puy de Dôme	529,181	525,916	515,399	− 3
Pyrenées, Basses	423,164	433,318	414,556	− 2
Pyrenées, Htes	212,173	206,105	187,875	−11
Pyrenées, Orientales	209,447	212,986	229,979	+10
Belfort	91,765	101,386	96,591	+ 5
Rhône	835,157	915,581	993,915	+19
Saône, Hte	265,179	257,606	226,313	−15
Saône et Loire	616,389	604,446	549,240	−11
Sarthe	422,944	419,370	387,482	− 8
Savoie	249,460	247,890	231,210	− 7
Savoie, Hte	259,595	255,137	245,317	− 5
Seine	3,599,870	4,154,042	4,628,637	+29
Seine Inf	843,928	877,383	885,299	+ 5
Seine et M	355,638	363,561	380,017	+ 7
Seine et O	700,405	817,617	1,137,524	+62
Sèvres, Deux	339,340	337,627	309,820	− 9
Somme	534,101	520,161	473,916	−11
Tarn	326,396	324,090	301,717	− 7
Tarn et Garonne	194,458	182,537	164,191	−16
Var	325,490	330,755	347,932	+ 7
Vaucluse	235,457	238,656	230,549	− 2
Vendée	439,637	438,520	395,602	−10
Vienne	333,896	332,276	310,474	− 7
Vienne, Hte	374,212	384,736	351,311	− 7
Vosges	419,784	433,914	382,100	− 9
Yonne	316,047	303,889	277,230	−12
Moselle			519,052	.
Rhin, Bas			670,985	.
Rhin, Haut			490,654	

the republic The powers of the president of the republic include most of those usually exercised by a constitutional monarch With the concurrence of the Senate he can dissolve the Chamber of Deputies, he can call it and the Senate to meet in extraordinary session and can adjourn them for a period not exceeding one month, he can also send messages to them, and can refer their decisions back to them for reconsideration He is responsible in principle for the making of wars and treaties Every act of the president must be countersigned by a minister and his messages are communicated by a minister; he chooses the president of the council of ministers and is liable to attainder only by the Chamber of Deputies and to trial only by the Senate constituted as a high court With allowances for establishments and travel, the president receives about two million francs per annum The council of ministers is nominated by its president after the latter has been chosen by the president of the republic The actual appointments are made by the latter who has the right to preside at the council, but there are unofficial cabinet meetings for most political purposes and he does not attend these A minister is responsible to the Senate and Chamber of Deputies, he can enter and claim to be heard in either chamber, he is responsible for a department of government, and responsible conjointly with his colleagues for the government in general. A minister is paid 100,000 fr per annum.

The legislative chambers make laws, control the executive and exercise special powers mentioned under each; the constitution provides for these sessions, adjournments and dissolutions These chambers are the Senate and the Chamber of Deputies.

The Senate is elected by an electoral college system, one-third of its members vacating their seats every third year so that the whole is renewed during each period of nine years The "thirds" are reckoned in departments "A" includes the departments in alphabetical order from Ain to Gard, also Alger, Guadeloupe and Réunion, total 96 seats "B" includes the departments from Garonne (Haute) to Oise, also Constantine and Martinique, total 106 seats "C" includes the departments from Orne to Yonne, also Oran and the French establishments in India, total 98 seats This accounts for 300 seats in addition to which there are seats for ministers who may not be members of the Senate, but though a minister may sit in both houses without necessarily being a member, he may vote only in a house of which he is a member

The Senate may sit as a court of justice to try a president of the republic or a minister on the accusation of the Chamber of Deputies or to try a case in which national safety is involved A senator receives 60,000 fr per annum The electoral college system provides that in each department concerned a college shall assemble It is composed of the deputies, general councillors, councillors of the *arrondissements* and representatives of municipal councils, a council of 10 members appointing one representative, a council of 12 members two, a council of 16 members three and so forth A senator must be a person with full civil rights and over 40 years old

The Chamber of Deputies has at present 568 members elected every four years by France and Corsica, together with 16 members elected by Algeria, and certain other French possessions

abroad which are held to have reached an appropriate stage of development, Cochin China having one representative in the Chamber of Deputies, though it has none in the Senate In France, apart from the territory of Belfort, which elects two deputies, there is one deputy for every 75,000 inhabitants and an additional one in any department with a residuum of more than 37,000 inhabitants

The total number of deputies thus varies with the population. Every male citizen over 21 years of age free of legal disabilities is a voter, provided he has resided six months in any one commune, but a deputy must be over 25 The voting is by lists for each constituency, an electoral college allocating the seats according to the votes cast, it is composed of general councillors nominated by the prefect of the department Algeria has six deputies and other French possessions concerned have 10, their numbers being fixed by law A deputy receives 60,000[1] fr per annum

The Senate and Chamber of Deputies both have legislative initiative and can demand that the president shall convoke them, one-half of the members of each having to agree for this purpose Financial initiative and the power of accusation of a president or a minister before a court belong to the Chamber of Deputies alone The members of former reigning families are not permitted to become senators or deputies

If a bill be presented to the Chamber of Deputies, it is referred to a bureau for examination and report, after which it must go through the chamber twice before being presented to the Senate If it be presented to the Senate, it is referred to a commission of parliamentary initiative for report, after which it must go through the Senate twice before being presented to the Chamber of Deputies Either the Senate or the Chamber of Deputies may pass a vote of no confidence in the Government, but the Government resigns usually only on such a vote passed by the Chamber of Deputies The Senate cannot be dissolved and the president may dissolve the Chamber of Deputies only with the consent of the Senate Mention should here be made of the Council of State, the King's Council under the old monarchy, suppressed at the Revolution and re-established under Napoleon

The Council of State (*conseil d'état*) is the principal council of the head of the State and his ministers, who consult it on various legislative problems, more particularly on questions of administration It is divided for dispatch of business into four sections, each of which corresponds to a group of two or three ministerial departments, and is composed of (1) 32 councillors *"en service ordinaire"* (comprising a vice-president and sectional presidents), and 19 councillors *"en service extraordinaire,"* i e , Government officials who are deputed to watch the interest of the ministerial departments to which they belong, and in matters not concerned with those departments have a merely consultative position, (2) 32 *maîtres des requêtes;* (3) 40 auditors

The presidency of the Council of State belongs *ex officio* to the minister of Justice The theory of *"droit administratif"* lays down the principle that an agent of the Government cannot be prosecuted or sued for acts relating to his administrative functions before the ordinary tribunals Consequently there is a special system of administrative jurisdiction for the trial of *"le contentieux administratif"* or disputes in which the administration is concerned.

Local Government.—According to the census of 1926, France, including Corsica, consisted of 90 departments, with 279 *arrondissements,* 106 having been suppressed in 1926, 3,024 cantons and 37,981 communes Before the Act of 1926 the *préfet* of each department, elected by the president, was advised by an elected council, but now only the department of Seine has such a council, the others are grouped under 22 councils which are thus interdepartmental. A department is divided into *arrondissements,* each with a *sous-préfet* advised by a council elected by the cantons. Each commune has a mayor advised by an elected municipal council, with numbers regulated by the census returns save in the case of Paris, which has a council of 80 members; these councils are re-elected every four years. The elected councils of the *préfet,* etc , are chosen by universal suffrage. The *préfets, sous-préfets* and *maires de communes* are nominees of the central authority and are entrusted with local headship of administration Simplifications effected in 1926 were made for the sake of economy and in view of the diminution of population in many remote areas The general council advising the *préfet* superintends public property and assigns amounts of tax revenue to be raised by each *arrondissement;* it has no concern with political controversy The *sous-préfet* allocates amounts of tax revenue to be raised by each canton Each canton is the seat of a justice of the peace and is the unit for elections to the general council and the council of the *arrondissement* The *maire* is the executive officer of the commune, looks after police, revenue, public works, civil registration, etc In small communes he has one deputy, in larger ones he has more

[1]The salaries of senators and deputies, which were only augmented to 60,000 fr. from 45,000 at the end of 1928, are expected shortly to be again increased to 75,000 fr

JUSTICE

The ordinary judicial system of France comprises two classes of courts (1) civil and criminal, (2) special, including courts dealing only with purely commercial cases, in addition there are the administrative courts, including bodies, the Conseil d'État and the Conseils de Préfecture, which deal, in their judicial capacity, with cases coming under the *droit administratif* Mention may also be made of the Tribunal des Conflits, a special court whose function it is to decide which is the competent tribunal when an administrative and a judicial court both claim or refuse to deal with a given case

Taking the first class of courts, which have both civil and criminal jurisdiction, the lowest tribunal in the system is that of the *juge de paix* In each canton is a *juge de paix* who in his capacity as a civil judge takes cognizance, without appeal, of disputes concerning small amounts, but where larger amounts are concerned there is an appeal to the court of first instance Criminal affairs are treated similarly It is an important function of the *juge de paix* to endeavour to reconcile disputants who come before him, and no suit can be brought before the court of first instance until he has endeavoured without success to bring the parties to an agreement Tribunals of first instance consider appeals from the *juges de paix* and initiate consideration of somewhat larger civil cases An appeal from them in cases above a certain amount lies to the courts of appeal When sitting as a criminal court the tribunals of first instance are known as correctional tribunals and their decisions are subject to revision by the courts of appeal Tribunals of first instance formerly existed in each *arrondissement,* but in 1926 they were restricted to one in the capital of each department, the bigger departments having sections of the tribunal in other towns Above the tribunals of first instance stand the 26 courts of appeal instituted for groups of departments at Paris, Agen, Aix, Amiens, Angers, Bastia, Besançon, Bordeaux, Bourges, Caen, Chambéry, Dijon, Douai, Grenoble, Limoges, Lyons, Montpellier, Nancy, Nîmes, Orléans, Pau, Poitiers, Rennes, Riom, Rouen, Toulouse The departments of Haut Rhin, Bas-Rhin, Moselle, that is, Alsace-Lorraine as returned to France after 1918, are not included in the above scheme, being still under special arrangements in several respects

At the head of each court, which is divided into sections (*chambres*), is a *premier président.* Each section (*chambre*) consists of a *président de chambre* and four judges (*conseillers*) *Procureurs-généraux* and *avocats-généraux* are also attached to the *parquet,* or permanent official staff, of the courts of appeal The principal function of these courts is the hearing of appeals both civil and criminal from the courts of first instance; only in some few cases (*e g* , discharge of bankrupts) do they exercise an original jurisdiction One of the sections is termed the *chambre des mises en accusation* Its function is to examine criminal cases and to decide whether they shall be referred for trial to the lower courts or the *cours d'assises.* It may also dismiss a case on grounds of insufficient evidence.

The *cours d'assises* are not separate and permanent tribunals—they are held in the departmental capitals by a *conseiller* appointed *ad hoc* of the court of appeal upon which the department depends.

The *cour d'assises* deals with serious criminal cases The president is assisted in his duties by two other magistrates, who may be chosen either from among the *conseillers* of the court of appeal or the presidents or judges of the local court of first instance In this court and in this court alone there is always a jury of twelve They decide, as in England, on facts only, leaving the application of the law to the judges The verdict is given by a simple majority

In all criminal prosecutions, other than those coming before the *juge de paix,* a secret preliminary investigation is made by an official called a *juge d'instruction* He may either dismiss the case at once by an order of *"non-lieu"* or order it to be tried, when the prosecution is undertaken by the *procureur* or *procureur-général* This process in some degrees corresponds to the manner in which English magistrates dismiss a case or commit the prisoner to quarter sessions or assizes, but the powers of the *juge d'instruction* are greater

The highest tribunal in France is the *cour de cassation,* sitting at Paris, and consisting of a first president, three sectional presidents and 45 *conseillers,* with a ministerial staff (*parquet*) consisting of a *procureur-général* and six advocates-general It is divided into three sections the *chambre des requêtes,* or court of petitions, the civil court and the criminal court The *cour de cassation* can review the decision of any other tribunal, except administrative courts Criminal appeals usually go straight to the criminal section, while civil appeals are generally taken before the *chambre des requêtes,* where they undergo a preliminary examination If the demand for rehearing is refused such refusal is final, but if it is granted the case is then heard by the civil chamber, and after argument *cassation* (annulment) is granted or refused The *cour de cassation* does not give the ultimate decision on a case, it pronounces, not on the question of fact, but on the legal principle at issue, or the competence of the court giving the original decision Any decision, even one of a *cour d'assises,* may be brought before it in the last resort, and may be *cassé*—annulled If it pronounces *cassation* it remits the case to the hearing of the court of the same order as that from which it came

Commercial courts (*tribunaux de commerce*) are established in all the more important commercial towns to decide as expeditiously as possible disputed points arising out of business transactions They consist of judges, chosen from among the leading merchants, and elected by *commerçants patentés depuis cinq ans, i e ,* persons who have held the licence to trade (*see* FINANCE) for five years and upwards

In important industrial towns tribunals called *conseils de prud'hommes,* or boards of trade-arbitrators, are instituted to deal with disputes between employers and employees, actions arising out of contracts of apprenticeship and the like They are composed of employers and workmen in equal numbers and are established by decree of the Council of State, advised by the minister of Justice The minister of Justice is notified of the necessity for a *conseil de prud'hommes* by the *préfet,* acting on the advice of the municipal council and the Chamber of Commerce or the Chamber of Arts and Manufactures The judges are elected by employers and workmen of a certain standing

Police.—The judicial police under the *maires* and *juges de paix* include *commissaires de police,* the *gendarmerie,* and, in the country, *gardes champètres* and *gardes forestiers* These are specially concerned with the detection of criminals and the gathering of evidence Special branches include *police des moeurs, police sanitaire, police politique,* etc The administrative police correspond more or less to the police constables of Britain and include the men commonly called *sergents de ville, agents de police,* etc The Paris police includes in addition to the judicial and administrative police above mentioned, an organization under the *préfet* which has charge of the safety of the president of the republic and of the regulation of ceremonies, amusements, etc There is also in Paris the *police municipale* concerned with traffic control and allied matters There are *depôts de sûreté* more or less corresponding to British police stations, departmental prisons in most but not all departments, central prisons for long term prisoners, and convict stations—one at *St. Martin-de-Ré,* and one in *French Guiana.* There are reformatories for young delinquents

Public assistance is given to the poor through *bureaux de bienfaisance* which also have endowments and charitable contributions, and there are many ecclesiastical charities Public institutions take charge of destitute children An old age pensions scheme was inaugurated in 1910 and amended in 1912 and provides for contributions from each worker up to his 60th year with a State contribution of 100 fr increased in cases where a worker has brought up at least three children to the age of at least 16 Maternity help has been legally established and, since 1923, 90 fr per annum is given to a family of more than three children so long as the additional children are under 13

RELIGION

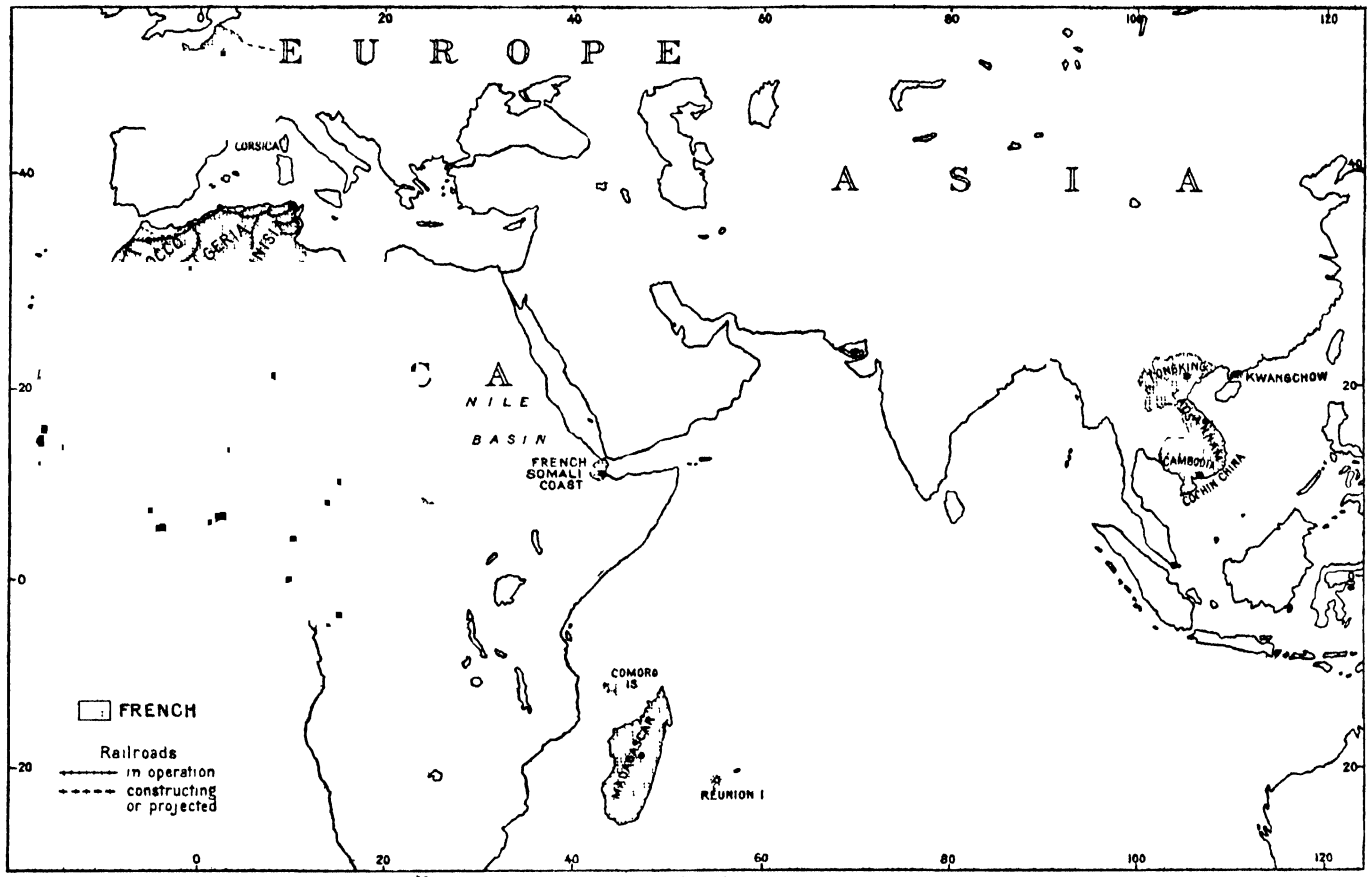
Since 1905 Church and State have been separated by law and public funds are no longer chargeable with the salaries of clergy Religious organizations are not allowed to organize public schools save in the case of special schools training persons for educational service abroad, and such organizations as the religious orders of the Roman Catholic Church must have the State's authorization before they can exist in France These arrangements apply to the whole of France save the departments of Moselle, Bas-Rhin and Haut Rhin, which were called Alsace-Lorraine, 1871–1918, under German rule; in these departments a special régime prevails The historic religious organization of France is the Roman Catholic Church, the hierarchy of which in the country includes archbishoprics at Aix, Albi, Auch, Avignon, Besançon, Bordeaux, Bourges, Cambrai, Chambéry, Lyons, Paris, Reims, Rennes, Rouen, Sens, Toulouse and Tours In addition to these 17 archbishoprics there are 71 bishoprics and the tendency has been in the main to make the sees correspond with the departments The sees are divided into deaneries and the ultimate unit is the parish served by a *curé* or *desservant* (incumbent) who may be assisted by a *vicaire* The training for the priesthood is given in *séminaires,* the lower ones being in part equivalents of grammar schools, the higher ones more strictly theological colleges

Protestantism has an interesting history in France having developed, chiefly under Calvinistic influences, in various centres in the 16th century, while Lutheran ideas spread in parts of the North-east (Montbéliard, etc) The revocation of the Edict of Nantes in 1685 led to the depletion of the Protestant population which had enjoyed a measure of toleration under that edict, and was specially strong in some districts which had been Albigensian in the 13th century With the re-establishment of ideas of toleration various British and other religious bodies founded groups in France and the following organizations now exist *Eglises reformées, Eglises reformées évangéliques, Eglise évangélique luthérienne de France, Eglise de la Confession d'Augsbourg (luthérienne), Société centrale évangélique, Union des églises évangéliques libres de France, Eglise évangélique methodiste de France, Eglises baptistes de langue française* In accordance with the law of separation of Church and State (1905) the Protestants have formed *associations cultuelles* There is a Protestant Federation with a lay president The Protestants of France may number about 1,000,000 souls, chiefly in Montbéliard, Alsace, Paris, the Cevennes, and a few isolated towns for the most part in the south

The Jewish religion has adherents chiefly in certain cities such as Paris, Lyons, Nancy, Bordeaux, etc , and is organized on the basis of *associations cultuelles* There are a few North African Mohammedans in France, many of them in and near Paris.

FOREIGN POSSESSIONS

The foreign possessions of France are in two historic groups First the remains of the old colonies, Saint Pierre and Miquelon, on the Canadian coast, Martinique and Guadeloupe, with their dependencies, in the West Indies; Guiana in South America; five enclaves in British East India, Pondicherry being the most important; Réunion, in the Indian ocean, near Mauritius, a relic of the match between Bougainville and Cook These are, if one likes to call them so, the aristocratic colonies. The American and Indian colonies and Réunion have their deputies and senators in the French parliament. They are united with France by old bonds



MAP SHOWING FRENCH POSSESSIONS IN AFRICA AND ASIA

of affection. They have given her scholars, administrators and great men of letters In certain cases they derive special importance from their situation on the great international routes or their great resources But, above all, their value for France is sentimental and historic, they are the outline of the first empire lost in the 18th century With them are sometimes reckoned Tahiti, etc (acq 1841 onwards), New Caledonia (acq 1854 onwards), also the New Hebrides (held jointly with Britain). The other possessions acquired in the 19th century include Algeria and Tunisia with expansions from these that now make up a vast continuous area, while Jibuti, or French Somaliland, and Madagascar stand apart. There is also the Asiatic group of territories in Indo-China

The following table shows the respective importance of the three groups —

	Colony	Area in sq km	Population
I	America, Australasia, Indian establishments, and Réunion (mainly the old colonies)	129,978	1,112,000
II	African group and Syria	9,910,710	36,890,000
III	Asiatic group	900,842	21,640,000
		10,941,530	58,642,000
	France (for comparison)	550,986	40,000,000

The African group consists of Northern Africa (Algeria, Tunisia, Morocco), French West Africa (Senegal, Guinea, the Ivory Coast, Dahomey, Niger) French Equatorial Africa, which stretches from the Congo to Lake Chad and the Nile basin; Madagascar, the third largest island in the world, and the French Somali Coast, at the mouth of the Red sea In addition, France has mandates in Togo and Cameroons. This group, by its proximity, seems specially destined to act as an extension of the mother-country. It is naturally commanded by Northern Africa, which is only 750 km distant from France, 20 hours' journey by sea, or six hours by air From Northern Africa the railroads and aerial routes spread out towards the tropical and equatorial territories, it links the mother country and the other African colonies Algeria, lying as it does between Morocco and Tunisia, is rightly considered the key position, and it has accepted a large measure of French culture Syria, though in Asia, may be considered in this group, it is administered under mandate and so is not strictly a possession

The Asiatic group consists of Cochin China, Cambodia, Annam, Tongking, Laos, and the territory of Kwangchow Historic reasons have made the relations of French possessions with the Government of the republic very various Algeria is under the Ministry of the Interior and is divided into departments, but it is not in all details of government like departments of France The "old colonies" and the Algerian departments are represented in the Senate and the Chamber of Deputies, and Cochin China is represented in the latter The *Conseil supérieur des Colonies* is an advisory body in Paris with representatives from the colonies. Tunisia, Morocco and Syria are under the Foreign ministry, the others under the Colonial ministry

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DEFENCE

The subject of Defence is dealt with in accordance with custom in three sections, military, naval, and air, dealing with the organization of army, navy and air forces, respectively.

MILITARY

The French army dates from the middle of the 15th century, at which time Charles VII formed, from mercenaries who had served him in the Hundred Years' War, the *compagnies d'ordonnance,* and thus laid the foundation of a national standing army But the armies that followed the kings in their wars still consisted mainly of mercenaries, hired for the occasion; and the work of Charles and his successors was completely undone in the confusion of the religious wars Louvois, as minister of Louis XIV., was the true creator of the French royal army. The organization of the first standing army is here given in some detail, as it served as a model for all armies for more than a century, and is also followed to some extent in modern times Before the advent of Louvois, the forces were royal only in name The army was a fortuitous concourse of regiments of horse and foot, each of which was the property of its colonel The companies similarly belonged to their captains, and, the state being then in no condition to buy out these vested interests, superior control was almost illusory Indeed, all the well-known devices for eluding such control, for instance, showing imaginary men on the pay lists, can be traced to the French army of the 16th century Louvois was unable indeed to overthrow the proprietary system, but he confined it to the colonels (*mestre de camp* in the cavalry) and the captains Henceforward the colonel was a wealthy noble, with few duties beyond that of spending money freely and of exercising his court influence on behalf of his regiment The real work of the service was done by the lieutenant-colonels and lieutenants, and the king and the minister recognized this on all occasions Thus Vauban was given, as a reward for good service, a company in the "Picardie" regiment without purchase Promotions from the ranks were very rare but not unknown, and all promotions were awarded according to merit except those to captain or colonel One of the captains in a regiment was styled major, and acted as adjutant This post was of course filled by selection and not by purchase The grades of general officers were newly fixed by Louvois—the *brigadier, maréchal de camp,* lieutenant-general and marshal of France The general principle was to give command, but not promotion, according to merit. The rank and file were recruited by voluntary enlistment for four years' service The infantry was composed, in 1678, of the *Gardes françaises,* the Swiss guards, the old (*vieux* and *petits vieux*) regiments of the line, and the regiments raised under the new system The *régiment du roi,* which was deliberately made the model of all others and was commanded by the celebrated Martinet, was the senior of these latter. The whole infantry arm in 1678 numbered 320,000 field and garrison troops The cavalry consisted of the *Maison du Roi* (which Louvois converted from a "show" corps to one of the highest discipline and valour), divided into the *Gardes du Corps* and the *Mousquetaires,* the *Gendarmerie* (descended from the old feudal cavalry and the *ordonnance* companies) and the line cavalry, the whole being about 55,000 strong There were also 10,000 dragoons In addition to the regular army, the king could call out, in case of need, the ancient *arrière-ban* or levy, as was in fact done in 1674 In 1688 Louvois organized a militia raised by ballot This numbered 25,000 men and proved to be better, at any rate, than the *arrière-ban* Many infantry regiments of the line were foreign, the greater part being Swiss.

LOUVOIS' WORK

The artillery had been an industrial concern rather than an arm of the service In sieges a sum of money was paid for each piece put in battery, and the grand master was not subordinated to the war office But Louvois adroitly filled the post with his own nominee, and eventually formed companies of artillerymen. The engineer service, as organized by Vauban, was composed of engineers "in ordinary," and of line officers especially employed in war. Louvois further introduced the system of magazines. To ensure the regular working of supply and transport, he instituted direct control by the central executive, and stored great quantities of food in the fortresses, thereby securing for the French armies a precision and certainty in military operations which had hitherto been wanting. The higher administration of the army, under the minister of war, fell into two branches, that of the commissaries and that of the inspecting officers The duties of the former resembled those of a modern "routine" staff—issue of equipment, checking of returns, etc. The latter exercised functions analogous to those of a general staff, supervising the training and general efficiency of the troops Louvois also created an excellent hospital service, mobile and stationary, founded the Hôtel des Invalides in Paris for the maintenance of old soldiers, established cadet schools for the training of young officers, and stimulated bravery and good conduct by reviving and creating military orders of merit

The last half of the 17th century is a brilliant period in the annals of the French armies Thoroughly organized, and led by such generals as Condé, Turenne, Luxembourg, Catinat and Vendôme, they made head against coalitions which embraced nearly all the powers of Europe, and made France the first military nation of Europe The reverses of the latter part of Louis XIV 's reign were not of course without result upon the tone of the French army, and the campaigns of Marlborough and Eugene for a time diminished the repute in which the troops of Louis were held by other powers. Nevertheless the War of the Spanish Succession closed with French victories The War of the Polish Succession in Germany and Italy reflected no discredit upon the French arms; and in 1740 the French army was still regarded as the first in Europe Since the death of Louvois very little had changed A royal regiment of artillery had come into existence, and the engineers were justly regarded as the most skilful in Europe. The total strength of the French in peace was somewhat less than 200,000, but relatively to the numbers maintained in other states, it was as powerful as before But its officers were not the equals of their predecessors of the time of Turenne or Luxembourg Louvois' principle of employing professional soldiers for command and wealthy men for colonelcies and captaincies answered fairly whilst continual wars gave the professional soldiers opportunities for distinction and advancement. But in a long peace the captains of eighteen and colonels of twenty-three blocked all promotion, and there was no work save that of routine to be done. Under these conditions the best soldiers sought service in other countries, the remainder lived only for pleasure, whilst the titular chiefs of regiments and companies rarely appeared on parade.

On the other hand, the fact that the French armies required large drafts of militia to bring up their regular forces to war strength gave them a vitality which was unusual in armies of the time. But in the wars of 1740–63, the superior leaders proved themselves incompetent, except for Marshal Saxe and some others of the younger generals, and defeats were the product of incompetency The administration, too, was corrupt and inefficient.

Under Louis XVI things improved somewhat; the American War and the successes of Lafayette and Rochambeau revived a more warlike spirit. Instruction was more carefully attended to, and attempts were made to reform the administration. Artillery and engineer schools had come into existence, and the intellectual activity of the best officers was remarkable (*see* Max Jahns, *Gesch. der Kriegswissenschaften,* vol iii *passim*). But the Revolution soon broke over France, and the history of the royal army was henceforward carried on by that revolutionary army, which, under a new flag, was destined to raise the military fame of France to its greatest height.

THE ADVENT OF CONSCRIPTION

If Louis was the creator of the royal army, Carnot was so of the revolutionary army. At the outbreak of the Revolution the royal army consisted of 224 infantry battalions, 7 regiments of artillery, and 62 regiments of cavalry, numbering about 173,000 in all, but capable of augmentation on war strength to 210,000. To this might be added about 60,000 militia (*see* Chuquet, *Première invasion prussienne*)

The first step of the Constituent Assembly was the abrogation of an edict of 1781 whereby men of non-noble birth had been denied commissioned rank (1790). Thus, when many of the officers emigrated along with their fellows of the *noblesse,* trained

non-commissioned officers, who would already have been officers save for this edict, were available to fill their places The general scheme of reform (*see* CONSCRIPTION) was less satisfactory, but the formation of a National Guard, comprising in theory the whole military population, was a step of the highest importance At this time the titles of regiments were abandoned in favour of numbers, and the costly and dangerous *Maison du Roi* abolished But voluntary enlistment soon failed; the old corps, which kept up their discipline, were depleted, and the men went to the volunteers, where work was less exacting and promotion more rapid The "first invasion" (July 1792) put an end to half-measures, and the country was declared "in danger," but after Valmy (*q v*), enthusiasm waned to such a degree that, of a paper strength of 800,000 men (December 1792), only 112,000 of the line and 290,000 volunteers were actually present The disasters of the following spring once more called for extreme energy, and 300,000 national guards were sent to the line, a step which was followed by a compulsory *levée en masse;* one million men were thus assembled to deal with the manifold dangers of civil and foreign war. France was saved by mere numbers and the driving energy of the Terrorists, not by discipline and organization The latter was chaotic, and almost every element of success was wanting to the tumultuary levies of the year 1793 save a ferocious energy born of liberty and the guillotine But under the Terrorist régime the army became the rallying-point of the nation, and when Lazare Carnot (*q v*) became minister of war a better organization and discipline began to appear The amalgamation of the old army and the volunteers, which had been commenced but imperfectly carried out, was effected on a different and more thorough principle A permanent organization in divisions of all arms was introduced, and schools of instruction were re-established The artillery and engineers, which in 1790 were admittedly the best in Europe and which, owing to the *roturier* element in their officer cadres, had not been disorganized by the emigration, steadily improved The infantry, and in a less degree the cavalry, became good and trustworthy soldiers, and the glorious campaigns of 1794, 1795 and 1796, which were the direct result of Carnot's administration, bore witness to the potentialities of the essentially modern system But, great as was the triumph of 1796–97, the exhaustion of years of continuous warfare had made itself felt. no sufficient means existed of replenishing them till in 1798 the *conscription* was introduced. From that time the whole male population of France was practically at her ruler's disposal; and Napoleon had full scope for his genius in organizing these masses His principal improvements were effected in the interval between the peace of Amiens and the war with the third coalition, while threatening the invasion of England The divisions had already given place to the army corps, and Napoleon completed the work of his predecessors He withdrew the whole of the cavalry and a portion of the artillery from the divisions, and thus formed "corps troops" and cavalry and artillery reserves for the whole army The grade of marshal of France was revived at Napoleon's coronation. At the same time, the operation of Jourdan's law, acquiesced in during times of national danger and even during peace, soon found opposition when the conscripts realized that long foreign wars were to be their lot It was not the actual losses of the field armies, great as these undoubtedly were, which led Napoleon in the full tide of his career to adopt the fatal practice of "anticipating" the conscription, but the steady increase in the number of *réfractaires,* men who refused to come up for service. To hunt these men down, no less than forty thousand picked soldiers were engaged within the borders of France, and the actual French element in the armies of Napoleon grew less and less with every extension of the empire. Thus, in the Grand Army of 1809, about one-third of the corps of all arms were purely German, and in 1812 the army which invaded Russia, 467,000 strong, included 280,000 foreigners. As the later wars of the Empire closed one by one the foreign sources of recruiting, the conscription became more terrible and more difficult every year. Finally the capacity for resistance was exhausted, and the army, from the marshals downward, showed that it had had enough.

One of the first acts of the Restoration was to abolish the conscription, but it had again to be resorted to within three years. A part only, according to the requirements of the service, were enrolled; the remainder were sent home on leave or furlough Up to 1855 the individual drawn was obliged either to serve personally or find a substitute, but then the law of "dotation" or exemption by payment was passed, and put an end to personal substitution The state now undertook to provide substitutes for all who paid a fixed sum, and did so by high bounties to volunteers or to soldiers for re-engaging Thus gradually the conscription became rather subsidiary to voluntary enlistment, and in 1866, out of a total establishment of 400,000, only 120,000 were conscripts Changes had also taken place in the constitution of the army On the Restoration its numbers were reduced to 150,000, the old regiments broken up and recast, and a royal guard created in place of the old imperial one. Subsequent revolutionary changes of government were accompanied by increases in the army, while under Napoleon III. the imperial guard was re-created, and every effort made to revive the old Napoleonic traditions in the army In 1859 the victories of Magenta and Solferino raised the reputation of the army to the highest pitch, and for a time made France the arbiter of Europe But the campaign of 1866 suddenly made the world aware that a rival military power had arisen, which was prepared to dispute that supremacy

In 1867, therefore, Marshal Niel (*q v*), the then war minister, brought forward a measure for the re-organization of the army This was to have been a true "nation in arms" based on universal service, and Niel calculated upon producing a first-line army 800,000 strong—half with the colours, half in reserve—with a separate army of the second line Niel himself died within a year, and 1870 witnessed the complete ruin of the French army The law of 1868 remained therefore no more than an expression of principle

At the outbreak of the Franco-German War (*q v*) the strength of the army on peace footing was 393,000 men, on war footing, 567,000 Disasters followed one another in rapid succession, and the bulk of this war-trained long-service army was captive in Germany within three months of the opening battle But the spirit of the nation rose to the occasion as it had done in 1793 The next year's contingent of recruits was called out and hastily trained. Fourth battalions were formed from the depot cadres, and organized into *régiments de marche.* The *gardes mobiles* (Niel's creation) were mobilized, and by successive decrees and under various names nearly all the manhood of the country called to arms Altogether the new formations amounted to nearly 1,700,000 Though, in the face of the now war-experienced Germans, their efforts failed, this cannot detract from the tribute due to the patriotism of the people and the creative energy of their leaders, of whom Gambetta and Freycinet were the chief. After the war the adoption of the "universal service" principle of active army, reserves and second-line troops, the essential feature of which was the *line* training of every man, was almost as a matter of course the basis of the re-organization, for the want of a trained reserve was the most obvious cause of the disasters of "the terrible year"

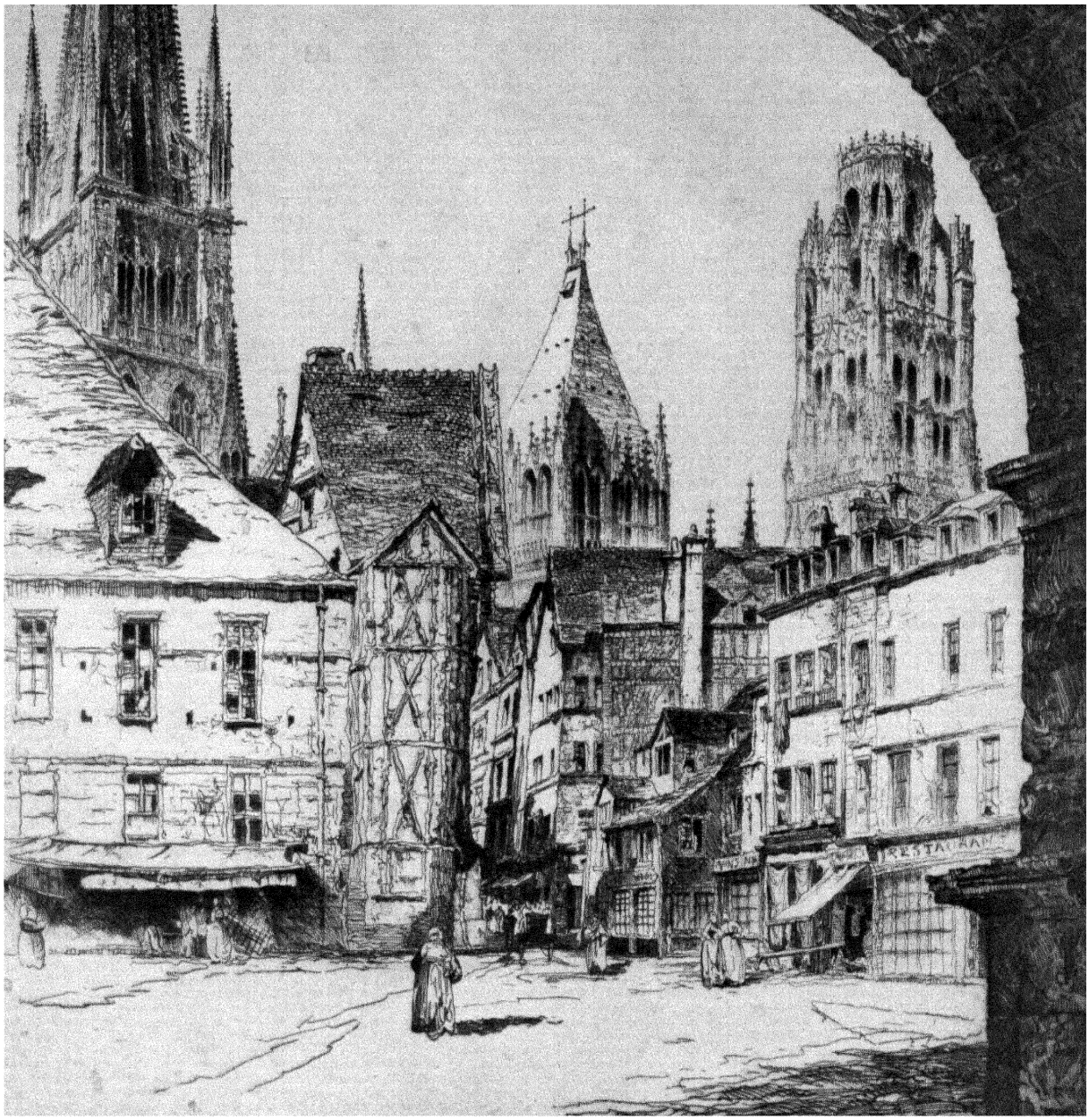
The most important of the recruiting laws passed subsequent to 1870 were those of 1872, 1889 and 1905, the last the "loi de deux ans" which embodied a special effort of the French Ministry of War to keep pace with the ever-growing numbers of the German empire. Not merely was the period of colour service reduced—to increase the strength of trained reserves—but exemptions were almost abolished except for physical unfitness.

But the growth of a school of military thought which placed little trust in reserve formations, led to arguments for a return to three-year system without its manifold wastage by exemptions.

(X)

FRANCE IN THE WORLD WAR

In face of Germany's continual increases in the man-power and material strength of her armies, the French Parliament decided in 1913 to return to the Three-Year Act, the classes to be embodied



BY COURTESY OF THE RANDOLPH COLLECTIONS

ROUEN, NORMANDY

From an etching, by John Taylor Arms, of a view in the city of Rouen, the mediaeval capital of the duchy of Normandy, now the chief town of the department of the Seine-Inferieure The towers rising above the old houses in the foreground are those of the Gothic cathedral, which was started in 1201 and built during a period of four hundred years The tower at the right surmounted by an octagonal lantern is the "Tour de Beurre," built in the 16th century, in the flamboyant style of the late Gothic The lower Tour St -Romain, in the centre of the etching, belongs to the earlier period At the extreme left is seen the great central tower, with a modern spire. As the plate is reversed, the position of the various objects shown is the opposite of their actual one

at the age of 20, so that the 1912 and 1913 classes could be called up simultaneously in October and November 1913 A special appropriation of 500 millions was also voted for military equipment. Unfortunately the full effect of these measures could not make itself felt until 1916 The three tables which follow illustrate the growth of the effectives; the growth of the budgets; the military position of the two countries in 1914. They bring out clearly the considerable increase in Germany's armaments, and France's reluctance to join in a race in which, indeed, she remained always far behind They also demonstrate the French army's inferiority in heavy artillery and special troops

Growth of the Budgets of the French and German War Ministries Before the War

Year	France	Germany
1909	762,503,000 francs	1,015,119,000 francs
1913	1,287,615,000 ,, including 347,239,000 for extraordinary expenditure	1,903,005,000 ,, including 651,085,000 for extraordinary expenditure

Growth of French and German Effectives

Year	France		Germany	
	Officers	Other ranks	Officers	Other ranks
1875	23,326	361,590	21,488	382,180
1910	27,436	517,000	34,502	607,150
1913	27,756	532,000	36,600	721,780
1914		709,000*		870,000*

*These figures represent the maximum strength to be developed under the Army Acts of 1913.

Military Establishments of France and Germany on a Peace Footing in July 1914

France	Germany
163 infantry regiments	217 infantry regiments
30 battalions light infantry	18 battalions light infantry
10 regiments Zouave rifles and Foreign Legion	11 machine-gun detachments
	15 fortress machine-gun detachments
79 cavalry regiments	110 cavalry regiments
10 regiments Spahis and "chasseurs d'Afrique"	
62 regiments field artillery (655 batteries)	100 regiments field artillery (642 batteries)
11 regiments heavy or foot artillery (89 batteries)	25 regiments heavy or foot artillery (190 batteries)
6 regiments sappers and miners	35 battalions pioneers
1 railway regiment	3 railway regiments
1 telegraph battalion	9 telegraph battalions
1 balloon regiment	6 balloon regiments
25 squadrons (of 5 or 6) aeroplanes	5 aeroplane battalions
	1 motor battalion

(B) *Munitions.*

Total output during the war

297 million shells of all calibres.
6,000 million rifle cartridges
2,375,000 rifles and carbines
225,000 automatic rifles.
87,000 machine-guns
17,300 75-mm. guns
6,722 heavy guns and howitzers.
5,300 tanks.
67,982 aeroplanes
49,000 tons of asphyxiating gases.
34,000,000 gas-masks.

Number of munition-workers employed

August 1st, 1914 25,000, Armistice, 1,493,800, including 429,000 women

Daily Output of Certain Munitions

Scheduled output in mobilization orders	*Maximum attained*
14,000 75-mm. shells	226,000 75-mm. shells (1917)
465 155-mm ,,	51,780 155-mm ,, (1918)
2,600,000 rifle cartridges	7,000,000 rifle cartridges (1917)

(C) *Railways.*—From the beginning to end of the war a heavy call was made on the French railways. The traffic was on an average 40% greater than in 1913, and at certain periods, in the uninvaded part of the North, 100% greater. At the outset, mobilisation movements demanded 10,000 trains, and subsequently covering and concentration movements called for 5,400. During the operations about 100,000 trains were run from point to point on the front, conveying 60 million men with the corresponding stores. Supplies of all kinds for the forces required an average of 200 trains a day Additional to all this traffic was that due to the evacuation of the civilian population of the invaded regions, the supply of the civilian population, the provisioning of factories with raw materials, etc Further, in the course of four years the railway engineer troops constructed a length of track (7,500 kilometres) equal to one-sixth of the entire French railway system.

(D) *Ports* The following figures represent goods loaded and unloaded.—

1913, 42,300,000 tons; 1916, 56,673,000 tons; 1918, 53,550,000 tons

At Rouen, where 5,148,000 tons were discharged in 1913, the figure for 1918 was 10,000,000 The import traffic of Le Havre rose from 2,747,000 tons in 1913 to 5,755,000 in 1918

PRINCIPLES OF REORGANIZATION SINCE THE WAR

Post-war national defence in France has reached the final stage of its development. The essential legislation is, without neglecting the lessons of the war, to reduce the burden imposed on the country to a minimum The war left France impoverished in manpower (1,700,000 killed and 600,000 disabled) and also economically and financially But, deprived of the treaties of assistance contemplated in 1919, and not feeling that her late enemies shared her own pacific spirit, she was obliged to retain the ability to

FRANCE'S EFFORT IN THE WORLD WAR

(A) *Effectives and Munitions Placed at the Disposal of the Commander-in-Chief*

	August 1914 before mobilisation	Sept 1, 1915	July 1, 1916	January 1, 1918	Armistice
Effectives mobilised	947,000 men	..		.	4,200,000
Infantry divisions	44	111	109	113	112
Cavalry divisions	10	10	7	8*	8*
Field guns	2,800	3,250	4,400	5,900	6,400
Heavy guns	250	3,070	3,040	4,765	6,175
Machine-guns	5,106		..	..	24,475
Tanks	.	..	.	..	2,756
Aeroplanes	120	600	1,000	3,000	3,608
Motor transport vehicles (excluding trailers but including motorcycles)	8,500 (requisitioned)	25,000	32,000	49,000	56,000
Supplies of munitions in the army zone:					
Shells, 75 mm.	4,000,000	5,500,000	13,000,000	36,000,000	20,000,000
Shells, 155 mm.	500,000	500,000	800,000	4,000,000	4,000,000
Rifle cartridges	600,000,000	800,000,000	1,250,000,000	2,150,000,000	1,800,000,000

*Including two dismounted divisions.

provide for her security unaided

Such were the principles, in some senses opposite, which underlay the reforms effected in the military organization They led to the following conclusions. that in time of peace France should possess only such military and naval forces as were indispensable (1) to cover the mobilisation of the nation in case of attack and enable it to be carried out fast enough to cope with the rapidity of such attack, (2) to provide for the security of her colonies and her communications with her oversea possessions in case of need, (3) to enforce the treaties of peace in concert with her allies, and that the general organisation of the nation for war should be prepared in every detail In consequence, *compulsory personal service* was maintained, but the period was reduced to one year (Act of March 31, 1928) The 18-months' period of military service will be maintained until Nov 1, 1930, when it is expected that the necessary conditions for the reduction of the period of service with the colours (recruiting of additional professional soldiers, military police and civilian employees, formation of a mobile National Guard) will have been fulfilled The tables which follow show the effectives and budgetary expenditure for 1928 as compared with those for previous years

Comparative Peace Establishments on Aug 1, 1914 and Jan 1, 1918

	August 1, 1914, before the war	1928 (18-months' period of service)
Army		
Establishment (France and Colonies)	947,000	666,000
Infantry divisions	44	25
Cavalry divisions	10	5
Field guns	2,800	1,300
Heavy guns and howitzers	250	1,000
Air Force		
Number of aeroplanes	120	1,900
Navy		
Establishment	69,000	58,000
Battleships	26	9
Cruisers	31	11
Aeroplane-carriers	0	1
Destroyers	0	7
Torpedo-boats	83	47
Submarines	72	44

General Organisation of National Defence.—The last war taught the lesson that the nation as a whole must be organised for the eventuality of war, so that all may be in readiness beforehand for the entire strength of the country, civil and military, and the whole of its economic, industrial and other resources, to be thrown into the scale A bill for the organisation of the nation to meet the contingency of war has accordingly been introduced by the Government, passed by the Chamber, and adopted with certain amendments by the Senate, and now only awaits its formal enactment by both Houses The following are its main features —

(a) *Functions of the Government* —The Government is responsible for preparing the organisation of the country to meet the contingency of war It will be assisted by the Supreme Council for National Defence, whose subordinate bodies (Commission of Enquiry and Permanent General Secretariat) are responsible for investigation and for co-ordination between Ministries

The direction of the war will be in the hands of the Government, which will decide the ultimate objectives of the operations, distribute the forces among the different theatres of war, and supervise their employment; the actual conduct of operations, however, will be entrusted unconditionally to the commanders-in-chief of the army and navy The Government will determine the duties of each Ministerial Department in time of war Each Minister will be held responsible for the preparation and execution of the work of his department

(b) *Decentralisation of Preparations* —The preparations for organising the nation for war form too complicated a task to be carried out by the unaided efforts of the Central Offices of the Ministries The work has been decentralised and given to the local departments. The Prefect of each department is made responsible for co-ordinating the preparatory work to be done by all officials in his area. He is assisted by an advisory committee of the representatives of the various Ministries in the department, together with employers' and workers' delegates Apart from persons liable for military service, all men over 18 years of age are bound to take a share in national defence proportionate to their physical and mental capacities.

(c) *Economic Organisation* —A single Minister is responsible for the production and collection of a single commodity, and on mobilisation must be in a position to supply all the Ministries requiring that commodity The supplying Ministries place orders with manufacturers for the commodities for which they are responsible As one firm may manufacture goods required by several supplying Ministries, the economic allotment of output demands that a single branch should be entrusted with the negotiations with any particular firm, and should arrange the placing of orders This co-ordination is effected by the Inspectorate General of Munitions on mobilisation, by means of machinery specially created for the purpose

PRESENT ORGANISATION

The army, when mobilised, consists principally of the reserves called up The standing army is only its nucleus, and its duties are to train the contingents called up, to guard the oversea possessions, to prepare for mobilisation, and, in the event of an attack, to cover the frontier until mobilisation is completed

The Recruitment Act of March 31, 1928 provides for —(i.) Men with the colours, comprising (a) men called up for one year (all who have attained their 21st year), (b) half the contingent is called up on April 15 and the other half on Oct 15 Volunteers (enlisted, re-enlisted, and officers) constituting the cadres of professional officers and N C O 's required in peace and war (ii) Men on long furlough (disponibilité), which lasts for three years after the completion of service with the colours, these men may be called up in case of need (iii) A first reserve, also to be used on active service, in which the citizen serves 16 years, and a second reserve in which he serves for 8 years, this reserve is to be employed on home military service or in administrative and economic organising work

The 635,000 rank and file (France, occupied areas, and colonies) at present forming the Army are made up as follows —

Frenchmen (1½ contingents called up, and professional soldiers)	383,000
Foreigners (Foreign Legion)	16,500
North African native troops	103,500
Colonial native troops	87,500
Irregular and auxiliary native troops	12,500
Gendarmerie and National Guard	32,000
Total	635,000

Army Organisation.—The Act of March 28, 1928, dealing with the constitution of cadres and effectives provides for the distribution of the effectives among the various arms and services When this Act comes into full operation (during 1928), the army will comprise 25 infantry and 5 cavalry divisions. The standing army is divided into three classes, embodying home and colonial troops (a) Home forces, composed as a rule of French troops and stationed permanently in France. (b) Oversea forces, composed of Frenchmen, natives, and foreigners, detailed to occupy and defend French possessions, and stationed permanently there. (c) Mobile forces, reserves for the permanent oversea forces, consisting of French and native troops, and normally stationed in France and North Africa The peace establishment (including officers) of these forces is approximately as follows.—

Home forces	365,000
Oversea forces	230,000
Mobile forces	70,000

Distribution of Troops —The following table shows the proportions of the different arms at mobilisation in 1914, at the armistice, and at the present time

(1) Arm or service	(2) Aug 1, 1914	(3) November 1918	(4) 1928	(5) variation 1914–18		(6) variation 1914–28	
				−	+	−	+
	%	%	%	%	%	%	%
Infantry (home and Colonial)	65 6	43·7	55·2	21·9	..	.	
Tank corps		0·6			9·6	10·4	
Cavalry	9	3·5	7·8	5·5		1·2	
Artillery	16·1	27·4	16·5		11·3		0·4
Engineers	3	8·0	4·4		5·0		1·4
Air force	0·3	3·3	5 4		3·0		5·1
A.S C transport (horse and motor)	1·3	7·7	2·6		6·4		1·3
A G and Q M G's department, etc., army medical corps	2·3	5 2	3·1		2·9		0·8
Gendarmerie	3·4	0·6	5·0	1·8			2·6

This table illustrates the development of the primarily mechanised arms (tank corps, artillery) at the expense of the non-mechanised arms (cavalry) The movement would be still more accentuated but for the necessity of increasing the normal rate of embodiment in certain arms requiring young men (cavalry, air force) because their peace establishment has to be kept at a figure approaching their war strength

ARMY TRAINING

Officers.—The system of military training embraces both officers on the active list and officers of the reserve

The military training of officers on the active list is based on the following principles —Military training should be founded on a wide general education with a strong scientific bias, and on a specialized technical education for each arm The officer's military education should be perfected during his service by keeping him abreast of developments in military manoeuvre, tactics and technique Advanced training should be provided for staff officers and those who are fit for promotion to field rank

Primary military training is given at the officer cadet schools (Saint-Cyr, the Polytechnique, and the Army Medical Service School), to which admission is obtained by competitive examination open to young men not yet liable for military service, and at the officer cadet schools for N C O.'s (St -Maixent, Saumur, Poitiers, Versailles), which are filled by competitive examination among professional non-commissioned officers The general training is completed in detail for each arm at the appropriate special school

Additional training is provided by sending officers at various stages of their career to the schools for special branches or to technical courses (practical musketry courses, school of liaison and signalling, etc), and to the special schools for the different arms (promotion courses, general course for field officers, instructional tours for colonels and general officers).

Prospective staff officers receive advanced training at the Staff College. Training for high command is given at the advanced military training centre and at the artillery tactical training centre.

Officers of the reserve receive, as far as possible, the same military training as officers on the active list, and at the same schools (St.-Cyr, St.-Maixent, Saumur, Poitiers, Versailles, Vincennes). The courses, however, are shorter. On embodiment, prospective reserve officers first perform six months' service with the colours; they then (after competitive examination) attend the reserve officer cadet schools, and, if they pass the final examination, perform their last month of service as second lieutenants of reserve. Students in important educational establishments (faculties, institutes, technical schools, etc) take preliminary military courses there; then, after examination, they pass direct into the reserve officer cadet schools, and perform their last six months of service as officers. Reserve officers receive additional military instruction during their training periods, and at refresher courses when not on service.

N.C.O.'s and Men.—The N.C O.'s comprise professional N.C.O.'s, and corporals and lance-corporals of the contingent. Both classes are trained in platoons organised for the purpose in the regiments, and receive additional instruction at training centres The training of the rank and file begins with physical training before embodiment, continues throughout the period of service with the colours, and is resumed when they are called up for periods of training as reservists.

Tactical training of cadres and units begins as soon as individual instruction ends, and reaches its height in camp Sufficient numbers are obtained with the help of the reservists who are called up at the same times This training comprises separate exercises for each arm (the artillery, in particular, does its firing practice), and combined exercises

THE MODERN THEORY OF WAR

A country's theory of war is not now, as it may once have been, a purely military concept It is essentially a reflexion of the political principles that country pursues. Although forced by experience to maintain a certain attitude of mistrust, France regards herself as being better protected now than she was in 1914, thanks to the undertakings given at Versailles, to the Covenant of the League of Nations, and to the Locarno agreements. Following out this purely defensive theory, she has abandoned the idea of a powerful peace-time army, easily convertible into an attacking machine, and always supplied with all the weapons of offence necessary to the conduct of a war with large forces rapidly mobilised Instead, she has unreservedly adopted the theory of the "nation in arms," taking the view that in the event of an attack the entire country should be responsible for its own defence, and that the peace-time army should only be expected to cover the frontiers while the nation prepares itself to defend its territory

According to this theory of war, the French High Command is bound to take all necessary steps in advance to enable the peace-time army, though reduced to the minimum strength, to discharge its function of providing a screen if required For this purpose the frontier fortifications need to be strengthened Further, the High Command proposes to equip the regular army with every device that will increase the efficacy of its fire to the maximum (automatic weapons, observation and signalling arrangements, etc). It is endeavouring to provide sufficient transport (railways, motor vehicles) to enable the reserves to be speedily conveyed to threatened points It is also seeking to establish mechanised formations (major units, artillery reserves) and air forces which will be able to act with the minimum of delay

The present military organisation of the French Army and its training are based strictly on these principles. (1) The period of service is reduced to the minimum compatible with the provision of adequate cover (18 months at present, one year from 1930, when the necessary conditions will be satisfied). (2) The regular army is to provide a screen and to serve as a training school for the reserve formations, which will make up the real war-time army. Moreover, a considerable portion of its establishment is employed outside France for the purpose of maintaining French authority, if necessary, in the oversea territories (3) The reserve formations which make up the army must be strongly officered and thoroughly trained. These two requirements entail: (a) an increase in the number of professional N C.O.'s, many of whom will form the nucleus of the subaltern cadres of the reserve units, (b) the training and periodical additional training of reserve officers, as already described; (c) the calling of reservists to the colours for short but frequent periods, such reservists to be detailed where possible to the units in which they served when in the first line, or to corps having some degree of connection with those units; (d) the training of reservists in camp, in contact with men serving with the colours, and under the direction of officers on the active list

A policy has also been taken up with regard to arms and equipment: (a) new automatic weapons, representing an improvement on those used by the French infantry during the war, have been brought into service. (b) Owing to lack of funds, the other arms are for the most part keeping their old material, but are being increasingly mechanised (c) The liaison and signalling arrange-

ments in use during the war are being daily improved to keep pace with scientific developments (d) The Air Force is being exercised in close mutual communication between machines in flight and Army headquarters, other arms, troops in the field, aircraft and Air Force headquarters on the ground It is being exercised also in forming immediate temporary concentrations to act against important points without losing its readiness for every eventuality, and is thus becoming a first-rate covering arm and supplementing the action of the other arms

Lastly, in order that those citizens who will form the mobilised army in time of war may be quickly furnished with arms, ammunition and other necessaries not normally available, provision is already being made in peace-time for a detailed organisation to effect, when need arises, the industrial mobilisation of the nation—the more specifically military part of its organisation for the contingency of war (B Se)

NAVY

The geographical position of France has always compelled her to draw her navy from and maintain it in two widely different areas: the Channel and the Atlantic coast on the north and west, and the Mediterranean in the South Originally the rule of the French Monarchy was only effective in the centre of the country, and before France could begin to acquire sea power it was necessary for her authority to be extended to the coasts A beginning was made in this direction in 1180–1223, when Philip Augustus expelled King John of England from Normandy and Poitou Although the process was not complete until Louis XII (1498–1515), a Royal fleet was in being as early as 1249, when Louis IX. sailed on his first crusade This monarch also established the first French dockyard at Aiguesmortes, while he also created the first admirals appointed by the French Crown, Ugo Lercari and Jacobo di Levante, both Genoese Later Aiguesmortes was cut off from the sea by the encroachment of the land and Narbonne and Marseilles became the war ports

The fleet of Louis IX was purely Mediterranean in character It consisted of galleys with secondary sail power, but mainly dependent on oars The rowers of the French galleys were originally hired men, but by the middle of the 15th century they began to be composed of galley slaves—prisoners of war, slaves purchased in Africa, criminals or vagabonds serving their sentences Under Philip IV, le Bel (1285–1314), efforts were made to constitute a naval force in the Channel in rivalry to Edward I of England As before, the Genoese were called in to assist and build a dockyard at Rouen

The fortunes of the French navy have been wont to suffer from alternations of attention and neglect Francis I (1515–1547) made vigorous efforts to revive it at the very close of his reign but it languished again until the 17th century Richelieu, the great minister of Louis XIII found the navy extinct He was reduced to seeking the help of English ships against the Huguenots, but from him dates the creation of a better fleet In 1626 he abolished the office of Admiral of France, created by Louis IX, and himself assumed the title of Grand Maitre et Surintendant de la Navigation, while seagoing commands were entrusted to two Admirals, one assigned to the west or Atlantic and Channel, the other to the Mediterranean. Richelieu's establishment shrivelled after his death and was recreated by Louis XIV (1643–1714). A code of laws was then framed bringing in compulsory service, affecting the inhabitants of the coast and of river valleys, and at the same time a system was organised for the control of finances and of the dockyards of Toulon, Brest and Rochefort, while the office of Admiral of France was recreated

As the result of these efforts the organisation of the French Royal navy on paper appeared very complete, but in practice it was not efficient. The Admiral of France was Louis' natural son, the duc de Vermondois, while the fleet was officered by men who owed more to birth than to professional ability. The ships' companies were ill-paid, ill-fed and otherwise defrauded and the severity of the Inscription Maritime was most unpopular. Under Louis XVI. (1774–1792) when the Revolution broke out, the majority of the noble officers were massacred by the Jacobins or driven into exile It was long before the Republic was able to create an effective navy and to form a new body of educated officers, but France had no reason to be ashamed of the way her fleet fought at Trafalgar, in 1805; but that battle marked her end as a naval power capable of challenging Britain by sea and, with the introduction of steam and ironclads, she ceased to maintain a fleet which constituted a menace to her traditional enemy across the Channel From time to time some temporary irritant, such as the Fashoda incident in 1897, called forth comparisons between the British and French fleets, while the development of the torpedo boat, to which France paid much attention in the 'seventies, was regarded by many people at the time as an attempt to neutralize the power of the British battlefleet, but the World War found the two navies united in a common cause

Between 1908 and the World War, France exerted herself to improve her fleet From 1905 to 1909 inclusive, Germany had spent an annual average of 377 million gold francs on her fleet, while France had spent only 318 millions. A more serious difference was that Germany had a modern fleet, of which more than one-fourth of the units were nearly new France, on the other hand, had a fleet mainly consisting of vessels approaching obsolescence This resulted in considerable annual expenditure in upkeep and less to spare for new construction By 1909 the tonnage of the German fleet (689,000 tons) exceeded that of the French fleet (664,000 tons), and for an equal tonnage France could only meet Germany's new units with old, and in some cases obsolete, vessels

In 1910, the latest battleships France possessed were the six ships of the "Voltaire" type, then nearing completion These were similar to the British "Lord Nelson" (1906) The most modern battleships of the French Navy in commission were the two "Républiques" and four "Justices"—approximately equivalent to the British "Londons" (1902), the German "Braunschweigs" (1902), and the American "New Jerseys" (1904) Moreover, while Germany had increased the number and improved the type of her light cruisers, which constituted so strong a threat to communications, France had devoted most of her attention to the construction of armoured cruisers of from 12,000 to 14,000 tons These were not strong enough to act as battle-cruisers, and not fast enough to outpace the light cruisers Again, the French torpedo-boats, whether of 350 tons ("Pougnard" type) or of 450 ("Spahi" type), had no longer the speed, endurance and armament necessary for an equal contest with the big German torpedo-boats During the next four years great efforts were made to improve the position, but Germany had too long a lead for the situation to be retrieved in the time

Dreadnoughts were put on the stocks—four "Courbets" (23,000 tons, 12 305-mm guns), which, however, were barely ready in 1914, three "Provences" (23,500 tons, 10 340-mm guns) were launched in 1913, but could not be put into commission until long after the opening of hostilities In 1914 other battleships were building or in contemplation, but they could not be completed or begun owing to war necessities Bigger torpedo-boats (800 tons), very fast and well armed for that time, were also built These vessels, of the "Bouclier" type, were to render valuable service in the war, which threw such heavy work on the lighter craft. There were far from enough of them to do what was needed. As regards submarines, France continued to construct and improve the "Laubeuf" type Submarines of 800-ton were on the stocks in 1914, but it was then so difficult in France to obtain and install Diesel engines of sufficient power that these vessels could not be put into commission for some time, and after a number of trials they were ultimately equipped with steam power.

Simultaneously with this strengthening of the material side of the navy, training was improved and, most important of all, the French naval forces were redistributed, the main squadrons being concentrated in the Mediterranean

During the World War.—The main theatres in which the French navy operated during the World War were the Mediterranean, the Channel and Straits of Dover and the north Atlantic. Even before 1914 France had concentrated her principal forces in the Mediterranean, to defend her most important communications—those with North Africa By arrangement with her Allies, she kept them there The French fleet took part in all the general

Allied efforts at sea—blockading the enemy, protecting sea-borne supplies, transporting the Serbian army, the Dardanelles and Salonika expeditions, etc In the Mediterranean the French fleet co-operated with the Allied naval forces in safeguarding the routes through that sea In the Straits of Dover France had at first no more than a screen, consisting of torpedo-boats, submarines and a few cruisers Later, these forces were strengthened, and assisted the British forces in safeguarding Channel shipping and in supporting the left flank of the Allied armies (*see* BELGIAN COAST OPERATIONS)

In more distant seas, French craft helped to chase raiders and took part in certain of the colonial expeditions The navy also furnished men to the army, notably the Brigade of Marines which, under Rear-Admiral Ronarc'h, distinguished itself at Dixmude But the navy did not expand in numbers of big warships because industries which had before the war been associated with this work devoted themselves almost wholly to the needs of the army; this was the case both in private works and in the Government arsenals, which manufactured, among other material, bridges, artillery and munitions

Losses of the French navy during the war were

Personnel 15,650 killed and missing, including 519 officers			
Fleet proper			
Units destroyed by enemy action	4	battleships	32
	5	cruisers	
	13	torpedo-boats	
	10	submarines	
Units lost accidentally.	5	torpedo-boats	7
	2	submarines	
Units put out of commission by wear and tear	15	battleships	136
	15	cruisers	
	42	torpedo-boats	
	64	submarines	
		Total	175
Auxiliary fleet 127 units in all			

Gains (fleet proper)

Vessels commissioned			
Built in France	3	battleships	35
	7	torpedo-boats	
	25	submarines	
Bought from Japan	12	torpedo-boats	
Ex-enemy	4	cruisers	39
	2	destroyers	
	9	torpedo-boats	
	12	submarines	
		Total	74

The net decrease was 16 battleships, 16 cruisers, 30 torpedo-boats and destroyers, and 39 submarines Total tonnage in 1914 was 816,000 tons (37% of the tonnage of the British fleet, 93% of that of the United States fleet), while in 1919 it was 590,000 tons (23% of the tonnage of the British fleet, 57% of that of the United States fleet) This shows a considerable weakening, still more serious in view of the wornout condition of all ships remaining in commission, a situation which was especially serious in the smaller craft.

Present Situation.—Up to 1921 the French navy was engaged in making up its war losses, but the reconstitution of the fleet was delayed by the impossibility of further increasing expenditure and the high cost of upkeep of too many wornout or obsolete ships; its tonnage, therefore, continued to decrease (to 394,000 tons in 1924). Eventually France agreed at Washington in 1922 to the proposed reductions, limiting her total capital-ship tonnage to 175,000 tons As a great Colonial power, however, France is bound to keep up a fleet equal to her needs For this reason, profiting by the lessons of the war and paying due heed to the Washington Treaties and her own financial difficulties, she made preparations to reconstruct her naval forces at the minimum practicable strength The building of capital ships was deferred To protect the country's vital communications, especially in the Mediterranean, the Ministry of Marine decided to rely chiefly on submarines, aeroplanes and light craft, with fortified bases. A reorganization of coast defence was undertaken, and the naval air force was developed along new lines Light craft and submarines were placed on the stocks between 1922 and 1928, eight cruisers, three of 8,000 tons and five of 10,000 (now in commission [1928]. the three "Duguay-Trouins," of 8,000 tons, and two "Duquesnes," of 10,000 tons, undergoing trials the "Suffren," 10,000 tons), 18 destroyers of from 2,400 to 2,890 tons (now in commission six "Jaguars", undergoing trials· three "Guepards"); 26 torpedo-boats of from 1,400 to 1,500 tons (18 at present in commission and four undergoing trials), 51 submarines, including 20 of 600 tons ("Ondine" type), four "Saphir" minelayers of 760 tons, nine of 1,150 tons ("Requin" type), 17 of 1,500 tons ("Redoutable" type), one "Surcouf" of 3,250 tons (now in commission nine "Requins" and 12 "Ondines", undergoing trials two "Saphirs" and four "Redoutables")

The future of the French navy is embodied in three bills, determining the naval position of France The high-sea fleet is to comprise, apart from special craft, 175,000 tons in capital ships and 60,000 tons in aircraft-carriers, in accordance with the Washington treaties, together with 360,000 tons in light craft (cruisers, destroyers and torpedo-boats) and 96,000 tons in submarines Age-limits are as follows capital ships and aircraft-carriers, 20 years, cruisers, 17 years; destroyers, 15 years; submarines, 12 years The naval air force will consist of 50 squadrons of aeroplanes (35 armed), and a variable number of miscellaneous aircraft (dirigibles, captive balloons, etc) The coast will be defended by coastal flotillas (submarines, patrol-boats, minesweepers, minelayers, etc), artillery, obstructions, detection systems, air forces, and by troops and material lent to the navy by the War Department Although these bills have not yet (1928) been passed and no time-limit has been fixed for the execution of the programme they represent, the Department of Marine hopes to complete it in about ten years

Administration and Personnel.—The French Navy is administered by a ministry of Marine which consists of (a) a navy cabinet and the minister's private staff, (b) a civil cabinet with civil secretariat There is a naval staff which deals with organisation, intelligence and operations, and has also a section devoted to ports and bases, transports, supplies and communications There is a central department of naval aeronautics, a hydrographic department, historical department, central headquarters of naval intendance, stores, medical, construction and naval artillery departments Ships' companies of the French fleet are mainly composed of conscripts who are undergoing their eighteen months of military service, but the higher ratings are employed on a long service basis Officers are recruited from the naval cadet officers' school and the polytechnic school Naval engineer officers pass through an engineer cadet officers' school or are recruited direct from warrant officers of the engine room branch There is a naval construction corps and a mates' corps, the latter recruited from chief warrant and warrant officers of the fleet. Most of the personnel of the French navy comes from Brittany, which is the traditional naval province of France

Command.—The Chief of the naval general staff takes command of the whole naval forces and generally directs operations in war, while the central administration (ministry of Marine) ensures the working of the technical branches so as to give the command the necessary facilities for acting. Two Vice-admirals act as inspectors-general of the naval forces in the north and in the Mediterranean respectively, in war they become commanders-in-chief of the forces, but they may operate ashore and do not replace the existing commands afloat The coast is divided into six naval arrondissements, each having its headquarters at one of the principal naval ports, with a chief known as the *prefet maritime*, who is the commander-in-chief of all naval formations allocated to his region Under him are the commandants of sectors, known as commandants de la Marine, who are the senior naval officers in the commercial ports. (E A)

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AIR

The military air arm, which came into being at the end of 1909, was organised on a proper legal basis in 1912, when a Directorate of Military Aviation was established in the Ministry of War and a few scouting squadrons were formed, which took part in the general manoeuvres There were also some balloon companies, with spherical balloons and dirigibles. In 1913, the Ministry of Marine established two naval seaplane centres

The Air Arm in the War.—The war brought about a great development in the air arm. In four years 40,000 aeroplanes and 92,000 engines were built, and 17,000 pilots trained The development during this period is illustrated by the following figures:—

	August 1, 1914		November 1918	
	Army	Navy	Army	Navy
Aeroplane branch				
Number of squadrons	23	0	130	4
Number of aeroplanes	120	8	3,430	1,264
Balloon branch				
Captive balloons	12	0	77	190
Dirigibles	8	0	0	37

Commercial Aviation.—The Directorate General of Aviation (Commercial) organises and supervises civil aviation, it is also responsible for research, for the manufacture and collection of all air equipment, and for the preparations for industrial mobilisation It controls the Air technical and industrial service, the Air navigation service and the National meteorological office The French air lines are operated by five air transport companies, with a fleet of 250 aircraft, which link Paris with the principal European capitals, North Africa, Syria and South America, the total length of the system being 24,000 km In 1927 their machines covered 6,000,000 km , and carried 16,000 passengers, 800 tons of goods and 125 tons of mails

Military Air Arm.—The military air arm was organised as a separate arm by the Act of Dec. 8, 1922 It consists of two branches, the aeroplane branch and the balloon branch The anti-aircraft regiments are attached to it for duty, but are officially subordinate to the artillery command The Air directorate in the Ministry of War is responsible for the organisation, training and mobilisation of the Air arm The Inspector General of the Air Arm reports to the Vice-President of the Supreme War Council on its general position, its needs, and the improvements in contemplation, he ensures uniformity in the application of the Air Arm regulations, and he is president of the Commission which decides what material is to be acquired

The basic flying formation is the squadron Squadrons are of three types. scouting, fighting and bombing Several squadrons together form a group, and several groups a regiment Several regiments, in combination with balloon units, make up a brigade Taken together, several brigades constitute an "air division" There are at present 2 air divisions, 7 brigades, 14 air regiments and 5 independent groups, making a total of 133 squadrons and about 1,600 aeroplanes The balloon branch consists of 18 companies, forming 6 battalions Each company handles one balloon, and has an establishment of 2 officers and 100 men

Naval Air Arm.—The central air service in the Ministry of Marine is responsible for the organisation, training and mobilisation of the naval air arm. The air strength of the navy comprises aeroplanes, dirigibles and captive balloons The flying unit is the squadron, which consists of 10 or 15 aircraft according to the branch Several squadrons form a group, and several groups a flotilla The balloon unit is the dirigible; these are of two types, escorts (about 10,000 cu m) and scouts (3,000 cu m.) The Naval Air Arm at present consists of 18 squadrons.

Colonial Air Arm.—The Colonial Air Arm was organised in 1920. It is purely military, but performs political, economic and medical duties It comprises The Central Colonial Air Service of the Ministry of the Colonies (the controlling authority), the Indo-Chinese air force (4 squadrons of 10 aeroplanes each), and the French West African air force (one squadron).

The Air Ministry.—By two decrees of Sept. 14 and Oct. 13, 1928, a new organisation was created Commercial aviation, as well as the military, naval and colonial air-arms become dependancies of a new Air Ministry, but the Minister of Navy keeps under his authority the staff of the air-squadrons carried on board men-of-war

The three Ministries of War, Navy and Colonies receive from the Air Ministry, all the air-formations necessary for practical uses—co-operation with troops in the field or mutual instruction with other arms

This reform creates great changes in the former organisation of the Air Arm, and in its connections with the army and navy, but details were not yet settled at the end of 1928

Conclusions.—France spent on defence in 1928 31% less than in 1914 Her national defence budget—which includes certain items that appear, in many countries, in other budgets than those of the Ministries of War and Marine—represented 44% of the entire budget in 1914, whereas in 1928 it amounts to only 21% Thus France's military expenditure has been reduced to the lowest practicable level, while her defence has been so organised that all her resources could be utilised if an attack should have to be met Her dearest wish is to be able to diminish her armaments still further, and with that object she has made every effort to base her security on the enforcement of the Covenant of the League of Nations, the progress of arbitration and the spread of the conception of international solidarity (B Se)

ECONOMIC AND SOCIAL CONDITIONS

Natural Resources.—France, which has an area of 212,700 sq m , possesses great natural resources of wealth in her soil, sub-soil, climate, watercourses, maritime and geographical situation The qualities and varieties of her soil and climate, as well as her maritime position, enable the facile production of the bulk of the national requirements in foods and feeding-stuffs, so that in normal times the country tends towards self-sufficiency in this important respect She is still well provided with woods and forests Although her coal deposits are not of exceptional richness or variety, yet they are now supplying 70% of the national consumption Iron ore, potash, bauxite, salt, pyrites, antimony, are available in full abundance, and certain quantities of zinc, lead, manganese, and gold are regularly mined In building and kindred materials she is exceptionally rich Her numerous watercourses provide not only means of internal communication and irrigation, but also electric light and power

No mean assets are her geographical position and characteristics Placed on the most frequented sea route between the New World and the wealthiest parts of the Old, and on the Mediterranean, she reaps therefrom great maritime, climatic, food, trade and general civilization benefits, and her land frontiers connect her with populous, highly developed and wealthy communities The physical conformation of the country is favourable for internal communications between the Bay of Biscay and the Mediterranean they lie through the fertile and sunny plains of the Garonne and of Languedoc, between the Mediterranean and the North sea along the valley of the Rhone, Saône and Seine, between Lyons and Britanny, along the Loire valley and across the plains of Touraine and Anjou. The central Plateau (*Massif central*) of the Auvergne, Limousin and Cevennes alone offers some obstacles Although not endowed with many good natural harbours on the coast lines, yet she possesses natural sea and inland ports of great merit (Brest, Toulon, Bordeaux, Rouen), and has succeeded in substantially bettering natural provisions in the sea ports of Marseilles, Cherbourg, Dunkirk, La Rochelle-Pallice, St. Nazaire.

Population: The Alien Elements.—During the last century, France has not shown growth in population similar to that of the other nations of western Europe From 1821 to the eve of the Franco-German war, population increased indeed from 30½ to 38 millions, but from the first census (1876) after that war to 1911, the increase was only from 36·90 to 39·60 millions. The 1921 census reflected the results of the World War, and of the recovery of Alsace-Lorraine: for, even with the contribution

of 1,709,000 Alsace-Lorrainers, the total population was inferior by nearly 400,000 to that of 1911 In 1926, however, an increase of 1½ millions was shown (census population 40,743,844). It was mainly the result of foreign immigration (which has been the outstanding phenomenon in the social life of France since 1922): the number of aliens grew from 1,530,024 to 2,498,230 Its percentages of the total population in 1901, 1911 and 1922 were, respectively, 2·6, 3·9 and 7·2 In the late summer of 1926, over 3 millions were in the country The most numerous are: Italians, 700,000; Belgians, 450,000; Spaniards, 400,000; Poles, 350,000; Swiss, 140,000; Russians, 90,000; British, 80,000; Germans, 60,000, U S A, 48,000 and Czechoslovakians, 36,000 Apart from Europeans, a large number of North Africans (Algerians, etc) have entered France as workers in recent years

Italians preponderate in the east of the Rhône area from the Italian frontier to Narbonne, and up to Lyons (they are said to form one quarter of the population of Marseilles and of Nice), but in recent years they have been moving also towards the Atlantic into the declining population areas of the south-west (Toulouse, Montauban, Auch, Agen) Italians, of which about 30% go into agriculture, are numerous in building and railway construction within a line from Amiens to Marseilles

Spaniards, who have increased proportionately far more than the Italians or Belgians, their number having grown from 106,000 in 1911 to 400,000, are mainly found within a line drawn from Bordeaux to Cette on the Mediterranean They are engaged principally in agricultural occupations, but are numerous in manual occupations in Bayonne, Bordeaux, Toulon and Perpignan (in this town in 1926 nearly a third of the population was Spanish) These great waves of immigration in 1922–26, which was due to the intense economic prosperity of the country, were systematically directed and controlled State agreements were made with Poland, Italy, Czechoslovakia, Belgium and Luxemburg which provided free equality of treatment with French workers as regards wages, accidents insurance, disputes, education and other matters Depots of the Ministry of Labour were established to direct the immigrants to their employment The coal and ore mining and metal industries central organization introduced directly about 400,000 workers in 1921–26 In 1927 a reflux occurred, owing to the return to less feverish employment conditions, and the number of recorded departures of workers exceeded the arrivals (89,982 against 59,271) This new and conspicuous prominence of the alien, his numerical importance, his penetration into so many fields of industry and agriculture, as well as into commerce, is not likely to give rise to grave problems The direction of immigration has been largely determined by propinquity (Spaniards into the south-west and Pyrenees region, Italians into the south-east, Belgians into the north and east), so that assimilation as regards the normal scheme of life is more readily realized by persons who are akin in general civilization A stringent system of control is exercised: every alien must possess an identity card, and its withdrawal or non-renewal is equivalent to an indication that his presence is no longer desired, and any employer of foreign labour must notify the fact within 24 hours to the proper authority.

Certain Demographic Facts.—The percentage of females in the total population, which was 50·87 in 1911, was 52 46 in 1926 (in that year the numbers were 20,352,884 and 18,444,656, or an excess of over 1,900,000: in 1911, that excess was 683,000) The French birthrate is higher than those of certain other countries (*e.g.*, in 1926, 1·88 per 100 born living in France, 1·78 in Great Britain, 1·75 in Sweden, 1·84 in Switzerland), but the death rate for under one year is much higher in France (in 1926, 9·7 against 7 in Great Britain). Many public and private inducements towards large families are provided, including exemption or reduction in taxation for families with over two children, extra taxation of childless married persons, unmarried or widowed persons, and the family and maternity allowances now universal in Government employment and widespread in industries.

The movement from the country-side continued: in 1926, the percentage of the population classed as rural dwellers (*i.e.*, those living in communes of under 2,000 inhabitants) was 53·6. Few towns showed increased population, save Marseilles (now the first after Paris, with 647,700), Nice and Clermond-Ferrand, the great tyre centre. It is noteworthy that a large number of the ports of the Atlantic and the Channel have nearly all declined (Bordeaux, Lorient, Nantes, Cherbourg, Caen, Havre, Rouen, Boulogne, Calais and Dunkirk).

Of the total native population of 38,797,500 in 1921, 21,720,600 were engaged in occupations, of whom 8,606,000 were females; of the total alien population of 1,532,000 in the same year, 910,700 persons, of whom 213,000 were females The total occupied population (exclusive of Alsace-Lorraine) of 20,720,879 in 1926 was distributed as follows:—Agriculture and forestry, 877,053; Fisheries, 78,000; Mining, 281,027, transforming industries, 5,979,216, transports and warehousing, 887,337; commerce and banking, 2,002,681; liberal professions, 483,179; domestic services, 1,012,232; civil and military services, 1,220,154

Economic Characteristics of French Nation.—The composite racial origins of the French race, their immemorial contact with the Roman and other Mediterranean and Near-Eastern civilizations before and after the Crusades, the political preeminence of the nation in several later centuries, have no doubt left their imprint in the high level of intelligence, taste, artistic and creative power that characterize the present population France remains in the economic domain the principal world's purveyor of fine quality or luxury goods, and of works of art, which by their constantly changing nature, fancifulness, taste, quality and finish attract the more fastidious and discriminating classes in most civilized countries The primary notes of French production retain this individuality and inventiveness, despite certain oncoming and more pronounced industrialization These qualities explain the vigour of the small industries in France—the host of Paris trades, jewellery, artificial flowers, toys, knick-knacks, distinctive creations in innumerable branches, as well as the specialization in so many textile and other industries that have been now organized on larger lines than formerly. The persistence of these traits also explains how France still contains a very large body of small masters, and of skilled workers formed by them, whose inherited intellectual and artistic curiosity is extremely keen The general population has not been overwhelmed to the same extent as most western European nations by urbanization and industrialization The bulk of this inspiration, however, tends to come from more southerly parts of France where vivacity, impressionism and artistic feeling are more rife than in the north The nation as a whole displays other important economic qualities such as adaptability, staying power, physical and moral, and a passion for hard work, which is equally conspicuous in the school, in the factory and in the field In French agriculture that passion and staying power are, no doubt, strongly stimulated by the magic of property These qualities are partly maintained by the fact that the French national economy has kept at least an even balance between the two great accepted divisions of activity—industry and agriculture. An exceptional economic role is played by the French woman Although she works with head and hand in the workshop, office, home and kitchen and, unlike her Anglo-Saxon sister, also takes her full share in the field, the structure and scale of French industry and agriculture, their many-sidedness and their considerable co-existence, owing to the great degree of localization of industry in rural areas, prevent her being unduly affected by the influence of factory and urbanization

AGRICULTURE

Predominance of Agriculture.—Although strong tendencies have been operative in contrary direction, especially within the last forty years, the national economy of France retains a predominantly agricultural character The action of the urbanizing tendencies is, however, strikingly illustrated by the returns of the successive censuses, in which the inhabitants are classified as rural or urban, according as they are dwellers in local units known as communes with a population of under or over 2,000 souls: from 75 in the middle of the 19th century this percentage of rural dwellers fell to 62·6, 55·8 and 53·6 in 1891, 1911 and 1921, respec-

tively Had it not been for the supplementary "rural" population brought into the scale by the return of Alsace-Lorraine, the 1921 percentage would have been lower, the war losses having fallen with exceptional severity on the rural districts As representing an occupational group, agriculture ranks first in 1921, out of a total occupied population of 21,720,604, there were engaged in forestry and agriculture 8,951,099 persons, as compared with 7,846,234 and 2,313,710 then assigned to the industrial and commercial groups In 1896, 1911, and 1921, respectively, 444, 442 and 416 per 1,000 of the occupied population were engaged in agriculture The return of Alsace-Lorraine with its 1,700,000 inhabitants has little affected the agriculturally occupied quota in the total population, as about one-third of the occupied population of the regained provinces were agriculturally employed

Outstanding Features.—Certain outstanding features of the agricultural industry in France appear to be constant The vast majority of the landholders are owners and occupiers, the excess of owners or independently-working occupiers over wage-earners remains great (in 1911 and 1921 the former totalled 5,219,464 and 5,017,152, and the latter 3,297,766 and 2,834,127), the proportion of female owners or independent occupiers is very high (in 1911 and 1921, 2,346,529 and 2,476,023, compared with 2,872,935 and 2,541,129 male occupiers), and the proportion of females as regular agricultural labourers is noteworthy (1911 and 1921, 891,226 and 987,451, against 2,406,540 and 1,846,676 males)

These figures are also distinctly indicative of the effects of the war despite the accession of 65,600 Alsace-Lorrainers of the independent holders' class, the total in that class is 200,000 less, and women are 150,000 more numerous, and despite the same accession and the immigration of many alien males for agricultural work, there is a still more remarkable decrease in the agricultural labour figures

The very small scale undertaking persists, and the relatively few large-scale undertakings have in considerable proportion been split up since the war for various reasons (labour shortage, loss of male owners or heirs through war, relative lack of capital of larger owners and relative enrichment of medium owners, taxation) No comprehensive official figures exist on this subject more recent than those of 1892 which showed that 85% of the holdings occupying a total of 27% of the cultivated area were under 25 acres Owing to the widespread occurrence of dismembered holdings, whose strips are scattered usually within the same commune, about 145 million such strips (*parcelles*) are said to exist

A recent enquiry (1924), limited, however, to vinegrowers' holdings, confirms the extreme subdivision of the land of 1,565,567 vinegrowers who declared their output, 409,297 had vineyards of less than ¼ hectare, 403,962 of under ½ ha , and 275,800 of less than one ha , or about 70% with under one ha ; besides another 13% (200,228) with from one to under two hectares

Food and Drink Production.—Of the total area of 54½ million ha , about 41% (26% in Great Britain) is devoted to crops, 20 to meadows and pastures (about 50% in Great Britain), 18 to forests, three to the vine, and two to market and other gardening Far the most important single crop is that of wheat, explained by the unusually large consumption of wheaten bread by the French, once occupying 12% of the total area, wheat now covers about 10% (5 4 million hectares, or 1 2 million less than in 1913) Oats (3 4 million ha), potatoes (1 5), rye (·86), barley (·85), sugar (·21), are other important crops The area under vines has sunk to 1 42 million hectares a century ago (1830) it was 2, and in 1871, 2 4, but in 1891, 1901 and 1913 the figures were 1 7, 1 6 and 1·5 million Fruit and vegetable cultivation has made progress both in area and in quality, and a profitable foreign trade in luxury goods with many countries is maintained

The livestock has regained its pre-war strength as regards cattle (14½ millions), but sheep, of which there were 33·2, 22 5, 20·2, and 16·1 millions in 1852, 1880, 1900 and 1913, numbered only 10·8 millions in 1927 Large importations from Algeria are being made In dairy and poultry farm products (milk, butter, cheese, eggs, poultry), made with increasing success, especially in Normandy, Britanny, the Savoy and in Poitou; a large foreign trade has developed, and a decrease in the imports of several items (eggs, poultry, game) is observable

Capacity for Feeding the Nation.—French agriculture, which has long been strongly supported by State action in many directions, and which has made immense progress in its general and technical efficiency, provides the great bulk of the food requirements of the nation In wheaten bread, the chief staple, the home production before the war, which averaged in the thirteen years 1901–13 about 89 million metric quintals (220 lb), was within 4 or 5% of the home consumption, since 1914, as the result of the war damage in several leading wheat areas of the north, of lack of man power, of mediocre seasons, and of reduced area under wheat, annual output averaged in the seven years 1921–27 about 77 millions The shortage was made good by increased imports (which reached 12 to 14½ million metric quintals in 1923–25, but were only one-fourth of these quantities in 1926 and 1927), by higher percentages of bolting, and at times by official enforcement of say 10% substitution of rye, rice or manioc As the yield per hectare is improving (the annual average yield per hectare rose from 10 69 metric quintals for 1871–80 to 13 57 quintals for 1901–10 in 1921 and 1925 it was over 16), better wheat soils and more fertilizers being used, France may be regarded as likely to be in normal times all but self-sufficient for her bread

French soil produces practically the full home requirements, whether for man or beast, in other cereals, root crops and fruits (oats, barley, rye, maize, chicory, potatoes, vegetables, sugar beet, apples, grapes, plums, nuts, etc) In milk, butter and cheese, France is, or should shortly be, practically self-sufficient she is a large exporter of soft fine quality cheeses and of butter, especially to England, and imports the harder cheeses Although meat consumption has much increased owing to habits acquired on war service, French flocks and herds should, within a few years, nearly meet the French demand One noteworthy development of the depletion of livestock and of war events has been the virtual introduction of frozen or chilled meat (from 3,200 tons in 1913, the French imports for the 5 years 1923–27 averaged 106,000 tons) and the growth of the horsemeat trade (imports alone are tenfold those of 1913)

France, although the greatest wine producing country, has consistently imported quantities of wine many times greater than she exported (she imports ordinary wines mainly from Algeria, Spain, Greece and Tunis, largely for blending purposes, and exports, mainly to northern countries and Great Britain, finer grade wines), other alcoholic beverages, brandies, liqueurs, beer, cider, are all produced from home raw materials in sufficient quantity, not only for national consumption but also for a considerable export trade Of tobacco, the soil yields about half of the national requirements

AGRICULTURE. COMMERCIAL ASPECTS

Industrial and Commercial Products.—French agriculture is fortunate in the cultivation of a number of important commodities for use after transformation or factory treatment sugar beet, distillery beet, hops, oilseeds (*e g*, rape, poppy, olive), flowers and herbs for perfumery (lavender, mimosa, orange, etc) in the south and south-east, flax, hemp Potatoes and fruits are also utilized for the production of much industrial alcohol Among industrial or commercial products of French agriculture must also be noted the immense output of flowers, fruits, vegetables and plants and of the seeds thereof, for sowing, grafting, or embellishment purposes The internal and external trade in cut flowers is great, as is that in seeds

The official returns show that the area classified as specially devoted to fruit and floral horticulture has far more than doubled since 1913, having increased from 42 to 98,000 hectares: that to nurseries has likewise much increased (from 12,730 to 18,000 h)

The yield of the woods and forests in commercial products must not be overlooked for example, that of the pine forests of the Gironde and of the Landes and of Britanny, not only in pitprops, wood pavings and railway sleepers, but in turpentine and other extracts In the category of textile raw materials, may here be

included that of the silkworm; the output of fresh cocoons and the number of growers has much diminished (in 1900, 1913, 1927, quantities in fresh cocoons were, respectively, 9,200, 4,400, and 3,600 tons, and growers numbered 136,000, 91,500 and 70,254) The production both of flax and hemp is less than half the prewar output

Great Export Trade in Agricultural Products.—French agriculture has developed a great export trade in food and drink commodities the total value of this trade in goods for human consumption (as distinct from animal feeding stuffs and other products) in 1926 and 1927 reached 5,079 and 5,386 million francs (880 millions in 1913) Great Britain provides far the largest market, and owing to the diversity of her demands in every season, her relations are of the most ramified and constant nature throughout the year with most agricultural regions (*e g*, wines from Bordeaux, Burgundy, Champagne, Touraine, brandies from the Charente, flowers and plants from the Paris and Mediterranean areas, Angers, Orléans, seeds from Provence and Orléans, potatoes, cauliflowers, strawberries, apples, pears from Britanny and Normandy, eggs, butter, cheese, poultry from a great part of France west and south-west, and south and south-east of Paris, early vegetables and fruits from Algeria, the Rhône valley, and the Mediterranean coast)

Advance in General Organisation and in Technical Efficiency.—Within the last generation, and notably since the war, French agriculture has made great progress both in organization and provision for the general purposes of the industry, and in technical efficiency

County Agricultural Offices—For the purposeful realization on a decentralized system of the definite national policy for the increase of home food production, there was created in each county under the law of Jan 6, 1919, a county agricultural office (*Office départemental agricole*) with independent legal status, directed by five elected representatives of agricultural interests of the same county, and managed by trained agriculturists Its functions include the permanent general guidance on practical lines of the agriculture of the county The State restricts its action to the giving of technical advice through its inspectors of agriculture, and to the supervision of the proper employment of its grants Under the public Order for the administration of the law, close collaboration with the agricultural co-operative and other associations within the area is postulated These county offices are linked with a regional office (*Office régional agricole*), whose area corresponds to that of one of the eight agricultural regions into which France is divided this regional office, on which the county offices are represented, has a general supervision of the county offices, and fixes the allocation of the State grants to the latter This organization has proved efficient, and has much stimulated local progress in the theory and practice of agriculture

Agricultural Banking System.—The development of the special institutions for financing the farmer has been marked Before the law of Aug 5, 1920, under which the National Agricultural Credit Office was founded, no central independent banking institution existed for agriculture, the administration of the considerable funds obtained as foundation capital or as annuities from the Bank of France for agricultural credit purposes being administered by a branch of the Ministry of Agriculture under the rather rigid regulations governing all monetary transactions by State bodies This office, which was given legal personality and financial independence, so that it could follow in the main ordinary banking practice, received more extensive powers and scope than the previous State organ. inclusive of the sums placed at the disposal of the latter, it has been endowed since 1897 to the extent of about 700 million francs, composed mainly of the loan without interest of 40 millions in 1897 by the Bank of France and the annual payments for Agricultural credit by that bank to the Treasury of a fixed percentage of its profit-yielding discount business To this Office are now affiliated 90 county agricultural banks, to which are attached 5,500 local banks with 295,000 members moreover, 1,400 rural co-operative societies or other agricultural collectivities with 195,000 members, and 120 rural communes have obtained from it long-term loans either for building or purchase of materials

Rural Electrification.—Immense progress has been made since 1923 with the rural electrification which is so important as a means for the improvement, not only of the amenities but also of the actual work of the farm Thanks to the active policy of the State, which has accorded at low rates of interest (4%) advances of funds not exceeding 50% of those raised for the purpose by the local authorities or agricultural collectivities concerned, and which makes grants on certain terms for approved rural schemes up to one-third of cost of their first establishment, about 7,000 communes have now been equipped through its support, and schemes covering about 12,000 more have been drawn up In the five years 1923–27, total subventions of about 280 millions were sanctioned for 2,800 approved schemes, and by July, 1927, about 150 millions had been paid In some French departments most villages or communes are already equipped (*e g*, in the Isère, 500 out of 564, in the Rhône, 220 out of 268), and by 1938 it is expected that only a few thousand out of the 39,000 communes will lack electricity, as a consequence of the large thermic and water-power works already erected or to be erected in various parts of the country (*e g*, the northern departments, Paris area, Britanny, Pyrenees, centre, Savoy and south)

The co-operative movement has made great strides The local credit societies had 320,600 members in 1927, and the agricultural trading associations (*Syndicats agricoles*) increased from 2,069 with 513,000 members to 9,100 with 1¼ million grouped into 176 federations Production co-operative societies number about 1,500 (principally dairies, cheese factories, wine depots, etc) There are 7,000 cattle insurance societies with 340,000 members, 5,000 fire insurance societies with 194,000 members, and about 200 accident insurance societies with about 60,000 members

Public Aid to Agriculture.—Space limits prevent the full description of the increasing part taken by the State in promoting agriculture In education, higher and other, it is immense, the National Agronomic Institute at Paris for training of the highest kind in chief branches of agricultural science, 3 National Schools of Agriculture, Grignon, near Paris, Rennes and Montpellier National School of Horticulture at Versailles, National Forestry School at Nancy, National Hippique School, 3 Veterinary Schools, High School for Agricultural Engineering at Paris, National School of Agricultural Industries at Douai, numerous technical schools for special branches such as dairying, sheep-keeping, rural industries, fruit growing, 30 provincial residential schools, of agriculture, five farm schools, a dozen winter or season schools; itinerant winter schools and numerous post-school 4-year courses for primary scholars The State or other public authorities maintain a large number of agricultural laboratories or research stations, which are under the direction of the State Agronomic Research Station (established in 1921)

It may be noted that the State as the owner of 1 15 million hectares of woods and forests, and the local authorities (communes) and other public entities as the owners of 1 94 million hectares of similar property, are the greatest agricultural landlords The return of Alsace-Lorraine brought about 140,000 h of woods and forests to the State, and 201,000 h. to other public bodies The administration of the whole is entrusted to a special service with a certain military basis for the 32 forest districts The total forest land covers about 10 34 million hectares

NATIONAL EQUIPMENT FOR WEALTH PRODUCTION

National Economic Effort.—As one result of the far-dated political and economic unification of France, of the great military efforts in preceding centuries and notably in the Napoleonic period, the country has long possessed extensive national highways giving direct communication to chief points on the seaboards, on the various frontiers and between the principal towns Her waterways were also developed at an early date Much royal care was devoted to the ports in the days when French fleets and merchantmen were disputing with England the mastery of the seas, of India and of North America In the 19th century, extensive main and subsidiary railway systems were gradually created, and with substantial State subsidies rivers and canals were

also improved Ports, inland and maritime, were extended and equipped

Probably never within such a brief period has so much been accomplished, however, in the way of improvements or renovation in the common utility services and by provision of the most various kind that forms part of the national economic equipment, as has been accomplished since 1914, and especially since 1919 The railway systems have been thoroughly overhauled as regards their permanent ways, rails, rolling stock and railway stations two trunk systems have made great strides in the matter of electrification Immense efforts and money have been expended on repairing and reconstructing the main highways throughout the country Remote country districts have been provided with motor services in most cases with State or departmental subsidies, and are generally linked with railways During and since the war manifold improvements have been made in the dock and warehousing capacity, in the machinery, motive power and in the general equipment of most French ports Great achievements in this sphere have been the completion of the broad Rove tunnel, which gives Marseilles a large landlocked inner-harbour, the transformation and enlargement of the port of Strasbourg, the construction of a large fishing port near Lorient, and the building of large docks or other extensions at Havre, Rouen, La Pallice, Dunkirk and Marseilles The canal system and its working equipment have been improved and extended, *e g*, the traffic capacity of the St Quentin canal has been doubled, and the technical improvement of the water-courses, the modernization of inland ports, of haulage methods, and type of boats, has been noteworthy The electrification of the country is now being pushed forward with such great energy that within ten years every French village and farm will no doubt possess electric light and power The hydro-electric capacity of the country has been increased from 647,000 k w to 2,000,000 k w, and the capacity of the thermic stations from 1,000,000 to 3,800,000

Recovery of Alsace-Lorraine.—The return of the lost provinces not only added 5,600 sq m (2·5%) to the native territory and some 1,700 000 (4%) to the population, but it also doubled the ore capacity, conferred an immense benefit on French agriculture by bringing in valuable potash mines (output now over two million tons a year) and breaking the previous German world monopoly It provided five to six million tons of coal and 65,000 tons of crude oil a year It brought 1 900,000 cotton spindles an increase of one-quarter, besides 40,000 looms, and more than doubled French cotton printing strength by its contribution of 160 machines, together with probably the most highly-developed skill in Europe in this branch To the French woollen trade it added with its 400 wool combing machines about 20%, another 20% with its half-million worsted spindles, and about 12% with its 6,800 looms Nor must the highly developed blast furnaces, steel and engineering works, chemical and food and drink industries of this area be forgotten

Human and Mechanical Power.—In man power France, thanks mainly to the vast alien immigration movement (already noted) from Italy, Poland, Spain and Belgium, has more than recovered her pre-war position, the census of 1926 having shown an excess of 900,000 over that of 1911 Reinforcement of human and animal by mechanical power is proceeding at a greatly quickened pace in nearly all trades, notably in the mining, iron and steel, and machine and engineering, and that movement is particularly visible to the lay observer in the dwindling of animal traction and in the building trades group (house, tunnel, railway and harbour construction, road building and maintenance) The shortage of human power has led in agriculture to great development in the use of oil-driven motors, pumps and other small and large machinery, as well as of electrically driven labour-saving appliances and tools The total electric power capacity in industrial establishments in fact doubled between 1919 and 1925 (from 2,465,000 to 4,839,000 kilowatts), that of railways and tramways increased from 9,886,000 to 16,283,000 h p.

Manufacturing Capacity.—The remarkable advance in manufacturing resources has been due to two chief causes, apart from the return of the highly developed industry of Alsace-Lorraine The ten devastated departments contained over two-thirds of total coal capacity in the two departments of the Nord and Pas-de-Calais, a large percentage of the ore capacity in Lorraine, and great blast-furnace, steelworks, engineering, glass, chemical, and other undertakings; in the textile trades approximately 60 and 50% of the cotton spindles and looms, nearly all the wool-combing mills, about 80% of French woollen yarn and cloth capacity, 93 and 80% of linen yarn and weaving capacity The reconstruction of all these devastated areas has been completed New and larger scale factories or works have generally replaced those destroyed or badly damaged the machinery, general equipment and layout correspond to the latest requirements of efficient production In many trades the process had led to more economical output capacity for war sufferers in the same industry often pooled their resources and replaced by more efficient units previous small undertakings In the second place the enemy occupation of the greatest manufacturing area compelled the new installation or extension of works during the war in many other areas; and the needs of war likewise caused the erection of great engineering and other works with modern machinery for standardized production The unbroken period of intense industrial prosperity from 1922 to 1927 permitted further great extension in means of production both in the former war area and throughout France Some striking cases of industrial transformation may be noted A large proportion of the northern coal mines were damaged or thoroughly wrecked they have been entirely reconstructed

Fresh Technical Knowledge and Foreign Undertakings.—Great accessions to the manufacturing capacity of France result from the acquisition of new technical processes and the immigration of foreign industrial undertakings The French since 1914 have learned to make, or improved their knowledge of making, high-speed and special steels, dyes (about 600 synthetic dyestuffs covered by 1,000 patents), sulphate of ammonia by the Claude process, and they have acquired at various times manufacturing rights for the most varied engineering and electrical machinery and products from English, American, Swedish, Swiss, German, Norwegian and Italian owners High customs tariffs and the depreciated franc have impelled the settlement of numerous foreign industries, especially from America, England, Switzerland and Sweden, including those of agricultural machinery, motor vehicles, railway brakes, central-heating plant, turbines heavy and light electrical material, household and office furniture, safes, rubber and rubber goods, artificial silk, boots and shoes, biscuits, cakes, jams, etc

Mechanical and Industrial Organisation and Direction.—The enlargement of factory units can be indicated only up to 1921· the 1921 census returns which concerned 77 departments, giving comparisons with the year 1906 for the groups of units occupying 201 to 500, 501 to 1,000, and over 1,000 persons, showed that there were respective increases of 50, 48 and 56% in the number of such establishments and of 49, 48 and 77% in the total number of persons therein employed Since 1921 this tendency has gathered further impetus The mechanical equipment of factories, especially in machine tools, has been much augmented In many works has been introduced in recent years the chain or continuous-process system (*e g*, in motor and cycle, electrical material, rubber, boot and shoe factories, woodworking and several engineering trades)

Direct control of the national production in a single branch by a single concern has not been often achieved (save perhaps in potash, aluminium, dyestuffs, shipping), but in many cases effective control has fallen into a few hands which may reach understanding as to conditions Several French firms or group undertakings now own or have large participations in industries in several foreign countries, *e g*, one steel concern in Luxemburg, Czechoslovakia, Poland, Austria, Hungary, Roumania, Great Britain, South America, another in Italy, Luxemburg, Spain, Denmark; two or three motor concerns have works in two or three foreign countries

Actual Results.—Complete demonstration of increased national capacity, output and power of the present France compared

with that of 1913 may not here be given in detail. It may be briefly noted, however, that hydro-electric and thermic capacity have both tripled in kilowatts, the merchant fleet is greater by over 800,000 tons, oil tankers are tenfold more numerous, on the main systems railway trucks number 550,000 against 385,000, locomotives 20,600 against 13,900 (besides about 150 electric locomotives against nil), automobiles 900,000 against 100,000 In actual output some figures are telling· potash, two million tons against nil, iron ore 43 million against 22, pig-iron 8½ million tons against 5·2, and steel 7½ against 4 7 million, coal 52½ against 40 8, metallurgical coke over 6 against 4 million The annual output of automobiles grew from 55,000 in 1921 to 190,000 in 1926 The home industry of dyestuffs produces nearly 90% of home requirements and enjoys a large export trade in 1913 the figure was under 10 per cent ; in light and pharmaceutical chemicals, in the electro-chemical trade it also produces nearly all home requirements

The State as Employer.—The French State is a large employer of labour in production In agriculture it owns and exploits about 2½ million acres of woods and forests Two of the seven main railway systems, the State (5,700 miles) and the Alsace-Lorraine (1,350 miles) railways, are administered by it the former employs 88,000 and the latter perhaps 30,000 The State tobacco monopoly employs 17,000 workers and 1,000 employees in its 21 factories in various towns.

COMMERCE

Commercial Policy and Recent Treaties.—French opinion is indissolubly wedded to protection The powers acquired in 1916 by the executive to enact by decree, without reference to Parliament, import prohibitions and modifications of duties were extended till 1923, and were regranted in August 1926 In July 1919, to provide, in face of the depreciating tendencies of the franc, the same effective protection as was intended under the 1910 customs law, the system of coefficients or multiples of increase was applied to the specific duties (*i e*, to most duties, which are based on weight or material characteristic), these were raised on various subsequent occasions, and were stiffened in 1926 by two separate increases of 30 per cent

The number of commodities subject to *ad valorem* duties has been much augmented In the spring of 1927 was presented to Parliament, after nearly six years' preparation, a most comprehensive and far reaching measure of customs and tariff revision By new and more detailed classification the tariff articles were increased threefold, and their sub-divisions were so multiplied that the total number of classes came to 6,000 or 7,000, and practically all rates thereunder were raised, many in substantial proportions Parliament was not invited to discuss these rates, but gave special powers to the executive for the German and other international negotiations The curious situation has now materialized that the great bulk of existing French tariffs have not been determined by the French Parliament directly but result from rates fixed by way of treaties with foreign countries. The effect of the 1927–1928 series of commercial agreements (with Germany, Switzerland, Belgium, Italy) and of additional customs legislation passed simultaneously with their ratification in a single legislative measure, has been substantially to raise almost the whole range of the minimum rates of duties and to increase certain *ad valorem* rates.

France indicated immediately after the war, by a year's formal notice of the denunciation of all her commercial treaties, her intended change of general policy, and by a law of 1919 she discarded the most-favoured-nation treatment for the reciprocity principle through the introduction of a third column of intermediate rates between maximum and minimum. It was also announced in 1927 that the minimum rates were not intangible. The reciprocity principle was applied in several treaties (Canada, Czechoslovakia, Austria, Italy, etc.) In the long negotiations (1924–27) with Germany, that country claimed and finally obtained as from Dec. 15, 1928, most-favoured-nation treatment. France accordingly now returns to that system, but not, however, without having previously negotiated a series of important treaties in which, in exchange for advantages, the minimum rates were worked out for particular commodities with countries specially interested in these commodities (*e g.*, for silks with Italy)

Changes in General Organization.—In France commercial enterprise for home and foreign trade has undergone transformations similar to those manifested in industrial enterprise, so that larger-scale organization and combination or concentration among distributors of goods and services, with the attendant consequences, are now its leading features In banking, transport by land and sea, the selling of oils, chemicals, metallurgy, and engineering products, certain textiles, clothing, boots, gloves, foods, drinks, hotelkeeping, and other branches, the movement has taken pronounced form Five or six banks with large capital, which have up to 60 offices in Paris and up to 1,300 in the provinces, and which tend to work on commonly arranged rules and rates, have gradually taken the place of hundreds of smaller banks or bankers. Three shipping companies control merchant shipping The home and foreign chemical trade is controlled by three or four undertakings. The four or five great motor-car makers, besides having hundreds of agents as distributors at home and abroad, maintain numerous branches or garages, and in some cases have fleets of cars plying for hire in large towns Great steel and electricity material firms have selling branches in the principal towns and in foreign countries In many provincial towns and areas the multiple grocery shop is a prominent feature (*e g.*, at Rheims, one with 850 branches, at St Etienne, one with 600, at Lyons, one with 600, another with 300), but the meat trade is not generally strongly represented, and their importance is not equal to that of the multiple grocery and meat companies in Great Britain. More important than in Great Britain, however, is the departmental store About one-quarter of the Paris retail trade in the range of goods sold at similar shops in London (but excluding groceries, meat, etc) is asserted to be done at the dozen or so great stores of the capital Manufacturers have to a considerable extent become also retailers a goodly number of departmental stores have become manufacturers or acquired interests in appropriate factories The co-operative distribution movement is far from having attained the same development as in Great Britain or Germany. The large local society with numerous grocery, meat and general goods branches, so familiar in the north of England, is scarcely known in France

Magnitude of Visible Foreign Trade.—France ranks after Great Britain, Germany and the United States, as regards the value of visible foreign trade, the combined total of her imports and exports in 1926 and 1927 having reached respectively 119 and 108 milliards. In these two years visible exports represented 59 60 and 52 85 milliards; but it must always be recalled that invisible exports in the case of France make a most important addition to the credit side of the foreign trade account In recent years unmistakable signs of progressive efficiency have been manifested In 1919 and 1920, when the sterling rate averaged 32 and 51 francs, the debit balance of visible trade reached the enormous totals of 24,000 and 23,000 million francs: this was reduced to 2,500 millions in each year 1921–23, was converted into an average credit balance of 1,000 millions for the years 1924–26, and into one of 2,400 millions in 1927

In brief general terms, France now purchases abroad mainly certain sources of energy (coal, coke, mineral oils), many raw materials (especially textiles, rubber, oil-seeds, timber, wood pulp, copper, zinc, tin, phosphates, nitrates), certain foods and drinks (wheat, tropical fruit, rice, wine, coffee, cocoa, tea), and to sell abroad mainly manufactures (textiles, clothing articles, metal and engineering products, leathers and leather goods, chemicals, perfumery, paper) and agricultural products (wines, brandies, timber, skins, vegetable gums, beet sugar, fruits, vegetables, seeds).

Exports of food and drink products are superior in weight to the average weight of the years 1909–13 In weight, exports of manufactures show remarkable advance. the average annual weight of 2·15 million tons for 1909–13 became an average of 4·84 million tons for 1925–27. On the other hand, in weight the imports of manufactured goods have decreased (1913, 1·54, 1926

and 1927, 1 36 and 1 14 million tons) In the total value of exports of manufactured goods the textiles group occupy the leading place: in 1913 and 1924–27 it represented 35 5, 45 7, 41 4 and 43 7 per cent Developments in this group have been very striking, even after due allowance is made for the depreciation of the franc to about 20% gold silk piece goods, which averaged 324 millions for 1909–13, reached 4,774 and 3,589 millions in 1926 and 1927. similarly woollens, 205, 2,500 and 2,168 millions. cottons, 353, 3,312 and 3,456 millions, under and outer clothing, 205, 2,886 and 2,138 millions, woollen yarns, 81, 1,041 and 1,732 millions, cotton yarns, 16, 315 and 739 millions Similarly in other groups the value is multiplied. machine and machine tools, 108, 1,900, 1,756 millions small tools and metal goods, 110, 2,954 and 2,251, rubber, 73, 1,372 and 957, chemical products, 211, 1,169 and 1,523 millions

The value in gold of the imports of most of these groups has considerably declined (*e g*, woollens, 51 in 1913, 146 and 123 in 1926 and 1927, cottons, 56, 155, 86, silks, 49, 143, 100 millions) In the category of raw materials, notable advances have occurred as regards the group pig-iron, iron and steel (87, 3,023 and 3,297 millions), potash (nil, 161 and 231 millions); resinous products (24, 375 and 258 millions) The recovery of Alsace-Lorraine has considerably affected several branches of exports (cottons, woollens, ore, engineering, potash)

Nature and Direction of Foreign Trade.—French export trade is distinguished by the exceptionally large proportion that belongs to the category of fine quality or so-called luxury goods In the textiles group (in 1927, nearly 44% of total exports of manufactures) a predominant place is taken by silks, silk ribbons, silk and mixed under and outer clothing, laces, both cotton and mixed, and woollen dress goods in other groups by jewellery, knick-knacks, fancy leather goods, perfumery, toys, games, pipes, motor cars, wines and brandies, choice and early fruits, flowers and vegetables, seeds and so forth But whilst retaining primacy in the above classes, France is developing with a certain rapidity in many trades large-scale standardized production of ordinary goods of popular consumption, as well as of many heavy goods (*e g*, metals, engineering products, heavy chemicals)

Her principal customers, as shown by percentages of total annual exports, are U K, about 18 to 20, Belgium-Luxembourg, 14 to 17, Germany, 12 7 before war, 7, 1922–26, nearly 12, 1927, Algeria, 7, United States, nearly 7, Switzerland, 6, Italy, 4, Spain, 3, Holland, 2 5, Argentine, 2%, Indo-China and Morocco, nearly 2, Tunis, 1 4, Brazil, Canada and French West Africa, about 1 Her principal suppliers in annual percentages, are the U K, 1909–13, 13, now about 12; U S A, 10, and now 13 to 14; Germany, 12, now about 8, Belgium, 7, Algeria, 4 to 5; Argentine, Holland and Italy, about 4, and Spain, 2

Importance and Character of Anglo-French Trade.—France in 1913, 1926 and 1927 sold to Great Britain goods to the value of 1,454, 10,707 and 10,179 million francs, and bought there goods to the value of 895, 6,516 and 6,404 millions the resultant balances of the visible exchanges to French credit were accordingly 559, 4,191 and 3,775 million francs The yield of the invisible Anglo-French exchanges, were they statistically calculable, would show proportionately a far larger credit balance for France: for nothing on the English side of the Channel can match, to take the most important item, the expenditure in France of 700 to 800,000 British persons who yearly cross, thronging in the summer months Paris, the coast from Calais to Brest and round to Baule, as well as the inland touristic and health resorts, and in the winter the Riviera or the Basque coasts Great Britain in fact, as the buyer since time out of mind of one-fifth of French exports, is the vital and greatest French market, and so widespread and ramified are the origins of the exports that most industrial and agricultural regions are interested

English exports to France, unlike those from France, which are goods into which much labour cost has entered, are mainly fuel, raw materials like wool, rubber, tin or factory equipment and textiles, of which a not inconsiderable element is made up of materials from other countries (*e.g*, wool, rubber) Coal is drawn mainly from south Wales and (less) from the north of England; Australian or Argentine wool hides, raw rubber, tin, from London; textiles from Bradford and Manchester, boilers, machinery and machinery spare parts, mainly from Manchester and Birmingham areas, and Leeds; these alone represent in value over 50% of British imports into France (if the milliard francs worth of pearls are excluded—France also exports to U K pearls to the value of $1\frac{1}{4}$ milliard)

Invisible Export Trade.—France has suffered a serious curtailment in this respect, especially through the heavy decline in her holdings of foreign securities from war and post-war causes, but almost ample amends appear to be derived from the enhanced tourist industry and from more extensive French activities in foreign banking, insurance, industrial participations, shipping and other services

Trade with Overseas Dependencies.—Steady expansion is notable in the trade of France with her overseas territories its value and volume have greatly increased, although its percentage of the total foreign trade, owing to the still more increased transactions with non-French markets, fails to indicate the full measure of that development The annual average percentage for 1909–13 of French colonial exports was 12 8 of the average total exports of 6,324 millions that percentage for 1923–27 was 14 1 of average total exports of 46,451 millions French imports from colonies averaged for 1909–13 11 1 per cent of 7,627 millions for 1923–27 that average was 10 6 for average total imports of 45,675 millions The bulk of the traffic is with North Africa, notably with Algeria

PUBLIC FINANCE

Position Before 1914.—In the twenty-five years (1889–1913) before the war, annual budget expenditure increased from 3,247, to 5,066 millions The internal debt simultaneously increased from 28,328 to 31,452 millions, and the external debt from 915 to 1,534 millions It may be observed that these figures relate to gold francs In the seven or eight years preceding the war, it was recognized that the public finances required drastic overhauling, and that the old taxation system had proved inadequate Despite easements by adjustments and loan in 1912 and 1913, the estimated deficit for 1914 was 800 millions; in that year indeed, a loan of 800 millions had to be issued in June under unfavourable circumstances, and the floating debt had become more serious It was widely realized that new taxation resources were essential, but it was not until July 15, 1914, that the important principle of national income tax was established by statute Thus at the outbreak of war in August the state of the public finances was not regarded as being from a technical standpoint entirely sound, although all were fully conscious of the bases of that great national financial strength that made France the banker if not of the world at least of continental Europe

Financial Policy and Practice, 1914–19.—For the three years 1915–17 (the 1914 budget had been voted before war began), no regular budgets were presented to Parliament, which simply voted for the civil and military needs credits, whose distribution was determined later by decrees, in 1918 and 1919 were voted each year the series of two budgets, one for normal and one for extraordinary expenditure, the needs of the second to be met by loan Although new direct and indirect taxation was introduced during the war (in 1916 income and war profits tax was first applied, and raised in 1917 and 1918, in 1917, substantial increases in those on landed property and buildings; and new, or increased rates of old, indirect taxes on a whole series of commodities or services, *e g*, the luxury tax, the early form of the now highly productive business turnover tax, tobacco, spirits, sugar, watches, stamp duties, postal rates, etc), yet it was deemed that, since a very large proportion of the population (for two years practically all able males up to fifty years) was mobilized, and since the devastated regions, which formerly yielded about one-sixth of the total revenue, yielded little, any attempt by rigorous and comprehensive measures to cover the war costs was foredoomed to failure The trained human agents of collection were also lacking: thus the income tax, inaugurated in 1916 by reduced and inexperienced staffs, produced extremely little (in 1916 and 1917, only 51 and 269 millions) For the six years

1914–19 (1919 may be included, as demobilization and return to normal conditions was gradual), the total revenue from taxation amounted to 36·24 milliards, and expenditure to 224 18 milliards, or approximately one-sixth was met out of revenue The deficit was made good in various ways: by loans or advances by the Bank of France (about 12–14 milliards), by internal loans of various types, and by foreign loans The current financial mainstay of the State was the national defence bond first issued in Sept 1914 (the normal type became a treasury bill with 3, 6 and 12 months, afterwards 1 and 9 months' maturity, with interest payable in advance, but later issues carried 5, 6 and 10 years' maturities)· at times after the war their total circulation approached 60 milliards Several long-term internal loans, to a total of 28 milliards, were issued and numerous external loans were negotiated (England, America, Spain, Switzerland, South America, etc)

Three Financial Reform Measures.—Early in 1920 the situation appeared most serious: for in 1919 expenditure had been 54 25 and revenue only 10·17 milliards, and the exchequer was faced with the necessity of providing for war damage reconstruction greater sums in 1920 and following years than the whole revenue of 1919 (in which year war damages payments reached nearly 8 milliards) Decisive action was necessary to secure a reduction of borrowing and to approximate more closely income to expenditure The proposals of the François-Marsal Finance Act of June, 1920, aimed at producing 8 more milliards of revenue by a general increase of taxation The flaws of this reform were the retention of the second budget for extraordinary expenditure, which was to be entirely fed by loan, and the institution of a third budget of expenditure recoverable under the peace treaties (*i e*, from Germany), which also had to be fed by loans in France The Finance Act of 1922 united the first two, but left the third as separate The second reform, that by the Poincaré Government in March, 1924, after the Jan–Feb 1924 franc crisis, showed progress towards a sole State budget by the transfer of the permanent charges of the reparation budget to the State budget; it provided also out of revenue for six milliards so transferred, as well as for 4 additional milliards of revenue, and reduced the borrowing limit for the devastated areas to three milliards

Another shock to public confidence in the summer of 1925 prompted the voting in July of a third reform measure in the 1925 budget, which for the first time since the war included all expenditure, and which provided for 6 milliards of additional revenue (although it still left to the exchequer the burden of providing a part of heavy war damages payments) It introduced a host of changes and of increases in rates of many important taxes

Comprehensive Poincaré Reform of 1926.—The effect of these reforms was being continually counteracted by the persistent depreciation of the franc, which, in view of brilliant economic conditions, appeared mainly due to the growing lack of public confidence on political grounds The existence since May, 1924, of successive Governments which, although not containing members of the extreme parties yet represented a combination of advanced parties, relied on the support of extreme parties, and were believed to intend to apply some of their principles (*e g*, capital levy, compulsory exchange of 100-franc notes for new notes of 87·50 francs, increased nationalization of industry), caused a gradual decline in the purchase of Government securities or in renewals at maturity, so that the Government had to borrow more heavily from the Bank, and to increase the note circulation, to meet both current needs and the heavy maturities. Twenty-two milliards fell due in 1925 (though only 8 were claimed) and 6·4 milliards in 1926, apart from the regular maturity every month of about 7 milliards of National Defence Bonds. Under this influence the note circulation rose from 43 milliards in June, 1925, to 54 in June, 1926, and the loans from the Bank from 32 to nearly 36 milliards. The movement was accelerated by the lack of confidence that caused the non-repatriation of a great proportion of the yield of the great export trade, as well as the flight of capital from France. Within the year July, 1925–July, 1926, six Ministers of Finance and one Minister of the Budget left office without securing the desired results In July the situation of the exchequer grew critical, its coffers were almost empty, the American loan was practically exhausted, and the official exchange rate actually sank to 243 francs Under the staggering influence of this fourth shock, a coalition government under Poincaré was formed with the full support of the nation, which at once took in hand its declared main function—that of the restoration of the national finances

The principal aims were (1) to balance the budget, (2) to relieve the exchequer, (3) to reduce the floating debt and (4) to stabilize the currency About 2½ milliards of new taxation revenue for the remaining 5 months of 1926 and 9 2 milliards for 1927, were voted on Aug. 5: of the latter 5 5 were to be obtained from indirect and 3 6 by direct taxation Provision was made for the exchequer to meet its possibly heavy short-term liabilities through (a) budgetary receipts, (b) funds under the Dawes scheme (850 millions allotted in 1927), and (c) through the transfer to a special autonomous sinking fund, created under constitutional guarantee and given specific resources, of the service and redemption of national defence bonds and ordinary exchequer bonds. To this fund were assigned the total receipts of the tobacco monopoly, the yield of the new supertax on first transfer of buildings, stocks and goodwill, and of the successive duties (together estimated at 1,800 millions), as well as of other taxes Its two-fold direction was confided to financial and technical experts (the latter skilled in the cultivation, manufacture and sale of tobacco). Its main positive function was to prepare the gradual reduction of the floating debt (then about 49 milliards principally made up of national defence bonds of under 12 months) As the stabilization of the currency depended principally on the general conditions resulting in the restoration of public confidence, on which would ensue the relief of the exchequer through the cessation of withdrawals, the renewal of subscriptions, the repatriation of capital, cessation of new advances from the Bank and new note issues, few positive measures to this end could be enacted, but the Bank of France was given special authority to purchase gold and foreign bills, and to issue in payment therefor notes not to be comprised in official total of notes in circulation

Wholesale Reform of Political, Judicial and Administrative Systems: Economic Equipment Programme.—For the needs of their financial reconstructive policy, the Government also acquired exceptional powers to legislate by simple decree subject to Parliamentary ratification within six months, and introduced within a brief period reforms almost on a Napoleonic scale into the political, judicial and administrative systems as ordered after the Revolution In each capital of the 90 French departments, the executive has maintained since that period an agent entitled the prefect with official buildings as splendid as the town hall, and with staff running perhaps into hundreds, and in the chief departmental divisions a sub-prefect also with fine buildings and considerable staff, each official being advised by a prefectoral or sub-prefectoral council; and attached to each prefecture has been an official known as the general secretary By a decree in September 1926, 106 out of 274 subprefectures with their staffs, all the 360 odd councils (23 councils from groups of departments were established in their place), and 70 out of 87 general secretaries' offices were suppressed In the same month 228 out of 359 courts of first instance in the former sub-prefectoral towns were suppressed, as were 396 posts of magistrates, 228 clerks of court and 218 local prisons Two tax-collecting departments of the Ministry of Finance with separate offices throughout France were amalgamated, and 1,000 other offices of the same ministry abolished Customs officials and postal servants were greatly reduced. The supply services of army and navy were amalgamated, two naval ports suppressed, army officers so reduced, that the 1914 figure of 35,200 will gradually sink to 28,000, a dozen cavalry regiments disbanded, 400 squads of gendarmes transferred into foot police The Public Works Ministry, which has its engineers and employees throughout France in mines, railways, roads, ports, waterways, is compressing its departmental services into regional services By a decree also, the Education Ministry undertook a large scheme of co-ordination and retrenchment. The great State departments occupied particularly with economic activities (Agri-

culture, Mercantile Marine, Public Works, Colonies) were required to draw up comprehensive schemes for the improvement of the national equipment or resources (*e g*, for agriculture as a whole, for hydraulic power development, for full utilization of reparations in kind to provide national equipment of various categories, for colonial equipment and general expansion). The strength of France as an economic unit cannot fail to be fortified by this large-scale recasting and modernization of the public services This enlightened legislation by decrees produced a profound moral effect and promoted public confidence

Budget Expenditure and Revenue, 1913–1928.—The following is a view of annual expenditure under its main headings and of the total annual revenue from 1913 to 1928 The burden of reparations payments is obvious; and as these payments had to be made principally by loans, it has been twofold by the concurrent addition to the debt charges account, which since 1924 has become the heaviest item of all

State Expenditure and Revenue, 1913 28
(Million francs)

Year	Expenditure						Revenue
	Civil services	Military and naval services	Special accounts	Reparations (recoverable expenditure)	Services of the national debt	Total	Total
1913	1,904	1,807	6		1,355	5,072	5,091
1914	2,005	6,526	108	372	1,360	10,371	4,518
1915	2,479	14,712	1,197	1,104	1,818	21,400	4,113
1916	2,817	23,853	3,904	2,947	3,327	36,848	4,640
1917	4,119	28,662	2,983	4,081	4,816	44,661	5,811
1918	5,443	36,120	2,113	5,952	7,021	56,649	6,986
1919	9,297	18,185	3,387	15,481	7,903	54,253	10,176
1920	11,397	7,648	5,092	22,279	11,747	58,163	18,176
1921	9,938	6,312	2,714	21,423	11,636	52,023	21,217
1922	7,035	4,910		23,084	13,191	48,220	21,383
1923	5,896	6,540		16,455	12,810	41,701	23,495
1924	8,502	5,992		14,628	12,765	41,887	27,574
1925	8,980	6,207		3,643	19,264	38,094	32,957
1926	12,589	5,596		621	20,544	39,350	40,394 * 1,017
1927	11,539	7,823		1,980	21,081	42,423	43,344 * 7,684
1928†	12,273	8,482			21,690	42,445	42,497 * 8,074

*Separate revenue of the Autonomous Fund for Redemption of Debt (*see* text)

†Anticipated receipts and expenditure, according to Budget estimates

NOTE: The postal, telegraph and telephone services form an independent administration with separate legal personality. Their receipts were 2,708 millions in 1927.

Principal Sources of Present Revenue.—Before the war, revenue was mainly derived from indirect taxation, but the introduction of the income tax and the development of other direct and allied taxes (*e g*, that on dividends or securities) has considerably altered the proportion of direct and indirect taxation

Introduced in 1916 (which year yielded only 51 millions), income tax showed receipts in 1927 of 9,693 millions, and those of the securities tax rose from 290 millions in 1919 to 3,385 millions in 1927; of other taxes on property, certain miscellaneous direct taxes produced in that year 90 millions, and those on registrations, stamp duties, property transfer super tax, death with successive duties, and duties on stock exchange operations respectively, 3,696, 1,898, 474, 1,942 and 347 millions The three specifically direct taxes yielded therefore 14,071 millions and the second group, which is akin, 8,358 millions, or together 22,429 millions, or 44% of the State revenue It may be noted in passing that the French income tax is levied in two guises both incident on the taxpayer: in the one form (as the *impôt cédulaire*) it is levied on the component parts classifiable as wages, salaries, business, industry, agriculture, professions, and at different rates according to the class or classes therein represented, and in the second form (as *impôt général*) at a single rate applicable to total assessed income after deduction of the other part of the tax payable. The most fruitful new tax has been the business turnover tax, which is normally 2% on all transactions, and 12% on luxuries; instituted in 1920 in replacement of the luxury tax, it yielded in that year 942 and in 1927 no less than 8,605 millions, of which 924 millions were under the 12% luxury schedule. Other sources of indirect taxation in 1927 were. tobacco, 3,725 millions, the group *contributions indirectes* (taxes on wines, cider, beer, candles, railway and other transport freights and fares, cards, sugar, public vehicles, etc.), 2,994, customs, 2,617, alcohols, 1,878, sugars and saccharine, 999 9, mineral oils, 866 millions (plus 75·5 for heavy mineral oils and 26 for benzoles), automobiles, 620, colonial commodities, 406, matches and lighters, 242, and salts 217 millions.

National Debt, Internal and External.—The following statements from the 1928 Budget report of the Chamber of Deputies Finance Committee show the composition of the internal and external debts on Aug 31, 1927 —

National Debt

Internal	Million francs	External	Million francs at 124 03 to £1
Perpetual and long term	178·70	Political	159·64
Long term (Autonomous Fund)	3·00	Commercial	18 24
Short term	29·22	Railways	1·95
Floating	59·37		
National Defence Bonds	44·38		
Advances of Bank of France	24 65		
Totals	294 04		179 83

The total debt amounted accordingly to 474 77 milliards, or 14 times that of 1913 (32 98 milliards of which internal was 31 45 and external 1·53 milliards) The internal debt had increased 8 milliards since July 31, 1926, but a certain reduction was subsequently effected by the repayment to the Bank of France of two milliards, and the external debt reduced by certain instalment payments to the two important creditors, Great Britain and America, by virtue of funding agreements not yet officially ratified According to the Churchill-Caillaux agreement (July 12, 1926) the French debt to Great Britain was funded at 600 million pounds, and repayment fixed by varying annual instalments (1926–27, four millions, 1927–28, six, 1928–29, eight, 1929–30, ten, 1930–31 to 1956–57, 12½, and from 1957–58 to 1987–88, 14 millions) · the first two have been paid The agreed scale of repayments works out at 2% a year, being equivalent on the 5% basis to a flat annuity of rather less than 12 millions a year, and represents on this basis a present value of £227 millions, or a reduction of this debt by 62% or 65% of gross debt

The other principal debt, to the United States, was funded in June 1925 at 4,025 million dollars, 30 million being payable in 1926 and 1927, 32½ in 1928 and 1929, and following years amounts increasing up to 120 in 1941, from 1942 to 1986, 125, and in 1987 117·67 millions This scale is equivalent on a 5% basis to a flat annuity of 88 million dollars, and represents on this basis a present value of 1,681·4 million dollars, or a reduction of 58% of the debt The war debts incurred to other countries (Holland, Spain, Switzerland, Argentina, Canada, Uruguay, etc), which were relatively unimportant, have been repaid to a considerable extent. On the other side of the account, the debts of foreign States to France at the end of 1927 amounted to 8,542 million gold francs, of which, however, 7,839 millions are due by Russia In March 1928 the Roumanian debt was funded at 525 million gold francs and the Greek at 178 million gold francs, both repayable in 62 annuities. The present value of the former is 185 millions and of the latter 103, on a 5% basis The redemption of the internal debt is being pursued in various ways by the autonomous fund: that of the external debt has been much facilitated by the great reductions accorded by the two chief creditors, although the French thesis tends strongly to reject any settlement which involved a risk that at a given time France might have to meet calls from its allies

superior to its receipts from Germany. A large portion of the cash receipts under the Dawes plan is, together with other resources of the autonomous fund, to be devoted to this purpose.

Dawes Plan.—This scheme has worked satisfactorily in the 4 years (since Sept. 1, 1924) of its existence. Up to its inception France had received as reparations a total of 1,794 million gold marks under all heads (troops of occupation, deliveries in kind, cash, etc.), 8% in fact having been in cash. for the subsequent period, Sept. 1924 to Dec. 1927, she received 1,875 million marks, of which about one-third in cash In the financial year 1928 France anticipated the receipt of 1,015 million gold marks (or about 6,090 million francs), of which the Treasury was to receive about 3,500 millions in liquid funds: but as 580 millions were to be absorbed by the upkeep of the Rhine army and about 1,250 millions by war damages compensation, only about 1,700 millions would have been theoretically available from this source for repayment of national debt

Position in 1928.—The results of the Poincaré policy were good The receipts for 1926 and 1927 were greater than for 1925 by 8½ and 18 milliards (including those of the autonomous fund), and balanced normal expenditure in 1926 and 1927 The exchequer has regained full independence, has reduced the debt to the Bank of France from 36½ to 31 milliards, and has acquired large reserves Thanks to the work of the autonomous fund for debt reduction, greater security against the floating debt danger has been obtained by the gradual conversion of the whole body of national defence bonds (about 48 milliards) into two-year maturities (from those of 1, 3, 6, 9 and 12 months), besides the funding of another part thereof Since Dec 1926, *de facto* stabilization of the franc at approximately one-fifth gold value existed; and in June 1928 legal stabilization at 124 21 fr. to the £ sterling was introduced For 1928, no new taxation of importance has been found necessary, perhaps even possible: for with the inclusion of the payments (8,014 millions) to the autonomous fund, the budget revenue amounts to 50,571 millions, compared with the revenue of 5,091 millions in 1913

Currency.—Paper money has been legal currency since 1914. Gold disappeared from circulation early in the war and silver followed suit in 1921 being replaced by notes The note circulation which was 5,655 millions in 1914, averaged 44,071 millions in 1925, and has ranged from 52,000 to 58,000 millions since mid-1926 The circulation in the early months of 1928 has been from 56 to over 58 milliards The gold cover actually in France hovered for many years about the figure of 3,685 milliards, but was increased in 1927–1928 by the purchase of gold at home and abroad to about 3,700, plus 463 millions in gold or gold value at disposal abroad (abroad but not at free disposal are another 1·4 milliards). The notes, issued by the Bank of France, are of the denomination of 5, 10, 50, 100 and 1,000 francs The coinage consists of 10 and 20 frs (gold); 20 and 50 centimes, 1, 2 and 5 frs (silver); 5, 10, 25 centimes (bronze-nickel), 5 and 10 centimes (bronze) In addition brass tokens, issued by the French Chambers of Commerce, for 50 centimes, 1 and 2 frs are in general circulation.

Banking and Credit Organisation.—Joint stock banking, which was winning its way to predominance in France before the war, has established more firmly its position in conformity with the greater scale of general industry and trade Four or five banks show 1,000 or 1,200 branches throughout France. The Bank of France plays a far larger part in current banking than does the Bank of England: in 1927 it showed 18 branches in the Paris area, elsewhere 159 branches, 83 sub-branches and 400 other offices. Leading industrial centres like Lille, Lyons, Nancy, Strasbourg, have strong local banks, but the private family banks, so numerous formerly in small and large towns, are rapidly disappearing.

France possesses two great institutions which are lacking in Great Britain: namely a central real property mortgage bank and a central agricultural system. The Crédit Foncier, created in 1852, administered under State supervision and accorded certain privileges, has headquarters in Paris with offices and agents in every centre of importance, makes mortgage loans and bond issues on urban and rural property, and may be held to rank after the Bank of France as the second banking institution The National Agricultural Credit Office is affiliated with 90 county and 7,000 local organizations. Great Britain also has no counterpart to the flourishing postal cheque system established in 1918 which showed 317,000 accounts with credit balances of 3,357 millions in 1926.

COMMUNICATIONS AND TRANSPORT

Roads.—By the middle of the 19th century the national highways system totalled about 48,000 miles Although the advent and general triumph of the railway spelt the doom of the former lively passenger and goods traffic by road, save for short distances, and stayed the pace of road developments, yet persistent advance as regards the main routes was made under the direction of the Bridges and Highways Department, which builds and maintains the roads classed as national roads (*routes nationales*) By 1927 the public roads mileage had increased to 384,930 miles, of which 25,400 (6·6%) were national roads It may be noted that the latter normally measure from 18 to 20 metres in breadth, inclusive of the space occupied by the bordering trees and ditches, and that county roads are from 13 to 14 metres broad France appears therefore to be admirably supplied with main and secondary roads, and little demand is observable for extensions. One great new road has recently been built—the Alps Road (*Route des Alpes*) which, roughly speaking, provides a highway from Grenoble to Nice.

Great improvement has been effected in the general state of the main roads, which underwent the severest wear and tear both within and without the war areas during the war years. The problem of maintenance has grown difficult, not only owing to the great road mileage in relation to population and the comparatively vast expanse of territory, but also because the roads also must bear now a far superior intensity, speed and weight of traffic: for within equal periods passenger cars can travel many times their former mileage, and goods transport vehicles have increased fifteenfold in number and carry heavier loads (the Minister of Public Works has, in fact, estimated the motor circulation on the roads to be thirty times greater than in 1914).

The public financial burden amounted in 1927 to nearly 2,500 millions, of which 614 millions under all forms were expended by the State on the national roads (Parliament voted 530 millions for 1928 as against 34 millions for 1913) The State however collected 1,197 millions in taxes and duties on petrol, and the automobile tax for 1928 was budgeted to provide the State with 538 millions and the local authorities with another 100 millions. The total cost to all public authorities is, however, elevenfold that of 1913.

Railways.—The railway mileage of France in 1927, including the 1,400 miles of Alsace-Lorraine, was approximately 27,300 miles, and new construction proceeds Besides the seven main systems, the secondary lines show a total mileage of 6,200; they are subject to the law regulating the tramways (length 4,300 m) It may be noted that there are approximately 150 public automobile services, State-authorized or State-supported, in some fifty departments, which employ 2,900 vehicles Many of these are linked with railway services

Two main systems are administered by the State: the Alsace-Lorraine and the State Railways The latter (length, 5,700 m) composed mainly of the lines of the former *Ouest* and of former minor concerns, connect Paris with Normandy (Havre, Rouen, Dieppe, Deauville, Caen. Cherbourg), Brittany (St Malo, Rennes, Brest, Nantes), the west and south-west (La Rochelle, Saintes, Bordeaux); but its considerable territory is mainly agricultural and sparsely populated. The taking over by the Paris-Orléans system (4,900 m , serves, beyond Orléans, Tours-Poitiers-Bordeaux, Tours-Angers-Nantes-St Nazaire, Vierzon-Limoges-Toulouse) of at least a part of the State system in territory into which it itself runs, as in south Brittany or in the area Nantes-Bordeaux, has been proposed, and certain areas have voted in favour thereof.

Under the far-reaching scheme of general reforms introduced by the Railways Law of Oct 1921, the separate railways were

left independent as regards their internal administration, but there was instituted the Superior Railways Council, having representatives of the State, the companies, the workers and several other private and public interests, including users and ordinary consumers Its principal functions consist in the supervision of the general working, the issue of guiding principles for the collaboration or better working of the units, as for example the establishment or alteration of common freight or passenger rates, the uniformity of rolling stock types or line equipment, the conditions of service of railways workers One important concrete foundation was the establishment of a common fund or pool, into which in principle is to be paid the excess of receipts over expenditure of the component companies, and from which is to be made good the deficits of any company On the institution of this new system, the State relieved the companies of a total indebtedness of 13,020 million francs, having already made full provision for the reconstruction work of the three systems (Northern, Eastern and Alsace-Lorraine) which were situated in the war zones. In the six years 1921–27, when the common fund only received comparatively insignificant sums as excess over expenditure, but had to disburse between 4,000 and 5,000 millions, the necessary resources were obtained by advances from the Treasury which required the railways to issue debentures, but the payment of loan charges for loans issued in the six years was assured by the State This new system has worked well It provides a co-ordinating authority that has tended greatly to increase the general efficiency and more economical working of the railways, it has already expedited many technical reforms

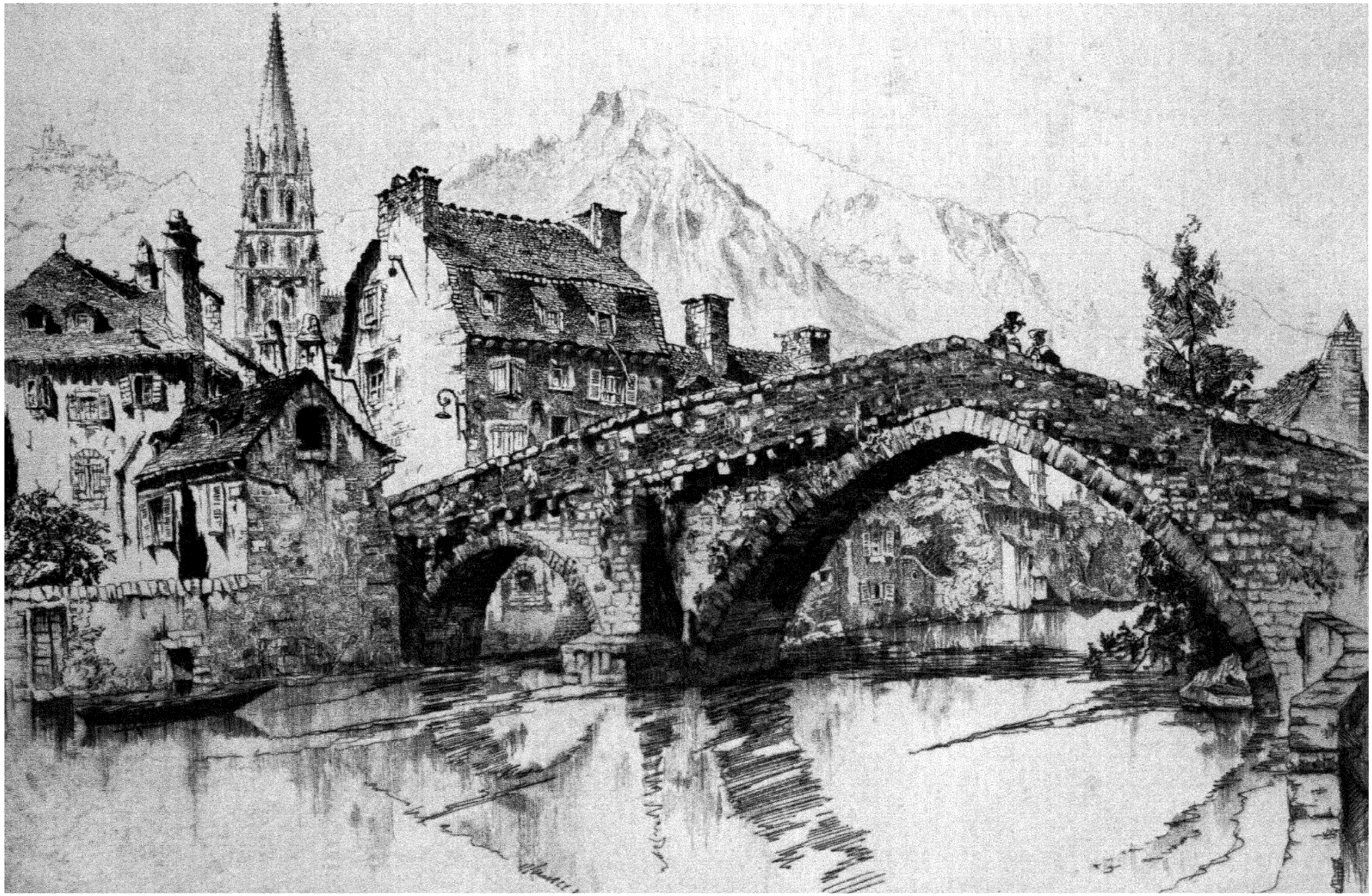
The electrification of French lines has made good progress; about 800 m. out of the after-war scheme of 5,000 m have been electrified The Southern (Midi), which had before the war electrified 142 m , has been the most active, and shows now a total of 500 m ; and by 1930, by having electric traction over 650 m out of the total 2,000 m. of that system destined to be so transformed, it reckons to dispense annually with 500,000 tons of coal Energy is derived from four water-power stations in the western and three in the eastern Pyrenees Of the 2,000 m planned to be electrified on the Paris-Orléans system, about 150 have been completed

The French Railways are more efficient and more comfortable than in 1913 In 1926 they carried 801 million passengers and 320 million tons of goods (against 525 and 193 million in 1913) The general direction has been centralized, with the results above enumerated The mileage is greater. the permanent works and ways have been thoroughly repaired after the war damage; rails and sleepers have been entirely replaced over a great proportion of line The rolling stock equipment is far larger (at present 21,000 locomotives and 590,000 trucks and carriages), its quality, interior fittings and conveniences are much improved, and sleeping-car and restaurant services have been developed. Apart from the new stations building in the devastated areas, new modern central stations have been built elsewhere (*e.g*, Rouen, Limoges, La Rochelle, Nice), new maritime stations are built or planned (*e.g.*, Dunkirk, Cherbourg), and nearly all the Paris termini are being improved and greatly extended The financial position has also shown improvement as a consequence of the repeated increases in rates since 1918, they have been raised eight times, and for 1928 a further rise in freight rates has been announced For the first time, the common fund showed a net surplus of 560 millions in 1926, of which 500 millions were allocated to repay to the State the amount payable by it in 1927 as charges on loans issued from 1921 to 1926 by the companies. In 1927 the total deficit was 822 millions, or 322 after deduction of the said 500 millions. In 1928 the deficit will be greater by the fact that the common fund has no resources to meet the annual loan charges of at least 500 millions· the deficit at first estimated by the railways at 1,650 millions is now put at 980 millions, although new wages increases alone will involve the outlay of 350 million francs. Receipts in 1926 and 1927 reached 13,373 and 13,377 million francs (2,022 millions in 1903), and ordinary expenditure 10,154 and 10,269 millions (1,276 millions in 1913), but the charges plus bonus on working, amounted to 2,640 and 2,693 millions (822 millions in 1913, exclusive of Alsace-Lorraine). These immense new annual charges have been due in large measure to directly or indirectly productive expenditure, *e.g*, on electrification (and new electric stock, locomotives, etc.), improvements in permanent way, new rolling stock, building of dwellings for employees, and so forth, but outlay has been swollen by the greatly increased costs, by the high rate of interest and by taxation Ordinary expenditure has been much increased also by the effect of the eight-hour-day—the number of railway workers on the six main systems (*i e*, excluding Alsace-Lorraine) rose from 356,000 in 1913 to approximately 479,000 in 1926 Wages and salaries have also risen (in 1928 the coefficient of increase is 5 8, 6·4 and 7 for married workers at Paris, with 1, 2 and 3 children, respectively, the minimum Paris rate, inclusive of 3,000 francs but exclusive of family allowances, being 9,450 francs, against 1,850 francs in 1913), and in 1926 represented 41% of the working expenses

WATERWAYS, PORTS AND SHIPPINGS

Inland Waterways.—In the forty years before 1914, the kilometric tonnage of the French inland waterways had quadrupled, but the war wrought great damage, so that the traffic tonnage of 42 millions in 1913 had recovered by 1921 only to the extent of 19½ millions Great advance has since been made (30·5, 37 and 39 million tons for 1922, 1925 and 1926, and for 1927, over 42 millions are anticipated) Of the French rivers, which have a navigable length of 3,800 m , and carried 21, 19 and 20 million tons in 1913, 1925 and 1926 respectively, far the most important is the Seine, which is navigable for 350 m , has several navigable tributaries, and is connected with the north, east and south by various canals merely over the 7 or 8 miles of its Paris stretch, it carries annually nine million tons The Scarpe, a tributary of the Escaut on its right bank (after having traversed Arras and Douai) with a navigable course of 46 m , shows a great coal tonnage, others of importance are the Escaut (40 m), the Rhine (56 m navigable along French territory), the Marne (115 m), the Lys (45 m), of the long rivers, the Rhône is navigable for 300 m , the Saône for 230 m , and the Loire for 130 m , but for various reasons are comparatively little used for goods traffic The South-Western rivers, the Garonne (navigable length, 240 m), the Dordogne (170 m), the Adour (72 m), are likewise hardly used beyond Bordeaux, Libourne, and Bayonne, respectively French canals, which have a total length of about 3,300 m , carried in 1913, 1921, 1925 and 1926, respectively, 21, 9, 18 and 19 3 (in 1927, probably 21) million tons The bulk of this traffic occurs in the area to the north and north-east of Paris, the goods mainly carried being fuel and building materials for the capital, and fuel, ores, building material and heavy agricultural products to various destinations within the same area, or to and from Belgium There are about 550 inland navigation ports (224 on rivers, 325 on canals), of which 30 show an annual in and out traffic of more than 200,000 tons, Paris, Rouen, Strasbourg, with about six others on the Seine or in the north, showing over one million tons Waterways connections are accordingly seen to exist between Paris, Belgium and Germany, and between Paris and the distant home areas of the Vosges, Lyons, the centre, and Burgundy, so that goods from Nancy, Strasbourg, Besançon, Lyons, Nevers, Djion, and elsewhere, reach the capital and the sea by waterway

State policy for generations has not ceased to promote the development of internal navigation, and within the last fifty years three national programmes (1879, 1903, 1921) have obtained legislative sanction, though not subsequent fulfilment in every particular In 1912 was established the National Office for Internal Navigation, designed to exercise central control and guidance, to further in every way the technical development of internal navigation and (especially since 1920) to take an active part even in its equipment and management. The yearly State appropriation is fairly substantial: that in 1927 was 117 millions, of which 57 was for new constructions, 39 for maintenance, and 21 for repairs of war damage, and that in 1928, 125 millions (the German National Budget allotted for 1927–28 for new canal



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THE BRIDGE OF NOTRE DAME AT MENDE

An etching, by John Taylor Arms, of the 14th century bridge crossing the river Lot at Mende, a small city in the Cevennes, in the department of Lozere in the south of France Mende is on the principal avenue of approach from the north to the gorge of the Tarn The spire of the 15th century Gothic cathedral is seen on the left, in the distance is the Ca sse de Mende, a mountainous wall rising 1,100 feet above the town

building was twelvefold that amount with 110 million marks for construction, plus 36 millions for improvements).

Of the three greatest French modern waterway projects, the Marseilles-Rhone canal, the Rhone development scheme, and the Grand Canal of Alsace, only the first-named has made real headway This canal has a minimum depth of 8·3 ft , and comprises two sections in its length of 51 miles The second part, which was completed in 1926 after over 20 years' work, and at a cost of over 200 million francs, is likely to have a great influence on Marseilles as a port, as the Etang de Berre provides in its quite close proximity an outer spacious harbour for the reception and distribution of heavy goods for the interior and within the Marseilles urban area The ambitious scheme for the development of the Rhone from the Swiss frontier to Arles, with the threefold object of making it navigable to Geneva, of obtaining about one million horse-power from a number of power stations (Valence, Montélimar, Avignon, etc), and of irrigating the adjacent lands on both banks, which was to have been undertaken by a semi-public organization with a capital of 360 millions, with the participation of the State, the municipalities (*e g* , of Lyons, Paris), the departments affected, the Paris-Lyons-Mediterranean railway, and of other public and private bodies and persons, has not yet materialized A beginning, however, is now probable with the construction of the first part of the Grand Canal of Alsace

France acquired much equipment for its Rhine traffic as a result of the Treaty of Versailles, having received in river boats about 300,000 tonnage, and in tugs a total of 33,200 h p , besides equipment such as cranes, metal moving-bridges (*ponts transbordeurs*), silos and sheds

Although since 1914 the production of power by the French water courses tripled from 647,000 to 1,900,000 kw , yet over two-thirds of the estimated capacity remains undeveloped Lack of money rather than of plans has delayed progress in recent years The present power is produced mainly by the waters of the French Alps, the Savoy and Provence (60%) and of the Pyrenees (25%), but some important works have been established recently on the Dordogne, the Truyère and the Creuse

Ports.—Few ports with exceptional natural advantages are to be found along the lengthy coastlines of France The principal existing Mediterranean ports, Marseilles, Toulon, Cette, Port-Vendres, had relatively few natural harbour facilities or convenient spaces for docks or warehouses at their immediate disposal, either being cramped at the foot of hills, or, like Cette, having low levels and waters on the land side; and some considerable ports in earlier ages, such as Narbonne and Aigues-Mortes, have ceased to be.

The principal ports are Marseilles, Rouen, Havre, Bordeaux with its outports, Dunkirk, Nantes, St. Nazaire, Cherbourg, Boulogne, La Rochelle-La Pallice and Calais Their relative position may vary according to the standard of estimates adopted (tonnage of ship entries and clearances, tonnage of goods handled, passenger traffic). Cherbourg, now mainly a port of call for transatlantic liners, showed in 1925 a superior ship tonnage (21·9 millions) to Marseilles (18·7), Havre (8 5), Bordeaux (3·7) and Rouen (3·2), but these and others have greater real significance as places of maritime and trade activity. For passenger traffic, the leading ports are Marseilles (about 700,000 in and out annually), Boulogne (550,000 to 600,000), Calais (500,000 to 580,000), Havre (in 1926, those to and from foreign countries, 306,900), and Cherbourg (from 68,700 in 1913 to 200,000 in 1926). Marseilles, which has the practical monopoly of the passenger and goods traffic for the Rhône valley and the south and south east of France, for north and east Africa, for the Near and Far East (it has been a great beneficiary of the Suez canal, but its great Mediterranean rival, Genoa, by reason of the Alpine tunnel routes to Switzerland and the Rhine, has diverted to itself much traffic) is the leading port. Rouen, the second port, leads for coal imports (3 to 4 million tons) and for mineral and other oils (800,000 tons); Havre for cotton, coffee, oils, and the export of luxury and valuable goods; Dunkirk for wool, jute, linseed; Bordeaux for imports of products from Morocco, Senegal and Martinique (*e g* , ground nuts, rhum, sugar), and for exports of wine and pit props; Boulogne and Fécamp for fisheries. It may be noted as a characteristic of French maritime traffic that, as a consequence of the necessity of importing in large quantities coal, copper, petrol, cereals and other heavy raw materials, and of the predominant character of French exports (textiles and other manufactured goods), there is a wide disparity between the weight of the imports and of the exports, the latter being about one-third of the former. The two important inland river ports are Paris and Strasbourg: at Paris about 6½ million tons are annually discharged, and about 2 million loaded

Brest and Toulon may be regarded as almost solely naval stations and arsenals, although certain attempts are being made to develop the commercial traffic. At Cherbourg, which with Bizerta under the 1925 Government Bill was to rank as auxiliary arsenal but to be reduced in peace time, the work of the old arsenal appears to be concerned for some years only with ordinary ship repairing. Lorient, under the same Bill was to specialize in shipbuilding, but by the State construction of the fishing port Lorient-Kéroman (opened in 1927), it appears likely to lose its naval port character

The State has played a great part in all matters connected with French ports since the Napoleonic period and their construction, maintenance and administration are still subject to the Ministry of Public Works. The prior authorization of the State is no longer obligatory before undertaking new works, but as the State makes large grants for improvements, it retains an effective control. for all the other ports the centralized system remains, and in 1924 there were created by decree as directors thereof, engineers of the State service. The extent of the annual State grants for capital expenditure has been considerable having been 19·5, 16·5, 70 and 122 millions in 1912, 1913, 1918 and 1919, but since 1920, owing to the financial stringency, they became lower in gold value, having been 42, 31, 28, 26, 23 and 20 millions in the years 1920–25 The tendency is growing to hand over a greater part, not only of the financing, but also of the management of French ports to the Chambers of Commerce, which are powerful bodies in France regulated by law In the national programme for the improvements and extensions of the principal seaports (16 in number) regarded as indispensable which was presented by the Ministry of Public Works to the National Economic Council and approved, the total expenditure is estimated at 1,478 millions, of which the State would provide 649, and the local interests 829 millions

For the handling of goods, large new provision has been made since 1914 The total length of quay railway lines has increased by about 650 miles Cold storage plants have been erected at Havre, Dunkirk, Kéroman-Lorient, St Nazaire, La Pallice and Marseilles. In some cases (*e g.*, Marseilles and Strasbourg) large cereal warehouses or silos have been built Ship repair facilities have been increased by the building of dry docks or by the acquisition of floating docks.

Mercantile Marine.—The French mercantile marine, whose gross tonnage rose from 1,793,300 in 1913 to 3,362,000 tons in 1927, now ranks as fifth in the world, after those of Great Britain, the United States, Japan and Italy (3,395,500 tons), but is still before that of Germany (3,320,500 tons). Both Italy and Germany have a far larger tonnage under construction than France (227,000 and 408,000, respectively, against 137,000 tons). According to an official statement, 800,000 tons of the French mercantile marine are now represented by vessels of over 20 years of age, which will be unusable in a few years, and new annual building of 150,000 tons will be necessary to maintain its present total figure One noteworthy change in French shipping is the reduction in its formerly unusually high tonnage of sailing vessels, which from 561,000 tons in 1914 sank to only 168,000 tons in 1927: this change is due, partly to the opening of the Panama canal, which has brought more steamers into the nitrate and corn carrying trades, partly to the greatly increased utilization of steam trawlers in French coastal and distant fisheries, and not least to the general trend towards the elimination of the slower type. At the present time, out of a total of 4,700 vessels, about 2,600 are steamers: in 1926 none, and in 1927 only one, sailing vessel of over 100 tons was launched in France, against

34 and 21 steamers or motor-driven vessels Notable features in recent years have been the appearance of several large steam trawlers (1,000 to 2,000 tons), the increase of cold storage vessels (now about 65 in number), mainly used for the growing import meat trade, and of oil tankers, whose gross tonnage has grown since 1919 from 30,000 to 300,000 tons. Several great liners, *e.g*, the "Paris," the "Ile de France" (43,500 tons), have been launched in recent years for the Atlantic service, and two liners of 15,000 tons were built in 1927 in Germany as reparations in kind for use on the Indian ocean services

In French vessels is now carried a larger proportion of the total imports and exports: the percentage of tons of goods imported in French ships was 36% in 1925, against 17·3% in 1913, and that of the exports was 38 1, against 35 8%

The French shipping trade has undergone the same concentration tendency as in many other countries, and is now controlled by a few concerns The largest company directs a fleet of 73,000 tons (with financial interests in another 181,000 tons), and there are two groups which with their affiliated companies direct a total of about 580,000, and of about 380,000 tons, respectively, relations appear to be maintained between several undertakings within these groups by means of directors common to two or more affiliated concerns State aid is no longer given directly for shipbuilding, but subsidies are paid to the shipping companies for the mail and other services A new government measure for financial assistance for shipbuilding through the agency of a maritime credit institution (*Crédit maritime*) was introduced early in 1928, whereby the great French mortgage bank known as the *Crédit Foncier* will undertake to place for five years an annual average sum of 200 million francs at the disposal of shipowners for the building or purchase of ships

THE NEWER COMMUNICATION SERVICES

Postal and Wireless Communications.—The State postal and allied services for communications purposes have shown some noteworthy developments since 1913 Post offices had increased from 14,600 to 16,100 at the end of 1925, pillar boxes from 84,500 to 91,000, and the total of all units carried (letters, cards, printed matter) in the year from 3,397 to 5,677 millions Postcards had diminished, as had the pneumatic missives (17% less than in 1913). The payment on delivery system had made notable progress in number of items from 16·7 to 31 millions, and in turnover from 17 to 500 million francs. The institution of the postal cheque in 1918 proved highly successful. the number of accounts grew from 9,012 with credit balances of 187 millions in that year, to 316,820 accounts with 3,357 millions as balances in 1926 Aerial telegraph lines increased from 121,000 to 220,000 miles in total length, and offices from 23,117 to 29,923, but the use of the telephone for medium distances and the extension of wireless somewhat affected the actual traffic (in the years 1923–25 it was 3 5, 4·3 and 8% less than in 1913).

Telephonic communication has immensely developed (subscribers in 1925 totalled 709,000 against 310,000, the telephonic staff 15,758 against 7,952), although France still occupies a very low place (about the 20th) among nations as a telephone user, showing less than two per 100 inhabitants, and even Paris and Lyons showing only 5 52 and 2 15 per 100 inhabitants. As a result of much aerial construction, Paris connections with foreign capitals (*e.g*, Madrid, Zurich, etc.), have also been greatly improved in late years The installation of the Rotary automatic telephone system has already made progress In Bordeaux the transformation for 10,000 subscribers was completed in 1927 in Paris, 4 new central stations, each with 10,000 lines, will be finished in 1928, and about 1940 it is estimated that 40 such stations will be ready

Wireless telegraphy has become popular in France, although it has not yet attained the same remarkable vogue as in Great Britain, Germany or the U.S.A (a French statement that the value of wireless manufactures in France in 1926 reached only 500 million francs indicates the relative position in this respect). It is especially practised round Paris and Lyons and in the north and east, where the good contacts with English and German stations are largely utilized No stations of the same power as Daventry or Chelmsford have yet been created in France, where the most powerful are St. Assise at Melun near Paris (with two emission stations, one the *Continental*, 22 kilowatts and wave length 1,500 metres, and the second the *Transcontinental*) which is in private hands, the Eiffel Tower (12 kilowatts) in Paris, and the Bordeaux-Lafayette at La Croix-St.-Hins, both belonging to the State The State conducts a wireless station (with 500 watts, which may be raised to 10 kilowatts) at its higher school in Paris, and has established regional stations with rather low powers at Lille, Lyons, Toulouse, Marseilles, Grenoble and Rennes

French writers incline to ascribe the slower development of wireless in their country to the lack of really powerful stations, and to the absence of central direction, so that the various broadcasting stations (*e g*, in the Paris region) may use their own various wave lengths Powers of control to be taken by the Government were indicated by the decree of Dec 1926 (whose provisions have still to be ratified by Parliament). liberty is to be left to the small private wireless installations, but for broadcasting purposes there are to be established three great national stations and eighteen regional stations, which are to be worked by the State or under conditions permitting the eventual cession of the undertakings concerned to the State As from 1933, the State will become proprietor of all broadcasting stations which it will work in entrusting the programmes to collective organizations representing public bodies, great representative associations of trades or occupations such as the wireless industry, authors, composers, press, as well as the general public

Civil Aviation.—France, like other countries, has given substantial subsidies to civil aviation In the five years 1924–28 State grants amounted, respectively, to 138, 153, 143, 169 and 194 millions Individual air transport companies received large annuities from this source· in 1928 the company operating the new service France-South America is allotted 39 millions with an additional 23 millions for other services, and those operating the Paris-Constantinople and the London-Paris-Paris-Marseilles lines received in 1927, respectively, 20 and 17½ millions Although traffic has indeed greatly increased since 1919 (passengers from 588 to 25,010 in 1925, goods from 8½ to 1,114 tons, and postal goods from one to 173 tons), yet the monetary returns are still far from meeting the outlay involved Within France distances are rarely sufficiently great to attract passengers or goods to the use of internal services, and after various trials the purely internal passenger services may be regarded as abandoned The fairly successful external services have been chiefly fed by foreign travellers Save with Great Britain, the foreign services appear unprofitable, mainly because traffic eastwards and southwards into Europe is confronted by the competition of important native undertakings (*e.g*, Germany, Italy, Switzerland), which tend to secure passengers into and from their surrounding border countries. The air services are, however, much utilized by the postal authorities, especially for North Africa and Senegal (in 1923–25, letters carried thither numbered, respectively, 2,958,000, 4,026,000 and 7,500,000); and it has been decided to establish as from March 1928 an air postal service from France to South America. It is likewise proposed to create about a dozen internal night mail air services between Paris and important French centres and between Bordeaux and Marseilles and Marseilles and Alsace-Lorraine In 1927 there were five aerial navigation companies.

The aircraft industry in France has enjoyed much prosperity in recent years. It receives a large measure of State support (36, 40 and 40 millions in 1926–28 for industrial investigations and experiments), and large prizes are offered to the manufacturers of aircraft and of motors whose products gain records.

SOCIAL CONDITIONS

Unemployment.—No national compulsory unemployment insurance scheme is yet in operation in France. In April 1928 was promulgated, however, the Social Insurance Law voted in March, in accordance with which all workers in receipt of wages not exceeding 18,000 francs a year must contribute to a scheme which insures the risks of illness, premature unfitness, old age

and death, and participates in burdens connected with maternity and unemployment. The sole benefit under the last-named head consists in the payment for the insured, for a maximum period of three months in any one year, of the 10% illness insurance contribution. The law, which is likely to be subjected to revision, cannot become operative until 10 months after the issue of the administrative orders for which a limit of a year is allowed The only available unemployment record of any scope consists in the weekly returns of the numbers of recipients of unemployment benefit from 233 local and 31 county unemployment relief funds These funds, which are seen to be maintained by a relatively small proportion of these public authorities, are non-contributory for the worker, and may receive aid from the State, which may also make grants to the unemployment funds created by trade unions or by friendly societies Their records, although they are not as broadly based as those of Great Britain or Germany, and cannot provide any percentage figures for whole trades, yet may be regarded as indications of prevailing conditions, having been kept on the same basis for many years A French official figure relative to the years 1911–13 (but not available for subsequent years) gives the percentages of trade unionists unemployed as averaging 5·7, 5·4 and 4·7, respectively, for these years Since the close of the war, save for about nine months after the economic collapse in the summer of 1920, and for four or five months in 1927, unemployment has been non-existent in France, which has enjoyed an unbroken span of tense industrial, commercial and agricultural activity The relief funds assisted (average monthly totals for the five years 1922–26) 5,122, 1,900, 695, 705 and 1,289 persons The movement in these records was completely confirmed by the fact of the unceasing stream of immigration of industrial and agricultural workers into France over the same period, or by the slackening thereof in 1921 and in 1927 In 1928 France appeared to have settled down into a phase of good regular employment after the feverish period which ensued in 1922–27 through two principal causes—(1) the immense credits set in motion through loans for the reconstruction of the devastated areas which gave great buoyancy and purchasing power in the home market, and (2) the depreciation of the franc in relation to the currencies of many strongly absorbent foreign markets (*e g.*, Great Britain, North and South America, Spain, Holland, Switzerland), which induced an immense increase in both the visible and invisible exports thereto.

National Thrift.—The two definite institutions of a public nature for the receipt at interest of the savings of the people are the National Postal Savings Bank (established by law in 1881) with approximately 14,000 receiving offices, which is managed and guaranteed by the State, and the so-called private savings banks, which date back to 1818, and which transact a far greater volume of business, about 560 in number with 1,900 branches. They are local undertakings established by decree on the initiation of the local authorities, and managed under rules corresponding to those applicable to public institutions. Freedom of investment of their deposits is not permitted; all deposits must be lodged with the State institution known as the Deposits and Consignments Fund. Certain particulars respecting the operations of these institutions are here given: in both groups total deposits and average accounts are seen to fall very far short of the fivefold multiple required to bring them to the gold value of the pre-war figures.

It must be emphasized that for few countries less than for France have savings bank transactions been a just test of popular thrift, and that this fact has acquired more than usual validity since 1919. For generations nearly all classes (including peasant proprietors, domestic servants of both sexes, commercial and industrial workers) have been wont to invest considerably in State, departmental, municipal, railway and other standard securities home and foreign (*e.g.*, apparently there are 1½ to 2 million French holders of pre-war Russian securities). The bulk of these were bearer, therefore easily transferable, and purchasable in small amounts. Investment in foreign securities by people of small means has waned as a result of bitter European experience since 1914. National defence bonds of various denominations from 100 francs have absorbed in streams since their creation (1914) the popular savings, as they have offered a better interest, payable in advance

Year	Deposited	Paid out	Total deposits end of year	Number of accounts	Average of accounts	Accounts to 1,000 of population
		Million francs		Thousand francs		
(a) *Post Office Savings Bank*						
1910	625	583	1,709	5,786	295	146
1913	660	630	1,818	6,406	283	163
1920	1,016	819	2,354	6,983	399	176
1925	1,679	1,295	3,936	7,417	528	172
(b) *Private Savings Banks*						
1910	1,002	902	3,933	8,283	474	211
1913	1,006	942	4,011	8,660	463	218
1920	1,961	1,415	5,795	8,755	662	223
1925	2,052	2,051	9,830	8,880	1,087	236

Relief of Poverty.—Public assistance to the necessitous in various conditions and circumstances has been legislatively ordained since the Revolution, and much additional legislative provision of diverse kinds has been instituted under the Third Republic The ordinary poor law relief is administered through the local relief offices known as *bureaux de bienfaisance,* which, directed by committees appointed by the local authorities, provide assistance at domicile, and other assistance, whether in kind in the form of coupons for food, fuel, clothing, or in money as rent advances, repatriation allowances, and others. In Paris each of the 20 districts maintains its bureau Exclusive of the capital, the numbers annually relieved in France by these organizations from 1871 to 1912 ranged from 1½ to 1¾ million, but since 1920, no doubt owing both to the persistence of brilliant economic conditions and to the institution of other relief services, the annual average sank to about 750,000 Public medical relief is provided on a large scale "Every sick French national, without resources, shall receive gratuitously from the commune (local authority), the department or the State, according to his domicile for relief purposes, medical assistance at his dwelling, or, if proper care cannot be there afforded, in a hospital" (law of July 15, 1893). This gratuitous medical assistance, organized by the department and supplemented by subventions of the local authorities, was provided before the war to two million persons annually, and since the war to 1 6 million, of whom both before and after the war 800,000 were attended at their dwellings, and (since 1920) from 150,000 to 180,000 at hospitals Hospitals and homes for unfit, incurable or aged persons under the general public scheme, which in 1924 numbered 1,836, of which 208 are classified as hospitals, of which 36 in Paris, 478 as hospices (34 in Paris), and 1,150 as combined hospitals-hospices (7 in Paris), treated annually 1920–24 from 750,000 to 820,000 persons, and housed at the end of each year from 67,000 to 76,500 unfit or aged persons The number of children assisted annually is about 180,000 at the cost of approximately 110 million francs. of aged 70 years and more, about 370,000, and of unfit and incurable, about 185,000 Of 107 existing lunatic asylums, 73 are maintained by public funds. Special public institutions take care both of abandoned children or of children of persons who may renounce all control of their children By laws of 1913, 1917 and 1919 a daily maternity allowance (in Paris of about 2 francs) may be accorded to mothers "without sufficient resources," which has been interpreted to apply in cases where fathers' daily earnings do not exceed 24 francs; and a monthly nursing bonus of 15 francs may be paid during 12 months benefit cases under the former and under the latter heading now number 300,000 and 250,000 a year. Heads of families of over 3 children may also receive under certain conditions a yearly State allowance of 90 francs for each after the third up to the age of 13 years. Public health provision since 1916 has included the institution of 500 to 600 dispensaries, besides sanatoria or preventoria with 12,000 beds, mainly for consumption prevention or cure. The State has assumed the burden of the education and protection up to majority of all children whose father, mother or family sup-

port died through war service (about 700,000 children have come under this scheme), and the provision of free board, lodging and education for those mutilated in the war (*e g*, schools for the blind, limbless, etc)

Important public provision is also made towards the old age pension scheme In 1850 was created the National Old Age Pension Fund under the guarantee and practically under the control of the State, which aimed at providing annuities on the voluntary contributory system from 1920–24 about 700,000 policies representing annuities of about 140 million francs were in operation But in 1910 was introduced for wage earners of both sexes in non-State employment a compulsory contributory system (State, masters, workers) payable at sixty for those in receipt of under 3,000 francs a year, and optional for those with from 3,000 to 5,000 francs, and for agricultural labourers and small masters with only one non-own family worker Miners and sailors come under special regulations (miners are entitled after 30 years' service and at age of 55 to 3,000 francs a year, and their widows to 1,800 francs, besides invalidity pension of 2,160 francs) At the end of 1924 the number of persons under the insurance obligation was 7,735,000, and of optional insurers (in 1922) 286,300 It should be added that in France a large number of important undertakings both in industry and commerce possess their own old age pension schemes also on a contributory basis, or supplement their statutory obligations in this respect A large proportion of the aid societies (*caisses de secours*) attached to so many factories also maintain old age schemes providing larger than the statutory annuity

Wages.—The only available official wages indices, given in the following table, which are based on returns of normal earnings in 21 ordinary male occupations in Paris, and on 38 male and 7 female occupations in provincial towns, show (1) that in 1927 in the capital daily male earnings are five and in the provinces six times those of 1911, but that hourly earnings have advanced in greater proportion, and (2) that female earnings in the provinces have risen in greater ratio than those of males Hourly earnings are greater because daily earnings tended to be maintained on the old scale although the day was shortened by law to 8 hours from the predominate number of nearly 10 Female wages in the Paris area may be said to have also increased in greater ratio than those of males, *e g*, in the dressmaking and domestic service occupations the indices for various categories reach 650 to 690

Indices of Wages (1911 = 100)

	1921		1924		1926		1927	
	D	H	D	H	D	H	D	H
Paris (21 occupations)	354	423	393	473	510	583	513	585
Provinces								
Men (38 occupations)	410	502	477	570	584	700	593	720
Women (7 occupations)	412	509	496	600	668	809	648	787

D = daily and H = hourly

As regards wages in certain staple occupations The available figures show an index of 576 for the French coal miners (excluding certain benefits such as houses at nominal rents for nearly half of all coal miners, medical attendance, pension contribution, etc) In the Paris area for 380,000 metallurgical and engineering workers the general index is 564, with 521 for skilled and 603 for semi-skilled In these trades the family allowances give an addition of about 12% per worker with 2, and from 20% per worker with 3 children Railway workers' index is 558 for man without children, 675 for one with two children State manual workers (State servants total about 800,000) have abundantly partaken of the increase in wages: *e.g.*, foresters in receipt of 800 francs in 1913 now receive 6,900; canal lockmen formerly 550 to 700, now 6,900 to 8,500 francs. Perhaps the present general coefficient for the earnings of manual workers may be put as at least 8½, as the minimum annual wage is fixed at 8,000 francs, and family allowances are payable. In 1927 the French Prime Minister stated in Parliament that the index figures for the various categories of smaller salaried workers ranged from 550 to 700, and for the upper salaried workers was 160. Subsequent increases bring these indices to from 616 to 784

Prices.—In general in 1927, wages had quite overtaken prices The cost of living index figure averaged 498 for that year. Rents, however, which are reckoned at 12% for weighting purposes, have been subjected to restrictions, and show still an index of only 275. As to the food group (60% for weighting purposes) it may be noted that it comprises only 13 items, of which coffee and wine are not included

Indices of Prices (1914 = 100)

	1921	1924	1926	1927
Wholesale				
General index (45 commodities, of which foodstuffs 20 commodities)	338	499	718	630
	348	442	619	584
Retail (13 commodities)				
Paris	306	360	574	539
Provinces	352	401	610	553
Cost of living, Paris region	297	377	545	498
Sterling rate (1914 = 25 13)	51 93	85 18	153 25	123 88

Important Social Changes.—Certain social changes of great importance have been enacted since the close of the war The introduction in 1919 of the compulsory 8-hour day was indeed epoch-making for a country where the 59 or 60 hour week was still customary in most trades (with 54 to 57 hours in a few skilled and organized trades), where the previous legislation permitted 12 hours of effective work, where one compulsory weekly day of rest, not necessarily Sunday, had been introduced only 13 or 14 years earlier, and where the Saturday half-holiday was extremely rare either in commerce or in industry Its immediate complete and general application under these conditions would have been subversive of the national economy, so that it was provided that its application would be determined only by special decree, after consultation with the organizations of the masters and of the workers representing a whole industry, trade or craft, and for the whole territory of France or for a section thereof In general the unit for distribution of the 48 hours was the week, but in certain cases the two-weekly unit was taken Permanent or temporary dispensation authorizing over a whole yearly period additional rations of working hours over the 48, but so as not to exceed as a rule 9 hours any day, were also determinable by the decree Up to 1927 about 50 decrees had been promulgated covering about 4½ million workers (agricultural occupations do not come under the law, and the mercantile marine and the mining industries are mainly regulated by special laws) All State workers also are liable only to an eight-hour day The 1919 law has in effect reduced the ordinary manual worker's day to an average of about 8½ to 8¾ hours for the decrees usually allow a regular annual addition of 100 to 120 hours (even more, *e g*, 150 in retail trade, in the building, paper, textile, pottery and porcelain trades, 200 feather dyeing, fur making-up and some occupations in the wholesale and semi-wholesale trades), plus exceptional or temporary additions, or compensation for time lost through the collective interruption of work due to accident or *force majeure*, or to public holidays or local *fêtes* (this compensation allowance for holidays means that a considerable part of the 64 or 72 hours of annual holidays may be recovered within the 48 or 96 hour period in which the loss occurs)

Family Allowances.—The most widespread innovation in the industrial welfare domain has been the generalization of the family allowance system Its payment has become the established practice not only in the case of State employees of practically all grades, who total 700 to 800 thousand persons, but also generally in the railway, mining, metallurgical, engineering, chemical, textile, printing, building and transport trades. There are in existence about 200 clearing houses or compensation funds formed by masters for the execution of their liabilities, which embrace 14,000 to 15,000 factories with approximately 1,400,000 wage-earners. The amount of the allowances means a considerable addition to the well-being of the recipients—the mining

companies allow 3 francs a day for each of the first two, and 2 50 francs for the third and fourth, child, railways may allow 804, 1,608, 2,910 and 4,212 francs a year to workers with 1, 2, 3 and 4 children and the textile trades of the north, 2 30, 5 75, 9 20 and 13 80 francs a day for 1, 2, 3 and 4 children

Other widespread forms of welfare provision in French industry are housing schemes. The mining industry houses about 40% of all its workers, many great metallurgical, engineering, rubber and textile firms make large provision in this respect

(J R C)

HISTORY

The history of a people is determined by the land which they inhabit. Geographically, France occupies a very happy position between continent and ocean Situated at one extremity of that indented peninsula known as Europe, France is on three sides closely united to the body of the continent—at once and equally a maritime and a land power If her position between north and south made her from earliest times the meeting-place of peoples, she has also had the task of defending on the north and east her very extended land frontier and her long sea-coast Hence French governments have been ever torn between two essential, but not always reconcilable policies

Earliest Gaul.—The foundation of Marseilles about 600 B C by Greeks from Asia Minor affords the first approximately accurate date in French history. A second and even more important invasion was that of the Celts, or Gauls, a tall, blond race who came from beyond the Rhine and spread themselves throughout Gaul in successive waves of immigration during the course of two or three centuries until it became a celto-ligurian country Settled in distinct tribes, the Gauls never achieved a centralized government The victory of Caesar over the Gauls (57–52 B C) was, above all, due to the fact that he never had to face a united Gaul, until, after six years of spasmodic effort, it united for a day round Vercingetorix only to die heroically at Alesia.

Roman Gaul.—The Roman conquest brought civilization in its train The assimilation of a conquered people is an essential of successful conquest, and in this art Rome was a past-master Roman rule was a harsh but beneficial discipline, and Gaul speedily forgot its independence, although an attempt was made (A D 252–273) to establish a Gallic empire The *Pax Romana* was seen to be preferable to the former anarchy thanks to the existence for three centuries of a common policy, language, religion, and administration, Gaul prospered under the Romans

THE BARBARIAN INVASIONS

Despite the benefits of the *Pax Romana*, the strongest bond uniting Gaul and Roman was their common fear of the Barbarians who thrust themselves unceasingly against the eastern frontier Many times already the storm had burst over Gaul. It had required a Marius to stem the torrent of the Cimbri and Teutoni (102 B C), a Caesar to hurl back the Helvetii into their mountain fastnesses (58 B C) Then the western horizon brightened until the disaster to Varus wounded cruelly the pride of an Augustus. Abandoning the conquest of Germany, the Romans for two centuries entrenched themselves behind the fortified frontier line that ran from Cologne to Ratisbon, affording a protection to which the Gauls gratefully acquiesced. But under the pressure of migrating tribes upon those already settled, the German invasion gradually penetrated across the frontier, now in the guise of colonization, now in that of war Suddenly, at the beginning of the 5th century, owing to a violent forward-thrust of the German tribes, themselves subjected to the pressure of the Huns, the Rhine frontier, denuded of guards by civil wars, was swept away. For 70 years (405–475) the tempest raged over Gaul

The Western Barbarians.—The Barbarians were a group of tribes and not a single nation. For them there was so little question of substituting a Barbarian empire for that of Rome (for which they entertained a superstitious reverence) that their conquests seemed to them illegitimate without imperial ratification. When the first storm had passed, the Visigoths had established a powerful kingdom from the Loire to Andalusia, the Burgundians set up another in the valleys of the Rhone and Saône, finally, the Franks, divided into two groups, settled in northern Gaul, the Ripuarians round Cologne and the upper Moselle, the Salians round Cambrai and the Somme For a last time all the Barbarians, auxiliaries of Rome, ranged themselves under Aetius in 451 to overthrow near Chalons the hordes of Attila. Then the empire of the West retreated over the Alps to die

The Church and the Barbarians.—The Roman Church, which survived the Empire, inherited to some extent the Imperial attitude towards Barbarian Europe Gradually the City of God came to take the place of the Roman State as the guardian of civilization That they might re-establish order, and maintain it, the bishops—"defenders of cities"—sought from the Barbarian kings the support they had hitherto received from the empire in their contest with the Arian heresy (which denied the divinity of Christ and the Holy Trinity) and all the survivals of paganism. But the Visigothic and Burgundian kings were infected with Arianism, and to them the Bishops were inevitably opposed The Franks, who were to give to the land its permanent designation, and who were to play so great a rôle in its history, seemed as yet far from such pre-eminence. they were less civilized than the Visigoths and Burgundians, and they were pagans, and by a double paradox, it was this that helped them Their strength as fighters enabled them to extend their power and keep out fresh invaders, and further, the Church has always preferred pagans to heretics The conversion of Clovis to the orthodox faith was a master-stroke at one and the same time, it made his fortune and that of the Franks A common faith was to become the token of a unified State and the foundation-stone of Christian France

THE MEROVINGIANS

Clovis.—Clovis was the king of only one of the tribes of Salian Franks who, under his father Childeric, had come in search of new lands to cultivate in the rich valleys of the Somme and the Oise When the victory of Soissons (486) over the Syagrius, who represented the Roman power in the west, had brought the power of Clovis to the Seine and then to the Loire, Remigius, archbishop of Rheims, made a swift decision To Syagrius, now a fugitive among the Visigoths, he preferred Clovis, who as an ally could be as useful as he would certainly be dangerous as an enemy For his part Clovis well understood that he would never bring Gaul beneath his sceptre without the support of the Church, and the Catholic Gallo-Romans who were tired of anarchy Clovis laid the foundations of the French state by his conversion to Christianity, due to his wife, Clotilde, and to Remigius, rather than by his victory over the Alemanni at Tolbiac (496). From that time forth his conquests took on the character of holy wars, by the victory of Dijon in 500, Burgundy became subject to him; in 507, by his victory at Vouillé, he set free the whole valley of the Garonne from the Arian Visigoths and forced them back into Spain In order to prevent a possible coalition of the Frankish tribes that had remained heathen, Clovis deposed and assassinated their kings In these murders the Church saw only the divine reward to a faithful soldier and a convert from paganism, and gave her consecration to his triumph by appointing him to preside over the Council of Orleans (511) Clovis, like the Christian emperors before him, became for the Church a new David Finally, the Eastern emperor, Anastasius, by sending him the consular emblems gave a legal sanction to his rule; even as the Church had sanctified his military conquests Thus the Merovingian dynasty was enabled to hold sway for two centuries and a half

The Successors of Clovis (511–752).—After the death of Clovis, his house produced no monarchs worthy to rank with him Neither the Roman law nor the influence of Christianity was strong enough to preserve the unity of the state The custom among the Franks of partitioning the royal domains at the death of each king to the exclusion of the female line, as though the kingdom were a private estate, coupled with the avariciousness of the princes, occasioned constant civil wars. Thus, at the death of Clovis (511) his domains were divided into four kingdoms For 50 years, indeed, his heirs sought to continue his work

and to add to his dominions From 523 to 532 they subdued Aquitaine, Burgundy and Provence, and love of booty brought their armies into Italy and Spain Two centuries before Charlemagne they even attempted the conquest of Germany Owing to the accident of Clotaire I. surviving his three brothers the dominions of Clovis were re-united from 558 to 561 But on the death of Clotaire, his kingdom was once more divided among his four sons, and during the years 567–613, domestic tragedies checked the progress of the Merovingian power, and took the place of wars of aggrandizement and pillage No trace is to be found of any political ideal in the wars between Chilperic and Sigebert Chilperic's murder of his Visigothic wife Galswintha, may have caused her sister Brunhild, wife of Sigebert, to urge her husband to make war, though ambition was urge enough After Sigebert's death Brunhild carried on the strife. Her bitter rivalry with Fredegund, Chilperic's widow, is the thread on which the history of continuous war is hung The central authority grew steadily weaker It was further threatened by the growing power of the bishops and great nobles against whose aggressions Brunhild strove all her life Two landmarks in this struggle are the treaty of Andelot in 587 and the edict of Clotaire II. in 614 by which benefices granted to the aristocracy of high officials were made tenable only for life But these exhibitions of strength were but momentary and could do little to arrest the steady development towards the feudal days (*see* FEUDALISM) The ordinary freeman, unprotected owing to the weakness of royal power, was driven to commend himself to the local bishop or great noble

The Mayors of the Palace.—From the 7th century onwards, the mayor of the palace (*q v . see* also MAYOR), seriously weakened the already failing authority of the kings The palace in those days, as in the time of the empire, and in mediaeval times was the court of the king and the seat of his government The mayors controlled this ambulatory court and in effect, controlled the State, they sought, not only to be independent, but also to establish over the rest of the Frankish kingdom the supremacy of that division over which they ruled Some tried to re-establish a unified Frankish monarchy and the rule of the State over the Church; others, who were distrustful of the idea of a single kingdom, sought above all to assure their own independence For a century (613–714) these two opposing tendencies can be traced After a brief revival of the royal power under Dagobert (628–638) there ensued its long decadence with meaningless partitions, perpetual minorities, the ever-increasing power of the mayors over the *rois fainéants*, and, finally, the duel between the Neustrians of the West and the Austrasians of the East, and the great conflict between Ebroin, mayor of Neustria, and archbishop Léger, who was all-powerful in Burgundy The battle of Tertry (687) finally decided the struggle in favour of the Austrasians under Pippin of Héristal; but the death agony of the degenerate descendants of Clovis was prolonged until 752

THE CAROLINGIANS

Merovingian savagery and chaos ended in a general paralysis of the State A new Clovis was needed, and found in Pippin II of Héristal In his person he united the two great houses of Pippin and of Arnulf, archbishop of Metz The Pippins, from father to son, had succeeded to the mayoralty of the palace in Austrasia from 615 to 655 They had at their back a great company of vassals and vast landed estates; above all they had patience—without which nothing lasting can be built It took them nearly 100 years to supplant the Merovingians by the Carolingian dynasty.

Pippin of Héristal governed under four kings A pioneer, he began all those tasks which his descendants were to carry to completion; he was himself precipitate in nothing. As warrior, he defended the frontiers that were threatened by the Frisians, the Alammani and Bavarians; as a son of the Church, the descendant of Arnulf, he brought in the train of his armies, missionaries through whom the Carolingians were to consolidate their conquests. He died in 714 without having deemed it opportune, or without having found the occasion, to sweep away the phantom kings whose sole utility was to date charters and diplomas.

Charles Martel (714–741).—With Charles Martel began the greatness of Austrasia He accomplished successfully a fourfold task Although a bastard, he asserted his power in Austrasia where he deposed his half-brothers from the mayoralty. He achieved the supremacy of Austrasia over Neustria and Burgundy by the victory of Vincy (717). Frankish unity was re-established. He then defended Gaul against the Frisians, the Alammani and the Bohemians Without being any more conscious of his mission than was Clovis, Charles Martel proved himself another soldier of the Cross by repelling the Moorish invasion at Poitiers (732), which won for him the appellation of Martel—the Hammer An alliance with Charles Martel, the pacifier of Gaul, the protector of St Boniface, and the vanquisher of the "Infidels," became ever more necessary to Pope Gregory III, menaced as he was by the Lombards, and promised to be even more fruitful than was that of Clovis with Remigius Unable to forget that the Lombards had aided him in expelling the Saracens from Provence, Charles contented himself with professions of zeal

Pippin the Short (741–768).—Pippin the Short at once took over and continued his father's work In 747 he became sole master of the kingdom, for his elder brother, Carloman, became a monk and Pippin compelled Childeric III, the last of the *rois fainéants*, to shave his royal locks Grifon, Pippin's half-brother, was also set aside It only remained for Pippin to assume the royal title Consulting Pope Zacharias on this matter and receiving the answer that "he who exercises the king's power should enjoy the king's title," Pippin had himself crowned at Soissons in Nov 751, an act which was further consecrated in 754 by the grander coronation in Saint Denis, whereby the Church pronounced the new dynasty to be holy and its title indisputable The title of patrician also conferred by the pope, still further attached the dynasty to Rome But these rewards were not unearned During 754–756 it was Pippin who founded, at the expense of the Lombards, that temporal power of the papacy which was to endure till 1870, the bulwark of their spiritual authority The price for his consecration paid, Pippin, between 758 and 768, assured the safety of his kingdom on the farther bank of the Rhine against the Germans and Slavs, and against the Arabs to the south of the Pyrenees Moreover, by the alliance between the greatest material force of the age with the greatest moral authority, the way was opened up for a restoration of the Western Empire

Charlemagne (768–814).—On the death of Pippin in 768 the kingdom was divided between his two sons, Charles and Carloman, but in 771, Carloman died, and the whole of this great inheritance was united under Charlemagne Charles devoted his half-barbarian genius to the service of the Church and of the traditions of Rome, and in realizing this ideal of his age, earned his appellation of "the Great" He attempted to found an empire after the Roman model Prevented by the Moors from founding its capital on a Mediterranean site, he placed it in his own native land, Austrasia, with the intention of doing for Germany what Caesar had accomplished for Gaul. Christianity, which had been the weakness of the old empire, was to be the strength of the new. The victory of the soldiers was to be completed by the victory of the missionaries. And thus would a common religion unite peoples otherwise separated by blood, language and customs.

The conquest of Gaul, from Brittany to Gascony (769–811) assured for his armies a reserve of soldiers that cost him nothing, since military service was obligatory upon all free men. The poor and the serfs cultivated the land. Between 774 and 777 he consolidated the patrimony of St Peter by the destruction of the Lombard kingdom, whose iron crown he placed on his own brow. This accomplished, he turned his forces against the Saxons (*q.v.*), but it took him 32 years (772–804) and 18 campaigns before he was at last victorious. But, unlike the Gauls, despite compulsory baptism, destruction of their idols, and deportation or massacre, these heathens submitted themselves unwillingly to "the easy yoke of Christ." Charlemagne fortified his frontiers by marches, or military districts, but in multiplying these advance-posts the Frankish empire came into contact with new peoples—each a

prospective enemy In Spain Charlemagne suffered disaster at Roncevaux (A.D. 788) (*see* CHARLEMAGNE LEGENDS) and afterwards created the Spanish March as a defence for his southern borders From their camp on the Hungarian plain, the tireless cavalry of the Avars had over-run Bavaria in the very year of its subjugation by Charlemagne (788), and it was not before the Danubian lands had been devastated that this new menace was destroyed Meanwhile, behind the Elbe and the Saale, the Slavs of Bohemia were engaged in an unceasing warfare with the Saxons, and in the north the Danish pirates raided the coasts of the North Sea and the Channel After 47 years of warfare, the Carolingian empire stretched from the Elbe to the Ebro, and from the Eider to the Tiber—growing greater day by day, but also exposed increasingly to attack Charlemagne's power extended further than his frontiers Christian princes from beyond the Channel and the Pyrenees, Moorish emirs from Fez and Baghdad visited his palaces or offered him presents, as to the great Christian emperors Through men like Alcuin and Peter of Pisa the Church taught this German—still primitive in many ways—the traditions of Rome and Byzantium Why should not he be the heir to the Caesars? Why should he not restore, in his own favour, the empire of the West? Nothing was wanting save the imperial crown In 797 the empress of Constantinople had deposed and blinded her son Constantine VI , and the imperial throne might be considered vacant In 797 the pope had been driven from Rome by a revolt and only restored by a Frankish army The time was ripe, and at Christmas, 800, Charles was crowned emperor by Pope Leo III

Of the reconstituted empire, Charlemagne wished to be himself the lawgiver He was himself the ruler of his empire He made his power felt to the furthest extremities of the empire by his *missi dominici*, or representatives, by his courts, military, judicial or political High-handed with his people in this violent world, the emperor believed that he was no less responsible for their eternal salvation in the next The *missi* enforced his spiritual as well as his temporal authority By this administrative hierarchy and centralization on the Roman model Charlemagne reconstituted the superstructure of the imperial monarchy; but in legalizing by his capitularies the fief and the beneficium he undermined the foundations of the edifice which he believed himself to be strengthening, by requiring from the greatest in the land the oath of fealty, he admitted that the sovereign of all needed in addition to be definitely acknowledged as the direct overlord of his most powerful subjects, by the extension of *beneficia* the small freeholder gradually disappeared to make room for the feudal tenant (*see* FEUDALISM) The poor free men gave up their freedom to win protection from the neighbouring lord or prelate Unable to prevent this development Charlemagne systematized it, thinking himself strong enough to turn it to his own account As long as he lived he was successful; but, even during his lifetime, the treason of Ganelon proved that he was not always served by a Turpin or a Roland His authority, powerful and respected, decayed because it depended on him, and him alone When, in 814, Charlemagne was laid in his tomb at Aix-la-Chapelle, his work was buried with him There remained only a twofold legend—the religious one that made of him a saint; the other that made of him the hero of French epic Twenty-nine years after the death of Charlemagne the empire had again fallen into three kingdoms; 40 years later, a single one of these kingdoms was divided into seven A century passed away France was no more than a scrap-heap of almost independent states, out of which feudalism was springing The seignorial system, which had at first aggrandized the Carolingians, had also prepared their ruin.

Louis the Pious (814–840).—The empire devolved upon Louis the Pious or affable—titles indicative of his characteristics, so valuable in peace, so calamitous in times of stress From the beginning of his reign, the clumsy machine of government was out of his control Like his father and ancestors before him, he retained the entire sovereignty in his own hands, but divided his benefices and offices between his three sons, Lothair, the eldest, whom he associated with himself in the empire, Pippin and Louis. A fourth, Charles, was born to him in 823 of a second marriage, and to him he gave a share also. War between the brothers resulted: the imperial dignity became a laughing stock, and Louis himself was twice deposed and imprisoned in a monastery. Scarcely was he buried at Metz (840) before his sons rushed to arms. Lothair desired to preserve the unity of the empire and the patronage of all the fiefs in one hand Louis the German and Charles the Bald leagued themselves against him by the Oath of Strasbourg, the first treaty in the history of France and Germany to be written in the vulgar tongue An amicable partition of the paternal property was, however, clearly desirable and this was presently effected by a treaty made at Verdun in 843

The Treaty of Verdun (843).—The Treaty of Verdun marks an important turning point in history Louis received for his share the land which has become Germany, Lothair the title of emperor, with Italy and the valleys of the Rhone, the Saône and the Meuse, in addition to the two capitals, Rome and Aix-la-Chapelle, Charles, called the Bald, found himself the possessor of the rest of Gaul The unity of the Carolingian empire was definitely broken The boundaries between the kingdoms were ill-defined That of Lothair, without a national basis, soon split up into transient principalities, so that the vast and indeterminate territories of Burgundy, Lorraine and Provence (*q v*), were to be the battleground of France and Germany till the 20th century

Charles the Bald (840–877).—Charles the Bald was the first king of western France Anxious as he was to maintain the traditions of Charlemagne, he was not strong enough Rather a man of culture than a warrior, he was obliged to spend his life sword in hand, fighting against the Bretons, against the people of Aquitaine who had appealed to Louis the German, against the Norman raiders who were becoming more and more insolent; fighting always, but always without success He even found himself obliged to entrust the defence of his patrimony to Robert the Strong, duke of the country between Loire and Seine, and ancestor of the Capetian dynasty Unable to defend his own kingdom of western France, Charles the Bald yet coveted other crowns, and looked obstinately eastwards He succeeded in becoming, in turn, king of Lorraine, emperor of Germany and king of Italy· an accumulation indeed of titles, but not of strength

Growth of the Feudal System.—The great vassals of the crown had remained faithful to Charlemagne because they had had need of his protection Under Charles the Bald, and still more under his successors, it was the prince who had need of the nobles Thus was the feudal system turned against the throne, for the great vassals took advantage of it to perpetuate themselves in their offices and in their fiefs, and to gain possession of lands and authority Little by little the monarchy lost influence, since it no longer performed any services, hence, from the end of the reign of Charles the Bald, there was left but the appearance of royalty—administrative officialdom No longer deeply rooted in the soil, a shadow without effective force, it hovered above the local powers which encroached upon it, seized its land, and divorced it from its subjects The king, the lord of lords, was poorer than his lords, while they were establishing themselves in strong principalities, he alone was creating no strong territorial basis for his power. The great vassals were confirmed in their new rights by the capitularies of Mersen (847), of Pitres (862), of Quierzy-sur-Oise (877).

Vassalage could only be a disintegrating, not a unifying factor That this disintegrating process did not go on indefinitely was due to the existence of 12 or 15 great military commands—Flanders, Burgundy, Aquitaine, etc (*q v*) The duchy of France, which Robert the Strong had received as a reward for his services, grew into a powerful fief, but it was not strong enough to withstand outside attack. In 911 King Charles the Simple gave to Rollo, a Danish chief, the lordship of the district surrounding the lower reaches of the Seine, land nominally under the rule of the dukes of the French Rollo began to build up the Norman duchy (*see* NORMANDY) The ecclesiastical fiefs emancipated themselves in the same manner as the lay fiefs, and ceased to sustain the royal authority unless it was given into their control Day by day the disparity became clearer between the vastness of the Carolingian empire, and the feeble administrative control of its weak rulers over a society once again become barbarian and menaced by other barbarians None obeyed an emperor whom all hoped perhaps to supplant Each country developed its individual life and language

The races no longer understood one another, nor possessed common ideals

The Last Carolingians.—The death-struggle of the Carolingians lasted for a century Royal power hitherto hereditary, tended to become elective It was only given to Charles the Bald's son, Louis the Stammerer, after election by the great magnates and bishops under the leadership of the successor of Robert the Strong Since the kings were no longer rendering service, they could no longer claim service from others, as in the case of Charles the Fat who narrowly escaped deposition for his incapacity and cowardice in face of the Normans After many intrigues, Eudes (Odo) son of Robert the Strong, was chosen as king in 888 on account of his brilliant defence of Paris Henceforth there ensued a long duel between the Robertians and the Carolingians, as much literary as political in character For long the issue was uncertain three times Robertians were chosen and might have taken the crown, three times they deemed it more expedient to favour the restoration of the Carolingians, or more advantageous to have the power without the title Thus heredity was asserted in favour of Charles the Simple in 893, of Louis IV in 936, of Lothair in 954, and of Louis V in 986 The difficulty indeed was not the taking of the crown but the keeping of it when once taken The dukes of France had rivals (notably Herbert of Vermandois), capable of crushing them by forming coalitions, and if the Robertians had the support of Normandy, the Carolingians had that of Germany Moreover the support of the archbishop of Rheims, faithfully rendered to the Carolingians, gave to them more distinction than the bishop of Sens gave to the Robertians Hence, until his death in 956, Hugh the Great (son of Robert, count of Paris, and grandson of Robert the Strong), was content to remain the "king-maker" of the Carolingians, even as Pippin's descendants had been of the Merovingian *rois fainéants* But by waiting for the fruit to ripen, he almost lost the chance of gathering it The Carolingians whom he had had elected—Louis IV and Lothair—displayed a fresh energy and capacity Was it the last flicker of a dying light, or the long-delayed return of their fortune? For 30 years none knew on which side the balance would dip, but on the death of Louis V after a reign of only one year, the Assembly of Senlis eliminated from the succession, the rightful heir, Charles of Lorraine, and elected Hugh Capet, son of Hugh the Great The final struggle followed The conflict raged between Laon, the royal capital, and Rheims, the ecclesiastical capital The one ensured the kingdom of France, the other the crown Hugh Capet won the first in 985 and the second in 987, but the prestige of the Carolingians was still such that their fall seemed to presage the end of the world

THE HOUSE OF CAPET

The same difficulties that confronted the last Carolingians confronted the first Capetians They inherited all the strength and weakness of the feudal system Their strength was their central situation in the kingdom—the Île de France Their weakness was the possession of a very small domain surrounded on all sides. on the west by the county of Blois and the powerful duchy of Normandy, on the north and east by the counties of Flanders and Champagne and by the duchy of Burgundy Behind this little belt stretched provinces almost impenetrable to the royal authority—Brittany, Gascony, Toulouse, Aquitaine and the Spanish March. Thus the kings lay stifling in the midst of a feudal jungle which thrust itself up on their horizon and forced them to establish their power in the only two towns of any importance in their kingdom—Paris, the capital of the future, and Orleans the city of learning Their first responsibility was, therefore, to gain breathing-space, to give their energies to practical politics and, above all, to avert their eyes from that chimera of a restored empire which had ruined their predecessors From 987 to 1060 they carefully avoided unequal combats in which they might have weakened their claim to those titles greater than any due to feudal rights, which they held in reserve for the future Thus the beginnings of the Capetians gave less an impression of regeneration than of a prolongation of the decadence of the Carolingians

Hugh Capet (987–996), thanks to his diplomacy rather than to his military strength, contrived to maintain his independence despite the opposition of Charles of Lorraine (the last descendant of the Carolingians), the insubordination of the great lords and the hostility of a pope who favoured the empire Above all, by associating his son, Robert the Pious (996–1031), with him in the royal power while he himself still lived, Hugh Capet secured the future of his dynasty by suspending the feudal right of election, an act of political sagacity that his grandson, Henry I (1031–60) copied in 1059 in favour of his son, Philip I But their system was still too like that of the Carolingians, and it became necessary to change it Apart from their prudent opportunism, the greatest merit of the early Capetians was that they had sons, so that their dynasty endured without disastrous minorities and quarrels over partitions of territory

Philip I (1060–1108) accomplished nothing during his long reign of 48 years beyond the essential son and heir, Louis the Fat Absorbed entirely in material pleasures and in love of money, he remained a total stranger to the great events of the second half of the 11th century The conquest of England in 1066 by William of Normandy was begun while he was a minor and could do nothing to prevent it, but for the moment it diminished the pressure of Normandy upon his kingdom The first crusade was preached in 1096 by a French pope, Urban II Philip played no part in it, but indirectly the monarchy benefited, for while it increased the prestige of France in the East, it also weakened the power of the feudal lords who either perished in or were ruined by it

Louis VI., the Fat (1108–37).—After a century of lethargy, the Capetian power awoke again under Louis the Fat, who concentrated his energy on extending his territory and rendering it obedient The summit of his ambition was effectively to establish the king's highway from Paris to Orleans, and during 34 years of war he purged his domain of feudal brigandage To become master in his own house he allied himself to a communal movement in Amiens against his rival Enguerrand de Coucy, but—sublimely an opportunist—he suppressed a similar movement in Laon because of the connection with it of his enemy Thomas de Marle If he refused to admit feudal principles in his own affairs, or to his own disadvantage, he invoked them quickly enough against the great feudal lords, who were more powerful than he Little more than a mere police officer, he had the Church on his side, but he did not allow it to dominate his actions His principal minister, Suger, began as a simple monk, he became abbot of St Denis His other officials were all unimportant people, trustworthy and dependent on him Thus, when the emperor of Germany, Henry V, sought to invade the kingdom in 1125, he soon fell back before the united strength of the vassals and townsfolk rallied under the oriflamme of St Denis The moral unity of the land had become a political factor

Louis VII. (1137–80).—His successor, Louis VII, almost destroyed his work at the very moment when circumstances were conspiring in his favour The two powers of greatest danger to his kingdom—England and Germany—were rent by civil distractions and disputed successions His marriage, on the other hand, with Eleanor, heiress of the duchy of Aquitaine, had increased the area of his kingdom fivefold Suger, his father's minister, continued to give him the support of his wise and moderate counsel, but unhappily, the second crusade, undertaken despite his warnings and the doubts of the pope, inaugurated a series of magnificent but fruitless exploits Quarrels with his wife were even more disastrous, and the death of Suger in 1151 deprived Louis VII of his wisest counsellor at the moment when his divorce was seriously compromising the fortunes of the Capetians. Two months after their separation Eleanor found a youthful candidate for her rich dowry in Henry of Anjou who thus added to his county of Anjou and his duchy of Normandy, the whole south-west of France Two years later he obtained the crown of England (1154). Henry and Louis at once began the struggle between England and France which lasted till the middle ages were almost ended Wedged in between the Angevin power and the German emperor, Frederick Barbarossa, it was little less than a miracle that the French dynasty escaped extinction Twice the Church saved her devoted son

by the moral prestige given him by the presence in France of a refugee pope, and by the interdict which was placed on Henry II after the assassination of Becket Happily, after 27 years of childless wedlock, the birth in 1165 of Philip Augustus saved the kingdom from a war of succession

Philip Augustus (1180–1223).—The new king had already given proofs of his cool energy and calculating ambition before his 20th birthday. Having vanquished the smaller principalities, he turned to overthrow or assimilate the greater ones In five years (1180–86) he freed himself from the Flemish tutelage of Philip of Alsace and from that of the counts of Champagne But the essential thing was the destruction of the Angevin empire The battle was a long one Abandoned by his sons Henry II in the moment of death was brought to submission, but Philip Augustus found himself confronted by a new English king, his former ally, Richard Coeur de Lion If he accompanied him to the crusade, he did so less from a desire to go than from a wish to return His one interest was Richard's kingdom, and the absence of his rival seemed to him to afford an opportunity to despoil it It was a foretaste of the duel between Louis XI and Charles the Bold, and it took the same course When Richard was captured in Germany on returning from his crusade Philip allied himself with Richard's brother, John, and they tried to bribe the emperor, Henry VI, to keep Richard a captive; but Richard bought his liberty, and the "devil at large" cost Philip all the fruits of his intrigues and shut him off from Normandy by the strong fortress of Château Gaillard Happily the arrow that carried off Richard at the siege of Chalus, and the misfortunes of his brother and successor, John, restored success to the Capetians Philip seized Normandy; then Anjou, Touraine, Maine and Poitou fell into his hands, but he failed to conquer the south-west Fortunately for the future of his dynasty, Philip, instead of seeking to conquer England, adopted the true Capetian policy and marched against the allies of John in the north-east, the counts of Boulogne and of Flanders The power of the Capetians had very definitely become dangerous, and a European coalition was formed to combat it The king of England, the emperor Otto, and all the great lords of Flanders, Belgium and Lorraine allied themselves together But the whole country responded to the call of Philip Augustus to repulse a feudal reaction allied with foreign intervention The national victory at Bouvines (1214) placed the Capetians in an unrivalled position The sole remaining task was to destroy the feudalism existing in Languedoc Anxious not to risk his gains, but desirous rather of consolidating them by organization, Philip left to others the toil and trouble of conquests, the advantages of which were not for them When his son Louis wished to wrest the crown of England from John, then fighting with his barons, Philip intervened without appearing to do so, supporting and disavowing his son by turns. Again when the Church and the needy and fanatical nobility of northern and central France destroyed the feudal dynasty Toulouse, and the rich civilization of the south in the Albigensian crusade, Philip took no part in order to avoid the odium that attached itself to this act of bloody oppression but it was for him that Simon de Montfort, although he knew it not, conquered Languedoc Henceforth, except for the English power in Gascony, there was but one royal France embracing the whole kingdom.

As in war, so in peace, Philip Augustus was an efficient sovereign. If he did not love feudalism, he liked theocracy no better—as is evidenced by his quarrels with Innocent III He allied himself to the Church on the condition that she was complacent to his designs. He took advantage of her weakness in the midst of a violent age and gave to her the protection of the royal power even in lands beyond his authority In setting the feudal lords against each other, the king and the Church found a common advantage. In furthering his anti-feudal policy Philip similarly exploited the wish for security and the instinct of independence among the townspeople who were demanding henceforth an assured position in the feudal hierarchy. By means of the communes (*q v.*) he was able to make a breach in feudalism and to exercise his royal authority far beyond his own demesne. He did yet more: he gave to the monarchy instruments of government of which it was still in need; at Paris, a council of men of humble birth, but wise and loyal, in his domains, bailiffs or seneschals, all-powerful against the great nobles, but submissive to himself, a treasury filled by the harsh exploitation of private wealth, an army that was no longer a temporary feudal levy, but a permanent royal force, and, finally, a fixed capital where the university sprang up about the towers of Notre Dame So strong had the monarchy become that the son of Philip Augustus was the first of the Capetians who was not consecrated in his father's lifetime

Louis VIII. (1223–26).—Louis VIII continued his father's work by the acquisition of Poitou from Henry III of England and of Languedoc from the Albigenses In distributing great appanages among his sons he avoided family quarrels such as had brought Henry II of England to submission, and he facilitated unity by encouraging French customs in the more distant parts of the kingdom But he lacked the time to reveal his capacity, for he died suddenly in 1226, leaving a foreign wife and infant son, the future Louis IX behind him Blanche of Castille assumed the regency and undertook the guardianship of her son, and for nine years she ruled with a strength of character and a farsightedness that frustrated her enemies who had hoped to take their revenge for Bouvines In 1227 and in 1229 by the treaty of Meaux, she prevented the feudal barons of the east from aiding those of the west who were threatened by Henry III of England, and she assured the annexation of Languedoc at the same time as, by the marriage of her son with the heiress of Provence, she finally broke the ties that held that country to the German empire

Louis IX. (1226–70).—But her greatest work was the education of her son She imbued him with that high morality that inspired not only his private life but the whole conception of kingship to which he remained faithful In Louis IX morality, for the first time, entered the domain of politics; his sole aim was the good of the whole world and the reconciliation of all Christians in the name of a general crusade Not that Louis IX was a monk Well-balanced, he inherited and exhibited the qualities of his house—courage, skill and commonsense, but he added to these a new element—religious fervour, the spirit of Christ Sometimes, indeed, he was forced to fight, as when the small nobility of the centre of France rebelled under the leadership of Trancavel, viscount of Carcassonne, or when Henry III. of England sought to maintain the English hold on Poitou. After the two victories of Taillebourg and Saintes (1242) Louis imposed terms on Henry III. Then he left for his first crusade in Egypt, which was to end disastrously Louis indeed preferred negotiations to battles On his return from Egypt, in the Treaty of Corveil (1258), he concluded with the king of Aragon an agreement which left in his hands the whole country to the south of Roussillon and the Pyrenees, and assured to France, all territory north of the Pyrenees By the treaty of 1259 with Henry III in exchange for the recognition of the conquests of Philip Augustus, Louis agreed to return those of his father, Louis VIII—an example unique in history of a victorious monarch acting solely in the interests of justice and peace. He won for himself and his kingdom a moral authority that made of him a universal arbiter. the oak of Vincennes under which, as it is said, he delighted to administer justice, cast its shade over all his policy Thus peace was established among the princes, and justice decided no longer by battle, but by law. He intervened in the interests of serfs; he granted privileges to townspeople; and in the famous *Livre des Métiers,* was founded the first statute of a social order organized on Christian principles Having accomplished all this and, notwithstanding his former failure, against the advice of his mother and his counsellors and even of the pope himself, Louis IX. embarked on the crusade to Tunis in which he met his death on Aug. 25, 1270.

Philip the Bold (1270–85).—His son and successor, Philip III departed from the wise traditions of Capetian policy. The death of Alfonse of Poitiers in the expedition to Tunis meant that as well as the crown of France, Philip inherited Toulouse, Poitou, Auvergne, and the marquisate of Provence The death of the king of Navarre and count of Champagne and Brie (*q v*) in 1273 left his heir a girl of 3 in Philip's hands. Champagne and Brie were annexed to the crown and a marriage between the heiress and the

king's second son (Philip, later Philip IV.) arranged These successes and the temporary success of Charles of Anjou (*q.v.*) in southern Italy encouraged Philip to look outside the boundaries of France for conquests But the Sicilian Vespers (*q.v.*) ended the hopes of Charles of Anjou in Italy in 1282 and Philip's attempt to win the crown of Aragon for his son failed in 1285 Philip III died on his return It was time for a commonsense ruler to make an end to these distant adventures for which the France of that day was not ready

Philip the Fair (1285–1314).—The new king, by methods completely opposite to those of St Louis, won for his kingdom a pre-eminent position in Europe His policy was simple. He sought to bring feudalism and the papacy into subjection to the monarchy by means of a more and more centralized administration In his realism and his prudent ambition, and still more in his method of government, Philip was a man of the modern world With him the French monarchy formulated its ambitions and changed by degrees its feudal and ecclesiastical character for a legal constitution His progressive and aggressive policy and his ruthless financial legislation were carried out by those lawyers of Normandy, or the south, who had been brought up in the school of Roman law, in the universities of Bologna and of Montpellier, raising themselves little by little to the political stage, and who were now leading the king and filling his *parlement*. It was no longer on religion or on morals, but on imperial and Roman law, that the *chevaliers ès lois* based the omnipotence of the ruler Nothing indicates more clearly the new tradition which was growing up than this fact—all the great events in the reign of Philip the Fair were given at any rate the appearance of legal process The first of these was with the papacy The famous quarrel between papacy and empire had ended in the victory of the former A new quarrel was opened by Boniface VIII with the kings of France and England As vicar of Christ, the pope insisted that the temporal princes should render him the same obedience as they owed to God—an obedience not only spiritual, but temporal And thus, in effect, they laid claim to the benefices of all Christendom and refused to admit that any king could demand tithes from the clergy without the consent of the pope. The quarrel began in 1294 The bull *Clericis laicos* definitely forbade the clergy to pay taxes to the lay power The king, whose expenses had increased with his conquests, and who had no revenues beyond those derived from his domains, was always short of money The feudal lords, ruined by the crusades, and the lower classes, fleeced by every one, could give but little As in all times of crisis, Philip forbade the export of gold or silver from the kingdom. Thus deprived of his revenues from the French clergy, Boniface protested in vain. Philip's expenses were constantly increasing and he took violent measures to improve his financial position. Everyone who had dealings with him resented the constant attempts to raise money by tampering with the coinage. He both issued bad money and ordered by proclamation the value that should be put on it Papal pretensions to interference in any matters that touched Philip's financial or political position could not be borne by the king and he used the meeting of National representatives, the States-General, to support the national cause against the pope In a meeting in 1302 protests against papal oppression were made Boniface determined to win the support of a council against Philip, whose ministers replied with a display of freedom of thought that was centuries in advance of the age Nogaret travelled to Anagni, where he seized the person of Boniface with the object of bringing him, in his turn, before a council. A month later the pope became insane, and died: the Capetians had conquered where the Hohenstaufen had failed. The Roman theocracy, which had thought to see its dream realized in the jubilee of 1300, found itself confronted by the captivity of the papacy at Avignon, the internecine quarrels of the Great Schism, the vain efforts of councils for reform, and, before a century had passed by, the sweeping and heretical solutions of Wycliffe and Hus.

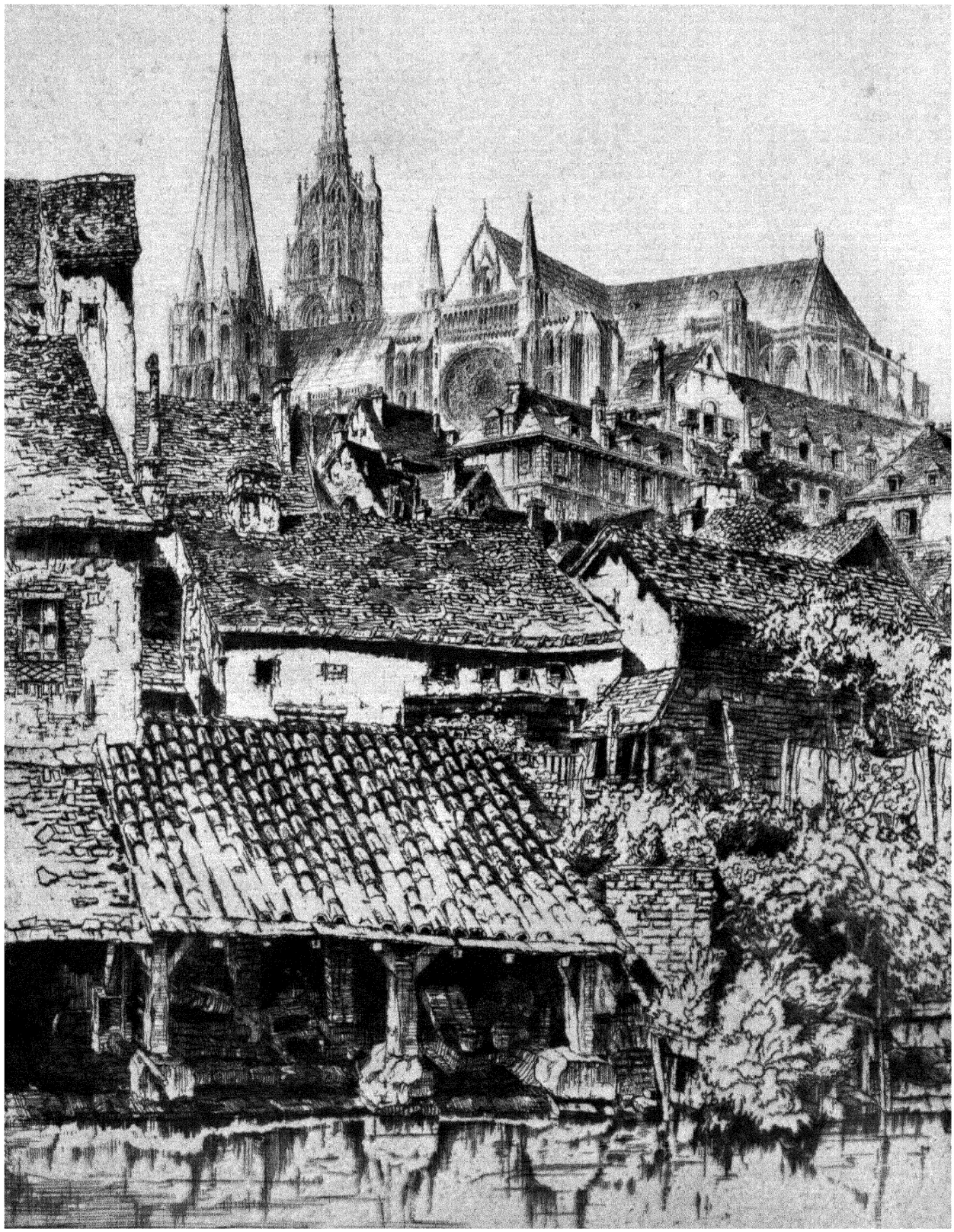
The affair of the Templars, also a matter of money, was another legal process carried out by Nogaret. As a military and religious order, the Templars had no longer any *raison d'être;* further, the order had the misfortune to be international and to have sided with Boniface, but its greatest crime was its wealth—for great financial powers become speedily unpopular: the Jews and the Lombards had already aroused popular dislike and envy. Philip made use of this hatred among the people, and also of the weakness of his creature, Pope Clement V. The trial of the order, though disguised under the imposing names of religion and morality, was in truth a political affair (1307–13); and this astonishing conclusion to the crusades resulted in a vast scheme of secularization that was the precursor of those in the 16th and 18th centuries

Philip's foreign policy had the same litigious character. He instituted suits against his natural enemies—the duke of Guienne (king of England) and the count of Flanders, the former as powerful as his suzerain, and the latter at once the vassal of two rival sovereigns, the king of France and the emperor of Germany. Philip began his reign by settling the Sicilian and Aragonese adventures that he had inherited from his father. Then he seized upon a quarrel between English and French sailors to institute his customary legal procedure. a citation of the king of England before the *parlement* of Paris, and in case of default, a forfeiture to be followed by execution, that is to say, by the seizure of Guienne (1295) A truce brought about through the mediation of Boniface VIII restored Guienne to Edward I, gave him Philip's sister as wife, and promised him the hand of Philip's daughter for his son (1298)

By a still more prolonged and unhappy law-suit Philip sought to incorporate Flanders within his kingdom (1297–1312). Guy de Dampierre, who was lord of the country, had desired to marry his daughter to the eldest son of Edward I without the permission of his suzerain Arrested and imprisoned in the Louvre, he was forced to deliver up Flanders (1297); but when Jacques de Châtillon attempted in the king's name to take possession, he found himself confronted by a rising of powerful counts and of turbulent and haughty republics of merchants and weavers, who had need of English wool for weaving the cloth that was the staple product of the land The Flemish infantry overthrew the chivalry of France at Courtrai (1302) in a battle that heralded the disasters of the Hundred Years' War (*q v*) By the Treaty of Athis-sur-Orge (1305), which was a veritable masterpiece of chicanery, this luckless venture for France was momentarily settled Philip secured the French-speaking towns of Lille, Douai and Valenciennes, but Flanders remained independent

The efforts of Philip the Fair to expand his territory eastwards met with greater success. His marriage had brought him one of the five great French fiefs—Champagne with Brie Hard cash enabled him to extend his influence over the county of Chartres, Bar, the Lorraine bishoprics and Franche-Comté and to acquire Lyons and the Vivarais. Thus he removed the threat of encirclement which had been the preoccupation of the early Capetians. Disdaining the dream of imperial honours that haunted the mind of his brother and the lawyers, he turned all his energies towards the eastern frontier, the line of least resistance, which might have yielded had it not been for his death at the age of 46 (1314) and for the Hundred Years' War.

The Sons of Philip the Fair, 1314–1328.—His three sons continued his work. Louis X. mastered the feudal reaction provoked in 1314 by the terrorist methods of his father's jurists. But in order to save the administrative and political gains of his predecessors, he was compelled to sacrifice Enguerrand de Marigny, his minister of finance, to the mob fury roused by taxation as severe as it was necessary Philip V. succeeded to the throne because Louis had only a daughter, and Charles IV. followed Philip V. for the same reason, for it was impossible to permit France to be brought as a dowry to a strange prince. This precedent came to be known as the Salic Law, yet it amounted to nothing more than the feudal rule that the whole domain returned to the crown in default of a male heir Under these eventless reigns, and thanks also to troubles in Germany and England, the development of the kingdom went on apace. In particular, under that born organizer, Philip V., the administration was improved by the development of the judicial and financial departments out of the *conseil du roi*. But with these kings the male line of Hugh Capet at last failed. For three centuries and a half they had laboured greatly in founding a kingdom, a kingship, and administrative institutions. Under



THE CATHEDRAL CITY OF CHARTRES

An etching, by John Taylor Arms, of Chartres, on the river Eure (Department of Eure-et-Loir), France The town is famous for its 12th century cathedral, one of the finest examples of the French Gothic style, which is seen here from the south east, across the red-tiled roofs of the houses on the river bank

Hugh Capet in 987 the territory of France was scarcely as great as two French departments of the present day; by 1328 it was equal in extent to 59 departments. The political unity of the kingdom was no longer impeded by some 15 great seignorial districts, but by four isolated fiefs. Flanders in the north, Brittany in the west, Burgundy in the east and Guienne in the south. For a long time unsettled, the capital was now established in the Louvre, which had been fortified by Philip Augustus. Like the fiefs, feudalism had been broken into pieces. The Capetians, though not of royal origin, had known how to create around them an administrative system in order to achieve order and centralization—the royal treasury of the Louvre; the *chambre des comptes;* the *parlement* dealing out a justice common to the whole realm; a royal currency; local representatives, provosts, bailiffs or seneschals Two adversaries alone might have been dangerous, but one, the Church, was now a captive in Avignon, and the second, the people, although they protested strongly against the taxes, had greatly prospered (if one may judge from the great booty captured by the English) and were consenting to efface themselves in the States-General behind the royal will. This well-established authority was also aided by the memory of Saint Louis, and it was through the strength of this ideal that the royal prerogative survived the Hundred Years' War in the course of which a unified monarchy arose and feudalism met its death

THE VALOIS

With the extinction of the direct line of the House of Capet, the crown passed to a cadet branch, the Valois From 1328 to 1498, seven kings, the inferiors of the Capetians in commonsense and in political sagacity, with the exception of Charles V. and Louis XI, lost for France the pre-eminent position she had gained over all other states During this period France passed through two grave crises, the Hundred Years' War which imperilled the very existence of the kingdom, and, under Louis XI, the contest with Burgundy which threatened the territorial unity of the monarchy that had been so laboriously builded amidst the ruins of feudalism On the death of Charles the Fair, the late king's cousin, Philip of Valois became king as Philip VI No one seriously thought of pressing the claim of the English king, Edward III grandson of Philip the Fair, least of all Edward himself The Hundred Years' War which soon began was aggravated rather than caused by the existence of this English claim.

The Hundred Years' War.—The war falls into two sections. the first from 1337 to 1378, the second from 1413 to 1453, periods separated by 35 years of mistakes and miseries From a feudal dispute between a suzerain and his vassal it quickly developed into a great political and economic conflict. Since the time of Philip the Fair the real quarrel had turned upon the question of Flanders Industrious, rich, jealous of their freedom, barely tolerating the yoke of their count and his suzerain, the king of France, the Flemish communes suffered at Cassel (1325) the revenge for their victory at Courtrai Moreover, Philip repaid the hospitality shown by Edward III. to his brother-in-law, Robert of Artois, with the seizure of Guienne. To attack the English in Guienne and Flanders was to hurt their most vital interests—the cloth and wine trades. English merchants sold wool in Bruges and bought wine in Bordeaux; Edward III, therefore, forbade the exportation of wool and threatened to transfer the manufacture of cloth to England. The industrial towns of Flanders were reduced to idleness, and on the advice of Jacob van Artevelde (*q.v.*), a rich woollen merchant of Ghent, threw themselves into the arms of Edward III. Their final hesitations disappeared when, on the advice of Robert of Artois and Artevelde, Edward claimed the crown of France (1337).

The war opened with a French naval disaster when the French fleet, which had been neglected for years, was destroyed at the battle of Sluys (1340). The sea was thus closed to France, but the war continued spasmodically on land. Flanders was overrun after the murder of Artevelde (1345). A war of succession broke out in Brittany between John de Montfort and Charles of Blois, [illegible] of Philip VI. Edward naturally supported de Montfort and war went on in Brittany. The capture of de Montfort did not end the struggle. Edward, setting out with a large army, exceptionally well provided with archers and including a small train of artillery, turned aside at the suggestion of a French exile, Harcourt, to land in the Cotentin and ravage the defenseless Normandy He raided almost up to Paris itself and turned northwards to join his ships, and so avoid a pitched battle while securing his booty Followed and overtaken at Crécy, Edward achieved a complete victory over the French (April 26, 1346). The subsequent capture of Calais (1347) afforded him a permanent gateway into France. These military disasters were followed by the Black Death, and Edward forebore to press his advantage, partly from prudence and partly because of the heavy cost Before he died in 1350 Philip VI at least had the good fortune to add Montpellier and Dauphiné to his domain—the future appanage of the eldest son of the French kings

John the Good (1350–64).—Philip's son, John the Good, has commonly been reproached for his extravagance, romantic restlessness, brutality and recklessness In truth, however, on ascending the throne, he found treason surrounding him on all sides—first Harcourt, next the constable d'Eu, and then, in his own immediate family, Charles the Bad, of Navarre. He crushed the traitors, but in default of any sufficient revenue, was driven, like Philip IV, to abuse his right of coinage. He spent money recklessly to win over Charles the Bad, who had betrayed him. As soon as Charles was imprisoned in Château Gaillard, his followers deserted openly to England and the war began again. Edward III. needed money as badly as John the Good. Wealthy by reason of her commerce and her industry, England could borrow from the Florentine bankers under the security of a monopoly upon wool. But in France, which was solely an agricultural country, recourse could only be made to the inadequate and dangerous expedients of confiscation, debasement of the currency, and arbitrary taxation Regularly levied taxes could alone fill the treasury In Nov. 1355 John summoned the States-General which voted him "aids" on condition that they should be levied upon all classes and that their collection and application should be regulated by definite guarantees The principle was a good one and resulted in the setting up in France of representative institutions analogous to those which were already established in England; the Estates, however, were no more fortunate than had been the monarchy in inducing the taxpayers to pay their impositions. Thus it was that John came to fight and be captured at Poitiers (1356) with a well-nigh empty treasury and with troops no better equipped nor disciplined than those which had been defeated at Crécy. Revolution followed. Confronted by a dauphin who was not yet of age, and amidst the ruins of a discredited council, the States-General reassembled and, at the instance of Robert Lecoq, bishop of Laon, and of Etienne Marcel, provost of the merchants of Paris, the leaders of the Parisian representatives, refused to co-operate with the dauphin's counsellors and determined to take him under their own tutelage But politics at once took the place of considerations for the public weal, and they demanded the release of Charles the Bad. The dauphin hesitated, but, threatened with a rising, was forced to give way. In Feb 1357, the States-General reassembled and transformed themselves, by means of the Grand Ordinance, into a deliberative, independent and permanent assembly. The government, at first seized by the middle classes, was soon under the revolutionaries led by Etienne Marcel; but the support of a name and a cause was imperative. This he obtained through the *coup de main* which liberated Charles the Bad. But the murder of the marshals of Champagne and Normandy under the eyes of the dauphin (Feb 22, 1358), and the consequent flight of the latter, provoked in the noblesse and the States-General at Compiègne, a strong loyalist reaction At the same time the burghers in the barricaded capital, shocked at these crimes, deserted the reformers with their foreign allies. Neither the peasant rising of the Jacquerie, which was crushed at Meaux, nor a last, but unheeded, appeal to the towns, nor the uncertain alliance of Charles the Bad, whom he offered to make king of France, availed to save Marcel from death at the hands of the royalist party in Paris (July 31, 1358). As a consequence of the reaction that followed his death, the Crown inherited the financial administration which the States-General had erected as a protection against its extrava-

gance Instead of being the representatives of the Estates the *élus* and superintendents became officials like the *baillifs* and provosts Taxes, such as the hearth tax and the tax on salt, voted provisionally to meet the expense of war, were levied throughout the entire reign of Charles V and were added to his personal revenues. The opportunity to found political liberty on the right to grant and control taxation was lost

Treaty of Brétigny.—Besides the re-establishment of order in Paris, it was important to put an end to the wars with England and Navarre This was done in the Treaty of Brétigny by which (1360) king John ceded a third of his kingdom to Edward III , but in the final draft, the French king retained the sovereignty of the lands John further obtained his liberty at the price of the enormous sum of three million gold crowns, which he was never able to pay in full, and he returned to his pleasant captivity in England, where he died in 1364 But in her suffering and sorrow France was gradually realizing herself Vanquished, she felt far more strongly than her king the shame of defeat Local patriotism, like municipal patriotism, grew up in the peasants as in the burghers, and in a common hatred of the English was gradually founded a national feeling

Charles V. (1364–80).—The Treaty of Brétigny, however, did not bring peace to the kingdom For ten years the stragglers of the English, Navarrese and Breton armies, banded together in what were known as the Great Companies, ravaged France till Charles V , *durement subtil et sage,* succeeded in sweeping them away He persuaded their chiefs to lead them off wherever there was any fighting to be done—to Alsace, Brittany, Spain With the help of du Guesclin, a Breton adventurer of military genius, who became constable of France, some were trained to form an army to fight the English when war should be renewed At the same time Charles fortified the towns and cities A great diplomat, he made it his object to nullify the Treaty of Brétigny by alliances with Flanders, the heiress of which he married to his brother Philip, duke of Burgundy, with Ferdinand of Portugal and with the Emperor Charles IV His alliance with Henry of Trastamara, the usurping king of Castile, was an inducement to the Black Prince to support the exiled Peter the Cruel Debts incurred in Spain forced the Black Prince to try to raise money from his lands in France; the Gascon lords therefore appealed to Charles V Summoned to appear before the courts in Paris, the Black Prince failed to obey, and war was renewed in Gascony, Poitiers and Normandy But this time (1369) different tactics were used As the English still held to the employment of great masses of cavalry, Charles gave orders that the towns were to be defended and that the enemy was to be harried without risking a general engagement Thanks to the prudent Constable du Guesclin and the admiral Jean de Vienne, Charles was able, sitting quietly at home, to win back, bit by bit, all that his predecessors had rashly lost on the field of battle When he died in 1380 the English possessions in France were reduced to Bayonne, Bordeaux, Brest, Cherbourg and Calais

Charles VI. (1380–1422).—The death of Charles V and the dynastic quarrels in England brought the war with that country to a close, but inaugurated a civil strife that lasted 35 years The late king's brothers at once fell to fighting for the regency of Charles VI , a child of 12, and in the place of a strong central power there arose a republic of princes divided among themselves and wholly concerned for their personal interests The faithful and wise counsellors of Charles V , whom the princes derisively called the "Marmousets," were removed, and the bad government of the king's uncles aroused widespread and increasing discontent When they claimed to levy the *aides* which Charles V had renounced on his death-bed, the populace of Paris, armed with mallets, sought to murder the tax-collectors The great towns followed the example set by Paris and the Jacquerie was renewed in Auvergne and the Vivarais; but the battle of Roosebeke (1382) won by a French army over Flemish burgesses reacted on the situation in France, and the forces of feudalism and of monarchy triumphed

When he came of age, Charles VI. recalled his father's counsellors to power, and in two months they restored order. But they could not control the king's pleasures, nor his extravagance, and when he became insane their rule came to an abrupt end (Aug 5, 1392) Once more the king's uncles assumed the government, but instead of lessening the evil consequences of the king's insanity, they aggravated them.

War Between Burgundians and Armagnacs.—This time the combat was fought between two branches of the royal house—Orleans and Burgundy Philip the Bold, duke of Burgundy, uncle of the king, had over his rival, Louis of Orleans, the king's brother, the advantages of superior age, of alliances with England and Germany, of wealth and great territorial possessions The two opponents did not represent two different political programmes what each sought was to be the master of the intermittently insane Charles VI , in order to exclude his rival from the pillage of the royal treasury The contest became still more bitter when John the Fearless succeeded to the dukedom of Burgundy in 1404 Up to this time the queen, Isabella of Bavaria, had been held in a sort of dependence by Philip of Burgundy, who had brought about her marriage to Charles VI Less desirous of power than of money, she suddenly became favourable to the side of the duke of Orleans Whether it was passion or policy, it cost the duke his life, for John the Fearless had him assassinated (1407) and thus set loose against each other the parties known as the Burgundians and Armagnacs, the latter so called because the son of the murdered duke, Charles of Orleans, was the son-in-law of the count of Armagnac (*q v*) Despite all efforts to effect a reconciliation, the whole country divided itself into two camps, the south and west supporting the Armagnacs and the north and east the Burgundians Paris, with her tradesmen—above all the butchers—and her university, played a prominent part in the quarrel, for to be master of Paris was to be master of the king In 1413, owing to the rising of the *Cabochiens* (the butchers led by Simon Caboche), the duke of Burgundy gained the upper hand Out of this new and daring combination of brute force and idealism sprang the famous *Ordonnance Cabochienne,* a practical programme of financial reform Unhappily the time was lacking in which to give it effect, nor were the actions of its authors in accord with the spirit of the ordinance The Government was at the mercy of the mob which was itself terrorized by turbulent and incapable leaders The conflict ended in a war of factions between the carpenters under Cirasse and the butchers under Caboche John the Fearless fled from Paris, and the Armagnacs entered the city in his rear; from Dec 12, 1413, until July 28, 1414, the white terror took the place of the red These disorders allowed Henry V of England to resume the offensive

War with England: Agincourt.—A national disaster was the reward of these internecine feuds At Agincourt (1415), as at Crécy and Poitiers, the chivalry of France was shown to be incapable of playing the soldier in real warfare Charles of Orleans was taken prisoner and John the Fearless, who had held aloof from war set out to return to Paris The Armagnacs were discredited by defeat, but the duke of Burgundy did not take advantage of the situation

An unnatural alliance between Burgundy and the queen led to a renewal of civil war, and Henry V , seizing his chance, occupied Normandy and in two years destroyed the work of Philip Augustus No serious resistance was anywhere offered and the common need urged the duke of Burgundy to seek alliance with the Armagnacs, in whose hands was the heir to the throne, the dauphin Charles But the assassination of John the Fearless at the conference at Montereau in 1419 by members of the dauphin's household was a fatal mistake, the whole Burgundian party, with them the queen, made a close alliance with the English. This treacherous assassination gave renewed life to the feuds which were showing signs of dying a natural death in face of foreign invasion By the Treaty of Troyes (1420) Henry V., who was to marry Catherine, daughter of Charles VI , was recognized as heir to the French throne instead of the dauphin Charles. When Henry V and Charles VI died in 1422, Henry VI., with the aid of the new duke of Burgundy, Philip the Good, was proclaimed in Paris as king of France and England In 1428 the English held the whole of northern and eastern France as far as the Loire,

and the two chief institutions in the land—the university and the *parlement* of Paris—acknowledged the English king.

Charles VII. (1422–61).—But the greatest weakness of the French was again the king himself, Charles VII., the "king of Bourges," as he was commonly called This youth of 19, born of a madman and a loose-living Bavarian princess, timorous and suspicious, was the symbol of France itself After his victories of Cravant and Verneuil (1424) the duke of Bedford, regent for the young Henry VI , gave Charles a respite of four years. But Charles's successive favourites, Giac and de la Trémouille, solely occupied in lining their own pockets, surrounded the king with intrigues The banishment of the constable Richemont, the one forceful man about Charles, was secured and the unhappy king faced the tragic hour, when Orleans, the last bulwark of the south, besieged by the earl of Salisbury, was about to fall (1428) He had neither the desire nor the means of Philip VI or John the Good to undertake reckless military expeditions to defend his country A policy of withholding his hand from a vain display of military strength which might easily be broken had served Charles V well, but Charles VII had not his grandfather's skill, nor was he acting on any well thought out plan

Joan of Arc.—Help came to him from an unexpected quarter The cruel, prolonged war had year by year stimulated the growth of a national feeling against the English *La grande pitié qui était au royaume de France* was suddenly incarnated one day in the person of a young girl from Domrémy, in Lorraine, inspired with a stubborn faith and an exalted spirituality. The timid counsels of the army commanders, the not disinterested doubts of the courtiers, the criticism of experts and the questions of the doctors, she countered and overcame by her "voices" They told her, she said, to raise the siege of Orleans and to lead the gentle dauphin to Rheims for his coronation Her sublime folly was to prove itself wiser than all their wisdom In two months (May–July 1429) she raised the siege of Orleans, destroyed the prestige of the English army at Patay, and brought the hesitating and spiritless king, in spite of himself, to his coronation at Rheims—an event that was to have an extraordinary political effect throughout France Through her, Charles VII was accepted without question as "the man to whom the kingdom of France ought to belong" After Rheims the Maid's first thought was of Paris and of completing the destruction of the English A check outside Paris enabled the jealousy of la Trémouille to use the Maid for eight months in secondary operations until the day when, under the walls of Compiègne, she was captured by the Burgundians and sold by them to the English She received a scrupulously fair trial, but was condemned by her own persistence, and was burnt alive at Rouen on May 30, 1431 (*see* JOAN OF ARC)

Her martyrdom paved the way for the realization of one of the Maid's dearest wishes the reconciliation of the warring parties in France The English regent, Bedford, had with difficulty kept the Burgundian alliance It was strained by the Duke of Gloucester's marriage with Jacqueline of Hainault and the consequent quarrel between Burgundy and Gloucester It was broken when on the death of his wife, Anne of Burgundy, Philip's sister, Bedford married a vassal of Burgundy, Jacquetta of Luxemburg The overthrow of the favourite la Trémouille through the agency of the constable Richemont removed the last barrier to agreement Hard though its terms were, the treaty of Arras enabled a united France to expel the English from the east and opened the way for the king's return to Paris (1436) During the next three years, famine, plague, the atrocities of the *écorcheurs*, or flayers, and finally the aristocratic rising of the Praguerie completed the misery of the country But during the truce with England, Charles VII succeeded, with the aid of the brothers Bureau, in establishing the first permanent royal army (1445), and with that of Jacques Coeur (*q v*) in paying for it by means of a permanent tax (1449) But he repaid his servants with the same ingratitude he had shown towards Joan of Arc, whose fame he only rehabilitated in 1450 Meanwhile the English, weakened by the death of Bedford, continued to wage war unsuccessfully and to lose their possessions. Normandy dropped from their hands at Formigny (1450); Guienne, which had been English since the 12th century, was lost at Castillon (1453). Calais alone remained to them, and now it was they who were ruled over by a madman, Henry VI France emerged from the Hundred Years' War victorious, but ruined and depopulated Her patriotism, in the broadest sense, had been stimulated by the menace of dismemberment But the victory was, above all, a victory for absolutism The distracted nation, preferring established order to insecure liberty, was content to abandon all attempt to control the government, and to give itself up to the enjoyment of living in peace The king and the nation, now more at one and trusting each other better, pursued a utilitarian and steady policy along lines set for them by the natural resources and extent of the kingdom Thus, when England was engulfed in the Wars of the Roses, and the menace of the Habsburg Empire rose up behind the indeterminate frontiers on the east, Charles VII turned towards Lorraine and Alsace Toul and Verdun claimed his protection, but the opportunity had passed for annexing them without grave difficulty. On the other hand the appanages that under the Capets had guarded the unity of the kingdom, had given rise under the Valois to a new and powerful feudal baronage

Louis XI. (1461–83).—A hard task awaited Louis XI The greatest of the new feudal lords, imprudently called into being by his ancestors, were the dukes of Burgundy whose domains were being gradually built up into a compact middle state between France and Germany The policy of successive dukes was to cement their somewhat inchoate territories, to keep a hold over such independent centres as the ecclesiastical principality of Liége; to encircle the monarchy with Burgundian dependants The policy of Charles of Charolais, known as duke Charles the Bold, was definitely to encourage feudal anarchy he said himself that instead of one king of France he would see six

The new king was a man of very simple tastes, endowed with a restless and impatient imagination, with an easy good nature designed to inspire confidence, penurious for himself, but reckless of money when he hoped to win over men who were useful or dangerous, favouring diplomacy rather than the hazard of war He had observed and comprehended the weaknesses of a Burgundy not yet a sovereign state, and too quickly aggrandized to be strong But in his early years he made many mistakes He was forced to struggle against the new Prague ries called Leagues of the Public Weal (presumably from their disregard of it) The adhesion of Burgundy gave solidity to this feudal combination On three occasions (1465, 1467, 1472) his own brother, the duke of Berry, supported by the duke of Brittany, the count of Charolais, son of Philip the Good of Burgundy, who was now too feeble longer to dictate Burgundian policy, and the duke of Bourbon, sought to impose their authority upon him That he triumphed was due rather to diplomacy than force of arms After an indecisive battle at Montlhéry, near Paris, knowing that he had to deal with a coalition of marauders out for plunder, he gave way in everything in the treaties of Conflans and of Saint Maur His promises, however, cost him little since he had no intention of keeping them. In the course of the second league provoked by his recovery of Normandy, which he had promised to his brother in exchange for Berry, he found himself caught in his own trap Venturing with an escort inadequate for protection to Péronne to try by his own persuasive powers to break the alliance between Charles of Burgundy and the dukes of Brittany and Berry he forgot that his agents were busy fomenting a rising against Burgundy in Liége He had hardly reached Péronne when news arrived of the outbreak of the rebellion in Liége, at the instigation of Louis' emissaries Threatened by Charles with imprisonment, Louis had to promise to fulfil his engagements made at Conflans and Saint Maur, to give Champagne to the duke of Berry, Charles' ally, and to assist in person in the subjugation of the rebels of Liége (1468). Once again at liberty he hastened to annul the treaty of Péronne and to force his brother, the duke of Berry, to give up Champagne in return for distant Guienne. The duke's death occurred opportunely at the moment when a third league was being formed with the object of placing him upon the throne Charles the Bold, who wished to recapture the

towns on the Somme, bought by Louis from his father, was repulsed before Beauvais; the executioner made an end to the treasons of the smaller nobility

It only remained to destroy the duke of Burgundy "The universal spider," as he called Louis, sat spinning his web in the darkness, and was eventually able to entangle him in it Louis secured Edward IV of England at Picquigny by means of a subsidy, and united the duke of Lorraine and the Swiss against his rival After the terrible defeats of Granson and Morat (1476) the Lorrainers destroyed the duke of Burgundy near Nancy (Jan 5, 1477) A scramble for the spoils ensued French provinces or imperial territories—Louis claimed them all But in his violent haste he caused the heiress of Burgundy to throw herself, in despair, into the arms of Maximilian of Austria, when he might have annexed the whole inheritance by marrying her to the dauphin The treaty of Arras (1482) gave him only Picardy, the Bourbonnais and Burgundy; while, through his error, the establishment of the Habsburgs in the Low Countries started the three centuries' rivalry between the Houses of France and Austria

The Administration of Louis XI.—The political tendency which governed all Louis XI 's foreign policy formed also the inspiration of his home Government Against his authority, right alone was of no avail Military and fiscal power, the two chief agents of domination at home and abroad, proved the basis of his policy As to the nobility, his only thought was to humble them as his predecessors had done by multiplying the number of new creations Rebels were subdued, the Church was held in a strict tutelage that was rendered more galling through the way in which Louis abrogated or affirmed the Pragmatic Sanction of 1438 to suit his fiscal needs or his Italian policy He was dubbed the king of the common people; and he was certainly one of them in his simple manners, no less than in his simple pleasures and religion, which was limited to superstitious practices But in the States-General of 1467 he revealed the same opposition to a democratic control of the revenues as he had shown to the privileges of the nobles He inaugurated that rule of autocracy which was to increase in strength until the days of Louis XV Louis XI was the king of the bourgeoisie, true, he demanded much of them, but he repaid them by measures which made for the suppression of those above them, as the restraint of those beneath them But the most faithful ally of Louis XI was death Saint-Pol, Nemours, Charles the Bold, the duke of Berry, his brother, old René of Anjou, and his nephew the duke of Maine, heir to great riches; death mowed them all down as though it were in his pay One day, however, death came to his retreat at Plessis-les-Tours to demand his wages, and carried him off despite all his relics (Aug 30, 1483)

Charles VIII. (1483–98).—The death of Louis was swiftly followed by the reaction that had threatened his work while he still lived That this reaction was only partly successful was due to his eldest daughter, Anne, wife of Peter de Beaujeu, brother and heir of the duke of Bourbon She had inherited her father's ability Anne and her husband, guardians of Charles VIII , began by making concessions Certain agents of Louis's were sacrificed to the anger of the *parlement* and lands were restored to hostile nobles, of whom the chief was the duke of Orléans, a son-in-law of Louis XI They even authorized the States-General to meet at Tours (1484) and for the first time the country districts as well as the towns were represented in it The royal party, however, succeeded in making the States-General reject the duke of Orleans' demand that he should be regent, and in packing the *conseil du roi* with their supporters Once supplies had been voted, they could ignore such demands of the Estates as the control of taxation and the summons of a meeting of the States-General every two years. The malcontent party next attempted to obtain by revolt what the Estates had failed to secure. Thus began the "Mad War" (1485) in which the duke Francis II. of Brittany played the rôle of a Charles the Bold and in which the Lorrainers, the kings of Navarre and England and Maximilian of Austria, took part This last sally of feudalism ended in what it sought to prevent—the marriage of Anne, the heiress of Brittany, to Charles VIII. (1491).

It only remained to consolidate the final victory of the Valois: the acquisition of Burgundy and of a Brittany that had ever been jealous of its independence. Suddenly, however, this policy seemed to be in danger of being abandoned and forgotten in the crazy ambition to assert the rights of the House of Anjou to Naples—an enterprise into which Charles VII and Louis XI. had refused to be drawn Obstinate, of mediocre ability, and with his head filled with the romances of chivalry, Charles VIII responded to the appeal of the Italians By this war he interrupted for a century and a half the national tradition which was not returned to until the accession of Henry II The truth is that this policy of magnificence appealed to the people of France who sought an outlet after the dull years of Louis XI 's reign. Charles began operations by returning Roussillon and the Cerdagne to Ferdinand of Aragon, and Artois and Franche-Comté to Maximilian of Austria; the first, acquisitions of Louis XI , the second, part of the Burgundian heritage He also paid a large sum of money to Henry VII of England to secure his neutrality After these foolish transactions, the paladin marched throughout the length and breadth of Italy If his journey was triumphal, his retreat was precipitate Charles only just escaped utter disaster at Fornovo (July 6, 1495), owing to the first of those Italian Holy Leagues which, at the least sign of friction, were ready to turn against France After these fruitless adventures he died, in 1498, without male issue

Louis XII. (1498–1515).—He was succeeded by Louis, duke of Orleans, who married his widow, Anne of Brittany, and thereby retained Brittany for France Along with his widow, he espoused his cousin's Italian policy He did not hesitate to plunge further into this imbroglio that was so popular in France, since with glory it brought a rich booty To the claims of Charles VIII. upon Naples Louis added his own upon the duchy of Milan derived from his grandmother, Valentina Visconti Appealed to by Venice and supported by Cardinal d'Amboise, who wished to become pope, Louis wrested the Milanese from Ludovico Sforza in seven months (1500). His conquest endured for 14 years Naples remained to be won At first Louis agreed to a division of the kingdom between himself and Ferdinand of Aragon; but that crafty individual presently betrayed him and, notwithstanding the gallantry of Bayard, Naples was lost to the French for ever (1504) Pope Julius II was responsible for a renewal of the Italian wars Jealous of Venice, he stirred up France, the German empire and Spain against her in the League of Cambrai (1508) Once he had attained his object, he sought to drive out of Italy the "barbarians" he had himself brought in, and summoned Spain, Germany, the Swiss, Venice and even Henry VIII of England to aid him against Louis XII. Gaston de Foix put an end to this Holy League by the crushing victory of Ravenna (1512) in which he himself lost his life; but, disheartened by the death, not only of de Foix, but also of his adviser, Cardinal d'Amboise, and beholding France threatened with an Anglo-German invasion, Louis XII abandoned Milan, for which he had sacrificed everything, and died in 1515 His subjects, remembering only his careful government and the prosperity he had given to his kingdom, and forgetting the 17 years of war about which they had never been consulted, dignified his memory with the appellation of "Father of his People "

Francis I. (1515–47).—As Louis XII had no sons the throne passed to his cousin and son-in-law, Francis, count of Angoulême, who along with the crown, inherited his predecessor's Italian ambitions The epic victory of Marignano (Sept. 13, 1515) made him master of Milan In return for the renunciation of Naples, he received from Spain in 1517 the restitution of French Navarre. The peace of Fribourg (1516) with the defeated Swiss, and the concordat of Bologna with Leo X. inaugurated a two-fold alliance that was to last as long as the monarchy itself. The deaths of Ferdinand the Catholic in 1516, and of the emperor Maximilian in 1519, and the election to the imperial throne of Charles of Austria against Francis I., opened up a field for adventure far greater than Italy. The rivalry of Charles V and the king of France was to let loose imperialism throughout Europe for forty years (1519–59)

Everything conspired to make their enmity inevitable. Lord of the Austrian lands of the Habsburgs, of the territories of Charles the Bold and of Spain, Charles V. could not go from Spain into the Low Countries or Germany without encountering France. Italy was of special interest to him, for she was the key to the Mediterranean, and without her it was impossible to preserve communications with Trieste, Naples, Palermo, Barcelona or Valencia. But France was to Charles V. a geographical as well as a political obstacle. If his imperialism were victorious, France, threatened simultaneously on her northern, eastern and southern frontiers, would be stifled From 1519 the Italian war ceased to be an expensive amusement for France, and became a matter of life and death To the rivalry of policies was added that of persons Francis was handsome, chivalrous and brave; the admired ruler of an aristocracy devoted to pleasure and to feats of arms, his court brilliantly united the ideals of chivalry with those of the Renaissance Charles, on the other hand, was a less attractive figure, with his grave and hard temperament, his hesitating and calculating disposition, he was little affected by the intoxicating influence of the Latin genius Each sought allies. Two presented themselves. the king of England who, not having abandoned the conquests of the Plantagenets, was able at any moment to checkmate Francis I. should the latter descend upon Italy; and the Pope who, seated between Milan and Naples, was invaluable to both but always feared the union of north and south Assured of the support of Henry VIII., whom Francis had failed to win over at the Field of the Cloth of Gold (*q v*), Charles sought for allies within France itself; and the sole survivor of the great feudal lords conquered by Louis XI., the constable duke of Bourbon, agreed to play the traitor in return for a promise of the restoration in his favour of the ancient kingdom of Arles Charles hesitated no longer From 1521 he attacked Francis both in France itself and in Milan, he reached the summit of his fortune at Pavia (1525), where Francis I. was defeated, taken prisoner, and, after a year of galling captivity, compelled to agree to the crushing stipulations of the treaty of Madrid (1526). Happily France remained quiet and united; Burgundy expressed its desire to remain French, and the States-General, in their meeting at Cognac, denied the king the right to alienate a province of his kingdom. At this juncture, however, in return for two million gold crowns, Henry VIII., alarmed at the success of Charles V., changed sides, and all Italy, with the pope at its head, rallied to Francis. In a rage, Charles V loosed upon Rome the mercenaries of the constable de Bourbon, who renewed the saturnalia of Alaric, but there met his death Nevertheless, Charles was forced to sign the "Ladies' Peace" (1529) by which Francis kept Burgundy, but lost Italy, though in placing on his own head the iron crown of Lombardy, Charles proved that he had not abandoned his imperialistic designs.

In the following six years of recuperation (1529–35), Francis spared no effort in his own defence, and embarked on a new policy of balance of power He did not scruple to bring within the same alliance the German Lutherans, Suleiman and his Turks, the heretic Henry VIII., and Clement VII. Diplomacy was more active than belligerency. The history of the years 1536–44 is that of truces made and broken, alliances formed and dissolved, reconciliations and imbroglios—the contradictions inseparable from a policy that crushed the Calvinists in France but supported the Lutherans in Germany, that sought the alliance of Clement VII. without any intention of breaking with Henry VIII., and asked the aid of Charles V. without renouncing the claims of France to Italy. Court intrigues between Madame d'Etampes, the imperious mistress of the aged Francis I., and Diane de Poitiers, who exerted great influence upon the dauphin, when combined with the constant changes in the personnel of the government and the lack of money that rendered all combinations ephemeral, further complicated the whole situation. Defeated at Cérisoles in Piedmont, Charles V. carried the war with no better success into Provence and Champagne. At the outset his power was curbed by the Schmalkaldic League between the German Protestants, by the threat from the Turks to Vienna and Italy, and by the disastrous failure of his expedition to Algiers. Unable to fight on three fronts at the same time, he concluded with France the peace of Crépy-en-Valois (1544), which confirmed the loss of Artois and Flanders and left Charles free to devote his attention to the Protestants and the Turks The treaty of Ardres (1546) between Henry VIII and Francis was little more than a new and heavy letter of credit drawn by Henry upon the French treasury

Absolutism.—In 1547, Francis I died. While in foreign affairs he had brought the doctrine of the balance of power within the sphere of practical politics, in home affairs he had strongly inclined the kingdom towards absolutism He was the first king to rule *du bon plaisir*. To a temperament so brave and fiery, love and war were schools little calculated to teach moderation in government. Italy not only inspired him with the love of letters and art, she also provided him with an arsenal of despotic maxims; his true teachers, however, were the lawyers of the universities in the south. The great legal traditions of the days of Philip the Fair were revived in the hands of men like Duprat or Poyet, who worked successfully to distinguish the "greatness and superexcellence of the king" from the rest of the nation, to isolate the nobility amid the seductions of a court life full of pleasures and possibilities of favours and high places; and to win over the *bourgeoisie*, at first by bribery and afterwards by the hereditary transmission of office. Thanks to them, feudalism, in its landed interest, was smitten in the person of the constable de Bourbon, in its financial aspect by the execution of the superintendent Semblançay, while the special privileges of the provinces were countered by administrative centralization

The master-stroke was the Concordat of 1516, which was a great step towards absolutism While Germany and England sought remedies against the fiscal exploitation of the papacy in reforms of dogma or in schism, France thought she had found it in the Pragmatic Sanction of Bourges of 1438 The lawyers went still further In giving to the king, by the Concordat, ecclesiastical patronage, they not only rendered the clergy a docile instrument, but they placed in the king's hands an inexhaustible reserve of wealth far greater than that which he obtained from the sale of offices They transformed a necessitous and easily-controlled monarchy into an uncontrolled despotism. As a peace-offering, they restored to the pope the canon law and first-fruits; and thus succeeded in isolating the monarchy within the presumptuous pride of its omnipotence

Henry II. (1547–59).—Master of the kingdom, Henry II was never for an instant master of himself. he never succeeded in being other than a reflection, in his private life of the ambitious and greedy Diane de Poitiers, and in his political activities of Montmorency or the Guises. Under him the policy of the balance of power was pursued as heretofore Charles V., who was seeking to convert an elective empire into a hereditary monarchy, everywhere encountered his opposition Henry's ally, Suleiman, by his conquest of Hungary and mastery of the Mediterranean, menaced the Empire on the east In Germany the protestant princes who had been defeated at Muhlberg (April 1547) obtained the assistance of Henry by means of the cession of Metz, Toul and Verdun (1551) To recover the princes, Charles was forced to sign the treaty of Passau (1552) and thereby to register the failure of his political ambitions by leaving to the empire its electoral character. At the same time he suffered a severe defeat before Metz (1553) at the hands of Francis of Guise From that time, Fortune, who does not love old men, betrayed him Despite the marriage of his son Philip with Mary Tudor, by which he gained the support of England (1554), despite the peace of Augsburg (1555), which pacified Germany by allowing the Lutheran princes to practice their religion undisturbed, Charles V was defeated by Henry II in the Low Countries, Montluc held him in check in central Italy, and—exhausted by illness and overwork—he abandoned Piedmont and the three bishoprics to Henry by the truce of Vaucelles (1556). After dividing up his territories between his son Philip and his brother Ferdinand, Charles abdicated the throne of Spain in Jan. and the imperial throne in Sept 1556 For France this was a twofold victory The renewal of the war by Henry, however, was a grave mistake. It was probably sug-

gested by the Guises who, since the victory at Metz, had been all-powerful at court and dreamt of obtaining Naples for themselves. Profiting by the absence in Naples of François de Guise Philibert of Savoy hurled himself into France by way of the Low Countries, the classic route of invasion, and overthrew the constable de Montmorency at St. Quentin (Aug 1557), but Philip II failed to take advantage of the victory Recalled to France from Italy, the duke of Guise avenged the national honour by capturing Calais (Jan 1558), which had been in English hands for two centuries

The treaty of Cateau-Cambrésis (1559) finally put an end to the Italian follies. Naples, Milan, Piedmont and Savoy were lost to France The loss of Savoy in particular was to leave a gap in the frontier for a century; but the possession of the three bishoprics of Toul, Verdun and Metz, and the re-capture of Calais, were symptomatic of a renewed effort towards making good the weak spots in the French armour The treaty was not concluded before it was due, for the Reformation, during 38 years of fresh civil wars, was about to subordinate national interests to religious quarrels, and to bring France to the very edge of the abyss

The Reformation.—Since the failure of the great councils of the 15th century, the cry "Reform! Reform!" had filled Christendom without awakening an echo That Reformation (*q v*) which the popes would not carry through was carried through without their assistance In France it did not possess at first a revolutionary character, it was not more than a belief arising out of traditional Gallican theories and the new humanism, and began as a protest at the decadence of the papacy and against mediaeval scholasticism among a small group of moderate and sagacious reformers centred at Meaux, around Lefèvre d'Etaples, and supported in opposition to the theological faculty of Paris by Marguerite de Navarre, the sister of Francis I But neither the doctrine itself, nor persecutions, were sufficient to create a church and so a party That was to be the work of the economic revival brought about by the great discoveries overseas This revival had concentrated wealth in the hands of the middle classes, and, along with capitalism, all the other elements of power The monarchy and the peasants had also benefited by it; after a century and a half of foreign wars and civil disturbances the former appeared the one and only power capable of maintaining order and unity, while the latter had taken advantage of the disappearance of the landed aristocracy—who would not work—and of the depreciation of the currency to regain possession of the land and to sell their produce more profitably. But there were two victims of this new order of things the city proletariat, who were ever more oppressed by their employers, and the aristocracy bereft of its economic power and deprived day by day of its sovereign rights

Thus the Reformation, the product of the educated classes, found its earliest supporters among the working classes of the 16th century It was essentially an urban movement, although in the days of Francis I and Henry II it had already reached the country districts. From these artisans, labourers and small shopkeepers there were enough to create a martyrology, but not enough to found a party For a long time the reformers respected the monarchy and its institutions, and, in accordance with the doctrine proclaimed by Calvin, suffered persecution for 40 years before they finally took up arms. It was not until the second half of the reign of Henry II that Protestantism, having attained its religious evolution, became the watchword of a political party

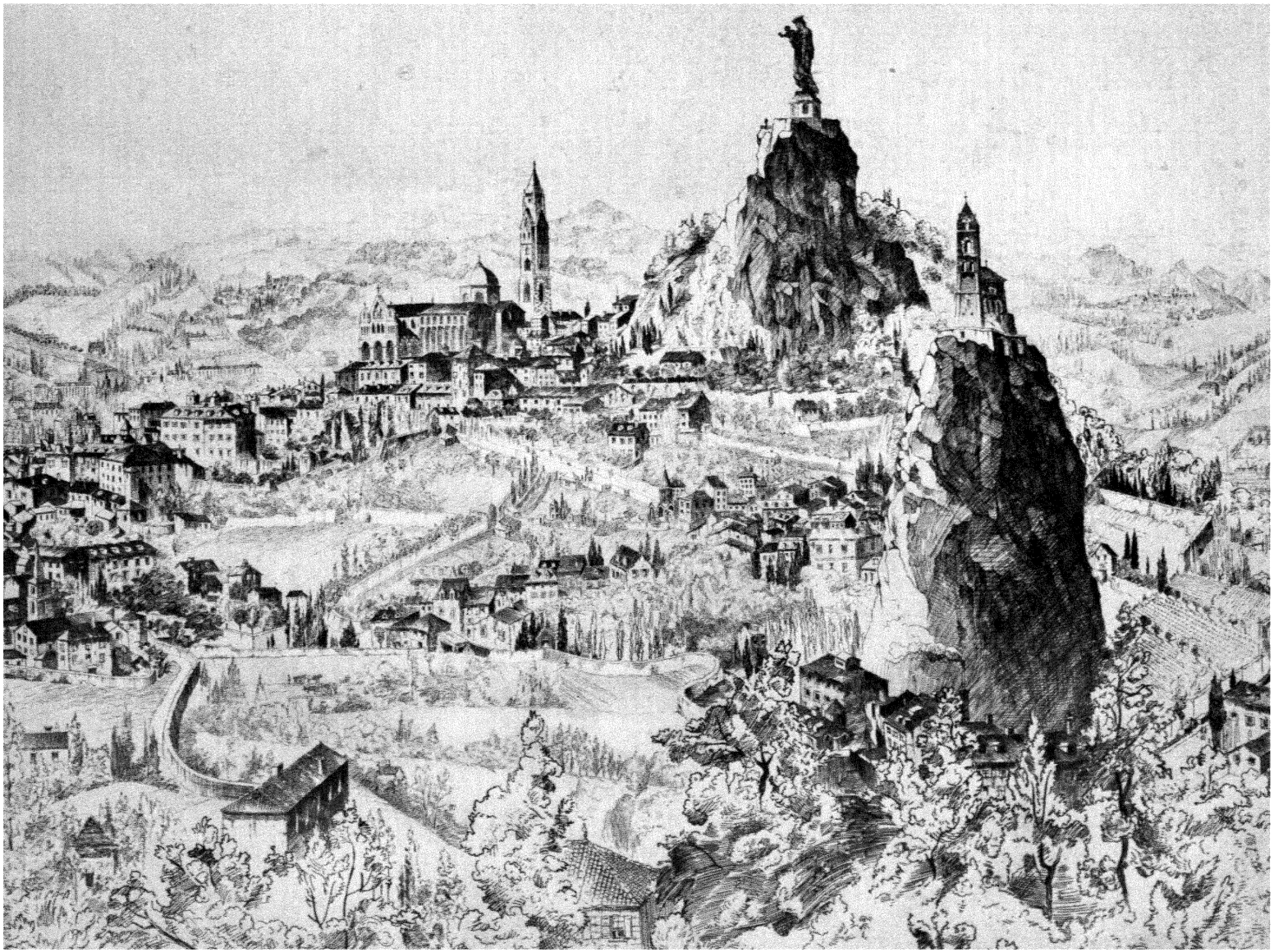
Gradually the party brought forward measures that grew ever more and more radical in character, and the peaceable citizens who composed its ranks were transformed into a military aristocracy which saw in the secularization of the ecclesiastical estates a remedy for the existing high cost of living. Coligny and Condé took the place of the timid Lefèvre d'Etaples and the harsh Calvin. Men succeeded to saints. Contrary to their tenets, the reformers became a political and religious party of an increasingly international character The lance of Montgomery, by accidentally killing Henry II. (1559), gave the reformers a favourable opportunity. Henry left behind him four youthful and degenerate sons. There followed a series of minorities and regencies—all causes of trouble in a kingdom that depended on centralization; all giving excuse, also, for the revival of the old feudalism, whose chief upholder, Antoine de Bourbon, king of Navarre, had reason to hope for the crown.

Catherine de' Medici.—Francis II. was never other than a sickly and nervous child governed by two women. his mother, Catherine de' Medici, and his wife, Mary, queen of Scots, niece of the Guises Through her, Francis, duke of Guise, victor of Metz and Calais, gained control of the army and his brother, the cardinal of Lorraine, power over the king and the kingdom. To be excluded from power by the Guises, sprung from Lorraine and thus half foreigners, was infinitely exasperating to the princes of the blood—Antoine de Bourbon and his brother Condé. They sought a following among the discontented Calvinists and the disbanded officers of the armies that had fought in the Italian wars Strengthened by the failure of the conspiracy of Amboise, which had been organized (1560) by Condé to overthrow them, the Guises took advantage of their victory to issue the edict of Romorantin The chiefs of the reforming party, arrested at the States-General of Orleans, were in danger of their lives when the early death of Francis II (Dec. 1560) ruined the Guises and saved Protestantism

Charles IX was also an invalid and a minor Catherine de' Medici easily ousted the legal regent, Antoine de Bourbon, and for ten years kept her son in her own charge Up to that time she had appeared to be no more than the retiring and self-sacrificing widow of Henry II Subtle and full of maternal ambition, she had attained to power at the age of 41, in the midst of the hopes and fears aroused by the fall of the Guises and the return to power of the Bourbons But she needed the support of a party Indifferent in religious matters, she had a love of power, a characteristically Italian adroitness in intrigue, and a fine political sense She was the first to understand in the interests of the royal authority that between the violence of Catholics and Calvinists lay the middle path of toleration Her spokesman in the States-General at Orleans was the chancellor, Michel de l'Hôpital, an honest man whose scepticism rendered him moderate, who was pliable because he was a courtier, and who was, nevertheless, so unpractical as to believe that a reform of the laws could be undertaken in the midst of disturbances, and to disarm the government when the factions were arming themselves against it By the Colloquy of Poissy (Sept 1561), Catherine and de l'Hôpital attempted, after the manner of Charles V at Augsburg, to achieve a religious peace They were soon overwhelmed by the different factions The Catholic triumvirate of Montmorency, the duke of Guise, and the marshal Saint-André so far abused the spirit of the Colloquy as to embroil the French Calvinists with the German Lutherans, and to make the Catholics believe that the Government was ready to sacrifice the faith The Huguenots (*q v*) under Coligny and Condé, having obtained liberty of conscience in Jan (1561), now demanded liberty of worship. When Michel de l'Hôpital, in the edict of Saint-Germain (Jan 1562) granted the Huguenots a restricted right of worship the triumvirate, thinking themselves menaced, hesitated no longer The massacre of Vassy (March 1, 1562) gave the signal for the outbreak of the wars of religion, and the abduction of the Queen-Mother and the young king from Fontainebleau gave the reins of government into the hands of the duke of Guise.

THE WARS OF RELIGION

At the commencement of these eight fratricidal wars, neither Protestants nor Catholics had any intention of overthrowing the king's authority, but rather sought to control it with a view to strengthening their cause. But as the contest became more and more embittered, Catholicism itself became a revolutionary force and a menace to the dynasty. The fanaticism of both parties rendered the struggle peculiarly ferocious, as witness the terrible cruelties of Montluc and Des Adrets in the south of France. Incapable of destroying each other each party sought allies outside the kingdom, and thus the struggle became international rather than national. The Protestants received the support of the Ger-



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LE PUY, IN THE CEVENNES

An etching, by John Taylor Arms, of Le Puy, the chief town of the department of Haute-Loire, in the south of France The town is situated on the steep slopes of the Rocher Corneille, against the side of which (in the centre background) is the cathedral On the summit of the Rocher Corneille is a colossal statue of the Virgin; on the Rocher d'Aiguilhe a little lower, stands the chapel of St -Michel-d Aiguilhe, a 10th century oratory The plate is reversed

man Lutherans, the Calvinists of the Low Countries, and the protestant subjects of Queen Elizabeth. In support of the Catholics, Philip II. of Spain rallied the pope, Spain, Italy, and the duke of Savoy. The two camps were divided, not by patriotism, but by religion. The war was fought in three principal theatres, the northern, Normandy and the Loire valley where Orleans, the centre of the Reformers, guarded the line of communication between Germany and the south; the south-eastern, Lyons and the Vivarais; and the south-western, Gascony and Guienne

The first war lasted a year and cost the lives of the majority of the leaders. Threatened by an English invasion, which Coligny and Condé had purchased by ceding Havre, Guise captured Rouen by assault, but in the attack Antoine de Bourbon lost his life At Dreux, fought to close the road to German reinforcements hastening to join the English, Saint-André was killed, but the victor, Montmorency, and Condé were taken prisoners Guise was assassinated by Poltrot de Méré as he was attacking Orleans (Feb 1563). Freed from his uncomfortable tutelage and head of a Catholic party of tried strength, Catherine was able to destroy the unity of the Huguenots in the Peace of Amboise (March 1563), by which Condé demanded freedom of worship only for the Protestant aristocracy; Catholics and Protestants then united to drive the English out of Havre.

The Second War.—A breathing-space of four years, during which Charles IX attained his majority, followed upon this peace which satisfied neither party Catherine, who desired peace at home and abroad, endeavoured in the conference of Bayonne (June 1565) to win over Philip II to a sort of Catholic Holy Alliance that should combat heresy without using force That the hour for moderation had not yet struck is shown by Condé's attempt to kidnap the king and Catherine, and to hold Paris He failed, and the second religious war broke out in Sept. 1567. During the siege of Paris Montmorency was killed (Nov. 1567); the peace of Longjumeau, which followed in March 1568, sought to re-establish the settlement of Amboise

The Third War.—The peace was of short duration. The fall of Michel de l'Hôpital, who had so often guaranteed the loyalty of the Huguenots, destroyed the moderate party (May 1568). Stirred up by the monks and the Jesuits, the Catholic reaction displayed itself everywhere The leadership of the movement was entrusted by the cardinal of Lorraine to Catherine's favourite son, the duke of Anjou, the future Henry III. This disquieted Condé, who was in the west, where the Reformation was firmly established Thanks to Tavannes, Anjou gained easy victories at Jarnac over Condé, who was slain, and at Moncontour over Coligny, victories that were nullified through the jealousy of Charles IX (March–Oct. 1569). Coligny replied with a bold thrust at Paris and defeated the royal army at Arnay-le-Duc in Burgundy. Lacking resources and exasperated by the overweening conceit of the Lorraine family, Catherine signed the peace of Saint-Germain on Aug. 8, 1570. More generous than that of Amboise, it guaranteed to the Huguenots, for the first time, four fortified cities: La Rochelle, the key to the sea; La Charité, in the centre of France; and Cognac and Montauban in the south.

St. Bartholomew.—Charles IX., now 20 years of age and the husband of Elizabeth of Austria, set up as his own master, but merely exchanged the tutelage of his mother for that of Coligny, through whose eyes he viewed everything. The monarchy had negotiated with the rebellious Huguenots as though with a belligerent power. For its success, this policy demanded a complete reconciliation between the parties. This Charles attempted by seeking to marry his sister, Marguerite de Valois, to the son of Antoine de Bourbon and Jeanne d'Albret, queen of Navarre, that Henry who was both head of the Huguenots and heir to the crown should Charles IX. and his young brothers die childless. Coligny, a Huguenot but first of all a Frenchman, declared war against Spain in order to unite all patriotic Frenchmen and to divert the nation from civil war to the conquest of Flanders Unfortunately his troops were defeated in the Low Countries, while the marriage of Marguerite—the first "mixed marriage"—scandalized the Catholics who were already jealous of the growing power of the Huguenots.

The attempted murder of Coligny, instigated by Henry of Guise as a reprisal for that of his father, was the first intimation of the general unrest. Charles IX was incensed and the Huguenots wished to avenge their chief; but Catherine, alarmed at the imminence of war with Spain and fearing lest the Guises, as leaders of the Catholic reaction, should master the kingdom, persuaded her son, distraught with fear of both Guises and Protestants, to forestall the former by crushing the latter. The signal was given in Paris and throughout the provinces for a wholesale massacre of the Huguenots (Aug. 24, 1572).

The Fourth Civil War.—The massacre of St. Bartholomew settled nothing It is true that Calvinism lost its greatest leader by the death of Coligny The other chiefs, Henry of Navarre and Condé, as well as the wealthy middle classes, abjured their religion under pain of death at the very moment when the reforms effected by the Council of Trent cut away the ground from beneath their feet But the pastors, relieved of the aristocratic politicians, and supported by the Protestant democracy, sounded the call to arms This fourth war was chiefly remarkable for the siege of La Rochelle. During the war the Huguenots organized themselves and formed a State within the State. They were saved by the excesses of the reaction A third party, which drew moderate men from both camps, was inspired even more by jealousy of the ambitions of the Guises than by horror at the massacres. Its leader was the king's brother, the duke of Alençon, who was supported by the brothers Montmorency, the parents of Coligny, the king of Navarre and Condé The edict of Boulogne (1573) put an end to the war, and the Catholics lost their chief by the election of the duke of Anjou to the throne of Poland (May 1573).

Henry III. 1574–89.—Anjou had scarcely arrived in Poland before the news of Charles IX 's death recalled him in haste to France He found the kingdom divided into rival groups. His young brother, Alençon, abandoned the court to place himself at the head of the *Politiques,* or Third Party Henry of Navarre resumed his Calvinism and imitated Alençon by placing himself at the head of the Protestants A compact was concluded between them at Millau Thus broke out the fifth religious war Notwithstanding the victory won by Guise at Dormans, Henry III. in the peace of Monsieur (May 6, 1576) yielded all that the coalition demanded Alençon received the appanage of Anjou, Touraine and Berry; the king of Navarre, Guienne; Condé, Picardy; while the Protestants obtained the restoration of their fortified cities and liberty of worship throughout the kingdom, with the exception of the neighbourhood of Paris. Seats were granted to them in the *parlements* and the massacre of St Bartholomew was disavowed.

This was going too fast In the reaction that followed upon this seeming abandonment of the kingdom by the king there arose a fourth party, the Holy League, of which Henry of Guise was popularly considered the leader This league was organized on the lines of the Huguenot provincial associations, but with this difference—that it was designed to be offensive The membership was primarily recruited from among the upper middle classes and the lesser nobility—men of honesty and caution. In the name of a people menaced by heresy it demanded from the States-General at Blois (1576) the re-establishment of unity of faith, and opposed to the divine right of incapable or evil monarchs the religious right of the nation.

In order to oust his rival, Henry of Guise, Henry III. determined to reveal himself an ultra-Catholic, but by declaring himself head of the League he lowered himself to the level of a party leader. Enraged by this trick, the League refused to finance his war against the Huguenots. Next Henry abolished the Edict that had placed Huguenots and Catholics on the same footing. The Huguenots, however, were not to be intimidated by the "packed" States-General of Blois, and, after a brief campaign, obtained in the Peace of Bergerac (1577) the restoration in a somewhat curtailed version of the previous peace. This was later renewed at Fleix (1580) after the so-called "Lovers' War," which arose out of the intrigues of the wanton Marguerite, wife of Henry of Navarre.

Would the Holy League succumb? The death of the duke of

Anjou after his foolish attempt to carve out a kingdom for himself in the Low Countries, coupled with the certainty of the accession to the throne of the heir of the effeminate Henry III, Henry of Navarre, upset the theories of both parties The Huguenots found themselves again the supporters of the hereditary principle and the divine right of kings The Catholics and the Guises, the latter inspired with a personal and selfish *arrière-pensée*, became the upholders of elective monarchy and the sovereignty of the people. Was it not unthinkable that the crown of the eldest daughter of the Church should be allowed to pass to a relapsed heretic? In order to facilitate their possible accession to the throne, the Guises, who had already fabricated a genealogy that led them back to Charlemagne, entered into an understanding at Joinville (Dec 1584) with Philip II and the pope to set aside Henry of Navarre and to substitute for him the old cardinal de Bourbon who, on his death, would leave the crown to Henry of Guise

But patriots, lawyers, members of the *Politiques* and Huguenots alike joined to protest against this management of French policy by Spain Civil war was renewed The three Henries, Henry of Navarre, Henry III, and Henry of Guise, faced each other Henry III was in a difficult position He did not dare to ask from the protestant Elizabeth of England the men and money which he needed. As the crafty Henry of Navarre did not mean to alienate the Huguenots, except by an apostasy profitable to himself, Henry III, while feigning to surrender everything to Henry of Guise, sought to play off the Huguenots against the Catholics and *vice versa* But his favourite, Joyeuse, who should have easily defeated the king of Navarre, was himself defeated at Coutras, and Guise, whom he had hoped to see crushed by the German levies sent by Elizabeth to aid Henry of Navarre, was victorious at Vimory (Oct) and Auneau (Nov 1585) The League believed that nothing remained to be feared It had organized in Paris a committee of action—the Committee of Sixteen—whose influence was felt throughout France At the same time, from every pulpit the preachers were hurling insults at the king On the threat of their arrest Paris revolted and called upon Guise, who entered the city despite the opposition of the king The king's troops also having entered, a St. Bartholomew of the Catholics seemed possible Barricades were set up in the streets Henry III, besieged in the Louvre, was forced to appeal to Guise to suppress the rising, and took the opportunity of escaping to Chartres Postponing his revenge for the moment, he yielded by the Edict of Union (July 1588) what he had refused in face of the barricades But infuriated by insults and by the States-General at Blois, composed entirely of members of the League, and emboldened by the destruction of Philip II.'s invincible Armada, Henry III. resorted, like Charles IX, to political assassination He imprisoned the old cardinal de Bourbon, and caused Henry of Guise and his brother, the cardinal of Lorraine, to be murdered (Dec 23, 1588) On Jan 5, 1589, Catherine de' Medici died "Now I alone am king"—cried Henry III. But he was ruler of a sadly attenuated kingdom: Blois, Tours and Bordeaux In order to win back his realm and, above all, Paris, he was reconciled with Henry of Navarre The dagger of Jean Clément put an end to his work (Aug 1, 1589). With his dying breath he named Henry of Navarre as his successor

THE BOURBONS

Henry IV. 1589–1610.—Would the new king also find himself powerless between the threat of Huguenotism and the popularity of the League? He could reckon only on the support of a section of the Huguenots and the catholic minority of the *Politiques;* whilst his rival, the cardinal de Bourbon, who had been proclaimed king as Charles X, could count upon the support of the League, Spain and the pope Henry had practically to reconquer the whole kingdom and to re-create its national unity His most valuable assets were his personal charm, his quick-wittedness, tenacity and dauntless courage Success would have come to him more easily had he not been a Huguenot, but he well knew that an abjuration of his faith would only ensure his position if he appeared sincere and not precipitate Thus his first task must be the reconquest of his kingdom with the assistance of the aristocracy that, in general, had remained loyal to him

Instead of retreating to the south he remained in the neighbourhood of Paris, on the banks of the Seine and within reach of the reinforcements sent by Elizabeth. Twice, at Arques (1589) and at Ivry (1590) he defeated the duke of Mayenne, the lieutenant-general of the League, and twice he fruitlessly attempted to storm Paris Mayenne, aided by Alexander Farnese (*q.v.*), governor of the Low Countries, prevented him also from capturing Rouen, that strong base for a siege of Paris Luckily the Committee of Sixteen had disgusted the upper middle class of Paris by their demagogic fury and offended the patriotism of the more moderate members of the League and of the *Politiques* by their open alliance with Philip II and by their acceptance of a Spanish garrison for Paris Mayenne, who was playing for his own hand with both Henry IV and Philip II, was compelled to break up this party of fanatics and theologians (Dec 1591), and in order to put an end to the temporizing policy that was hastening on the disruption of the kingdom summoned the States-General to Paris (Dec 1592) as though he himself were king Henry IV replied by outlawing every deputy who attended Three-fourths of them stayed away, but Philip II and the pope were represented This "shadow States-General," followed by the *parlement,* had the good sense and loyalty to turn a deaf ear to ultramontane claims and Spanish intrigues that sought to give the throne to the daughter of Philip II The famous pamphlet *Satire Ménippée* reflected the awakening patriotism of the people, the weariness of religious disputes and the revival of public interest in national questions

The movement in Henry's favour became irresistible when he decided to "take the step" and voluntarily renounced his protestantism at St Denis on July 26, 1593 The coronation of the king at Chartres in Feb. 1594 completed the rout of the League. The *parlement* of Paris pronounced itself against Mayenne, the tool of Spain; and Brissac, the governor, opened the gates of his capital to the king The example of Paris and Henry's clemency rallied round him the most prudent members of the Catholic party, such as Villeroy and Jeannin, who were anxious for national unity, but he was forced to buy the adherents of the League, who charged him more than 60 million francs for his own kingdom The pontifical absolution of Sept 17, 1595, finally drew the fangs of the League which was again betrayed by the frustrated attempt of the Jesuits' pupil, Jean Châtel, to assassinate the king It only remained to expel the Spaniards This war of deliverance was to efface the nightmare of the civil wars Unhappily, the latter had so exhausted France that, notwithstanding a victory at Fontaine-Française (June 1595), Amiens was captured and Paris threatened with a siege But since the defeat of the Armada, Spain had grown equally enfeebled Philip II therefore resigned himself to the treaty of Vervins (1598) which confirmed that of Cateau-Cambrésis and set its seal upon the decadence of Spain Spain was no longer able to dismember or conquer France The duke of Savoy was forced to capitulate in his turn The treaty of Lyons (1601) at last brought the frontiers of the kingdom to the southern Jura

The Edict of Nantes.—Within a month of the treaty of Vervins, the Edict of Nantes (April 13, 1598) was also signed The example of the United Provinces enabled the Protestants to form a federal and Calvinistic state in France Not wishing to break with them, Henry compromised with the Huguenot Government In return for abandoning the question of freedom of worship, which was authorized only where it had existed before 1597, and in two towns of each *bailliage*, the Huguenots obtained an unrestricted liberty of conscience, admission to all offices, courts in the *parlements* composed equally of Catholics and Protestants, and an annual financial contribution from the royal treasury towards the salaries of their pastors To these political guarantees Henry was forced to add territorial guarantees—100 fortified towns were to be occupied by the Huguenots at the expense of the king This was certainly a "legalized republic" within the kingdom; a fact that explains why the Edict was only registered with difficulty because public opinion saw in it—and with reason—a source of future danger

With the kingdom freed from the Spaniards and the religious

wars concluded, all that remained for Henry IV. to do was to re-establish the royal authority that had been severely shaken since 1560. Was he to associate the nation with him in this work? As on the morrow of the Hundred Years' War, the weariness and the want of political intelligence in the land no less than the arrogance of the upper classes brought about a fresh abdication of the nation's rights The cares of living made them forgetful of that necessity for control which had been maintained by the States-General from 1560 to 1593 And this time, moderation on the part of the monarchy, although a factor, was no longer to be an essential of its triumph. A man of action and a soldier, Henry IV. never expected to have to render an account of his actions to anyone except God Himself He ruled by divine right There were no more meetings of the States-General, only of the Assembly of Notables, and then only "with his sword in his hand." No longer was the power shared with a Council of Twelve. His *"conseil étroite,"* limited to five members drawn from all the parties, was little more than a committee of clerks, of whom the principal, Sully, a madman for work but of a cross-grained honesty, was the architect for the restoration of France

The most characteristic symptom of the misery of the kingdom was brigandage, which could be put down only by the gallows The governors of the provinces furnished another danger Great nobles with an armed following, they were rarely in open revolt against the king, but they were accustomed to quarrel and threaten, and to start underhand negotiations with foreign Powers that, at times, as in the case of marshal de Biron, duke of Bouillon, attained to the dimensions of a conspiracy (1601–02) As to the Protestants, contrary to Henry's hopes, their political activity showed no signs of diminishing Between 1598 and 1601 they held three assemblies and managed to prolong until 1611 the possession of the *places de sûreté* which had been granted them only for eight years

Sully.—The most urgent duty confronting the king was to resuscitate the corpse of France With the restoration of order, he gave to the peasant the desire for work and by reducing the *taille* rendered him better able to pay the tax By forbidding the seizure of agricultural tools, by draining the marshes, and by permitting the free sale of wheat and wine according to the state of the harvests, Henry encouraged agricultural prosperity In this work he was aided by Sully The scarcity of agricultural labour, the high wages following on the civil wars, and the rise in the price of agricultural produce, enabled Henry's desire that "every family should have a fowl in the pot on Sunday" to be more frequently realized Moreover, in spite of Sully, who, with his hatred of luxury and waste, was an agrarian, Henry, with the aid of Laffémas and Olivier de Serre, sought to awaken industry in the towns; in which they would have been more successful had they seen that greater liberty could safely be given to the artisans. The edict of 1597, inaugurating the system of commercial companies, was a prelude to Colbert's legislation; but Laffémas' suggestions for syndical courts were never given effect. Nevertheless some industries were founded or re-organized. silk-weaving, for which the planting of mulberry trees was encouraged, glass-making, tapestry, etc

Sully at least provided internal commerce with the necessary roads and canals In the export trade Laffémas was again the precursor of Colbert in establishing the exemption from taxation of raw materials, and in prohibiting the importation of manufactured products similar to those made in the kingdom. Without actually winning back her former pre-eminence in the Levant, Marseilles gained for herself an honourable position in commerce But Sully did not understand the significance of the commercial expansion started by Francis I. in Brazil and continued by Champlain in Canada His real province lay in the supervision of finance, and in this he did not reveal himself an innovator; but he administered the wealth of the country as his own, honestly, carefully and strictly. His ideal was the accumulation of vast reserves in the Bastille. His only original creation, the edict of la paulette in 1604, was disastrous In return for the annual payment of $\frac{1}{60}$ of the estimated revenue of the office, this edict made hereditary the judicial offices which had been held for life only By means of the millions thus brought in from day to day, the kingdom was relieved from the necessity of having to seek revenues from more regular and better sources. but political liberty and social justice were equally the losers by this extreme and ill-considered measure.

Henry IV.'s Foreign Policy.—The foreign policy of Henry IV. from 1598 to 1610 bore no resemblance to the "grand design" of Sully, the invention of a minister embittered and disgraced. Under the inspiration of Jeannin, Henry, who was the least visionary of kings, hovered between two contradictory policies: the war against Austria and Spain demanded by the Huguenots and *Politiques* like Sully, and a Spanish alliance, cemented by marriages and demanded by his second wife, Marie de' Medici, and the ultramontanes The question of the Cleves succession at last forced him to take sides The affair was grave in that Austria in claiming it sought to set foot upon the left bank of the Rhine. But the war was undertaken by Henry chiefly through an access of senile passion for the princess of Condé The dagger of Ravaillac caused the curtain to fall abruptly on this new Trojan War (May 14, 1610) The *cornette blanche* of Arques, the *poule au pot* of the peasant, his fame as a lover, his lively and vigorous good humour have surrounded Henry with a halo of popular hero-worship not entirely justified by facts

Louis XIII. 1610–43.—With the accession of Louis XIII the unstable character of the monarchy was again made manifest. A sovereign at the zenith of his powers was succeeded by a child of nine Since all power rested in and emanated from the king, a minority provided an opportunity for the elements of civil unrest to come to the surface The Huguenots were resolved to defend their religious and political privileges, the princes of the blood and the great nobles were convinced that the hour of the monarchy had struck and that their own tenure of power was about to return

Proclaimed regent by the *parlement*, Marie de' Medici was as jealous of power as she was incapable of exercising it. Instead of weakening her opponents by pursuing Catherine de' Medici's policy of playing off one party against another, she could think of nothing better than to distribute offices and money among the chiefs of both parties Once the treasury was despoiled and Sully disgraced she lost all her influence and became the tool of the ambition of a low-born Florentine, Concini. Thenceforward policy became a matter of petty artifice. after having made a show of drawing the sword against Condé, the leader of the great nobles, the Queen-Regent opened her purse instead The "costly peace" of Sainte-Menehould (May 1614) marks the first abdication of power on the part of the monarchy

To avoid giving Condé the pretext for further rebellion, the States-General—as always during a minority—was summoned It was to be for the last time until 1789; but their meeting was of little importance No mention was made of reforms or of any endeavour to curb the government Each of the three orders was concerned solely to defend its own interests—the nobles, their pensions; the clergy, the theocratic claims of the papacy; the Third Estate, the *paulette* that gave it a kind of hereditary judicial nobility. After subsidies had been voted and Louis XIII declared of age, Marie de' Medici was able to bring about the marriage of the king with Anne of Austria, and that of the princess Elizabeth with the son of Philip III The Protestants were rendered anxious by these Spanish marriages and by Sully's disgrace, and they united themselves to the party of the nobles who were irritated by the increasing power of the Concinis Once again an incipient rebellion was nipped in the bud by means of governorships and pensions (Peace of Loudun, May 1616). Concini then conceived the plan of imprisoning Condé and of replacing the "greybeards" of Henry IV. by his own men, notably by the almoner to the queen, Richelieu He thought himself the master of the kingdom and assumed towards the king a sort of condescending guardianship. That sealed his doom: Louis XIII. had him assassinated on April 24, 1617, and his widow executed a few weeks later.

As Richelieu rose to power through the influence of Marie de' Medici, so another adventurer, Albert de Luynes, came to the

front by reason of his influence with Louis XIII, a forlorn child whom he had contrived to amuse. The change was one of name only. Luynes became a duke and marshal in Concini's stead, while the duke d'Epernon, a supporter of Marie de' Medici, who had been banished to Blois, assumed the leadership of the opposition in place of Condé The treaties of Angoulême (1619) and Angers (1620) resembled the "unwholesome" treaties of Loudun and Sainte-Menehould The Huguenot revolt was of a more serious nature At the instigation of the militant Catholics, Luynes conceived the unfortunate idea of re-establishing the Roman Catholic faith in Béarn, which had been Calvinist since 1563. But he was repulsed before Montauban, and his death in 1621 spared him the disgrace of his predecessor His authority and intrigues were inherited during the next three years by Marie de' Medici In those three years, there were three different ministers—all mediocre men In the background stood the cold and subtle personality of Cardinal de Richelieu, who was to seize the helm and be for 18 years the king behind the throne

Richelieu, 1624–42.—Richelieu was fortunate in the moment of his accession to power. The country was sick of rule by deputy and of the 14 years of disorder, moreover grave events in Europe demanded the pursuit of a vigorous foreign policy. In his *Testament* Richelieu has revealed that the course of action followed by him with an indomitable and often cruel determination had been planned at the time of his entry into the royal council "I promise," he told the king, "to devote all my energy and all the authority that it may please you to place in my hands to destroying the Huguenots, abasing the pride of the great nobles, restoring all your subjects to their duty and in raising the name of your majesty among foreign nations to its rightful place" Everybody was forced to bow before the dogma of absolute monarchy; the Huguenots were the first on whom it was enforced Taking advantage of Richelieu's pre-occupation in expelling the Austrians from the Valtelline, the emperor's line of communication with his Spanish lands, the Huguenot leaders, Rohan and Soubise, supported by their powerful organization and by England, took up arms in 1625 Richelieu, who was hampered by court intrigues, and who wished to engage in a political rather than a religious conflict, preferred to make peace; this was, however, no more than a postponement of the struggle When in 1627, the English declared war upon France, and the Huguenots took their side, Richelieu resolved to fight to a finish The capture of La Rochelle, after a siege marked by fierce fighting on both sides, and Rohan's defeat in the Cevennes, notwithstanding the help of Philip IV of Spain, enabled Richelieu to impose upon the Huguenots the Edict of Alais (1629). Henceforth they ceased to form a separate body within the State

The overthrow of "the four square feet of the king's cabinet" involved a longer and more bitter struggle To achieve his end, Richelieu had to remain in power, a difficult task with a master like Louis XIII who "liked to be governed yet bore being governed with impatience." Taciturn and distrustful, Louis gradually came to trust his minister, but never learned to like him He was accustomed to listen to his mother who accused the cardinal of "black ingratitude," and to his wife—too good a Spaniard—who reproached him with desiring to dismember her country. The heir to the throne, the king's brother, Gaston of Orleans, who posed as the beloved prince in all conspiracies directed against Richelieu and each time ultimately played Judas, had oftentimes to be reckoned with These divisions within the royal family were naturally exploited by the nobles. Suspicious and irritable, Richelieu frequently believed himself to be threatened when he was not, and, in identifying himself with the king, sincerely believed that he was defending the king's authority and not that of the cardinal As long as his position was uncertain he was forced to suppress court conspiracies, time and again displaying his merciless severity: on Chalais, who sought to prevent the marriage of Gaston of Orleans with Madame de Montpensier, the richest heiress in the kingdom (1626); on the brothers Marillac; and even on the two queens, after the Day of Dupes, when they believed they had been successful in securing his dismissal (1630). There were also armed revolts against the powerful minister, for sharing in which Montmorency, governor of Languedoc, forfeited his head in 1632. Other rebels against the cardinal's authority summoned foreigners to their aid—notably de Thou and Cinq-Mars, who allied themselves with Spain, but were overthrown and executed at Lyons (1642) Obedience to the king became general and unquestioned throughout France.

Internal Administration.—Before Richelieu's day there had been no effective institutions of control other than advisory councils, which might have developed further had the king been willing; Richelieu, however, deliberately suppressed them According to his ideas the king should formulate his policy in secret the king's will was law Nobody else should occupy themselves with politics—neither the *parlements* nor the States-General, still less the public The press, only just created by Renaudet, was forced into the service of the Government, as was the Académie Française Provincial and municipal privileges met with the same treatment Under the influence of a natural but excessive reaction against the decentralization that had followed the League, Richelieu fell into the opposite error of a too great concentration of power He denied to the people the right of criticizing the acts of the Government, and killed the spirit of public opinion revealed in the *Republic* of Bodin, in de Thou's *History of His Own Time,* in La Boétie's *Contre-un,* and in the *Satire Ménippée.* But in establishing despotism Richelieu did not create new instruments of government He made use of the Intendants (*q v*), the revolutionary creation of the 16th century, ancestors of the commissaries of the convention, lawyers of middle class birth, detested by everyone and, therefore, all the more trustworthy By their means he began that great transformation of the monarchy by which influence was entrusted to civilians and bureaucrats, to the exclusion of soldiers and aristocrats

Finance.—With his passion for the uniform and useful on a grand scale, Richelieu's vision was far-reaching He dreamt of destroying corruption and of reducing the taxes But this required peace, and soon there arose an open issue between the reforms and the necessary war War is a costly amusement. Richelieu maintained a lofty attitude towards finance, and left the petty details to his agents—D'Effiat and Bullion

It soon became necessary to revert to old and bad expedients and to strain to the utmost all the resources of the financial system. This was the price of his nationalist policy Moreover, since 1630, among the rural population for whom this policy was a dead letter, insurrections inspired by sheer misery were frequent, the *Croquants* rose in the south, the *Va-nu-pieds* in Normandy Even the *rentiers* of the Hôtel de Ville, ordinarily a peaceable people, were excited by the curtailment of their incomes, and in 1639 and 1642 were roused to fury Despite the great work that was accomplished the treasury remained empty and the reforms a dead letter By education and temperament a priest, Richelieu looked upon material concerns as of secondary importance He could organize neither an army nor a navy, neither justice, nor finance, nor colonies, but at most a police system. he did not reform—he shattered. His true greatness lay in the ecclesiastical art of diplomacy. his work was wholly accomplished in the field of foreign policy where he displayed most continuity and foresight, perhaps because in foreign affairs alone he was able to work unhindered

Richelieu's Foreign Policy.—Actually his whole foreign policy was dominated by the Thirty Years' War By it he made France and unmade Germany It was the support of Germany that Philip II had needed to realize his dream of a Catholic empire. The election to the imperial throne of Ferdinand II of Styria had brought this support to his Spanish cousins in 1619. All the forces of the Habsburg monarchy were thenceforward united so long as the lines of communication were maintained in the north with the Netherlands, and in the south with Milan, so that there would be no flaw in the steel vice which locked France in on every side. Ever since his entry into the ministry Richelieu had applied himself to breaching the Habsburg ring. Hindered by the Huguenot problem and by the intrigues of the nobles, he had been able to intervene only indirectly and in a very restricted

manner By occupying the Valtelline, he severed the emperor's communications with Spain, by swift action at Susa, he forced the duke of Savoy to make peace; and, finally, he obtained for a French prince the succession to the duchy of Mantua (1629).

After being freed from the Calvinists by the peace of Alais, Richelieu everywhere attempted to stir up enemies against the emperor, victorious over the Bohemian Protestants at the White Mountain and the king of Denmark at Lutter. He united Sweden and the Catholic and Protestant Electors, who were disquieted by the Edict of Restitution (1630) which forced them to surrender the ecclesiastical estates secularized since 1552, and by the victories of Ferdinand's brilliant general, Wallenstein Next he stirred the United Provinces to action; and finally his skill effected a union of Bavarian Catholicism with the Lutheranism that dominated northern Germany, thus disarming Austrian imperialism by the removal of Wallenstein and a refusal to elect Ferdinand's son as king of the Romans. Twice Richelieu had succeeded by the purse rather than the sword in re-opening the passes of the Alps and of the Rhine About the same time Gustavus Adolphus, called in by Richelieu to take the place of the exhausted king of Denmark, entered Pomerania and, soon finding himself master of Germany and of the rich valley of the Rhine, sought, in face of Richelieu's opposition, to establish a great Protestant empire on the ruins of Catholicism This immoderate ambition, even after the death of Gustavus Adolphus at Lutzen (1632) provoked a violent Catholic reaction just when the Protestant alliance was dissolving as a result of the defeat at Nordlingen (1634), and at the moment of the murder of Wallenstein, whom Richelieu had sought to set up as a rival to Ferdinand in Bohemia In 1635 the emperor again dominated Germany

As his allies could no longer sustain the combat alone, Richelieu was himself compelled to make open war He took into his pay the army of a German *condottiere,* Bernard of Saxe-Weimar, and came to an agreement with the Swedish chancellor, Oxenstierna, and with certain German princes, he let loose the dukes of Savoy, Parma and Mantua against Spain in the Milanais, and, finally, he allied himself with the Dutch to achieve the conquest and partition of the Spanish Netherlands War followed in earnest (May 19, 1635) At the outset it went badly for France The capture of Corbie, near Amiens, by the Spaniards and the invasion of Franche-Comté by the imperial troops served to reveal the vulnerability of Paris, so dangerously near the frontier But (1638–40), owing to Bernard of Saxe-Weimar and to Guébriant, as well as to the Swedish Generals, Alsace was conquered Faced with revolts in Portugal and Catalonia, Spain lost Artois in 1640 and Roussillon in 1642 The defeat of the Spanish Habsburgs rendered their Viennese relatives more willing to negotiate Richelieu's death (Dec 4, 1642) prevented him from witnessing the triumph of his policy in the ensuing negotiations, but his dictatorship was justified by its results Six months later Louis XIII followed his minister to the grave (May 14, 1643)

Mazarin (1643–61).—A pupil of Richelieu's, Mazarin continued and completed his work But the task was not done without many set-backs As in 1610, the crown fell to an infant, for Louis XIV was only five years of age The regent was no longer an Italian but a Spaniard, and the first minister was again a foreigner, like Concini. Anne of Austria succeeded in annulling the will of Louis XIII, as had Marie de' Medici that of Henry IV., through the *parlement* of Paris, which was flattered by the opportunity of taking an active part in politics Then, in a new Day of Dupes, this Spaniard of waning charms, who had been neglected by her husband and insulted by Richelieu, gave her full-blown and opulent person, together with absolute power, into the hands of Mazarin, instead of those of Gaston of Orleans Of a handsome presence, amiable, very pliant, a lover of money to which he helped himself liberally, a superb diplomat, Mazarin justified Richelieu's confidence in him no less than the favour of Anne of Austria. For the maintenance of his authority in the kingdom, he relied upon the success of his foreign policy. Through his adroit diplomacy and the military genius of two young generals—Condé, the impulsive, and Turenne, the prudent—the great tree of the House of Austria was shaken to its very roots. At Rocroi (May 1643) Condé destroyed the renown of the famous Spanish infantry, afterwards joining forces with Turenne in Alsace. The Rhineland was freed by the victory at Freiburg-im-Breisgau (1644) and later the generals were again victorious at Nordlingen, Bavaria (1645). Meanwhile Mazarin laboured unceasingly to preserve the Swedish alliance The Swedes were finally victorious at Zusmarhausen in Bavaria, when Turenne effected a junction with Wrangel, at the same moment that Condé, at Lens, for a second time defeated the Spaniards. At last Ferdinand III brought himself to sign the peace that had for seven years been under negotiation

Treaty of Westphalia (1648).—For more than a century and a half the charter of Europe, the Peace of Westphalia dispelled the Habsburg dream of a unitary Catholic and German empire The victory had fallen to the "liberties of Germany," and to German Particularism. Germany was little else than a "republic of princes," a vast anarchical region under the protectorate of France and Sweden The territorial gains were no less great. Apart from the confirmation of the cession of the Three Bishoprics, conquered in 1559, the acquisition of Alsace safeguarded the Rhine frontier and prevented the Spaniards from uniting Luxembourg to Franche-Comté The Fronde (*see* below) afforded a momentary relief to Spain who, believing that Mazarin's triumph was not a lasting one, had refused to be a party to the peace

It was far less difficult for Mazarin to assure the safety of France than to govern the kingdom With the king a minor, he found himself confronted with the difficulties that Richelieu had been unable to solve, and which had become even more complicated Richelieu had governed in the name of a king of full age, and in the face of single opponents With his position hampered by his foreign birth and by the king's minority, the adversaries of Mazarin had had ten years to coalesce against him, whilst everyone was sick of government by ministers The maintenance of four armies, the necessity of supporting insurrections in Portugal and Catalonia, and the payment of subsidies to allies, had made taxation crushing. All who had been held in check by the iron hand of Richelieu sought to free themselves The nobles, cramped by the disciplining of the nation, the middle classes, whose commercial interests were suffering; the *parlements,* ambitious of playing a rôle in political life similar to that of the English parliament with which they shared a common name, the downtrodden populace—all made alliance. They were inflamed by the same fever that was then burning in Catalonia, Portugal, Naples and England

The Fronde (1648–53).—The coalition was born of the fiscal problem—ever the Achilles heel of the French In 1648 the monarchy had reached the end of its resources Completely immersed in the European problem, Mazarin left finances in the hands of his deputy, Particelli; if things went ill, he relied upon ingenious devices to settle them, but when, to fill the treasury he revived old edicts and withheld four years' salary from the holders of offices, the storm broke against him in the *parlement.* Mazarin made the mistake of thinking this to be a new edition of that aristocratic cabal which he had so easily crushed at the beginning of the regency The *parlement* of Paris, which he had thought to win over by exemption from the forced levy, made common cause with the *Cour des Comptes* and the Great Council, and in the declaration of July 27, 1648, sought to substitute constitutional for absolute monarchy Since all her forces were at the war, Anne of Austria was helpless and yielded; but when the victory of Lens set free Condé's army, she arrested some of the more violent members of the *parlement.* There followed insurrection and, as in the days of the League, the erection of barricades in Paris Once again Anne capitulated and, fearing for her safety, fled with the young king to Saint-Germain Civil war succeeded, involving in the general upheaval great lords, members of the *parlements,* generals, princes of the Church, the common people and mercenaries from the Thirty Years' War. As its name indicates, the Fronde was a crazy farce, played by grown-up children in many acts.

The first and shortest phase was the Fronde of the *parlement.* At a time when the whole world was a little mad, the *parlement*

had imagined a loyalist rebellion. Its armed protest was directed, not against the king, but against Mazarin and the men to whom he had delegated authority; but it was soon disgusted with its allies—the princes and nobles who had proffered their swords solely because they would thus be in a better position to extort concessions, and the Parisian mob which had been aroused by a warlike ecclesiastic, a Catiline in a priest's cassock, Paul de Gondi (*see* RETZ). When, therefore, a proposal was made in the *parlement* to receive a Spanish envoy *sur les fleurs de lys*, that assembly hastened to make terms with the Court by the Peace of Rueil (March 11, 1649)

In the short respite (April 1649–Jan. 1650) that followed the Peace of Rueil there ensued a scramble for power among the nobles: Condé, proud and turbulent; the coward Gaston of Orleans, the incapable Conti and the intriguing Longueville, the betrayed husband The victor of Lens and Charenton, thinking the world at his feet, assumed so dictatorial a manner that Anne of Austria and Mazarin, assured by Gondi of the support of the *parlement* and the mob, had him arrested In defence of Condé, a great conspiracy of Court ladies sought vainly to arouse Normandy, Burgundy and Bordeaux Enslaved by Madame de Longueville, Turenne involved himself with the Spaniards and was defeated at Rethel (Dec. 15, 1650) Unhappily, and as was his habit, no sooner was he victorious than Mazarin forgot his promises, especially that of a cardinal's hat for Gondi. The nobles and the *parlement* made common cause, and Mazarin fled to Bruhl in the electorate of Cologne, whence he continued to dominate the queen and the kingdom (Feb 1651) But the leaders of the two parties—Condé, designedly released from prison, and Gondi, who hated him—were soon engaged in a mortal rivalry The exile of Mazarin and the attainment by the king of his majority (Sept. 5, 1651) brought a temporary lull in the storm which broke out again on the return of Mazarin (Jan 1652). Because he had not been given Mazarin's place as chief minister, Condé renewed the civil war with the help of Spain Successful against the royal army at Bléneau, taken by surprise at Etampes, nearly destroyed by Turenne at Porte Sainte-Antoine, and only saved through the exertions of La Grande Mademoiselle, the daughter of Gaston of Orleans, Condé lost the support of Paris by permitting the massacre of a number of its citizens who were demonstrating in front of the Hôtel de Ville in favour of peace A general weariness of civil war gave a good opportunity to Mazarin's agents That the way might be smoothed to a reconciliation, the cardinal pretended to exile himself again to Bouillon. A general collapse of the revolt ensued. Condé had taken refuge in Spain where he remained seven years, Gaston of Orleans was in exile, de Retz (Gondi) in prison and the *parlement* confined to its judicial functions The field was thus left open for Mazarin who, four months after the king, returned in triumph to the Paris that had lately driven him forth with jeers and mockery (Feb 1653).

The Administration of Mazarin.—The work of restoring the damage wrought by four years of destruction awaited him He held the nobility in check by means of the rich dowries of his numerous nieces, and henceforth employed them in war and at court. Others, like de Retz or de la Rochefoucauld, sought consolation in their *Memoirs* or their *Maxims;* the *parlement,* which had confused political power with the exercise of judicial functions, learnt in the session of April 13, 1655, at Vincennes, that the days of political demonstration were ended. Power was given to middle-class men, such as Servien, Le Tellier and Lionne, who had faithfully served Mazarin in evil days. Like Henry IV after the League, so Mazarin after the Fronde gradually redeemed a ruined kingdom. Like Richelieu he covered France with a network of agents, who were henceforth a regular and permanent part of the administration, and who assured him of that peace and security without which he could not have carried out his immense peculations. His imitator and superintendent, Fouquet, the Maecenas of the future Augustus, cast over this gambler's policy the brilliant cloak of artistic prowess and the glamour of literature.

The Spanish War still dragged on, for the two countries were worn out by 20 years of war, and while both were incapable of terminating it by superior force neither would yield by seeking peace Spain had the advantage of being able to transport troops to the Netherlands by sea and to raise mercenaries within the empire; by breaking the alliance of Spain with Cromwell, Mazarin struck a blow at these sea-communications. Unable to prevent the election to the empire of Leopold I on the death of Ferdinand III, he cut off the emperor from the Netherlands by grouping together the princes of western Germany in the League of the Rhine, which insisted upon the neutrality of the empire (1658). Soon afterwards the decisive moment arrived with Turenne's defeat of Condé and the Spaniards at the battle of the Dunes and the subsequent conquest of maritime Flanders The victor was marching upon Brussels when Spain sued for peace

The Treaty of the Pyrenees.—By this treaty, France gained Roussillon and Cerdagne in the south; Artois with certain posts in Flanders, Hainault and Luxembourg in the north Mazarin crowned his work by the marriage of Louis XIV to the eldest of the Spanish infantas, Marie-Thérèse, who renounced her claims to the Spanish throne in return for a dowry of 500,000 crowns—a clause that held a menace for the future in view of the extreme poverty of Spain. Mazarin had thus realized the wise and cautious policy of Henry IV and Richelieu—the destruction of the catholic empire of Philip II. and the stabilization of the monarchy On his death (March 1661) the stage was set for the reign of the *Grand Monarque*

Louis XIV. (1661–1715).—For more than 50 years Louis XIV. was the personification of absolute power He both reigned and governed. He was the sole author of the policy that brought the French monarchy to a position of pre-eminence in Europe such as it had never before attained. His reign was not one of continuous progression and may be divided into two distinct sections The first ended with the death of Colbert (1683), the revocation of the Edict of Nantes (1685) and the revolution in England (1688) which upset the traditional system of alliances. the second, in which all the germs of decadence were developed, culminated in the depopulation and bankruptcy of the kingdom and in the formation of the coalitions abroad (1715) His whole training had fitted Louis for personal and autocratic rule, his tutors were nothing but courtiers, the Fronde had inspired him with a horror of revolutions, parliamentary remonstrances and disorder in general; and the universal reaction of public opinion in France against Leagues and Frondes and government by ministers, gave him a boundless popularity with the nation To the performance of his *métier de roi,* this handsome youth of 22, endowed with a superb constitution and, up to then, avid of pleasure, brought a mediocre intellect, great commonsense, a true and cautious judgment, a charm of manner and dignity of presence that impressed everyone who came in contact with him, and finally, a very clear conception of both his rights and his duties

For the performance of his duties, which he carried out with exemplary regularity and assiduity, Louis held himself responsible to God alone. To the *lieutenant de Dieu,* the utmost humiliation would be to accept his power from the hands of the people As to his rights—these he conceived to have no other limit than his own interest and his duty towards God. In this belief he was an apt pupil of Bossuet There were to be no grand-viziers or mayors of the palace, but only ministers who should be the trained instruments of his will. The superior rights of the people, and with them the States-General and the independent courts of justice, all these must be swept away; there could be no individual rights among his subjects, save only the use of their property; the sole remedy offered for their miseries was prayer and resignation. Liberty he tolerated for himself alone. Thus did the nation identify itself—and gladly—with the person of the king.

But this god upon earth required his temple. He made it at Versailles, where everyone and everything was his creation and offered up adoration to their maker. The highest nobility of France competed for posts in the royal household. The *anciennes cohues de France,* gay, unceremonious and military, gave place

to a stiff court with an elaborate etiquette in which the king pontificated Attendance at court was the first and only duty in the eyes of a proud prince who saw and noted everything and, above all, the absentees. Versailles became the centre of the national life and a model for foreign courts. If he thus played a part in the history of civilization, he also profoundly affected the social and political life of France. Through the insistence upon etiquette and the place-hunting that were the guiding principles in the lives of the courtiers, Versailles sterilized the leisured upper classes; its extravagant cost of upkeep exhausted the working classes and, finally, it separated the king more and more from his kingdom But, however deified, Louis XIV could not exercise power in solitude He was aided in his work of government by a hierarchy of officials, who were neither nobles nor ecclesiastics, but taken from the commonalty (to the indignation of the aristocratic Saint-Simon) and by special councils over which he regularly presided This entailed a working routine which he invariably observed

In administrative matters he proved himself no innovator. Refusing to sanction any radical reform, he devoted himself to organizing in all its details the mechanical system he had inherited from his ancestors, both in the central as well as in the provincial administrations He destroyed all vestiges of an autonomy that might have cast a shadow upon his own power The governors were reduced to mere puppets, the *parlements* limited to their judicial functions; the provincial estates met only on a royal summons and were curbed on occasion by *lettres de cachet* (*q v*); the liberties of the municipalities were destroyed on the pretext of their bad financial administration On these ruins Louis erected the absolute power of his intendants (*q v*).

Colbert.—Taxation and the army were the keys to Louis's policy Born in a clothier's shop at Rheims, hard and crabbed, estimable for his love of work and regard for the public weal, Colbert offered himself to Louis to help him in becoming a working and regnant king The most urgent task was to anticipate the fury of the downtrodden and to prevent a repetition of 1648 His first efforts were to restore the depleted treasury; by such means as the *chambre ardente* (1661–63) to recover everything that the farmers of the revenue had stolen since 1635, and to condemn Fouquet, who wished to make his financial power the stepping-stone to political power Towards these financiers the monarchy had merely fluctuated between complaisance and severity As a good man of business Colbert determined that the national accounts should be kept with the same attention to exactness and detail required in those of a shopkeeper, but although he was a great organizer of the public accounts Colbert was less effective as an organizer of taxation He preserved the old system of demesne revenues and reactionary imposts; if he lessened direct taxation, such as the *taille*, and heightened indirect taxation, such as the *aides*, he did so not from sympathy for the small taxpayers, but because the *aides*, with a wider field of assessment, brought in a better return He continued to extort money from whatever source he thought inexhaustible; now from the Church, whence he extracted voluntary gifts; now from the *rentiers*, to whom he applied the classic expedient of needy royalty—the reduction of its payments Like Sully and Richelieu, Colbert believed that to command a country to produce was enough to render the whole nation rich and ready to pay taxes gladly He knew nothing of the importance and sensitiveness of credit; he cherished the absurd hope of doing without loans in a France burdened with that over-production which he praised himself for having created; and when, after some years of normal budgets, the two great passions of Louis XIV.—conquest and building—forced him in 1672 to have recourse to borrowing, he was heartbroken.

A mere accountant, exacting and exact, Colbert was more original in economic matters. Not that he was concerned about the individual welfare of the people, nor preoccupied with theories. Commercial and industrial prosperity afforded him no other interest than that of making the country wealthy and the State great He wished to give to 17th-century France the same modern and industrial character that had been given to the maritime countries by the New World. As the manufacturers and merchants were either indifferent or lacking in initiative, Colbert replaced them by royal authority. He made general the mediaeval system of corporations, governed manufacture by stringent regulations which aimed at winning foreign markets by meticulous probity in business, and created industry on a grand scale by his energy and outstanding genius for organization But by placing industry in a strict dependence upon finance Colbert aggravated the servitude of the workers by the further servitude of their work. His royal factories of silk, glass, lace, linen, tapestry, etc, prospered under royal protection, but at the expense of the small industries. After his death, deprived of their crutches and injured by the intolerant policy of the king, his industrial creations, except for the manufacture of articles of luxury, collapsed Like all his contemporaries, Colbert believed that the true secret of commerce and of the prosperity of a country lay in selling as much as possible to the foreigner and buying as little as possible from him. Thus gold would flow into and not out of the country Sometimes a free trader, sometimes a protectionist, Colbert was always a realist If he imposed the prohibitive tariffs of 1664–67, he opened Marseilles and Dunkirk as free ports, built the *canal du midi* connecting the Mediterranean with the Atlantic, and reduced many taxes But he failed to establish a unified system of weights and measures and to abolish the inter-provincial customs that made of France a Europe in miniature. Bureaucracy alone was inadequate in a land in which individual effort was suspect.

That he might increase foreign trade Colbert inaugurated a colonial and maritime policy which was to prove the most original and most fruitful of his achievements Like Richelieu, he sought new markets and endeavoured to revive French interest in those distant enterprises in which it had been outstripped by the English and the Dutch trade since the Wars of Religion He extended the New France from Canada to the Mississippi by supporting la Salle in Louisiana; to this he added the French tropical possessions in Guiana; he established the king's authority on the African coast from the bay of Arguin to the shores of Sierra Leone; he gained a footing in Madagascar, and he established the first French trading-posts in India. A commercial monopoly of these territories was given to the great royal companies To enable France to defend her colonies, Colbert created a navy that became the passion of himself and of his son, Seignelay, and for its accommodation Vauban constructed great arsenals at Brest, Havre, Dunkirk, Rochefort and Toulon He took convicts to man the Mediterranean fleet, and for that on the Atlantic he introduced the system of naval conscription that has remained almost unmodified since. Thanks to his efforts, the French navy, at least until 1692, was in perfect condition His unwearying activity displayed itself also in the organization of justice, police and administration Although his forestry code remains a model to this day, while the great codification of his uncle, Pussort, was an attempt to unify legislation, Colbert preserved in its entirety the ancient machine of government. The hereditary transmission of offices of justice was maintained and the administration of the law continued slow, corrupt and cruel Organized in 1667 by La Reynie, the police became a ministerial force; and in like manner the Academies were charged by Colbert with the regulation of Letters, Science and the Arts

The system established by Colbert worked steadily until 1675, when everything had to be sacrificed to the wars in Flanders and the splendours of Versailles Versailles and war squandered the wealth of a country in which the peasants, almost prostrate under the burden of taxation, were everywhere in a state of revolt, and from which the persecuted Huguenots were fast emigrating Moreover, Colbert's work had inherent in it the cause of its own destruction Like a good Cartesian, Colbert conceived of the State as a vast "machine," of which all the various and well-ordered parts received their impulse from an outside source—himself. He did not understand, nor did his contemporaries understand, that efficient reform will not result from a government acting towards a nation as though it were some insensate object created solely to obey and pay

Louvois.—At the accession of Louis XIV the army was in a

wretched state The suave but forceful energy of Le Tellier and the authoritative will and uncompromising tenacity of his son, Louvois, devised for the king an army that up to that time had been in the hands of a nobility virtually independent and scornful of all civil control A severe discipline coupled with the suppression of fraudulent contractors, the equipment of the troops with clothes and arms at the king's expense, a proper grading of the officers, a regular system of recruiting and of supplies, the suppression of the great military offices, the control by the civil authorities of the governors of fortified towns and of their army leaders by commissioners and the intendants—all this was the work of Le Tellier and Louvois The army had become an all-powerful weapon which belonged to and obeyed the king alone

Absolutism and Religion.—Louis XIV , the Most Christian King and eldest son of the Church, considered himself the ruler not only of the bodies of his subjects but of their souls Thus he felt himself called upon to establish the unity of the faith and to repel with the hand of orthodoxy all Dissenters, Huguenots, Jansenists or Quietists, whose independence was as insupportable to him as to Philip II or the Stuarts Moreover, it was impossible for a king by divine right to yield to any other authority, hence his quarrels with the papacy Gently at first, later more violently as he became still more of a bigot, Louis' absolutism in religious matters asserted itself with the willing consent of a nation in love with the ideal of unity

Although since the Peace of Alais they had been deprived of their political privileges, the Huguenots had enjoyed freedom of worship and had prospered in the fields of industry, agriculture and commerce Religious division, however, hindered the unification of the kingdom The priests, under the influence of the *Compagnie du Saint-Sacrement* sought from 1651 onwards to unify matters —at first by persuasion, later by a legal and narrow interpretation of the Edict of Nantes His passion for absolutism, his religious zeal—the more active since he wished to make amends for his injuries to public and private morals, the financial necessity of increasing the free-will offerings of the clergy and of gaining their support in his quarrels with the papacy—all these led Louis XIV to identify himself with this foolish policy Between 1661 and 1685 the Huguenots were successively excluded from the States-General, the diplomatic service, and the municipalities, and were deprived of their hospitals, colleges, academies and schools Fines proving inadequate, soldiers were quartered upon the recalcitrant by Louvois until the day when Louis, at the instigation of the priests, revoked the Edict of Nantes (1685) There followed on the part of the Huguenots an emigration *en masse*, and later, the terrible revolt of the Camisards (*q v*) which held the royal armies in check in the Cevennes from 1703 to 1711, at a time when the kingdom was threatened with invasion Nevertheless, even if it was decimated numerically and intellectually, Protestantism was not entirely destroyed

The Jansenist Movement.—The persecution of the Jansenists proceeded from the same ideas Founded by the Abbé de' Saint-Cyran on predestination, a doctrine that was austere in the general licentiousness of that age, preserving a noble dignity in the midst of universal servility, the sect was recruited from the disillusioned followers of the Fronde, and owing to the brilliance of its writers and thinkers—Arnauld, Pascal and Racine—made a formidable body of opinion The inmates of Port Royal were also subjected to the *dragonnades* (1669) Three years later the dispute over the *régale* raised by the Jansenist bishops of Aleth and Pamiers reawakened the persecution Port Royal was destroyed, the nuns dispersed, and the ashes of the dead scattered to the four winds (1709–11). The Bull *Unigenitus* (1713) which once again condemned their doctrine, reopened a dispute that survived the death of Louis and filled the 18th century with its reverberations (*see* JANSENISM).

Quietism.—The much less grave affair of the Quietists (*see* QUIETISM) arose from the same desire for uniformity That it was even for a moment serious was due to the fact that Madame de Maintenon and the nuns of Saint-Cyr were waging war upon the mysticism of Madame Guyon, who had abandoned dogmas and prayers and given herself up to the pure adoration of God Fénélon, who had adopted her doctrines, was condemned in 1699, and the sole importance of the affair arose from his duel with the representative of the principle of authority, Bossuet The "libertines," free-thinkers like Richard Simon and Bayle, were exiled; but their doctrines were to revive again in the 18th century.

Louis XIV. and the Papacy.—Although on matters of faith he was in accord with the pope, Louis XIV was not prepared to admit any diminution of his own authority through papal claims to universal supremacy. The quarrels arose out of questions of form like that of the Corsican guards who fired upon the carriage of the French ambassador, but a more serious dispute (1673) was that over the *régale* (the right of the Crown to the revenues of all vacant bishoprics) Louis XIV wished to extend this claim over the whole of France, and thus to co-ordinate the new additions to his kingdom with the system obtaining in the north and centre The pope supported the protest of the bishops of Aleth and Pamiers, and the king appealed to a General Assembly of the clergy, and to the *parlement*, to define the precise limits of the authority to be exercised by the Crown, the Church and the papacy By denying the papal authority, the Declaration of the Four Articles (1682) consecrated the Gallicanism (*q v*) which gave to the king the semi-divine authority henceforward the official belief of the *ancien régime* It declared that the pope had no standing in temporal matters, that general councils overrule him, that the rules of the Church of France in France are inviolable, and that papal decisions on matters of faith are irrevocable only by consent of the Church The dispute over the diplomatic immunity of the palace of the French ambassador at Rome, wherein Louis was clearly wrong, still further exacerbated the quarrel, but during the War of the League of Augsburg, in the pontificate of Innocent XII , Louis XIV , like so many others, went to Canossa (1693)

Foreign Policy of Louis XIV.—Although she had a strong and stable government, and occupied the first place in Europe, France had not yet fulfilled her destiny The moment had come for Louis XIV to turn to foreign policy and again press the claim of France to her "natural frontiers" Arrogant demonstrations preceded his action the navy was forbidden to salute the English flag in the narrow seas, and precedence was claimed for the French ambassador over the Spanish ambassador in London Louis sought to justify these pretensions by offering to lead a crusade against the Turks in the Mediterranean and Hungary But it was soon clear that the real question was that of the partition or absorption of the Spanish inheritance An alliance between Holland—freed from Spain yet fearful of its position—and France with an exposed northern frontier, was natural As long as France had neither a navy nor great commercial interests, she could easily ally herself with either England or Holland who were fighting for a colonial empire All this was changed, however, when, by the hand of Colbert, France entered into the commercial rivalry, and still more when by the conquest of the Spanish Netherlands, Louis XIV became a more dangerous neighbour to the Dutch than ever the Spaniards had been For the success of the new French policy the neutrality of England was essential, and since the days of Edward III England had realized that such a policy was neither in accord with its tradition nor its interests But the Anglo-Dutch rivalry, and later the Stuart restoration, aided by Louis XIV , played into the hands of France until the day when William of Orange, having overthrown the Dutch republic and the Stuarts, became the soul of the coalitions and set himself, both on sea and land, to destroy the projects of Louis XIV

The War of Devolution, 1667–68.—On the death of his father-in-law, Philip IV. (1665), Louis XIV. claimed Flanders in the name of his wife, Marie Thérèse, whose dowry remained unpaid A conflict between England and Holland for some time prevented the outbreak of hostilities, and it was not until Louis had mediated in the Treaty of Breda and Hugues de Lionne, his clever secretary for foreign affairs, had isolated Spain, that France finally declared war. Turenne conquered Flanders (June–Aug. 1667) and, as the queen-mother of Spain would not yield, Condé occupied Franche-Comté in 14 days (Feb. 1668). At the same time Louis' ambassador, Grémonville, signed with Leopold I. a

treaty by which the Spanish possessions were to be divided up between the emperor and Louis if Charles II of Spain should die without issue Thinking themselves lost, the Dutch roused Europe by the Triple Alliance, concluded with England and Sweden at the Hague, to prevent the occupation of Flanders Acting on the advice of Colbert and Lionne Louis made a show of yielding, and in the Treaty of Aix-la-Chapelle secured his Flemish conquests, which were immediately fortified by Vauban (May 1668)

The Dutch War.—This experience taught Louis that the fulfilment of French aspirations in the north would necessitate the mastery of the wealthy, Protestant Dutch, without alarming the English, who still lamented the loss of Calais and grudged to France Dunkirk, which had been bought back from Charles II in 1662 Lionne bought off Charles II by the Treaty of Dover (*q v*) and in four years isolated the Dutch, as he had previously isolated the Spanish In 1672, when everything was at last ready —army, finance, alliances—the war began All would have been ended in a few weeks had not Turenne been too late in reaching Muiden, where the dykes had been broken and the country inundated, and had not the Dutch overthrown the bourgeois republic of the brothers de Witt and given the Stadtholdership to William of Orange. From that moment the whole aspect of the war was changed William devoted his energies to stirring up enemies against Louis throughout Europe He brought together in a coalition the emperor, the king of Spain, the duke of Lorraine, a number of the princes of the empire and England France was obliged to evacuate and then to settle with the United Provinces, and to stand in her own defence After five years of war, Turenne's victories in Alsace, where he was killed, those of Condé, and lastly those of Duquesne over de Ruyter at sea, resulted at Nimjwegen in a partition (1678) Spain, paying for her allies, had to cede Franche-Comté and half of Flanders While all Europe was disarming, Louis XIV sought to make the peace a means of conquest Acting on his orders the lawyers of the *chambres de réunion* pronounced in favour of numerous annexations in Alsace and Lorraine Their illegal proceedings, carried out by force of arms in Belgium, aroused the indignation of Europe But, owing to the siege of Vienna by the Turks, the emperor was helpless Luxembourg was seized by Créqui and Vauban, and by the truce of Ratisbon Spain was obliged to surrender that town to France (1684), and the emperor acquiesced in various annexations, including that of Strasbourg Thenceforward Louis' terrified allies avoided his clutches until the opportunity should present itself of fighting him.

War of the League of Augsburg.—At this moment William of Orange resumed the war He had married the niece of Charles II and was assured of the support of a powerful Protestant party in England For his part Louis was convinced that to cease to overawe Europe was only to provoke coalitions The revocation of the Edict of Nantes added religious hatred to political jealousy The Declaration of the General Assembly of the French clergy in 1682, the humiliation of the pope in Rome itself by the marquis de Lavardin, in the diplomatic immunity dispute, the attempted installation by force of Louis XIV 's candidate, cardinal Furstemburg, in the see of Cologne—all this had alienated the Catholics from Louis The signal for a general war was given by Louis' claim to a part of the Palatinate on behalf of his sister-in-law, the widow of the elector The French armies devastated the Palatinate instead of attacking William of Orange in the Netherlands, thus leaving him free to land at Torbay, accept the English throne, and form the Grand Coalition of 1689 Always defeated, but ever indomitable, William was the soul of the opposition With the exception of the elector of Cologne, Louis XIV found united against him almost the whole of Protestant and Catholic Europe. For eight long years, despite the disappearance of Turenne and Condé, of Louvois and Seignelay, his armies fought victoriously under Luxembourg at Fleurus (1690), Steinkirk (1692) and Neerwinden (1693); under Catinat in Piedmont, at Staffarda (1690), and at Marsaglia (1693). Louis would have emerged the victor if Tourville, victorious at Beachy Head (*q.v*) had not met with the naval disaster of La Hogue. Nevertheless, Jean Bart and Duguay-Trouin inflicted further severe reverses upon the English and Dutch admirals.

Louis XIV was the first to make tentative offers for peace, a fact that marks a stage in his foreign policy The temperate peace of Ryswick left him Strasbourg, while it compelled him to suppress all commercial tariffs and to recognize William III. as king of England; it also gave a barrier line of fortifications to the Dutch (1697).

War of the Spanish Succession.—By signing the peace, Louis was only gaining time to prepare himself for the inevitable quarrel over the succession to the throne of Spain, for Charles II. was childless and near to death As with the emperor in 1668, so now with William III , in the secret treaties of the Hague (1698) and London (1699) Louis sought to safeguard the balance of power in Europe and to hold to his task of gaining her natural frontiers for France Suddenly, on the death of Charles II (1700), he found himself confronted with a momentous decision, for Charles had left his whole kingdom to his grandson, the duke of Anjou After a meeting of the Great Council at Versailles (Nov. 16), Louis—who was guided in making his decision not only by dynastic interests but by the knowledge that if the Bourbons refused the succession the emperor, who had not assented to the Treaty of London, would reconstruct the empire of Charles V to the advantage of the Habsburgs—presented his grandson to the Spanish ambassador as his king. In either case war was inevitable· it were better then to make it with and for Spain, than without her aid and against her

The English and the Dutch, who were primarily interested in commerce, recognized Philip V , but the unwise policy of Louis XIV was to afford William III and Heinsius the opportunity they sought for partitioning the Spanish colonies The assertion of the right of Philip V eventually to succeed to the French throne, coupled with the expulsion of the Dutch from the barrier fortresses, brought about the Grand Alliance of 1701 between the maritime powers and Austria The recognition by Louis of James III as king of England was only in response to the Grand Alliance but it succeeded in forcing England into the inevitable war. In spite of the death of William III (1702) his policy triumphed In the long war of the Spanish Succession it was no longer the names of the French generals, but those of Prince Eugène and the duke of Marlborough, which were on all men's lips Though from 1701–03 success was equally balanced in Italy, Germany and the Netherlands, the successors of Villars (who had been sent against the Camisards) owing to the treachery of the duke of Savoy, lost Germany at Hochstadt or Blenheim (1704). In 1706 the defeats of Ramillies and Turin led to the evacuation of the Netherlands and of Italy In 1708 the disaster of Oudenarde left the northern frontier exposed, and Dutch cannon were heard at Marly Nature allied herself with the enemy during the terrible winter of 1709 Louis XIV was forced to humble himself to ask for peace from the Dutch, but they forgot the lesson of 1673 Disgusted by their unwillingness to compromise, Louis for the first time appealed to the patriotism of his people at Malplaquet. And then invasion followed Louis was saved from disaster only by his dauntless courage, the strong will of his secretary of State, Torcy, and the victory of Vendôme at Villaviciosa. The failure of the conferences at Gertruydenberg, which obliged the Whigs and Marlborough to resign their power into the hands of the Tories, now weary of the war and chiefly preoccupied in securing the mastery of the sea, the death (1711) of Joseph I , who had attempted to reconstruct the empire of Charles V for his brother, Charles VI , and the victory of Villars at Denain (1712) —all combined to render possible the Peace of Utrecht (*see* UTRECHT, TREATY OF) which sealed the Franco-Spanish defeat by giving Italy and the Netherlands to the Habsburgs, Spain and her colonies to the Bourbons, and a royal crown to the duke of Savoy and the elector of Brandenburg. Gibraltar, Minorca, the gates of Canada and colonial commerce, fell to England which, in affecting to defend the liberty of Europe, had always had the acquirement of these in view The Treaty of Utrecht was for France what the Peace of Westphalia had been for the House of Austria —a return to the first territorial acquisitions of Louis XIV and

an end to her hegemony in Europe. (*See* SPANISH SUCCESSION.)

Last Days of Louis XIV.—But it was not only the fortune of war which disappointed the old age of the Grand Monarch. The grief and misery in which his reign ended were worse than defeat. With the deaths of the Grand Dauphin, of the duke and duchess of Burgundy, and of his two grandsons, which left as his heir a frail great-grandchild of four years, it seemed as though his whole family were under a curse. The court now resembled a gloomy infirmary presided over by an old and evasive matron in the person of Madame de Maintenon. It was not merely the clamour of an exhausted people which arose against the monarch. The intellectual leaders, like prophets in Israel, denounced a tyranny which placed Chamillard in charge of the finances—because he played billiards well—and the incapable Villeroy in command of the army, while it disgraced the patriotic Vauban, banished Catinat, and exiled Fénélon. Everything conspired to make the end of the reign a glaring contrast to its brilliant opening. When one recalls Molière and Racine, Bossuet and Fénélon, the campaigns of Turenne and the statutes of Colbert, the many literary and scientific foundations, the harbour of Brest, the *canal du midi*, the colonnade of the Louvre, the Invalides, Versailles and Vauban's fortifications—admiration cannot fail to be aroused for the brilliant and magnificent age of Louis XIV. But the art and literature expressed by the genius of masters, reflected in the tastes of society, and adopted by Europe as its model throughout a century are no criterion of the social and political organization of that age. They are but a magnificent cloak which serves to conceal the ostentation and arrogance, no less than the misery and superstition, of the time, remove it, and reality appears in its brutal and sinister nudity. The corpse of Louis XIV. deserted by all save the lackeys, and greeted all along the road to St. Denis by the curses of the crowd in the cabarets—who fêted his death by getting drunk because they had suffered too often from hunger in his lifetime—such was the coarse but truthful epitaph inscribed by public opinion on the tombstone of the "Grand Monarque." And that, too, was the reason why the people hailed the accession of the handsome child whom they called Louis the Well-beloved with the joyful hope to which the future was to give the lie, and whose funeral, 60 years later, was to be greeted with the same proofs of disillusionment.

The Regency.—The death of Louis XIV. closed the great age of France. the 18th century opened upon the crisis of the monarchy, and 1715–23 was the reactionary period of the Regency, characterized by unique effrontery, innovations and frivolous immorality, from 1723–43 is remembered for the mealy-mouthed despotism of Cardinal Fleury, and his half-hearted policy, at home and abroad, while 1743–74 forms the period of the personal rule of Louis XV., with all the different powers in conflict—the bishops and the *parlement* quarrelling, the Government disputing with the clergy and the magistracy, and public opinion in declared opposition to the State, and finally, from 1774 to 1789 we have Louis XVI. with his honest illusions, his moral pusillanimity and his intellectual impotence, to aggravate still further the accumulated errors of centuries and to render the Revolution inevitable.

The 18th century, like the 17th, opened with a *coup d'état*. By his will, Louis XIV. entrusted the regency to his nephew, the duke of Orleans, but, as he disliked him, he placed all the power in the hands of a council in which his illegitimate children with Madame de Maintenon and the Jesuits held the predominant position. In thus seeking to render the regent powerless, Louis only succeeded in making him powerful. For the regent, in order to rid himself of such possible rivals in the event of a premature decease of Louis XV., sought allies in the *parlement*. In return for its declaration that Louis' will was null and void, the regent restored to it the right of remonstrance which had been suspended since 1673. On the advice of Saint-Simon he replaced the secretaries of State by six councils, largely composed of the great nobles; he also abolished the laws against the Jansenists. Highly endowed, but lacking the ability to use his talents, Orleans was presently forced to recognize the inconvenience of a hydra-headed Government, the mistake of having restored to the *parlement* a political power they were not slow to abuse, and the vanity of his hope of achieving a religious peace. A reaction was accomplished, but not before Louis XIV.'s governmental machine had suffered gravely.

John Law.—Another event was followed by still graver consequences. The political reaction that had placed power in the hands of the regent had not made an end of the financial crisis, and only a strong Government could have dealt with one of such magnitude. The duke of Noailles, who had contented himself with outworn expedients, could accomplish nothing, when a clever Scottish adventurer, John Law (*q.v.*) offered to assist in reducing the enormous debt of three milliards and in replenishing the Treasury. The English and Dutch merchants, through the confidence that was placed in their good faith, were able to obtain plenty of credit for their bills of exchange. Why should not the same be true in France of notes issued by a royal bank? In return for a small discount the bank would pay the bills of the merchants by bank-notes which would circulate as legal tender, it would also interest itself in overseas enterprises, giving them support when necessary. With its gains it would indemnify the creditors of the State, extinguish the debt, and even eventually render taxation unnecessary. But there must be a cash reserve with which to guarantee the repayment of the notes. In 1716 Law was authorized to commence operations. he succeeded, and in 1718 his bank was transformed into the royal bank with power to issue a paper currency as legal tender. Law proposed to lighten the Treasury by the profits accruing to a great maritime and colonial company. The new *Compagnie d'Occident* was accordingly floated with a capital of 100 millions to exploit the valley of the Mississippi. The shares were eagerly subscribed, the company acquired a monopoly of tobacco and coinage, and, under the new name of the *Compagnie des Indes*, united all the privileges and the business of the old French maritime companies. His nomination as controller-general of the finances, brought Law to the pinnacle of his power. The bourse in the rue Quincampoix witnessed a frenzy of speculation, but when at the end of 1719 Law's company declared a negligible dividend there ensued a panic, followed by a suspension of payments at the close of 1720, and the flight of Law. A part of the public debt had been extinguished, and industry, commerce and the colonial enterprises had undergone a great development; but the collapse of the system killed credit, and, through the overthrow of private fortunes and the passion for gambling and easy riches, a social upheaval was effected which added further to the moral decadence of the period.

Foreign Policy.—Foreign policy underwent a similar reaction. During 1717–39 France was in alliance with her former foes, England and Holland. France, after 30 years of war, between two bankruptcies, Holland, now reinstated in her commercial position, and England, who saw before her the beginnings of her overseas empire. all three needed peace. On the other hand, peace was imperilled by Philip V. and by the emperor who, while they accepted the portion assigned to them by the Treaty of Utrecht, laid claim to the whole. A further danger was threatened by the maternal ambition of Elizabeth Farnese, second wife of Philip V., who sought Italian thrones for her children, and was aided by the efforts of Alberoni to revive Spain. It is to the credit of the commonsense of the French minister, Dubois, that a catastrophe was averted. He signed the Triple Alliance at The Hague, and next year, aided by Stanhope, induced the emperor to participate in it (1718). The intrigue between the Spanish ambassador, Cellamare, and the duke of Maine to exclude the house of Orleans from the French throne, was discovered and repressed; a Spanish fleet was destroyed by Admiral Byng and the dockyards at Pasajes burned by Marshal Berwick. The dreams of Alberoni were finally dissipated by the terms of the Treaty of London (1720).

When he attained his majority in 1723 Louis XV. left all power in the hands of his chief ministers for another 20 years. After the deaths, at an interval of four months, of Dubois and Orleans, the duke of Bourbon, great-grandson of the great Condé, took over the reins of power, only to suffer himself to be led by a worthless woman, the marquise de Prie, thus inaugurating the long reign in

diplomacy of publicly recognized mistresses and similar follies They found standing in their way the man who had been the author of their fortunes, Cardinal Fleury, the king's tutor. Bourbon hoped to maintain himself in power by marrying Louis XV. to Maria Leszczinska. The dismissal of the Spanish infanta, who had been betrothed to Louis XV, greatly strained relations with Spain Discontent was aroused by the new tax of the *cinquantième* imposed upon all classes of revenue, and by the revival of a persecution of the Jansenists and Huguenots which had seemed to have died out. All this was cleverly exploited by Fleury Acting on his advice the king dismissed the duke of Bourbon in 1726

Cardinal Fleury, 1726–43.—A typical ecclesiastic, Fleury had known how to await his ultimate success. When at last he attained to the supreme direction of government, he was already more than 70 Soft-spoken, crafty and unassuming, he was a pacifist by nature and conviction His desire for economy led him to appoint Orry, who was his right-hand man, to the controller-generalship of the finances A worthy successor of Colbert, and equally surly, Orry decreased expenditure and restored order to the finances Religious peace proved more difficult of attainment. Fleury took strong measures against the Jansenist agitation By means of *lits de justice* and *lettres de cachet* he routed out the flagellants and made an end of alleged miracles In a few years his wise administration had re-established affluence and prosperity His foreign policy was characterized by the same dislike of adventures In accord with Walpole he devoted himself to promoting general peace First of all he reconciled the descendants of Louis XIV, divided among themselves since the Polish marriage, by means of the Treaty of Seville (1729) Next the emperor, Charles VI, who desired to secure the succession to his daughter, Maria Theresa, was obliged to sign the second treaty of Vienna (1731). The sacrifice of the Ostend Company, whose competition was arousing the anger of the English and Dutch, procured the duchy of Parma for Philip's son, Don Carlos, and also the recognition of Maria Theresa's rights Fleury believed that peace was assured, but the Polish succession question—the first of the many destined to trouble Europe for 50 years—proved him to be mistaken On the death of Augustus II, the electoral king of Poland, in 1733, his son, Augustus III, and Stanislaus Leszczinska, father-in-law of Louis XV, offered themselves as candidates for the vacant throne The Poles chose the latter whom, however, they were unable to support against the Russo-German coalition Fearing English reprisals, Fleury rendered no substantial assistance to Stanislaus Chauvelin, the secretary of State for foreign affairs, who was supported by a public opinion enraged by Fleury's pusillanimity, unable to attack the Netherlands made a diversion in Italy with the help of the kings of Spain and Sardinia. Chauvelin had checkmated Fleury with war: Fleury now checkmated him with peace, and hastened to replace the victorious generals with diplomats. By the third Treaty of Vienna (1735–38) Louis XV. gained the whole of Lorraine for his father-in-law, pending its reversion to himself, and recognized the rights of Maria Theresa But Chauvelin was sacrificed to the cabinets of Vienna and London

Fleury had hardly had time to breathe again when a fresh conflagration burst out in the east. The tsarina Anne and Charles VI had agreed upon the partition of Turkey Villeneuve, the French ambassador at Constantinople, was supported by his government in his endeavour to postpone this event; he aroused the courage of the Turks and armed them with the assistance of Bonneval (*q v.*). The peace of Belgrade (1739), in which the capitulations (*q.v.*) were renewed and the designs of Russia and Austria checked, was a great moral and material victory for France (*see* EASTERN QUESTION).

War of the Austrian Succession.—France had become once again the arbiter of Europe when, in 1740, the unexpected death of the emperor opened a new period of war and misfortune for Europe and for the pacific Fleury. The whole of Europe had signed the Pragmatic Sanction (*q.v.*) which assured to Maria Theresa the succession to Charles VI; but his death was followed by an almost general renunciation and an attempt to partition his inheritance. Maria's most dangerous rival was Frederick II of Prussia, a stark realist, who was resolved to unite the scattered portions of his dominions, and to secure for himself the hegemony in northern Germany. Silesia was Brandenburg's shield against Austria; and, without making a formal declaration of war, Frederick seized it after the victory of Mollwitz (April 1741) Seeing that Austria was no longer dangerous Fleury's inclination was not to misuse France's traditional policy by exaggeration, but to respect his sworn word He dared not press his opinion, however, and yielded to the anti-Austrian party of the two Belle Isles—who were sick of peace, infatuated by Frederick II, and supported by the bellicose mistresses of Louis. This party brought about the League of Nymphenbourg between France, Spain, Prussia, Bavaria and Saxony for the dismemberment of the Austrian empire (1741) Fleury lived to witness the frequent treasons of Frederick II in his own interests; the precipitate retreat of Belle Isle from Bohemia, the humiliation of France before Austria, and her isolation in Europe The hour had come for the old Nestor, fallen into his second childhood, to depart (Jan. 1743)

The Personal Government of Louis XV., 1743–74.—Thus at the age of 33 years Louis became his own first minister and governed for himself but nothing had prepared him for his royal task Orphaned at the age of two, schooled in arrogance by his early tutors, ignored by Fleury in the administration because of his frail health, Louis grew to manhood in the midst of a dissolute court; indolent and egoistic he thought only of avoiding the boredom of business, of etiquette and of his neglected queen by hunting, supper-parties and spicy indiscretions Thus he sank into sensuality and into the hands of favourites His mistress, the duchess de Chateauroux, did indeed endeavour to arouse him to action, but she disappeared at the moment of her triumph There followed the insolent tyranny of the little *bourgeoise* the Pompadour, and for almost 20 years her whims and caprices ruled the realm (1745–64) A prime minister in petticoats, she established her own political system, upset the time-honoured alliances of France, made and unmade ministers, commanded the army and navy, concluded treaties, and miscarried in all her enterprises She was the queen of fashion in a society where corruption bloomed luxuriantly and exquisitely, and in a century of wit, hers was second to none. In the midst of this extraordinary instability, the mistress alone ruled on; in a reign of all-pervading satiety and tedium she managed to remain indispensable and bewitching to the day of her death France had in truth no real interest at stake in the war of the Austrian Succession; and when, in the attempt to make a stage-emperor of the elector of Bavaria she was defeated at Dettingen by the English and Hanoverians and driven back upon the Rhine (1743), it was realized that the policy of waging war in Germany was mistaken, for the true soul of the coalition had always been England, and the attack must be made where England was most vulnerable—in Flanders The victories of the marshal de Saxe, another brilliant adventurer, at Fontenoy, Raucoux and Lawfeld, were hailed with joy as continuing those of Louis XIV The "disinterested" peace of Aix-la-Chapelle (Oct. 1748) had no effectual result except to destroy in Germany, and to the advantage of Prussia, a balance of power which was not yet secured in Italy, despite the establishment of the Spanish prince, Philip, at Parma (*see* AIX-LA-CHAPELLE, CONGRESS OF).

In this war France had fallen into the Continental snare laid for her by England in order to distract her from India (where Dupleix was founding an empire with a handful of men), and for the sake of conquering Silesia for the king of Prussia, Canada had been left exposed by the capture of Cape Breton. She was now to lose both India and Canada for the sake of restoring this same Silesia to Maria Theresa.

The Seven Years' War, and Secret Policy.—In 1755 England suddenly attacked France at sea, and Frederick II by a fresh *volte-face* passed over to the English alliance Thereupon Louis XV. allied himself with Maria Theresa in the Treaties of Versailles, by which he received the promise of the extension of the French frontier to the south of the Austrian Netherlands (1756–58). Instead of remaining on the defensive in this continental war, to which he was no more than an accessory, Louis sought to play the chief part, and permitted himself to be governed by three

women—Maria Theresa, Elizabeth of Russia, and the Pompadour Out of this reversal of the alliances sprang the Prussian and English empires In three battles, three victories for the enemies of France, Rosbach (1757), Plassey (1757), Quebec (1759)—thanks to the recall of Dupleix who was not returning large enough dividends to the Compagnie des Indes, and to the abandonment of Montcalm who could not interest anybody in "a few acres of snow"—Silesia was finally acquired by Frederick II , and Canada by William Pitt, who adopted also as his own the French plan for the conquest of India

The Treaties of Paris and Hubertusburg (1763) once more revealed the fact that the French, though superb in their conceptions, were deficient in action, moreover, Choiseul, secretary of State for foreign affairs since 1758, created out of this deceptive Austrian alliance a system which set the finishing touch to disaster After losing everything to satisfy the hatred of Maria Theresa for Frederick II , he witnessed at Neisse and Neustadt (1769–70) the reconciliation of these two irreconcilable Germans at the expense of Poland—one of the oldest adherents of France The tardy device of the Family Compact, concluded with Spain in 1761 with a view to striking at England whose fleets were threatening the French coasts, served only to involve Spain in the disaster Choiseul who had, at least, a policy that was sometimes right, and who strove to realize it, saw clearly that the real struggle was with England; hence he devoted all his energies from 1763–66 to the development of the navy, and, as a compensation for the loss of the colonies, annexed Lorraine (1766), while by the acquisition of Corsica (1768) he gave France a base in the Mediterranean midway between a friendly Spain and Italy, which might one day be a stepping-stone to Africa

But Louis XV had two policies The efforts he made to repair, by the secret diplomacy of the Comte de Broglie, the evils wrought by his official policy, served only to aggravate his mistakes and to betray his weakness The contradictory intrigues of the king's secret diplomacy in the candidature to the Polish throne of Prince Xavier, the brother of the Dauphin, and the patriotic efforts of the Confederation of Bar, helped to provoke the Polish crisis, which was concluded in Frederick II 's favour by the partition of 1772. The Turks, in their turn, were involved in the same disaster. Of the old allies of France, Choiseul retained at any rate Sweden by means of the *coup d'état* of Gustavus III (1772), but instead of being, as heretofore, the arbiter of European destinies Versailles lost all its credit, and only exhibited to a contemptuous Europe the extremity of its decadence

Home Government of Louis XV.—These defeats and humiliations aroused further resentment in an already discontented nation, as the want of cohesion in the Government and anarchy in the central authority became more and more intolerable in home affairs In the absence of a royal and directing hand, the king's mistresses were unable, of themselves, to animate the administration. Since the days of Fleury a public opinion had gradually grown up in the salons and cafés of Paris which became daily more embittered It found more and more open expression among the writers, who loudly demanded reforms, and in the political opposition of the members of the *parlements*, the frequenters of the salons of Mesdames d'Epinay, Geoffrin, and Du Deffand, talk was translated into action The Government undoubtedly still possessed traditions and civil servants of capacity who were able to protect it against the ruinous influence of the courtiers; but it was impossible to achieve reforms without affecting private interests or suppressing privileges Thus in the absence of a firm royal power, the Government was confronted by a universal opposition, at once from the religious party and from Madame de Pompadour, who leaned for support upon the *parlement*, the Gallicans, the Jansenists and the philosophers Apart from the court, the armies, fleets and wars cost a great deal of money But nobody was willing to sacrifice fiscal immunity—least of all the *Parlementaires* Hence, as in foreign policy, so in home affairs, it was the opposition that held to the past and the Government that fought for reform. In reality the Government, far from being absolute, was held in check by the *parlements* whose resistance paralyzed the administration

Restored to their political activity the *parlements* refused to approve the plan of Machault d'Arnouville, which insisted on the right of taxation without respect of persons and arranged for the liquidation of the public debt by a tax of a twentieth; and the clergy for their part were no less selfish Louis XV. sacrificed his minister to the clamour of the privileged classes (1754). The *parlements* intervened also, and with equal vigour, in the dispute that arose regarding the papal Bull *Unigenitus* and in the question of the *Billets de confession* The general confusion was further aggravated by the fact that the *parlements*, which sympathized with the Jansenists, had the support of the Philosophers and of the sceptical Encyclopaedists Two facts served to reveal the breach between the nation and the king since 1750 the marquis d'Argenson had prophesied a revolution and Damiens, in 1757, had attempted to assassinate Louis, the Well-beloved

After the Seven Years' War, the necessary reorganization of the army and navy, with a view to a fresh war with England, proclaimed the need of money Choiseul had to appeal to the *parlements* He thought that he would win them and the Encyclopaedists by obtaining Louis XV 's consent to the expulsion of the Jesuits (1764) But the opposition to taxation steadily increased and became particularly violent in Brittany, where the estates, attached to their privileges, were supported by the *parlements* of Rennes and of Paris from 1766 to 1770 Choiseul fell in his turn in face of the coalition of the new mistress, Madame du Barry, the Abbé Terray, and the Chancellor Maupeou

The Triumvirate, 1771–74.—The fall of Choiseul was followed by a *coup d'état* on the part of Maupeou, who gave Louis XV to understand that in the opposition of the *parlements* lay a danger to the monarchy Ambitious and energetic, Maupeou suppressed the *parlements* and set up in their stead superior councils of magistrates nominated by the king The Philosophers supported this bold policy; and it was justified by the religious intolerance of the *parlements*, the scandalous trials of Calas, Sirven, the chevalier de la Barre, and Lally-Tollendal, and their selfishness in perpetuating abuses profitable to them The Abbé Terray began to reform the abuses of revenues and pensions, to organize the famous *vingtièmes* which had aroused so great a storm, and to create an equitable system of taxation similar to the *contribution mobilière* subsequently set up by the Constituent Assembly, but in spite of it remained as unpopular as every other minister of finance

A general unrest manifested itself throughout the nation, although no one sought to destroy either absolute power or the traditional constitution The Philosophers, like Voltaire, and the Physiocrats sought to utilize the king's autocratic power to accomplish the necessary work of reform. Montesquieu raised his voice in praise of constitutional and benevolent despotism; and if Rousseau put forward the theory of the "social contract" and a popular sovereignty, he did not pretend that it was applicable in territories of a greater size than Geneva. These new ideas had only reached the educated classes, and formed a piquant subject of discussion among the frequenters of fashionable salons who, however, had no desire to be martyred for their beliefs The intelligent, ambitious and wealthy *bourgeoisie* composed of farmers-general army contractors, financiers, business men and manufacturers, aimed only at securing themselves against the arbitrary action of royalty and bureaucracy In the face of the extravagant anarchy of the Government, they were no longer safe from bankruptcy The peasants, whom the acquisition of land had gradually enfranchised, were, above all, eager to enjoy their new wealth. So that to Louis XV.'s cynical and despairing declaration "Après moi, le déluge," the setting 18th century responded by a belief in progress and an appeal to the future.

Louis XVI., 1774–92.—This persistent loyalty to the Crown and this hope of reform affords an explanation of the confidence expressed anew by the nation in the 20-year old Louis XVI He was popular on account of his virtuous private life and his good nature: but to be a large eater, like all the Bourbons, a great hunter, and a clever locksmith, was not also to grasp and be able to exercise authority Louis was full of good intentions and confused ideas. Love of tradition and the old constitution of the

kingdom were united in his vacillating personality with a real desire for the public good and a wish to carry through reforms, even though he lacked the necessary force of character to put his desire into action. Since 1770 there lived in his company rather than at his side the Archduchess Marie Antoinette of Austria She was one of the most beautiful and lively women at Versailles, passionately devoted to pleasure and luxury, delighting to free herself from the formalities of court life, lovable and loving without ceasing to be virtuous. But when, later on, less clever than her mother, she sought to play the part of a Queen-regnant, she gave the rein to her likes and dislikes, and very quickly afforded Beaumarchais a terrible illustration for his *Barbe* Private jealousies and public impostures soon crystallized her tremendous unpopularity in the sinister nickname of "l'Autrichienne" Neither Louis XVI nor Marie Antoinette was capable of reconciling the nation with the throne, nor of taking the leadership in Europe, their reign was but a tissue of contradictions External affairs appeared even less hopeful than those at home, desirous of restoring to her position in Europe a France that had been humiliated by the Treaty of Paris and the partition of Poland, Vergennes resolved to free her from the maritime supremacy of England and to throw off the yoke of Austria The opportunity came when, in 1776, the English colonies in America rose in revolt Vergennes desired French intervention, but Louis XVI, yielding to the financial objections of Turgot, hesitated, while countenancing the assistance given to the Americans by volunteers under La Fayette, until after the capitulation of Saratoga (1778) In order to fight against England, France needed to have her hands free on the continent Vergennes assumed the rôle of arbiter of Europe When the Emperor Joseph II, unable to forget the triumphs of Frederick the Great, wished to compensate himself for the loss of Silesia by the acquisition of Bavaria, Vergennes prevented him by the Treaty of Teschen (1779), thus preserving peace in Europe Vergennes earned the gratitude of all peoples weary of the naval tyranny of England by the Franco-Spanish-Dutch alliance (1780) and, after the capitulation of Yorktown, by the Treaty of Versailles (1783) which crowned his efforts with formal success Henceforth, partly from want of money and partly from his own natural caution, Vergennes contented himself with maintaining the *status quo*—a difficult ideal in the face of the desire of Catherine II and Joseph II. to partition the Ottoman empire, he sought to crown his work by effecting a reconciliation between France and England in the commercial treaty of 1786, and when he died in 1787 his plans had been realized But his work was quickly destroyed by the very means taken to ensure its success. his American war had but hastened the "hideous bankruptcy"

The Home Government of Louis XVI.—From the outset of his reign Louis XVI displayed in home affairs the indecision that was to cost him his throne. In an extreme of inconsistency, and in order to please public opinion, he restored the *parlements*—the merciless enemies of reform—at the very moment when he summoned the reformers to his Council. Of these Turgot was the most remarkable, Physiocrat and contributor to the *Encyclopaedia*, he wished to extend to the whole of France that experiment in liberty which had already succeeded on a small scale in the government of his own province of Limousin He ordained the free circulation of grain throughout the kingdom despite the flour war (*la guerre des farines*) aroused by the prejudices of those who saw in this measure a new *"patte de famine"* For the *corvée* which had taken away the peasants from their work in order to build roads, he substituted a territorial levy, payable by all landowners; and he established freedom of commerce and industry by abolishing the privileged trade corporations (1776). He offered himself to Louis XVI as a minister of economies: there were to be no new loans and no new taxes But time failed him. He had been 13 years at Limoges; he was a minister for only two years. The two supports on which he had a right to count failed him simultaneously: public opinion that clamoured for reforms on condition of not paying the cost, and the king who was too weak to put down abuses or to refuse privileges The *parlement* was induced to register his edicts only by force; the court, the clergy, the financiers—one and all joined in maligning him; and when, in order to decentralize the too centralized administration, he proposed to set up consultative bodies of landowners in each parish, town and province, Louis XVI sacrificed him to the intrigues of Maurepas and to the American ambitions of Vergennes (1776)

Necker, the Genevan banker and Protestant, succeeded him. He abolished the Turgot edicts and then, either because he dared not or could not attack the evil at the root, proposed, like Law, a marvellous remedy. an unlimited loan He succeeded in financing the American war, but at a grave charge upon the future His administrative work showed no greater signs of originality, and borrowed largely from the ideas of Turgot He transformed the municipal bodies set up by Turgot into provincial assemblies, heirs of the *parlements* and the intendants, and immediately they assembled they revealed themselves to be inspired with a reforming spirit—while opposition on the part of the privileged classes broke out again. Necker replied with his famous *compte-rendu*, showing that the monarchy rewarded the idleness of the courtiers far better than it had ever rewarded the zeal of its servants, but in 1781 he in his turn was overthrown by the reaction which he had helped to promote in attacking Turgot To the reforming ministers succeeded ministers who were courtiers only The Marquis de Ségur removed from the army all officers of low birth, while the nobles displayed a fierce energy in enforcing their seignorial rights, the Church reasserted more strongly than ever its sovereign right to control the civil estate of all Frenchmen, but the reaction was not able to fill the empty coffers of the State, and in two years, two ministers, Joly de Fleury and d'Ormesson, were discarded. Calonne, a business man, a veritable Cagliostro of finance, succeeded Madly extravagant, he feigned an optimism which nourished the confidence necessary to ensure the success of his perpetual loans, but, like his predecessors, he experienced the enmity of the *parlements* After two years of combat, realizing that Louis XVI would never consent to a repetition of the *coup d'état* of 1771, he sought the support of a national suffrage; and it was on his advice that the king summoned an assembly of notables, thus exposing the monarchy at a time when it was already compromised by the affair of the Diamond Necklace (*q v*).

Loménie de Brienne, who succeeded Calonne in 1787, was no more successful The notables referred him to the representatives of the people, to the States-General. But Brienne, remembering Etienne Marcel and the League, preferred to present to the *parlements* his edicts for a stamp duty and a territorial subsidy He met with the same refusal, and was referred again to the States-General Against his own wishes, Louis XVI., by his declaration of Nov 19, 1787, was forced into open warfare with the *parlements* which he had re-established—a battle in which the king was to be the loser, for the royal Government was too exhausted to overthrow even a decaying power like that of the *parlements*

THE REVOLUTION

The Revolution began in the same manner as the Fronde. This time, however, it was the nobles and the magisterial aristocracy of the provinces who gave the signal for the revolt In Brittany and in Béarn the estates supported the *parlements*, and it was in Dauphiné, at Vizille, on July 21, 1788, that the first demand was made for the convocation of a States-General. The clergy, in their turn, having also refused the subsidy, Louis was forced to give way and to summon the States-General to meet on May 1, 1789. But the Government had to be carried on and Necker was recalled, no one understanding less than he that he was called upon to prepare the way for a revolution. Necker was occupied solely with new financial devices; the *parlements*, with the old reactionary formula of the estates of 1614; the throne, as on former occasions, was becoming the arbiter in the battle of interests between the privileged orders and the lower classes No one saw that public opinion was looking for something entirely different and that now it had a means of expression which it had hitherto lacked; the conflict was no longer between the Government and the privileged classes, but between the privileged classes and the people

The States-General of 1789.—A twofold question demanded

solution the number of deputies and the system of voting The Vizille programme, voting by heads and the double representation of the third estate, meant equality, the great revolution; voting by orders, on the other hand, would have meant the continued domination of privilege, and the lesser revolution The monarchy in its isolated position held the balance so long as it was ready with a definite policy But that was much to ask of Necker, who had little influence at court, and of Louis XVI, who was torn between his minister and Marie Antoinette Ultimately the king took the attitude that was least in accord with his real interests and most with his natural indolence he remained neutral At a council of Dec 27, 1788, and despite the sensational pamphlet of Sieyès, *Qu'est-ce que le Tiers Etat?*, he separated the two questions which were so closely connected He pronounced himself in favour of the double representation of the Third Estate, without deciding on the question of the vote by heads, although allowing it to appear that he would prefer the vote by orders The same indecision revealed itself in the general programme; the proclamation summoning the States-General spoke vaguely of "the establishment of lasting and permanent order in all branches of the administration" The same spirit of compromise marked the choice of the meeting-place, compelled to choose between the too-distant centre of France and the too-turbulent Paris, Louis chose Versailles "because of the hunting" The manner of the elections followed the traditional procedure of 1614, that is to say, the suffrage was almost universal For the third estate nearly all citizens over 25 years old voted and paid a direct contribution The country clergy were included among the ecclesiastics, the smaller nobility among the nobles, and, finally, protestants were both electors and eligible

There was equal confusion in the customary documents (*cahiers*), containing lists of grievances and proposals for reform. Although the whole of France still appeared as devoted to the monarchy, autocracy was unanimously condemned All the orders were agreed in demanding a written constitution, the regular convocation of the States-General to vote taxes and to legislate, and equality of taxation; and all condemned the existing financial system But the privileged classes denied equal rights for all citizens and hotly defended the system of voting *par ordres*, in which they recognized the safeguard of their tithes and feudal rights. The noblesse and the third estate gladly offered up the ecclesiastical properties, as a cheap way of settling the national debt Although the third estate was united as against the noblesse, its demands varied with the constituency—bourgeois or peasant, traders or artisans; it was, however, the wealthy and propertied middle-classes who actually drafted its demands, they allied themselves with the feudal lords as against the poor peasants, and they were far from unanimous in their condemnation of the corporations. Where they were in agreement among themselves was in favouring as light taxation as possible, and in condemning indirect (the most productive) taxation—a line of action which was to provoke worse financial embarrassments than those they sought to escape

The States-General and the King.—The elections had shown the opinion of France unmistakably. but Louis XVI did not wish to rule as a constitutional monarch like the king of England, nor did the privileged classes wish to sacrifice their ancient traditions Influenced on the one hand by Necker, who advocated the making of whatever sacrifices might be necessary, and on the other by Marie Antoinette and the comte d'Artois, who were the advocates of a policy of no surrender, the king was unable either to choose or hold to a definite course When the estates met on May 5, 1789, he had decided nothing; and there followed a conflict between king and assembly over the verification of their mandates. The third estate desired a common session of the three orders, the effect of which would be to suppress class distinctions and secure the system of voting by head The privileged orders refused to assent to this course, and after a delay of six weeks, during which the Third Estate firmly maintained its view, the latter, seeing that they represented 96% of the population, finally determined on the motion of Sieyès to proclaim themselves the representatives of the nation and, as such, authorized to make laws of their own volition. The first resolution passed by the third estate in its new capacity as a national assembly, was a declaration that for the future no tax should be levied without its assent. Urged by the privileged orders, the king replied to this action of the third estate by closing the Salle des Menus Plaisirs, where they were sitting. Whereupon, gathered in one of the tennis courts at Versailles on June 20, under the presidency of Bailly, they took an oath never to separate until they had established the constitution of the kingdom

Louis then determined to make known his policy in the *lit de justice* of June 23 He announced that he accepted fiscal, but not social, reforms, but he added that he desired the welfare of his people Then he annulled the meeting of the 20th and ordered the estates to deliberate separately The third estate refused to obey and, in the speeches of Bailly and Mirabeau, brought up the question of the legality of the revolution The refusal of the military to march against them revealed that the king could no longer rely upon the services of the army A few days later, when the lesser nobility and the humbler clergy joined the third estate, whose cause was theirs, the king yielded and commanded (June 27) the two orders to join with the third estate in the National Assembly By so doing he recognized and sanctioned the political revolution, though at the same time under the influence of the "infernal cabal" of the queen and d'Artois, he appealed to the still loyal foreign regiments, and dismissed Necker Fearing that an attempt would be made to overcome them by force the Assembly demanded the withdrawal of the troops; on the king's refusal Paris offered a municipal guard to protect the Assembly against the royalist forces, and by storming the Bastille, which symbolized the *ancien régime*, assured the victory of the Revolution (July 14) The king was forced to recall Necker, to place the tricolour cockade in his hat in the Hôtel de Ville, and to sanction the appointment of Bailly as mayor of Paris, and of La Fayette as commander of the National Guard which, by remaining armed after the victory, was later to dominate both king and Assembly Since June 20 the National Assembly had had right on its side, after July 14 it had might as well The Revolution was accomplished

Anarchy in France.—If Paris had captured her Bastille, it still remained for the towns and villages to capture theirs—the bastilles of feudalism Through force of example, poverty and fear, a spontaneous outburst of anarchy dislocated all authority, and on its ruins temporary local bodies arose, limited in area, but none the less defiant of the Government The provincial assemblies in Dauphiné and elsewhere gave the signal, and numerous towns, imitating Paris, set up municipalities and national guards to take the place of the intendants and their deputies While the middle classes were thus arming themselves and boldly assuming the local government the peasants were not idle Between March and July more than 300 agrarian riots swept away the feudal idea of property, already compromised by its own excesses, but the middle classes possessed sufficient perception to realize that by permitting the expropriation of the nobles they endangered the revenues of their own lands. In the dismayed Constituent Assembly, the Third Estate was, therefore, not the least zealous in advocating methods of repression. But repression could only be effected through the king; it was for him to find a way to check the revolution.

In the session of the night of August 4 the liberal nobles, such as the dukes of Aiguillon and Noailles, in order to find a way out of the impasse, proposed the suppression of all personal services and fiscal exemptions, and the purchase of the seignorial dues The peasants did not understand this laudable but unworkable distinction between personal servitude and the rights of contract, but the idea of purchase reassured the deputies, and in the additional laws passed in order to organize it the latter endeavoured to narrow the scope of the Revolution Amidst the joy inspired by this social liberation, Louis XVI. regained his personal popularity; but he failed to take advantage of it. With the worst possible grace, he ratified the decrees of Aug 4, and, while fearing La Fayette who, as commander of the National Guard, was in a position of strength, he sought to control him. Above all he

sought to profit by the dissensions that daily manifested themselves in the Assembly during the discussion of the Declaration of Rights and later of the Constitution Public opinion was disquieted by the king's hesitation in ratifying the decrees and the Constitution; and in the meantime a serious food shortage had arisen in Paris The emigration of the privileged engendered unemployment among the workers, and there was talk of another military *coup d'état*. A final imprudence hastened the explosion It was rumoured that at a banquet given by the officers of the guard at Versailles, the latter had failed to drink to the prosperity of the nation. On the night of Oct. 5–6, a Parisian mob forced the king and the royal family to return to Paris. The events of these days suddenly placed the king and the Assembly in the power of La Fayette, a new mayor of the palace, and of the commune of Paris Henceforward the master of the commune was to be master of the Government The capture of the Bastille had given the signal for the flight of the princes, the events of October prompted the flight of the royalists, and of Mounier, the leader of the reaction.

The Assembly.—Absorbed in the formulation of peaceful laws the Constituent Assembly thus found itself plunged into violent activity through the people's fear of betrayal and the court's fear of destruction Confronted with the opposition of a Right that was composed of talented men, the Assembly sought allies in the party of the Left, in the violent press conducted by Camille Desmoulins and Marat; in the demonstrations from the tribunes and the processions that wended their way past its bar, in the clubs, above all in that of the Jacobins (*q v*), and in the popular associations, and, finally, in the National Guard which under La Fayette, was less desirous of keeping order than of preserving the Revolution

By their personal influence and popularity, two men sought to act as mediators between king, Assembly, and people; and, by serving both the court and the revolutionaries, to attain to power These were La Fayette and Mirabeau, who were jealous and hated each other. The former, on the morrow of the days of October, cleverly contrived to throw the responsibility upon the seditious party, led, so he insinuated, by the duke of Orleans. Relieved of the embarrassment of Orleans' presence through his flight to London, La Fayette advised the king to be reconciled frankly with the Revolution, and to break off relations with the *emigrés* and the followers of the *ancien régime* If the king would have confidence in him, he would guarantee to restore order. But Louis XVI could not forgive him for his former rebellion, nor for his present loyalty to constitutional government; he refused to give up an iota of his rights, and schemed to rid himself of La Fayette.

Endowed by nature and by industry with rare abilities, possessing a finer political capacity than La Fayette but also an irremediable lack of character, Mirabeau sought to check and dam up the Revolution; it was his ambition to be its first minister and the saviour of the monarchy He foresaw the battle for popularity between La Fayette and the Assembly, the counter-effect upon the Revolution of revolutionary violence, possibly of civil war and, above all, of corruption He himself received money for his services He gave the king wise counsel: but the king did not understand it, or at least he never followed it. The queen consented to negotiate with so distrusted a servant only because it was necessary to endure everything in order to gain everything. All hope of his being entrusted with the conduct of affairs was shattered when the Assembly passed a law forbidding its members to become ministers.

The Declaration of the Rights of Man.—Having failed to come to an understanding with the king the Assembly ended by working alone, and turned its power of control into an instrument of strife rather than one of co-operation It inaugurated its legislative work by issuing the Declaration of the Rights of Man and of The Citizen, which was inspired by all the philosophy of the 18th century and by Rousseau's *Contrat Social* It set forth ideas of the sovereign right of the nation, and of the natural and imprescriptible rights of liberty, equality, ownership, voting and control of legislation and taxation, trial by jury, the vindication of the ideal and the dignity of mankind Lacking the support of historical precedents such as were to be found in England or the American colonies the Assembly took as the basis for its labours the tradition of all the great political thinkers And it is this very universality that, despite its omissions, has made of that work a magnificent chapter of public right and the source of all the political progress that has since been achieved in the world

The Constitution.—On this basis the Assembly founded the new régime Assuming to itself the right of sovereignty the nation proceeded to delegate it in accord with Montesquieu's theory of the separation of powers. The executive power was awarded to a "King of the French," and was to be exercised under his authority by responsible and dismissible agents. The legislative power was to be exercised by a single chamber of 745 members, freely chosen by electors, primary and secondary according to a property qualification; the laws which it passed could be vetoed by the king, but only during two consecutive sessions. The judicial power in civil causes was to be exercised by judges elected for ten years by the same electorate as chose the deputies, and in criminal cases by two juries one, like the grand jury in England, to bring accusations and one to judge them—in a word, by the nation itself

Organization.—Upon the same principle the Assembly swept away the entire ancient ecclesiastical and civil administration in a fury of reaction against the oppressive and inefficient centralization of the *ancien régime* After this clean sweep they built up a new edifice on a plan at once federal, logical and simple The old local divisions were replaced by 83 departments, with the object of crushing any spirit of particularism and of bringing together the administered and the administrators. To check the ministry, they loosened the bonds uniting local with central authorities, and against the retrograde central power gave extended powers to local bodies such as the councils and committees of communes, districts and departments In 1791 France was pulverized into innumerable administrative atoms incapable of cohesion, and the impossibility of an immediate restoration of public life led to the hegemony of Paris in France. Since it was the educated middle class who were the sole masters, by virtue of the electoral law, municipal life, like political life, was legally concentrated by the property qualification of the franchise in the hands of the middle classes In place of the former *parlements* there arose a hierarchy of jurisdictions rising from the cantonal justice of the peace through the civil tribunal of the district, the criminal tribunal of the department, the court of cassation in Paris, until it reached the supreme national court—all being independent of the king and his ministers

Having abolished financial as all other privileges, the Constituent Assembly established a just and equitable fiscal system. They also abolished the *impôts de consommation*, unpopular because they bore with equal force upon unequal incomes. Owing to their horror of tyranny and of personal taxation and strongly under the influence of the Physiocrats (who in theory were in favour of a single tax on land), they placed, as a form of direct taxation, a very heavy duty upon incomes derived from landed property, a far lighter duty upon those derived from personal property, and a license fee upon receipts from commerce and industry.

The re-organization of the State necessitated that of the Church. This was achieved in the Civil Constitution of the Clergy (July 12, 1790) The clergy were to be no more than civil servants, elected like any others, entrusted with a public service and paid by the State There were to be no more monastic vows or papal rights of spiritual investiture, the Church was disestablished and the priests, deprived of their civil rights, were compelled to take an oath to the Constitution. The Assembly destroyed the political organization of the Church in France, loosed the bonds that tied it to Rome, and attached it by the system of election to democratic interests Political and religious reform, however, was of no avail unless accompanied by financial reform: the Assembly was powerless in face of the deficit that had been further aggravated by the Revolution. Moreover, the clergy possessed very considerable landed estates; but only by

right of temporary possession, the Assembly argued—a view which had already been advanced by the States-General in the 16th century The suppression of the clerical order resulted naturally in the secularization of its property, which was handed over to the nation in its capacity of heir to the possessions as well as to the sovereignty of the king Moreover these estates would serve as collateral for the *assignats*, or mortgages, and would help to liquidate the debt The *noblesse* were also suppressed with all their rights, privileges of birth and entailed estates, the workmen's corporations, too, had disappeared, and Chapelier's law (1791) forbade any renewed combination on their part Finally the army was to be recruited by voluntary service, its strength was each year to be regulated by the Assembly, and a military career was to be open to all citizens

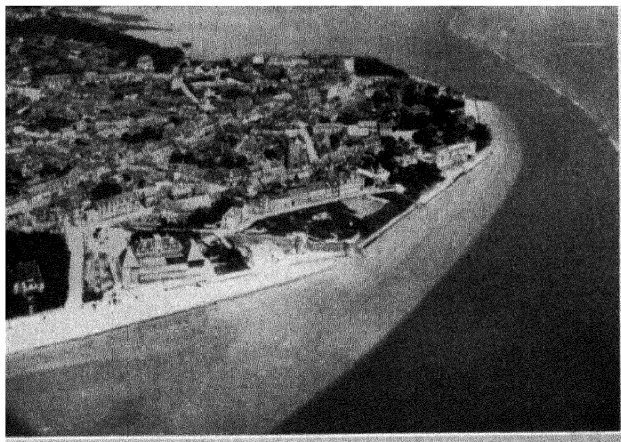
Thus the constitution of 1791 was a middle-class instrument directed against the king and the privileged orders The *bourgeoisie* were not wholly dominated by theory, their policy was a mixture of expedients both revolutionary and conservative Nowhere did they carry their political principles to their ultimate conclusion The suspensive veto, the electoral property qualification, freedom of worship (offset by the Civil Constitution of the Clergy), the grant of the vote for coloured races without the enfranchisement of slaves, the organization on parallel lines of the army and the National Guard, education and poor-law relief —all these measures serve to show that their solution of the political, as of the social, problem had been no more than a compromise between traditions and principles in order to safeguard the period of transition Such as it was, the Constitution contained durable elements in its principles and its civil institutions, its less durable elements were due to the parliamentary inexperience of the Constituents and to their hatred of the *ancien régime*. As Mirabeau's keen vision had foreseen, the separation of the three powers led to suspicion between them and, in the long run, to the encroachment of the legislative upon the executive power. This latter was gradually reduced to impotence, and was, as it were, suspended in mid-air with a monarch rightly held in suspicion, if not absolutely powerless, *vis-à-vis* the assembly and the local authorities. In an old-established monarchy entirely dependent on the central authority, the anarchy and irresponsibility due to this system of collective and elective self-government soon made it impossible to collect the taxes and led to an undue reaction against the system The distinction between active and passive citizens, according to whether or not they paid a direct contribution equal to three days' labour—a distinction which Robespierre had vainly opposed—violated in favour of the wealthier classes equality, the first principle of the Declaration, and destroyed for 50 years the solidarity of the middle classes and the proletariat. Finally, by seeking to constitute a national Church deprived of its lands and privileges—as devoted to the Revolution as formerly to the monarchy—they uprooted the existing Church, and drove it either into ultra-montanism or heresy The rigorous application of the penal laws against the non-juring priests provoked a religious war that strengthened the royalist insurrections at the very moment when the inadequacy of the direct taxes was aggravated by the colossal blunder of the *assignats*.

Flight of the King.—The anniversary of the fall of the Bastille was chosen for a celebration of the new unity of France, and to it came representatives from all the departments for the purpose of taking an oath to the Constitution, thus ratifying in the name of France the work of the Assembly and giving, by their voluntary acceptance of it, a formal consecration to the unity and indivisibility of their country. But Louis XVI was unwilling or unable to speak the words which, at this unique and fleeting opportunity would have served to dissipate all doubts. That he did not do so is to be ascribed to the fact that the court had not lost all hope of a turn of fortune True to the double game it had played between Mirabeau and La Fayette, the court party had secretly formed a coalition of the *emigrés*, reactionary clergy and foreign sovereigns. When to the expropriation of his legal powers the Assembly added the Civil Constitution of the Clergy which wounded Louis in his conscience as a Christian, and when by the emigration of the noblesse and the death of Mirabeau (April 2, 1791) he was deprived of his natural supporters and his sole counsellor, the king bethought himself of his former project of taking refuge with the army of the marquis de Bouillé at Metz Thus, in the face of mutiny, he substituted a perilous deception for the military violence which he could not impose, and to duplicity he added treason The flight to Varennes (June 20, 1791) was an irreparable mistake which, during the king's absence and even on his return, displayed the insignificance of the royal authority.

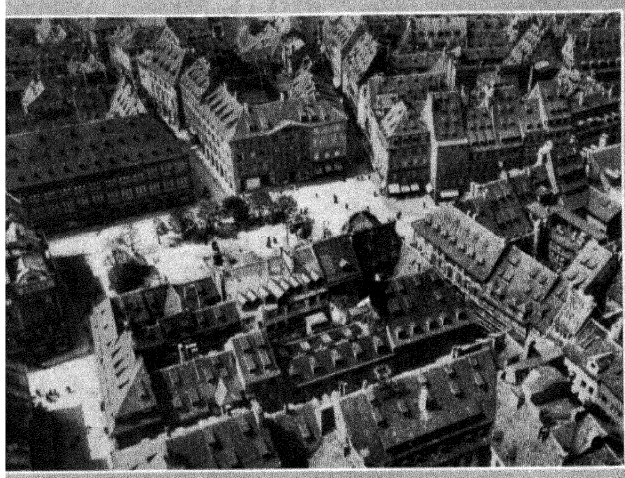
The massacre at the Champs de Mars by La Fayette of the republicans who had logically enough demanded the deposition of the king (July 17, 1791) led to an open breach between the middle classes, who favoured compromises, and the democratic party Hence, when Louis XVI was brought back a prisoner and—with mental reservations—took the oath to the Constitution on Sept. 14, 1791, the dissatisfied nation abandoned the Constitution and took up arms against the duplicity of the monarch and the selfish policy of the middle classes The battle between the National Assembly and the *ancien régime* had ended in the defeat of the latter Through boredom or want of interest, the Constituent Assembly decided, on the motion of Robespierre, that its members were not eligible for re-election This step involved leaving to still more inexperienced hands the task of putting the new constitution into force

The Legislative Assembly.—The life of the Legislative Assembly (Oct. 1, 1791–Sept 20, 1792) was equally short and troubled Its days were occupied in a struggle with the king who intrigued against it: as a result the monarchy, insulted by the proceedings of June 20, was eliminated altogether by those of Aug 10, 1792 Only in conditions of peace could the measures of the Assembly have prospered; instead they encountered war (April 20, 1792)

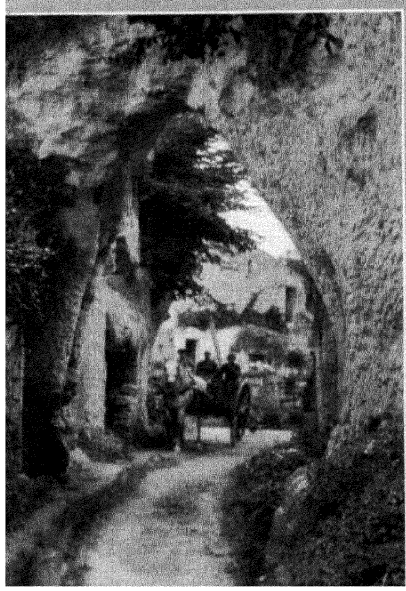
The majority in the new Assembly favoured the constitutional monarchy and a bourgeois franchise But these "Feuillants" of the anti-demagogic club (*see* FEUILLANTS, CLUB OF THE), which had seceded from the club of the Jacobins (*q v*) after the flight to Varennes, were divided into two opposing sections that of La Fayette and that of the triumvirate of Alexander Lameth, Duport and Barnave They agreed only in their opposition to the republic and to war, and were, therefore, in violent antagonism to Robespierre's Jacobins, who were drawn from the lower middle classes These small shop-keepers were greedy of acquiring national properties and were, consequently, in order to raise the value of the currency and the *assignats* which had been lowered by the intrigues of the noblesse and the priests, determined to end those activities and obtain the recognition of the Republic from monarchical Europe Among the Jacobins the dominant group was the Girondins, so called because their most brilliant leaders, Brissot and Vergniaud, were deputies for the Gironde. (*See* GIRONDISTS) The Republicans, however, were stronger outside than within the Assembly. Their strength was derived above all from the great popular club of Paris, the Cordeliers (*q v*) Vacillating between the Feuillants and the Jacobins stood the Independents, who believed in the Revolution but were as greatly disquieted by the demagogic factions as by the court intrigues Hence the Constitutionalists found themselves between two separate conspiracies, that of the royalists pure and simple, and that of the republicans, who joined hands in opposing the moderate party without surrendering their hatred for each other The first result of this coalition was the election of the Jacobin Pétion to the mayoralty of Paris, against Bailly, the resigning mayor, and La Fayette. But the republic could not be established without war—a war against the House of Austria, the ally of the king The Left of the Assembly (Brissotins and Girondins) against the wishes of Robespierre, were eager for war on the ground that it would be easy and that it offered the sole means of escape from the present confusion; the followers of La Fayette, militarist in spirit, lent it their support in the belief that with an army behind them, they could master both the Jacobins and the king; Louis XVI and Marie Antoinette accepted it in the secret hope that France would tremble when

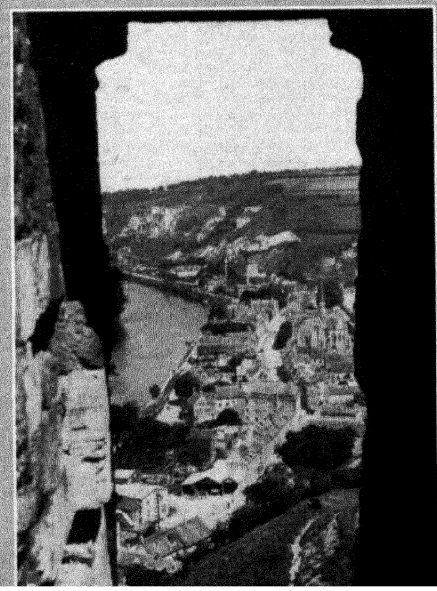


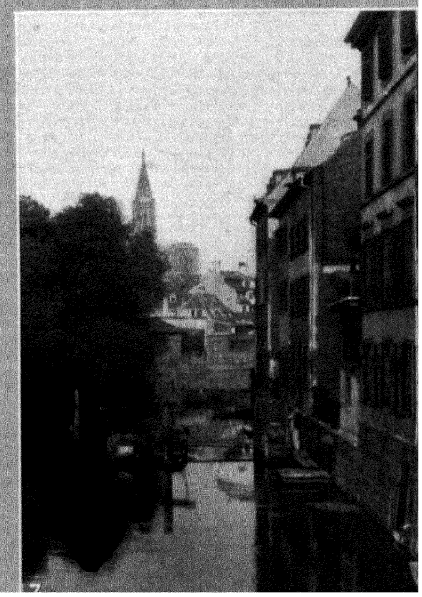












BY COURTESY OF (5, 7) H. ARMSTRONG ROBERTS, PHOTOGRAPHS (1) ORIENT AND OCCIDENT (2) COPR. DONALD M. LEISH (3, 6) BURTON HOLMES FROM EWING GALLOWAY (4) EWING GALLOWAY

CITIES AND TOWNS OF FRANCE

1 Le Crotoy, an ancient fortified city and port situated on the estuary of the Somme near the point where it joins the English channel It is frequented as a summer resort 2 The Promenade des Anglais, on the seafront at Nice, the chief city of the French Riviera 3 Aerial view of Strasbourg, showing the high gabled roofs with rows of dormer windows, which are characteristic of the town Strasbourg, the old capital of Alsace, is now the chief town of the French department of the Bas Rhin 4 Lyons, the third largest city of France, famous for the manufacture of silk; view from the hill of the Fourvière, looking east across the Saône and the Rhône rivers In the foreground is the 13th century cathedral of St Jean 5 Road near Saumur, the Loire section, northwestern France 6 Les Andelys, Normandy, twin villages on the Seine near Rouen View of Le Grand Andely, taken at le Petit Andely, from the Château Gaillard, a castle built by Richard Coeur-de-Lion 7 Strasbourg, from the river Ill, which, together with the canal de Faux Remparts, encircles the city, making it an island. The spire of the cathedral is seen in the distance

monarchical Europe took to arms.

The Declaration of Pilnitz.—The *emigrés,* who were collected at Trèves under the leadership of the prince de Condé, let loose the national and European war. The Declaration of Pilnitz (Aug 27, 1791), by which the emperor Leopold and king Frederick William II. of Prussia declared the restoration of order and the monarchy an object of interest to all sovereigns, was put forward by them as an assurance of forthcoming support The Girondins immediately took advantage of this to confound the Feuillants with the court in public opinion, and to denounce the king as the accomplice of foreign powers. In carrying through the Assembly the decrees against the Comte de Provence, the *emigrés,* and the reactionary priests, they forced Louis to declare himself by the exercise of his veto (Nov 1791), thus removing the last doubts of his complicity The indictment of De Lessart, minister for foreign affairs, led to the replacement of the Feuillant ministry by the Girondin cabinet of Brissot and Roland On the refusal of Francis II , the new emperor, to disavow the Declaration of Pilnitz, Louis sanctioned a declaration of war upon him (April 20, 1792).

Brissot and his friends had attained to power; but only a swift and decisive victory would enable them to retain it When however, owing to the disorganization of the army by desertion and emigration, the mismanagement by the Feuillant generals of their ill-conceived campaign in Belgium was followed by the invasion of France and the risings in La Vendée, the whole nation rightly suspected the existence of treason. To reduce the strength of the enemy within the gates, the Assembly voted the deportation of the non-juring priests, the replacement of the king's constitutional Guard by a body of 20,000 volunteer national guards in Paris, and declared itself to be in permanent session (May 27–June 8, 1792). The veto of Louis XVI caused the fall of the Girondin cabinet, and with them of Dumouriez, who had hoped to supplant them. Cleverer than the Feuillants, who had allowed themselves to be compromised by their court connections, the Girondins diverted the storm of popular fury against the king The *émeute* of June 20, a burlesque which, but for the persistent good humour of Louis XVI might have been a tragedy, alarmed but did not overthrow the monarchy. But the invasion of the Tuileries provoked among the middle classes and in the commander of the National Guard, La Fayette, a spirit of monarchist reaction which might have achieved much had not the entry upon the scene of the Prussians, allies of the Austrians, and the publication of the insolent manifesto of Brunswick, served to unite temporarily the Brissotins and Jacobins. By proclaiming that the country was in danger (July 11) the Assembly revealed to France that the king was no longer capable of defending her against a foreign enemy The summoning of the federal volunteers to Paris gave the opposition not only the war song "the Marseillaise," but also the army that had been refused by the defenceless Louis XVI The foolish measures taken by the distracted Girondins to effect a last reconciliation between the king and the revolution, the stupid decree by which the Assembly exonerated La Fayette (Aug 8) who had been guilty of deserting his army, its refusal to vote for the deposition of the king, the secret intrigues of the court—all this provoked the communal insurrection of Aug 10 led by Robespierre and Danton against the king and the Gironde. At a single stroke the tocsin of Aug 10 sounded the death-knell of the middle-class régime and the accession of democracy to power.

Insurrection of the Paris Commune.—The king having been suspended from his functions and imprisoned in the Temple, the Assembly, as after the flight to Varennes, temporarily assumed the royal authority by means of a provisional executive council presided over by Danton, in which the Girondins (Roland, Clavière, Servan, Lebrun) were in the minority. But the alliance of the mob is always dearly bought. The council found its authority quickly offset by one of those new powers, insurrectionary and demagogic in character, which on many occasions in the coming century were to rise against the legal government—the revolutionary commune composed of the delegates of the administrative divisions of Paris They had led the assault on the Tuileries and they remained, until July 27, 1794, one of the dominant powers in the State. Established in the Hôtel de Ville, they sought to exercise a dictatorship, entering into a conflict with the Assembly, which they looked upon as a temporary organ of power, and paralyzing the action of the executive council, notably in the bloody days of the September massacre. These were provoked by the discovery of the intrigues between the court and foreign powers, by the treason of La Fayette, the capture of Longwy and investment of Verdun by the Prussians (Aug. 19–30), and, finally, by Marat's incendiary placards Danton was compelled to avoid a conflict with the commune. Luckily, on the day of the dissolution of the Legislative Assembly, Dumouriez relieved France of the Prussian invasion by the victory of Valmy (Sept. 22, 1792); but before it dissolved, being without a mandate to alter a constitution that had become unworkable through the suspension of the king, it had convoked a National Convention and substituted universal suffrage for the property qualification Meanwhile, republicanism, under the influence of the Jacobin propaganda and the tide of patriotism aroused by the invasion of France, was steadily gaining strength. The decree of Aug 25, 1792, which marked the destruction of feudalism, now abolished in principle, finally converted the peasants to the republic

No sooner was the Convention fully established than it became distracted by the fratricidal disputes of its adherents (Sept 22, 1792–Sept 4, 1797) A great majority of the electoral assemblies wished for a democratic and equalitarian republic, but that it should be liberal, unitary and propagandist The 782 deputies in the Convention were divided less by principle than by ambition. All wished to achieve an unattainable unanimity through agreement, but being unable to convince, they destroyed one another.

The Parties.—The Girondins played in the Convention the part of the Feuillants in the Legislative Assembly. But they never formed a disciplined party (their whole policy was against it), and this led to their ruin. Oratorically, they represented the spirit of the south, and politically the ideas of the middle classes in opposition to the democracy which they despised, although making use of it They advocated a centrifugal, rather than federal system of government out of hatred for the preponderance of Paris, which had disgraced itself in their eyes by the massacres of September and by choosing deputies exclusively from the Mountain (the name given to the extremists of the Jacobins) which was no more a united and stable party than was the Gironde They were supported by the Parisian mob, and they saw in the decentralization advocated by the Girondins, a threat to the unity of the republic at a moment when the circumstances demanded a highly centralized and powerful government To the Polish republic of the Gironde, they opposed a republic on the Roman model Between these two parties stood the *Plaine,* the *Marais,* the troop of trembling bourgeois sincerely attached to the revolution, but timid in the defence of their beliefs. Some among them sought a refuge in the work of the commissions, while others, through fear, or for political reasons, identified themselves with the excesses of the Jacobins.

The Girondins were the first to take the lead. Fortune smiled upon them. Invasion was turned back and the offensive taken on every front The commune of Paris was made more moderate by the defeat of the Mountain in the elections Everything conspired to favour the substitution of a healthy competition in patriotic endeavour for the sterile party conflicts. But the Girondins remained an exclusive party, a product of the *émeute,* but with no influence over the mob The party lacked both a leader and popular support; it could have found both by accepting the advances made to it by Danton, but through hatred for the authors of the September massacres and above all because they saw in him their most formidable rival, the Girondins repulsed Danton and drove him back into the arms of Robespierre, Marat and the commune. After Sept. 23 they declared Paris to be a danger to the Convention and demanded the protection of a guard raised from the 83 departments. The Mountain replied by decreeing the unity and indivisibility of the republic, in order to emphasize the suspicions of federalism which weighed against the Girondists.

When the impeachment of Robespierre and the Septembrists missed fire, the Mountain replied by the trial of the king. His execution was to be the test of republican sincerity. Caught

between its horror of bloodshed and its fear of seeming suspect, the Gironde sought a way of escape in an appeal to the people which was rejected under the pressure of the crowd On the question of the death penalty, they were divided among themselves. Morally weakened by the execution of Louis XVI the Gironde was still further enfeebled by the course of events abroad, only by military success could it maintain itself in power. When the natural frontiers, regained in the autumn of 1792, were lost in the spring of 1793, the Gironde was doomed The fighting spirit of the Revolution, stimulated by republican propaganda and by the old royalist tradition of natural frontiers, found expression in the decree of Nov. 19 extending protection to all oppressed peoples, and by that of Dec 15 in which a preliminary condition of that protection was declared to be the revolutionary dictatorship of France

The First European Coalition.—The invasion of Belgium by Dumouriez after his victory at Jemappes (Nov 6, 1792) and the occupation of Antwerp (Jan. 21, 1793), rather than the execution of Louis XVI. (Jan. 21, 1793) brought about the European coalition of which England was to be the inspiration until Waterloo. The defeats in Belgium and on the Rhine coupled with the clerical and royalist rising in La Vendée embittered the struggle between the Gironde and the Mountain Each accused the other of treason From fear of the populace, the Gironde voted for the creation of a Revolutionary Tribunal to try suspects, but through jealousy of Danton it refused his proposal to set up the strong government necessary to conduct the war (March 10) This was the first of the exceptional measures which were ultimately to destroy the party As the insurrection in La Vendée continued to grow, and Dumouriez to retreat, the death penalty was decreed against *emigrés* and refractory priests. Dumouriez's treason in deserting to the Austrians lent substance to all the popular suspicions The provisional Executive Council gave place to the Committee of Public Safety, omnipotent in all but financial matters, a measure agreed upon because the Girondins meant to control it, but Danton got the upper hand (April 6)

Conflict Between the Gironde and Commune.—Discredited in Paris, the Girondins redoubled their efforts in the departments in order to defeat their rivals They impeached Marat, who was acquitted, and they turned upon the Paris Commune by seeking to quash that anarchical body and by arresting Hébert. The Jacobins for their part loosed against the Gironde, whom they accused of federalism and royalism, the Parisian mob which was weary of the increasing depreciation of the *assignats*, the scarcity provoked by the law of the maximum, and the ill tidings from La Vendée and Lyons There followed the "moral insurrections" of May 31 and June 2 in which Marat himself sounded the tocsin, and Hanriot, at the head of the army of Paris, surrounded the Convention, humiliating it, just as on June 20, 1792, the monarchy had been humiliated

The insurrection in Paris was answered in the provinces by a federalist insurrection to avenge the national representation. Sixty-nine departmental administrations protested against the violence done to the Convention, but the ultra-democratic constitution of 1793 took away all legal power from the Girondins who were arming themselves in the west, south, and centre of France It promised the departments, which were jealous of the dictation of Paris, the referendum, universal suffrage, and entire freedom of worship, and public opinion, which understood little of these parliamentary quarrels and was preoccupied with the question of national defence, abandoned the Gironde to its fate. The Girondins failed to excite enthusiasm in anyone save Charlotte Corday, who, by killing Marat, set the seal upon their doom. The battle of Brécourt marks the defeat of a party without foundations and a staff without troops (July 13) On Oct. 31 the remnants of the Girondins passed to the guillotine at the same time as Marie-Antoinette. At bottom, the Girondins were separated from their opponents by neither religion nor politics, but solely by a matter of time When in power they had had scruples of legality which had not troubled them while scaling the ladder; idols of Paris, they had flattered her in the belief that they could always hold her in restraint: when Paris passed out of their control by her excesses, they sought support in the departments; leaders of a faction, never of a nation, they brought down with them in their fall both the republic and the liberal *bourgeoisie* which they represented.

Danton.—The first Committee of Public Safety had also been wounded to death by the events of June 2. Its chief, Danton, who was neither a theorist nor a cabinet minister, possessed the vision of a statesman without having a following sufficient to translate his ideas into action. He failed to drive the enemy across the frontiers, or to sow dissension among them by his secret negotiations with Prussia and Sardinia. His temporizing policy towards the federal insurrections and the failure of his operations against La Vendée still further aggravated the discontent aroused by financial problems and the high cost of living Isolated and suspected Danton fell on July 10, 1793, and his power passed to the Robespierre faction This was supported by all the forces of democracy for whom there was no alternative but to conquer or die.

Composed of twelve members elected each month and eligible for re-election, dominated by the triumvirate of Robespierre, St Just and Couthon, the second Commitee of Public Safety (July 1793–July, 1794) gradually established a government of iron that crushed all liberty—the most autocratic government which had ever been seen at work Declared permanent, the committee swept away the Convention and became the real central power Moreover it realized the need of strengthening itself by co-opting specialists like Carnot, Lindet, Jeanbon Saint-André, the two Prieurs and Cambon

Robespierre.—The leader of this government was Robespierre Without special knowledge, or exceptional talents, devoured by jealous ambition and gifted with cold, grave eloquence, he enjoyed a great moral ascendency due to his incorruptible purity of life, which Mirabeau lacked, and a persevering will that was wanting in Danton When he entered the committee on July 27, 1793, the situation of the republic seemed desperate On the northeastern frontiers the armies were in flight, Mayence fell on July 28, and Valenciennes on the 30th; the Alps were threatened in spite of Kellermann, the Spanish were advancing through the Pyrenees, Angers was being threatened from La Vendée; disguised Royalists were arousing the whole valley of the Rhône from Lyons to Marseilles and calling in the Sardinians to their assistance; and Toulon was delivered to the English, whilst Paoli admitted them to Corsica Henceforth, Robespierre's plan of campaign was—no more temporizing with federalists or with generals afraid to conquer; war to the death in order to enrich the bankrupt republic, and fear as a means of government. The specialists answered foreign foes by their organization of victory; as for foes at home, the triumvirate crushed them beneath the Terror This government of despair saved France because it was a national government, and was supported by the outburst of patriotism that sent 750,000 soldiers to the armies through the general levy of Aug 16, 1793; it was aided, moreover, by the mistakes of its enemies Instead of profiting by Dumouriez's treachery and the successes in La Vendée the coalition, divided over the Polish question, wasted their time on the frontiers of this new Poland A situation that seemed hopeless in July 1793 had been completely altered by October through the victories at Hondschoote and Wattignies, by which the enemy were repulsed from the northern frontier. The army of La Vendée was crushed by Hoche at Le Mans and Savany; royalist sedition was bloodily suppressed at Lyons, Bordeaux, Marseilles and Toulon, the federalists were disarmed and the *emigrés* dispersed, forsaken by all Europe.

The Hébertists.—The Committee, however, had only overthrown the moderates with the support of the extreme revolutionary factions it was to be faced with the problem of restraining these From the very first it was excelled in violence by the Hébertists who were advocates of war to the death, and of the permanency of the Terror; it was they who compelled the Committee of Public Safety, which was too timid for their taste, to adopt the law of the suspects, to lay down a maximum price for foodstuffs and to use the revolutionary army to seize foodstuffs which were being held up by the cultivators. This was the dictatorship of the consumers, workers, and the poor. Despite the eloquence of Robespierre the Committee would not have been able to maintain itself against the attacks of the extremists of the Left and of the

defeatists of the Right, supported by all the threatened vested interests, but for the timely victories due to the reorganization of the republican army by Carnot. Soon the Hébertists, under the influence of foreign adventurers like Paoli and Anacharsis Cloetz, further complicated these extreme and impolitic measures by an anti-religious policy, as exhibited in the republican calendar and the secular feasts of Reason, which was not less dangerous because it could only profit the coalition. Beneath the double mask of anarchism and atheism, the Hébertists concealed their plan of becoming masters in their turn Robespierre determined to act boldly, and arrested and executed the leaders of the extremists on March 24, 1794. But the committee feared a reaction in favour of the moderates of the Right, who, with Danton and Camille Desmoulins, sought to put a stop to the Terror and to make peace. On April 5 these enemies were removed by a parody of justice in which, to discredit them, the moderates were tried along with common criminals

Robespierre now stood alone and omnipotent As long as his enemies had had control of affairs, he had strained the principles of liberty to the point at which he rendered all government impossible After his victory, his language suddenly changed and became that of a man labouring under an hallucination For five months, while affecting to be the representative of "the reign of justice and of virtue," he worked to strengthen with fresh powers his already formidable politico-religious dictatorship "The incorruptible sought to become the invulnerable"; to accomplish a moral reform the guillotine was crowded To restore religious beliefs he founded a theocratic government with the police as an Inquisition The festival of the Supreme Being, the crown of the work of moral reform which turned the head of the new pontiff (June 8), the *loi de Prairial*, or "code of legal murder" (June 10), which gave the deputies into his hand, and the multiplication of executions at a time when the victory of Fleurus (June 25) revealed the uselessness of this aggravation of the Terror, provoked against him the victorious coalition of revenge, lassitude and fear. Vanquished and imprisoned, he refused to participate in the illegal action proposed by the commune against the Convention. Robespierre was no man of action. On the 9th Thermidor (July 27, 1794), the guillotine made an end both of the democratic republic and of Robespierre and his party, thus paving the way for the 18th Brumaire This was a palliative rather than a solution. From the very beginning the Revolution had unsuccessfully sought a government between the 9th Thermidor and the 18th Brumaire it renewed its endeavours without any better success. On their return to the Convention on Dec. 18, the Girondins and the Dantonists were confronted with the same financial, social and military problems as their predecessors, but with them returned also many Frenchmen sick of anarchy and misery, whose only conception of order was a restoration of the monarchy On the other hand, there were many others—regicides, holders of national property and soldiers—who were too deeply compromised in the revolution and who had too great interest in it not to take alarm at a reaction of monarchist tendencies So much so that the moderates in the Convention, preoccupied with holding off both royalism and terrorism, merely kept disorder alive without establishing an effective government. The risings of the 12th Germinal (April 1, 1795) and the 1st Prairial (May 20) were as much economic upheavals as insurrections instigated by the survivors of Robespierre's party. To suppress them the moderates appealed not to the national guard, but to the army, and henceforward control of the army meant control of power.

After these events the Royalists supposed that their hour had come. While in the south the Companions of Jehu started a "white Terror" which had not even the excuse of *"le salût public"* they planned a double rising—in the west with the help of the English, in the east with that of the Austrians, and sought to bribe General Pichegru. But Hoche crushed the Chouans and the Vendeans at Quiberon (July 21, 1795) and Pichegru refused to entangle himself.

Constitution of the Year III.—The Convention then sought by the Constitution of the year III to set up a regular government. It established a Directory of five members, all of whom were regicides, and a legislative body composed of two assemblies or councils; the Ancients and the Five Hundred, elected on a property suffrage, a third to be re-elected each year By this means the former Convention was assured of a majority for some time Against its continuity of policy and *personnel* the Royalists, who were masters of the sections in Paris ever since the suppression of the daily dole of 40 sous, raised the insurrection of the 13th Vendémiaire (Oct 5, 1795) which was put down by General Bonaparte The *bourgeois* republic thus gathered in the fruits of the foreign policy of its predecessors After France had been freed from foreign invasion in Jan 1794, the impulse had been given for the spirit of conquest which had been the support of Robespierre's dictatorship: by means of the *amalgam* and the restoration of discipline, Belgium and the left bank of the Rhine had been conquered, and Holland occupied simultaneously with Kosciusko's rising in Poland Prussia's need to keep and extend its Polish acquisition, the death of Robespierre, the French superiority in *moral* and numbers, and the successive victories of Pichegru, Jourdan and Moreau broke up the coalition The French republic re-entered the Concert of Europe at Basel (April–July, 1795), where she concluded peace with Prussia, Spain, Holland and Tuscany which not only secured her conquests in Belgium on the left bank of the Rhine, and that of St Domingo, but also prepared the way for fresh ones The old spirit of domination that animated Austria and the persistent enmity of England finally turned the Revolution into the paths of war

The Directory (Oct. 27, 1795–Nov. 19, 1799).—On Oct 26 the Convention held its last sitting, leaving a deeper impress upon the political history and social ideas than upon the institutions of France After its disappearance the stage seemed empty For four years the Directory sought to occupy it, but in truth it oscillated from Right to Left and from Left to Right without creating anything It speedily discredited itself through its own *coups d'état*, its financial incompetence, religious persecution and warlike policy, and by a further contradiction strengthened the armies attached to the Revolution and kept the latter alive while bidding for the support of a *bourgeoisie* glutted with revolutions and war Although it filled the councils with former members of the Convention the Directory was in a minority throughout France and always on the alert against the two extreme parties—the old Jacobin faction and the new Royalists The democratic republicans demanded universal suffrage and lent their support to the desires for social reform voiced by a people ruined through the collapse of the *assignats* and the industrial and commercial stagnation, and exasperated by the tactics of financiers and profiteers In spite of their defeat on the 13th Vendémiaire, the Royalists hoped gradually to regain a place in the councils by means of the new franchise in order to put an end to the war, religious persecution, and revolutionary legislation

At the outset of its rule the Directory was brought face to face with the democratic republicans grouped in the Society of the Equals, or Club of the Panthéon This faction had found a leader in Babeuf and a doctrine in his equalitarian communism The general poverty and the financial situation aided their propaganda; the successive issues of *assignats* and the multiplication of foreign forgeries had so depreciated the paper currency that the Government, forced to accept them at their face value, was no longer able to levy taxes or to pay the *rentes* The destruction of the plates from which the *assignats* were printed (Feb 1796), and the liquidation of two-thirds of the debt (1797) was in vain; and the small *mandats territoriaux* with which they replaced this paper money failed to win any greater confidence. At this juncture the Babeuvists attempted to overthrow the government Babeuf and his followers were arrested after the conspiracy of Grenelle and were guillotined in May 1797.

Foreign Policy of the Directory.—Since all order had disappeared from the finances, the war became more and more the treasury from which the Directory drew its financial support. Thus the path was thrown open for the generals who became the life and pride of the State. There is a significant coincidence between the bankruptcy that was proclaimed on Feb 18, 1796, and the appointment of Bonaparte four days later to the command of

the army in Italy. No less significant is the famous proclamation of the young general with which he turned his army towards "these rich provinces" The independent commander of an army which he had rendered unconquerable, not through patriotism and honour but through love of glory and desire for booty, Bonaparte forced the Directory, which he kept alive, to accept his indiscipline By means of a succession of victories—Castiglione, Arcola, Rivoli—he carried out his programme and made himself indispensable Through the preliminary negotiations of Léoben (April 18, 1797), he won for himself the support of French pacific opinion, and shared the territory of the Venetian republic with Austria, contrary to French interests, but conformably with his own in Italy

Despite these victories, the Directory continued to lose ground throughout the country Since 1795 the constitutional opposition, which was in reality Royalist, had made threatening progress It had benefited by the conspiracy of Babeuf, whose communistic projects had frightened the propertied classes, the national bankruptcy had aroused the small *rentiers* Moreover, the elections of the year V. (May 20, 1797) had brought into the two councils a majority of counter-revolutionaries, and replaced the director Letourneur by Barthélemy, a constitutional monarchist, who had negotiated the Treaty of Basel Under the pressure of the counter-revolutionaries, the councils revoked in August the laws against the refractory priests and the *emigrés*, and attacked the regicides in the already disunited Directory Carnot and Barthélemy wished to oppose the Royalist peril solely by a legal means and to profit by the defeat of Austria and the negotiations in train at Lille with Pitt, to make peace But Rewbell, La Révellière and Barras, the most corrupt of all, thinking that peace would bring a reaction against them, appealed from the rebellious councils to the complaisant sword of Augereau

On the 18th Fructidor (Sept 4, 1797) Bonaparte's lieutenant quashed the elections in 49 departments Deportation took the place of the scaffold, the director Barthélemy and a number of priests were sent to Guiana, and Carnot escaped to Switzerland Each new *coup de force* strengthened the rule of the army—the vanguard of despotism

The Aggressive Policy of the Directory.—From his proconsulate in Italy, Bonaparte estimated the strength of the two currents of public opinion. One was carrying a part of the nation towards a stable and pacific government that would afford them protection for their lives and properties, the other sought to safeguard the results of the Revolution of which Bonaparte himself was the most distinguished child Although hostile towards the first current before Fructidor, because he feared to compromise the fruit of his victories, he allied himself with it afterwards, to the rupture of the *pourparlers* at Lille and the orders of the Directory to resume hostilities he replied with the signature of the peace of Campo-Formio with Austria (Oct 17, 1797), and the Directory was consoled for the peace thus forced upon them by the acquisition of the left bank of the Rhine and of Belgium The army, however, continued to make itself feared. In order to avoid a disbandment of troops which, as on the morrow of the peace of Basel, might add new recruits to the counter-revolution, the Directory nominated Bonaparte to the command of the Army of England, declared military service to be a part of the permanent duty of a citizen, and conceived the immense plan of fortifying the republic by the existence of vassal and tributary republics, such as the Batavian, Ligurian and Cisalpine. But Bonaparte had no intention of lending himself to the projects of an invasion of England upon which Hoche had in vain set his heart He determined to exchange his temporary proconsulship in Italy for the leadership of a glorious and fruitful expedition to Egypt, which was to destroy the British Empire in India He forced this expedition upon the Directory which had just, by the *coup d'état* of the 22nd Floréal (May 11, 1798), made an "inverted Fructidor" against the Mountain, greatly strengthened after the elections in May 1798

Though Bonaparte succeeded by extraordinary good luck in disembarking his army and conquering Egypt, Nelson's destruction of the French fleet in Aboukir bay cut off his retreat (Aug. 1, 1798). At once there arose, on the initiative of England, a second coalition which was strengthened by the alliance of Russia Austria broke off the negotiations which had been proceeding at Rastadt and even instigated the murder of the French plenipotentiaries All the republics that had been called into existence attempted to secure their independence and took up arms The French army no longer possessed the monopoly of success, nor the spirit for a war of conquest as for a war of national defence; nor had it the numbers, seeing how deeply the country had been bled Defeats were inevitable Insurrection raised its head in Italy; as though shattered by the far echo of the cannon of the Trebbia where Suvarov defeated Macdonald, the unstable Directory collapsed on June 18, 1799 Nominated Director in May, Sieyès sacrificed his colleagues Treilhard, Merlin de Douai, and La Révellière-Lépaux to the fury of the councils A few more military reverses like that of Novi, a few more royalist insurrections in the south and La Vendée, a few Orleanist intrigues—and the end came The reappearance of terrorist measures, as in all the tragic hours of the Revolution, such as the forced levy and the law of hostages, were not enough to put down revolt and protect the frontiers Sieyès realized that to achieve the indispensable revision of the constitution "a head and a sword" were necessary In default of Moreau, Joubert was to be the sword of Sieyès, the bullet that killed him at Novi gave the sword of the Revolution to Bonaparte

The 18th Brumaire.—It was in vain that Brune in Holland and Masséna at Zurich checked the enemy who lingered on the frontiers, as after Valmy The fortunes of the Directory were doomed Bonaparte, who had been checked in Syria, disembarked as by a miracle at Fréjus on Oct 8, 1799 After scheming between the parties, he achieved a military and parliamentary *coup d'état* that was organized within the Government itself Thus he realized the universal desires of the rich *bourgeoisie*, who were sick of warfare, of the wretched populace, of the new landowners who were alarmed at the prospects of a return of the *ancien régime;* of the royalists by whom he was hailed as a future Monk, of the priests who anticipated an indulgent policy towards Catholicism, and, finally, of the vast majority of the French nation who liked to be ruled and for a long time had not known a government During the night of the 19th Brumaire, a remnant of the Assembly replaced the Directory by a commission of three consuls. Sieyès, Roger Ducos and Bonaparte For 15 years, the history of France and a great part of that of Europe was to be summed up in the person of a single man (*see* NAPOLEON)

The Constitution of the Year VIII.—At first the 18th Brumaire seemed to be the victory of Sieyès even more than of Bonaparte Bonaparte's cleverness was in opposing Daunou's scheme for a new constitution to that of Sieyès, and in retaining from both only so much as would serve his ambition Parliamentary institutions annulled by the complications of three assemblies—the *conseil d'état* which drafted bills, the *tribunat*, which discussed them without voting them; and the *corps législatif* which voted them without discussing them· popular suffrage, rendered valueless by the lists of notables from which the members of the assemblies were to be chosen by the conservative senate; and the triple executive authority of the consuls elected for ten years. all these semblances of constitutional authority were accepted by Bonaparte But he abolished the post of Grand Elector, reserved by Sieyès for himself, thus reinforcing his own authority as First Consul, while he left the other two consuls, Cambacérès and Lebrun, and the assemblies equally weak

Thus the aristocratic constitution of Sieyès was transferred into an unavowed dictatorship, a public ratification of which the First Consul obtained by a third coup d'état from the three millions of reassured electors They were reassured by his offers of peace to the victorious coalition, which repulsed them, by the rapid disarmament of the Vendéans, and by the proclamations in which he filled the ears of the wearied people with the new diction of stability of government, order, justice and moderation He gave everyone the feeling that France was once more governed by a statesman, that a pilot was at the helm.

Bonaparte had now to free himself from Sieyès and the republicans collectively who were unwilling to hand over to a single

man the Republic which they wished to exploit and, on the other hand, from his military rivals, Moreau and Masséna. The victory of Marengo (June 14, 1800) opened a new path to his jealous ambition by still further increasing his popularity The royalist attempt to assassinate him in the rue Saint-Nicaise (Dec 24, 1800), gave him the chance of ridding himself of the democratic republicans, who were deported to Guiana in spite of their innocence, and of suppressing the assemblies that were a mere show, while he made the senate supreme in constitutional matters But it was not enough to restore order to France; he must give her the peace which she had so ardently desired for eight years The Treaty of Lunéville, signed in Feb 1801, with an Austria disarmed by Moreau's victory at Hohenlinden, restored peace to Europe, gave almost the whole of Italy to France, recognized all the revolutionary conquests and, at the same time, enabled Bonaparte to eliminate from the Assemblies all the opposition leaders in the debate on the Civil Code

The Concordat (July 1801) was concluded by Bonaparte in the interests, not of the Church, but of his own policy It enabled him to satisfy the desire of the French for a constitutional and democratic Church, to rally round him the peasants, and, above all, to deprive the royalists of the finest weapon in their armoury The *Articles Organiques* of the Concordat masked from his generals and councillors the true nature of the change which, in fact if not in theory, reduced to the level of a State religion a Church which had been subjected and deprived of her revenues Finally, the peace of Amiens (March 1802) with an England disquieted by growing unemployment, a peace made at the expense of France's allies, Spain and Holland, enabled the peacemaker to endow himself, as a recompense from the nation, with a consulate, not for ten years, but for life, with the right to nominate his successor On that day the Rubicon was crossed, and Bonaparte's march to empire began with the constitution of the Year X (Aug 1802)

The Consulate.—The work of reconstruction remained to be done The touch of the master was at once revealed to all the foreigners who rushed to gaze at a man about whom, after so many strange adventures and catastrophes, Paris, *la ville lumière*, and all Europe were talking First of all Louis XV 's system of roads was improved and Louis XVI 's canals developed; then industry put its shoulder to the wheel, order and discipline were established everywhere, from the frontiers to the capital, and brigandage suppressed, and finally there was Paris, the City of Cities! Everything was in process of transformation; a second Rome was arising with its forum, arches of triumph and parades In this new Rome of a new Caesar, the luxury and gallantry of the *salons*, the brilliance of the *savants* and artists, the masterpieces rifled from the Netherlands, Italy and Egypt, illustrated the consular peace To round off his governmental system the First Consul, by the Civil Code, maintained the social order and system of ownership that had sprung from the Revolution, but he cast them in the authoritarian forms of the *ancien régime*. Above all, the system of election introduced by the Revolution completely disappeared He borrowed from the *ancien régime* its *intendants* or omnipotent prefects, its magistrates nominated by the government, the *vingtièmes* or direct taxes, the *aides*, or indirect taxes—appointing as director for these Gaudin, an ex-official of the monarchy—he borrowed also the administrative centralization and the tradition of conscientious and ordered labour In this society, now as avid of authority as for ten years past it had seemed enamoured of liberty, peace and order at length assured prosperity; provisions became cheap and abundant in this very Paris that had so often known famine riots; trade prospered and wages were high

A shadow, however, hovered over this wealth and magnificence: the power of the First Consul lacked a solid foundation In the *tribunat*, among the republicans, and especially among the soldiers, a very strong opposition had already displayed itself against all the projects most dear to Bonaparte· the Concordat, the order of the Legion of Honour, and the financial system that marked the overthrow of the Revolution But the expulsion of Madame de Staël and Benjamin Constant, and the purging of the *tribunat* sufficed to put down this Fronde of the *salons*. The San Domingo expedition drained republican blood from the armies, the war gradually broke the leaders who were jealous of "Comrade" Bonaparte, and, cleverly compromised in a royalist conspiracy, Moreau disappeared into exile The great mass of the people looked upon the First Consul as indispensable and every attempt upon his life resulted in strengthening his popularity The conspiracy of Cadoudal and Pichegru, on Bonaparte's refusal to give place to Louis XVIII., and the political assassination of the duke d'Enghien, produced a wave of adulation by which Bonaparte was not slow to profit. The *Senatus Consultum* of May 18, 1804, which gave him the title of emperor, was the natural result of the fear which these attempts had aroused By his coronation in Notre Dame on Dec 2, 1804, Pius VII. made this soldier of the Revolution the chosen of God.

THE FIRST EMPIRE

In his foreign policy Napoleon was the slave of history—of the Carolingian legend as of the Capetian tradition, of the aggressive idealism of the Convention equally with the republican propaganda of the Directory He inherited the natural frontiers of France and the mandate to preserve them, but the most precious conquest was the annexation of Belgium, which England had invariably opposed since the Hundred Years' War Although he lacked a navy Napoleon hoped to make England consent to this point by his military victories The old monarchy had exhausted itself in this struggle. Napoleon was to overturn the whole of Europe without better success France shared the First Consul's illusion that the Peace of Amiens was a final one.

The Third Coalition.—The First Consul hoped to establish his power by peace He had himself proclaimed president of the Cisalpine republic, and annexed Piedmont; and when he suppressed, in Germany, the ecclesiastical states and free cities under the treaty of Lunéville, the German princes, instead of protesting, gave a cynical assent; he compelled Spain to cede Louisiana, began the conquest of San Domingo, and sent an expedition to annex southern and western Australia At the same time a French report was published pointing out the simplicity of a recovery of Egypt for France Alarmed by all these considerations, and excusing herself in particular because of the French seizure of Piedmont, England refused to evacuate Malta, in spite of her pledge to do so. This precipitated war Napoleon immediately occupied Hanover and established a camp at Boulogne He sought to strike at England because he knew she was forming a coalition against him Napoleon had no fleet, Pitt had no army The disaster of Trafalgar (Oct 20, 1805) revealed to Napoleon the impossibility of improvising a navy The third Anglo-Austro-Russian coalition—which, nominally directed against a new Charlemagne was, in fact, aimed at a new France extending to the Rhine and Antwerp—provided Pitt with the army he required Napoleon broke the coalition by his victories at Ulm and Austerlitz (Oct 20 and Dec 2, 1805) After this military triumph, he had two alternatives—to follow the policy of Louis XIV , Choiseul and Vergennes, and reconcile himself with Austria (who would henceforward be driven eastwards and opposed to Russia), or to regard his victories as valueless as long as England remained undefeated and to force her to capitulate by action in the east

The treaty of Pressburg revealed Napoleon's determination to adopt the latter course It marked a considerable extension of the Napoleonic empire towards the east Napoleon had already been crowned in Milan with the iron crown of the Lombard kings. In place of the Bourbons, who were allies of England, he installed his brother Joseph at Naples. He took Venice from Austria, and all her old Adriatic possessions as far as Albania, and expelled her from Germany. He achieved the destruction of the old Holy Roman Empire: and of its fragments he built up in southern Germany vassal kingdoms such as Bavaria, Baden, Wurtemberg and Hesse-Darmstadt, which he attached to France under the title of the Confederation of the Rhine He carved out other kingdoms for the numerous members of his family He made his brother Louis king of Holland, and he promised Hanover to the king of Prussia So powerful did he seem in the early days of 1806 that Alexander of Russia and Pitt made a show of negotiating

The Fourth Coalition.—At this juncture a new adversary came on the scene in the person of Prussia. Ever since the days of Frederick the Great, France had obstinately considered Prussia as a faithful ally. Napoleon's reply to her challenge was the crushing victory of Jena (Oct. 1806), which destroyed the army and the kingdom of Frederick William III On the refusal of the latter to concur in his policy, Napoleon made of Prussia what he had already made of the Confederation of the Rhine—a dependency of his empire, and he closed her ports to British ships At Berlin on Nov. 21 he proclaimed that Continental blockade by which he intended to destroy his great rival

But it was in fact a vicious circle Ulm led to Austerlitz, and Austerlitz to Jena. Next he must seek the Russians still farther to the east The slaughter at Eylau (Feb 8, 1807) did not bring peace The victory of Friedland (June 14) compelled the tsar at Tilsit to desert Prussia and to shake off the maritime tyranny of England in return for the partition of Turkey. This treaty closed the entire Mediterranean to England and threatened her communications with India. Napoleon thought that she would bow the knee (July 1807). But England displayed extraordinary energy. The blockade of the Baltic and the bombardment of Copenhagen shattered the illusions of the Franco-Russian alliance Moreover, although it had been more stringently enacted at Milan, the Continental blockade, in order to be effective, required to be made complete (*see* CONTINENTAL SYSTEM). When the pope sought to remain neutral General Rıdet occupied the Papal States, and when Portugal seemed unwilling to close her ports to British ships, Junot entered Lisbon—a step that involved alliance with the Spanish Bourbons. Why should not Napoleon, who had discovered in Berlin proof of their intrigues, treat them as he had treated the Neapolitan Bourbons by establishing in Madrid a Bonaparte, as Louis XIV. had established the duke of Anjou?

The Peninsular War (1809–1813).—After the ambush at Bayonne, Murat made himself master of Spain, subsequently taking the place of Joseph Bonaparte, who exchanged Naples for the Spanish throne. But Napoleon little knew how fierce a flame he was kindling. he thought that he might cut into the granite of Spain as into Italian mosaic, or "that big cake, Germany"; but he lacked the one essential—the assent of a people with a thousand years of history behind them. Their reply to him was a general insurrection. Spain became the grave of 300,000 of his picked soldiers (whom he had to replace by conscripts called up before their time), and a battle-ground for England Dupont surrendered at Baylen and Junot at Cintra (1808) and, what was more serious, Europe thrilled at this first defeat of the imperial armies. The example of Spain was copied in Prussia, Tyrol and Dalmatia. Napoleon found himself called upon to reduce Spain and intimidate Austria, which was again arming. Through the treason of Talleyrand he was forced to yield to Alexander at Erfurt and to abandon the east in order to carry out the evacuation of the Grand Army from Prussia and concentrate all his strength at Madrid (*see* PENINSULAR WAR).

The Fifth Coalition.—Supported by generous subsidies from England and encouraged by the reserved attitude of the tsar and by Napoleon's difficulties in Spain, Austria sought to take him by surprise as in 1805, and nearly succeeded. Despite Davout's initial success at Eckmuhl, the struggle at Essling was severe, and the victory of Wagram expensive Nevertheless Austria, at the Peace of Vienna or Schönbrunn (Dec. 14, 1809), lost her share of Poland (which was annexed to the Grand Duchy of Warsaw), Trieste and her Adriatic provinces. This peace marks the zenith of Napoleon's power; for two years he was undisputed lord of an empire that stretched from Paris to Rome and Hamburg, and comprised 130 departments. The empire never appeared so great, nor its future so brilliant, as in 1810 when Napoleon divorced Josephine because she had no child, and married an Austrian Archduchess; a year later Marie Louise bore him a son, the king of Rome: the hereditary empire possessed an heir.

The Beginning of the End.—Nevertheless the Tarpeian Rock never stood nearer to the Capitol. Already weaknesses inherent in his work, presaging his downfall, could be seen. The emperor's chief enemy, England, still survived to stir up and finance the rebellion of governors and governed, and he felt his impotence in face of the national rising in Spain Men such as Stein, Hardenberg and Scharnhorst made ready in secret for Prussia's revenge. The material omnipotence of Napoleon was defeated by the moral resistance of the pope, his prisoner at Fontainebleau. The Russian alliance was gravely shaken' by the threat of a restoration of Poland and by Napoleon's refusal to permit a Russian occupation of Constantinople. Even the men whom he had raised to power sought to oppose his plan. With the sole exception of Murat, all the Corsican dynasties betrayed him; Caroline at Naples intrigued against her brother and her husband; Louis, now Dutch in his sympathies, refused to maintain the blockade and to defend the Scheldt; debauched by his harem at Cassel, Jerome was removed from the surveillance of the coasts of the North sea; and Joseph, who was attempting a moral conquest of Spain, was continually insulted in Madrid. Treason among his officials was added to the intrigues of his own family and the national risings against Napoleon; he was compelled to dismiss Talleyrand, who at Erfurt had revealed his plans to Metternich, and Fouché, who carried on a secret correspondence with Austria and negotiated with Louis and with England All who had profited by his power dreamed in their turn of becoming sovereigns. Bernadotte played fast and loose with him in order to place on his own head the crown of Sweden, while Soult, like Murat, coveted the crown of Spain after that of Portugal. Many hoped for an "accident" that would bring about a tragic end resembling that of Alexander the Great or of Caesar, moreover France, weary of sacrifice, though vain of her conquests, had had enough "The cry of the mothers rose threateningly" against "the Ogre" and demanded peace Finally, amidst the profound silence of the press and the assemblies, a protest was raised against the imperial despot by the literary world, against the excommunicated monarch by Catholicism, and against the instigator of the Continental blockade, by the commercial class ruined in the crisis of 1811 Napoleon himself was no longer the General Bonaparte of his Italian campaign; physical decline had begun, and a falling off in his intellectual capacity showed itself in an unwonted irresolution The army—that marvellous instrument of his will—gradually lost its technique and *moral,* and all this at the precise moment when, behind the armies and the governments of the *ancien régime,* the spirit of nationality was rising After two years and three campaigns, the end came.

The Sixth Coalition.—The tsar gave the signal. His versatile character, his Polish and Eastern ambitions, and the dislike of the Russians to cease trading with England, induced him to take up arms. To become sole master of the Mediterranean and the East and at length compel England to capitulate, Napoleon risked his whole fortune on a desperate throw But Russia was as unconquerable as Spain (June, 1812), neither the victories of the grand armies at Smolensk and the Moskwa (Borodino), nor the capture of Moscow itself, cowed the Russians or induced them to ask for peace The disastrous retreat from Moscow followed at the moment when the seventh coalition was being formed.

The Seventh Coalition.—Napoleon was forced back from bastion to bastion. After the action on the Beresina, he had to retreat to the frontiers of 1809; then, despite the victories at Lutzen and Bautzen, over the Russo-Prussian armies—when he rejected at Prague the treacherous peace which Austria, not yet ready to fight, proffered him—it meant falling back on the lines of 1805. Those of 1800 followed his defeat at Leipzig, where Bernadotte fired upon him, Moreau assisted the allies and the Bavarians and Saxons deserted. The retreat from Moscow had involved the evacuation of Germany; Napoleon had to fall back still further, to the frontiers of 1795, after Wellington's conquest of Spain, the rebellion of Holland and the manifesto of Frankfurt, by which the allies repeated the ruse of Prague and made promises without any intention of keeping them; and further yet, within the frontiers of 1792—despite the brilliant campaign of 1814 across an invaded France in which the Bonaparte of 1796

came to life again and nearly wrung favour from adverse fortune. As England well knew, in a France that had been victorious for 18 years, no one was prepared for invasion. On March 30, 1814, Paris capitulated: the "delenda Carthago" he had pronounced against England had returned upon Napoleon's own head The great empire of east and west fell to pieces with the emperor's abdication at Fontainebleau (April 6, 1814), and on May 5 Louis XVIII entered Paris as Napoleon disembarked at Elba.

THE RESTORATION

Who was to govern France? Republican or imperial, the regime which owed its origin to the Revolution was condemned in the war France could do no more and the eagerness with which Napoleon's marshals ranged themselves on the side of Louis XVIII showed that they, too, had had enough. the only possible solution lay in a restoration of the Bourbons, as recommended by Talleyrand and England Without the Bourbons France was doomed to slavery or partition. The allies ended by accepting the dynasty

The First Peace of Paris.—For the moment Louis' restoration seemed thoroughly popular as a guarantee of peace and liberty. Louis XVIII, who possessed experience, cleverness and dignity, preserved the civil work of the Revolution, despite the opposition of the *émigrés*, in the charter of June 4, by adopting a constitution on the English model, achieving the transition from absolute to constitutional monarchy, and thus reconciling the past with the present.

The first task of the allies was to make peace This was by no means easy, and the hard conditions laid down showed that they had fought not against the Revolution, nor Napoleon, but against France. After having broken their promises made to the comte d'Artois at the armistice of April 23 to evacuate French territory and to restore the frontiers of 1792 the allies, in the first Treaty of Paris of May 30, 1814, reduced France, except for some slight modifications, to the frontiers she possessed before the Revolution England, who had waged war for so long to prevent the French domination of Belgium, insisted, as in 1713, on a "barrier" between the Scheldt and the north-western frontier of France, and stretched an eager hand over all the colonies and naval bases by whose possession she would be able to achieve her 18th century plan of naval supremacy

Louis XVIII, with the brilliant assistance of Talleyrand, profited in the congress of Vienna by the rivalries of Prussia and Russia with Austria and England In the name of the principle of legitimacy, which had caused him to concede the Charter ("concédée et octroyée") instead of accepting it, and in the name also of the disinterestedness of France, he was successful in protecting Germany from Prussia, Italy from Austria and Turkey from Russia. Scarcely a year after the entry of the allies into Paris France had recovered her place in Europe to an extent beyond all expectations.

The Hundred Days.—It was only necessary, however, for Napoleon to escape from Elba, with an audacity which recalled his return from Egypt, for nearly the whole of France to go over to him. What the natural friction between the returned *emigrés* and the society which had grown up in their absence, and the discontent of half-pay officers, was unable to accomplish, the personal magnetism of Napoleon achieved. Disembarking on March 1, 1815, near Cannes he returned to the Tuileries in triumph on the 20th, while Louis XVIII. fled to Ghent. But it was in vain that Napoleon sought, by the *acte additionnel* of April 22, to win over the remnants of the Jacobins and the liberal opposition by proclaiming his intention of founding a new empire that should be at once democratic and pacific, he merely succeeded in endowing French politics with yet another illusion, one which Napoleon III was to exploit with such disastrous success. The canon of Waterloo (June 18, 1815) put an end to an adventure of which the last act was played out at St. Helena.

Louis XVIII. (1814–24).—The results of the Hundred Days were very serious for France. They brought her into conflict with Europe and threatened her with the loss of what Talleyrand had obtained with such effort in 1814. The allies increased their demands in the second Treaty of Paris. Subjected to military occupation and bled white financially, France was reduced to less than she had been before the Revolution and was confronted by the Holy Alliance. Reconciliation at home was a matter of still greater difficulty; for France was henceforth divided into parties —both equally intransigent; the one ultra-royalist, anxious for reprisals and scornful of the Charter; the other composed of Bonapartists and Republicans united by the speedily concocted legend of a liberal Empire, chafing under their defeat and irreconcilable Once again the France of the *ancien régime* and the France of the Revolution came into conflict, and the whole 19th century is filled with the bitterness of their strife.

Louis XVIII. was very quickly led away by the White Jacobins. The legal reprisals against Marshal Ney and Labédoyère, who were held responsible for the further disasters of France, were followed, above all in the south, by scenes of popular violence which recalled the horrors of St. Bartholomew and the September massacres. The elections of Aug 14, 1815, held in a turmoil of Royalist and Catholic passions, sent to Paris the *chambre introuvable*, a revival of the *ancien régime*. The chamber certainly showed no sign of docility to the Government Neither the substitution of the ministry of the Duc de Richelieu for that of Talleyrand and Fouché, nor the enactment of a whole series of repressive laws that violated the Charter, succeeded in satisfying its tyrannical sense of loyalty, and Louis XVIII. was driven almost to a *coup d'état* in order to get rid of the "Ultras" in Sept 1816 Until 1820 the king and Decazes, with the support of the Constitutionalists and the Liberals, succeeded reasonably well in getting the Constitution to work almost on the English lines of alternation in power of two great disciplined parties— the left centre and the right centre Baron Louis, the Restoration minister of finance, brought order into the treasury, a necessary preliminary condition for the termination, before the specified date, of the foreign military occupation; the electoral law of 1817, by its institution of direct elections and a high property qualification, assured the predominance of the middle classes; Gouvion Saint-Cyr's measure, passed in 1818 and in force until 1868, based the recruitment of the army on conscription; and the Liberal press law of 1819 enacted that press offences were to be tried by jury But the rapid progress of the Liberal movement which in the course of elections had, in three years, increased the number of Liberal deputies from 25 to 90, among them the constitutional Bishop Grégoire, followed by the assassination of the heir to the throne, the Duc de Berri, on Feb. 13, 1820, caused the downfall of Decazes and induced the government to reconcile itself with the Right (Feb. 1820)

Until the end of 1824, Decazes's successors devoted themselves to destroying his liberalizing work, especially that of the electoral and press laws This was the period of great activity on the part of a secret society for clerical propaganda known as the Congregation. In order to keep himself in power, Villèle, a clever man of business, but bound by his party ties, was forced to submit to the impatience of the Comte d'Artois and the majority; the suspension of individual liberty, the re-establishment of the censorship, the electoral law of the "double vote" which favoured the more heavily taxed electors, and the surrender of the control of education to the clergy, marked the commencement of a counter-revolution. The Spanish expedition advocated by Chateaubriand to restore Ferdinand VII. to his throne, was the work of the Congregation and the Holy Alliance The Liberals replied with a new form of opposition in the secret Carbonari societies (as in Naples), and in Spain these societies plotted military risings which were ruthlessly suppressed But despite all this, on the death of Louis XVIII. in 1824, the dynasty appeared to be firmly established The success of the Spanish expedition had reconciled the army to the White Flag The growth of public credit and material prosperity satisfied the propertied classes The opposition was destroyed, and public life was sterilized by the law of septennial elections which was voted by the "Chambre retrouvée" and which suspended for periods of seven years any regular political demonstrations.

Charles X. (1824–30).—It was the monarchy that became

revolutionary on the accession of Charles X. (Sept. 16, 1824) who, although seated on the throne and endowed with greater charm, if less statesmanship, than his brother, was the most fanatical of those *émigrés* who had learnt nothing and forgotten nothing He grew weary of the Liberals' incessant reproach that the monarchy had come back in the baggage-wagons of the enemy, and he had to deal with a new generation which had never known the Revolution, nor even the Empire—a generation always in a hurry, hot-headed and impatient for the immediate realization of its desires

Hence the experienced and moderate Villèle, now prime minister, was attacked not only by the Left, but also by the extreme Right The latter continually threw down challenges to the modern spirit of France The law against sacrilege, the re-establishment of the right of primogeniture, the indemnity of a thousand millions designed to tranquillize the holders of State property, but which looked like compensation for the *émigrés*, all this aroused public feeling against Villèle—even the conversion of the *rentes* which had reached par The moderate and statesmanlike policy of Villèle in foreign affairs was no less subject to attack, a stranger to the romanticism both of the Right and of the Left, he declined to embroil Europe for the sake of tearing up the 1815 treaties The battle of Navarino (1827) in which the Turkish fleet was destroyed, was fought contrary to his instructions He resigned in Jan 1828, and the moderate royalist, Martignac, who succeeded him was only a stop-gap whom Charles X endured without supporting, and with whom the Liberals bargained for the price of their assistance (Aug 1829). Charles X took the opportunity to form, with the prince de Polignac, a mystical and ignorant *émigré*, and the comte de Bourmont, the traitor of Waterloo, a fighting ministry which should at one and the same time enforce the royal prerogative and wipe out the treaties of 1815, he thought to find a brilliant success abroad in the capture of Algiers (July 5) which was the prelude to the conquest of Algeria, but the nation was not interested Algiers was too far from the Rhine

The Revolution of 1830.—After winning the July elections in 1830, the coalition of Liberal Monarchists and imperialist Republicans first tried lawful resistance and subsequently achieved a popular *coup d'état* against the ordinances of July 1830 which had dissolved the *chambre intraitable*, eliminated license dealers from the electoral list and crippled the press After a three days' battle against the troops feebly led by the Marmont of 1814, the workers, driven to the barricades by the deliberate closing of the workshops, conquered Europe at least as much as Charles X, who bore the white flag of the Bourbons away with him into perpetual exile (Aug. 14)

The July Monarchy (1830–48).—By summoning to the throne a Bourbon of the younger branch, the liberal *bourgeoisie* thought they had found the ideal solution of the problem Would not the Duc d'Orléans, who was the son of a regicide, and who had fought at Valmy and at Jemappes, reconcile in his own person the Revolution and the *ancien régime?* In reality the July monarchy was affected with congenital weakness, it sought to model itself on the English monarchy which rested upon a single ancient tradition whereas in France there were two contradictory traditions—the Catholic-legitimist and the Revolutionary—both of which told against Louis Philippe Under the affable mask of a bourgeois and peace-loving king he hid a determination to recover an authority of which he was very jealous, from the beginning of his reign he fell foul of the legitimists, who looked upon him as the "king of the barricades" and the usurper of his cousin's crown In the eyes of the Republicans, too, he was a usurper, since he had been chosen by only a part of a chamber in dissolution The latter had thrown away their victory by installing the Duc d'Orleans in the Palais Bourbon. Thus, when Louis Philippe was endeavouring to reduce the revolution of 1830 to a mere substitution within the reigning family, the republicans considered that the revolutionary tradition had been revived with the tricolour and had restored to France the sympathies of the nations and democratic parties which sought support against Metternich's Holy Alliance Finally, the Republican party who had withdrawn from power, if not from all activities, never ceased to remind him of the grave problem arising from the acquisition by the people of political power

The men who, since 1829, had secretly organized the Orleanist Party and had chosen Louis Philippe, were divided among themselves on the policy to be followed in face of the opposition of the ultra-republican parties. Some thought with Laffitte and La Fayette that the July revolution and the lowering of the suffrage qualification by the revision of the Charter amounted to no more than a prelude, and demanded an extension of the suffrage and a destruction of the treaties of 1815; hence their name, the "Party of Movement," and their frequent alliances with the Republicans In the opinion of the "Party of Resistance," on the other hand, led by Casimir-Périer, Guizot and Thiers, the July monarchy should follow a conservative and pacific policy They forgot the tempestuous experience of the electoral chambers of the Restoration, and that Louis Philippe, who had the support neither of legitimacy nor of a plebiscite, had, in refusing universal suffrage, deprived himself of the support of the mass of the populace—at that time chiefly rural and the most conservative and pacific element in the nation From the start the new monarchy was beset with difficulties The mob that had created it demanded its reward Louis Philippe summoned to the ministry first Dupont de l'Eure, then Laffitte, leaders of the Party of Movement, in the hope of using them for his own ends The ministers soon had to withstand the pressure of the mob, which demanded the death of Charles X's ministers, sacked the Church of Saint-Germain l'Auxerrois, where the Legitimists had been guilty of a tactless demonstration, and brought about the terrible strike of the silk-weavers at Lyons But the greatest danger for Louis Philippe lay in foreign affairs the Belgians had risen against Holland, and the question arose of the desirability of re-annexing Belgium, which seemed to be not unwilling to accept help, and so settle under the most favourable conditions the perennial problem of Flanders Despite the insistence of Laffitte, Louis Philippe recognized that England would never tolerate the annexation He chose to pursue a wiser policy, the fruits of which were not gathered until 1914, and to concur in the creation of Belgium as a neutral state He refused the crown of the new kingdom for his son (March, 1831)

Eight months after the July Days, Casimir-Périer succeeded Laffitte as prime minister and with him came into power that "Party of Resistance" to advanced ideas which was to rule France for 17 years Peace having been assured abroad, order had to be established at home This was not accomplished without violent agitation, both by the Right and the Left, such as the disorder which accompanied the obsequies of General Lamarque, and the attempt of the Duchesse de Berri to raise *la Vendée*. The new electoral law, though lowering the age and the qualifications of the electors, left the control of the elections in the hands of the moneyed classes The institution of a national guard provided Louis Philippe with an army. After Casimir-Périer's death from cholera in May 1832, the Soult Ministry struggled with the socialist risings in Paris and Lyons fomented by the Society of the Rights of Man, and repressed by the threatened middle-classes with a thoroughness that was the precursor of the June Days and the Commune The attempted assassination of the king and his family by Fieschi (July 28, 1835), followed by the enactment of the September Laws, was the destruction of the Republicans Only in Guizot's law for the regulation of primary education was a new influence evident.

Though they were agreed as to the desirability of maintaining the monarchy the victorious middle classes were in disagreement about the powers it should exercise The conflict of warring ambitions and parties for the control of the ministry loosed a veritable Fronde against the king The Right Centre, led by Guizot, were prepared to admit the king to an active share in the government the Left Centre, led by Thiers, believed that he should reign but not govern Between these two stood the opposition of the nearly republican monarchical Left Louis Philippe endeavoured to take advantage of these party squabbles to ensure victory for his personal policy. The last experience of a ministry composed by the

parliamentary majority was that of Thiers in 1836; when, however, Thiers showed signs of embroiling himself with Metternich by an intervention on behalf of the Spanish Liberals, Louis Philippe dismissed him and replaced him by a creature of his own, Molé Then began the period of the king's personal government and of the systematic opposition of the coalition of the two Centre parties and the monarchical Left against the *"homme du château,"* Molé; he was defeated in the elections of 1839, as Martignac had been in 1829, and was replaced, after a long ministerial crisis, by Thiers (March 1, 1840).

The Thiers Cabinet.—Like Chateaubriand under Louis XVIII Thiers sought to make the monarchy rival the Napoleonic glory which he himself resurrected in the pages of his history Too bellicose to win the confidence of the king, who loved peace and the English alliance, Thiers fell from power over the Egyptian Question The Treaty of London of July 15, 1840, was signed by the remaining great powers without the knowledge of France, since France had persistently refused her co-operation As though this revived against her the Pact of Chaumont of 1814, Thiers fortified Paris and made a show of supporting Mohammed Ali by force of arms The nation, stirred but little by the attempted *coups d'état* (Strasbourg, 1836—Boulogne, 1840), of Louis Napoleon, son of the former king of Holland, was thrilled in 1840 by the return to France of the body of Napoleon I Its chauvinism revealed to the advocates of peace at any price that military inaction had ended by making peace itself warlike and by demonstrating the advantage of imperialism

The Guizot Cabinet.—From 1840 to 1848 Louis Philippe's foreign policy became more and more lethargic, and he lent himself more and more to deception abroad and unpopular measures at home Guizot fell into line and his watchword became "Peace and no reform" Except for the railway law of 1842, no single measure of importance was carried. Corruption was rampant in France, corruption, due to the illegal conduct of the deputies, many of whom were slavish or venal officials; electoral corruption, effected by the purchase of the 200,000 electors constituting the *"pays légal"*; and moral corruption, due to the reign of the bureaucracy and exemplified in a series of outrageous scandals This state of stagnation pleased the dominant middle class entrenched behind its twin citadels of the property qualification and the national guard Their rallying cry, borrowed from Guizot, was "get rich quick" This bloated, industrious, well-educated but insolent and hard-hearted *bourgeoisie,* which speculated in railway shares and went in large numbers to church, forgot that wealth alone is not so much a protection for the minority in power as a temptation to the excluded majority. They remained obstinately deaf to the grievances of a growing industrial proletariat

In face of this tragic contrast Guizot remained unmoved, blinded by the superficial brilliance of apparent success and prosperity He adorned by flights of eloquence his invariable theme· no new laws, no reforms, no foreign complications—the policy of material interests He maintained his yielding attitude towards Great Britain in the affair of the right of search (1841), and in the affair of the missionary and consul, Pritchard, at Tahiti (1843–45) And when the marriage of the Duc de Montpensier with a Spanish infanta in 1846 had broken this *entente cordiale* to which he clung, it was only that he might in turn yield to Metternich (who seized Cracow, the last remnant of Poland), or protect the *Sonderbund* in Switzerland, or discourage the Liberal ardour of Pius IX, or hand over the education of France to the Ultramontane clergy. Still further strengthened by the elections of 1846 he refused the demands of the Opposition formed by a coalition of the Left Centre and the Radical party for parliamentary and electoral reform, which would have excluded the officials from the Chambers, reduced the electoral qualification to 100 francs, and added to the number of the electors the *capacitaires* whose competence was guaranteed by their education For Guizot the whole country was represented by the *"pays légal,"* consisting of the king, the ministers, the deputies, and the electors. When the Opposition appealed to the country, he flung down a disdainful challenge to what "les brouillons et les badauds appellent le peuple" The challenge was taken up by all the parties of the Opposition in the "campaign of the banquets" got up somewhat artificially in 1847 in favour of the extension of the franchise The monarchy had arrived at such a state of weakness and corruption that a determined minority was sufficient to overthrow it The prohibition of a last banquet in Paris precipitated the catastrophe The monarchy which for nearly 18 years had overcome its adversaries, collapsed on Feb. 24, 1848, to the astonishment of all.

THE SECOND REPUBLIC

On this occasion, and in contrast to the July Days of 1830, the *bourgeoisie* were taken by surprise and, for want of time, failed to outmanoeuvre the revolution. Hence they were compelled to accept a "democratic and social" republic of a distinctly red character Thus, along with a great enthusiasm, there were signs of a panic inspired by fear of the socialism which, under the July monarchy, had developed with the growth of industry and of the working class population.

Included in the provisional government installed in the Hotel de Ville, and not, as in 1830, in the Palais Bourbon, were moderates like Lamartine, and advanced republicans like Ledru-Rollin, a socialist theorist, Louis Blanc, and a worker named Albert. What was to be their policy? The Socialists, declaring that 60 years of political change had not improved the condition of the people, demanded the reform of society itself and the abolition of the privilege of property, the sole obstacle to equality, and unfurled the red flag The remaining parties wished to maintain society on its former foundation and rallied around the tricolour. Under the pressure of the Parisian clubs the provisional government was forced to enact universal direct suffrage, to open the national guard, till then reserved to the middle classes, to all, and to guarantee work for all its citizens by creating national workshops (*q v*) and by setting up the Luxembourg commission to enquire into social reforms (*see* BLANC, J J LOUIS)

The Constituent Assembly.—The Constituent Assembly was elected on May 4, 1848 By paradox, universal suffrage had resulted in the election of a majority of moderate republicans and these entrusted the Government to an executive commission from which the Socialists were excluded From this instant, the attraction disappeared from this bloodless revolution which was to abolish poverty by the organization of labour, and which had at once awakened the fraternal solidarity of the people On May 15 the democrats under the leadership of Raspail, Blanqui and Barbes, attempted to overthrow the Government by an insurrection. This error brought together the Republicans and the Right. The republic became unpopular both with the peasants, who were irritated by the new land tax of 45 centimes, and the middle classes, who were terrorized by the omnipotent clubs and ruined by the general stagnation of trade. Would the republic retain the support of even the workers? Since the decree of Feb. 24 had proclaimed the right of every man to work, the provisional Government had established national workshops; they were organized by Marie to prove the falsity of the theories of labour organization of his colleague, Louis Blanc Their sudden closure by the Assembly on June 21 caused the insurrection desired by the Legitimists under Falloux, and the Bonapartists led by Louis Napoleon who had just been elected a deputy For the first time since 1789, the insurrection was confronted with a strong Government ready to defend itself During June 24–26 the working-class east of Paris, under Pujol, fought with fury against those of the west, under the republican dictatorship of Cavaignac. Defeated, decimated by executions, and later by deportations, the Socialist party was crushed Fear of the "Reds," of the *"partageux,"* opened the way to the Second Empire.

The road was swiftly traversed. In the new constitution of Nov. 4, the legislative power was given to a single assembly chosen by means of the *scrutin de liste* and the executive power to a president chosen by the people for four years and not eligible for re-election Through inexperience, by omitting to declare the members of former ruling dynasties ineligible, despite the objections of Grévy, the assembly made the presidency an office dependent on popular enthusiasm.

The Presidency of Louis Napoleon.—The plebiscite was held on Dec 10 A lively electoral battle was fought between Cavaignac, Lamartine, Ledru-Rollin and Prince Bonaparte. The name of Napoleon, with its halo of glory, won the election with more than 5,000,000 votes Unknown in 1835, forgotten after Strasbourg, laughed at after Boulogne, Louis Napoleon had in eight years profited more by the state of feeling aroused by the July Government, which had stupidly awakened memories of the Empire, than by his own manifestoes that were conservative in spirit, but democratic in style The monarchists, with Thiers and Montalembert, whose reactionary policy now passed beyond the saving dictatorship of the incorruptible Cavaignac, rallied round Louis Napoleon who had promised them freedom of education Moreover, the peasants—ever friends of order—and even many of the working men themselves, had voted for the "nephew of the great Emperor "

The ensuing three years were occupied with an indecisive battle between a legislative assembly that was not homogeneous, though elected on an anti-republican ticket and favouring the party of order, and the prince-president, who was timid and taciturn, but who was awaiting his time At first he chose his ministers from among the moderate republicans, and to strengthen his own position gave pledges to the reactionary party without allying himself to any of them. He gratified Catholic opinion by an expedition to Rome, designed to re-establish the pope who had been expelled by Garibaldi and Mazzini, and to commence that work of European reconstruction that he was already beginning to consider his mission When, however, General Oudinot changed the character of the expedition, whose especial purpose was to prevent Austrian intervention, and attacked the Roman republic, the republicans of the Mountain, in answer to the summons of Ledru-Rollin, rose in revolt and were defeated (June 13, 1849).

The disappearance of the republican leaders assisted the Catholic and monarchical majority. It already had "the republic without the republicans " It only remained for Louis Napoleon to lay his hand upon the system of education—that medium for dissemination of socialist ideas—and then to restore the monarchy The prince-president pretended to share in the fears aroused in the majority in consequence of the supplemental elections of March and April 1850, which had resulted in an unexpected victory for the advanced republicans

The Falloux law of March 15, 1850, under guise of establishing liberty of education, in reality handed it over to the Catholics For half a century the Church was destined to destroy the work of intellectual emancipation achieved by the 18th century and the Revolution. The majority next attacked universal suffrage The Electoral law of May 31, in requiring of every voter a domiciliary qualification of three years, deprived of its vote the working class population, which was forced by its occupation to be migratory. The Press law of July 16, by re-establishing the "caution money" deposited by editors as a guarantee of good behaviour, aggravated the severity of the press laws.

After the Socialists, it was the turn of the republicans to be crushed But the President only lent his aid to this campaign in the hope of obtaining the peaceable revision of the constitution The monarchists, for their part, had only accepted his presidency as a stage in the return to monarchy. A conflict was inevitable Louis Napoleon cleverly exploited their projects for a restoration which he knew to be unpopular with the country. He travelled through France discreetly posing the question of a revision of the constitution in speeches the tone of which varied according to the district in which he was speaking; he flattered and ingratiated himself with the army, while dismissing Changarnier, the general selected for a monarchical *coup d'état*. Finally he substituted for his Orleanist ministers unknown men who were devoted to him personally: Morny, Persigny, Fleury. It had now come to open warfare In reply to the defiant motions of the assembly he at once scared the *bourgeoisie* by denouncing the existence of a vast communistic plot, and attacked the electoral law to win over the mass of the people. The assembly retorted by refusing either to abrogate the article of the constitution which forbade the re-election of the president or to restore universal suffrage All hopes of a peaceful issue to the quarrel disappeared. The Mountain, fearing a monarchical restoration, refused to the quaestors of the Chamber the right of calling on the troops and thus disarmed the legislative power Louis Napoleon took advantage of this during the night of Dec. 2, 1851; he dissolved the assembly, re-established universal suffrage, caused the party leaders to be arrested and had his powers prolonged for ten years by another assembly. The army dispersed the republican minority in Paris and the provinces, and the plebiscite of Dec 20 sanctioned the *coup d'état* by an enormous majority The Second Empire was established

THE SECOND EMPIRE (1851–70)

This new 18th Brumaire resulted naturally in a new "constitution of the year VIII " It restored the consular dictatorship and the same political institutions The sole innovation was the election of the *corps législatif* by universal suffrage This new political change had rapidly the same consequences as that of Brumaire A year later, on Dec. 2, 1852, Louis-Napoleon re-established the hereditary empire and took the title of Napoleon III., acclaimed by an almost unanimous plebiscite.

The Autocratic Empire (1852–60).—Although the Second Empire had a machinery of government similar to that of the First, it differed in principle though it was the heir to the Napoleonic tradition of order and authority, the emperor had none the less been chosen by popular vote It was, therefore, incumbent upon him to give to his people the material and moral benefits that, from his prison at Ham, or his exile, he had often reproached the former oligarchical Governments for having neglected. Reaction at home, liberalism abroad—that was his programme Hence he set himself to paralyze everything that might inculcate in the people a public spirit. universal suffrage, parliament, press, education The first was mutilated by the system of official candidates, the *corps législatif* silenced, the press muzzled by the *autorization préalable* and by the censorship, education subjected to a severe system of control, and the republican opposition rendered harmless by the law of public safety after Orsini's attempt to murder the emperor, purely Italian in origin though this was. France became a sickroom in which the people spoke in lowered voices. For ten years political life was dead The Empire lived upon frequent plebiscites Until 1857 the opposition was non-existent; during 1857–60 it consisted of five members. The monarchists, who were never united, maintained a *Fronde* in the salons

Internal Policy.—The condition of the existence of the autocratic empire was that liberty should be forgotten in a material prosperity that would make all interests tremble at the idea of a revolution. Hence Napoleon sought and found his support in the clergy, great financiers, industrial magnates and great landed proprietors He revived for himself the slogan of 1840 "Get rich quick " Under the influence of the Saint-Simonians, great credit institutions and public works were launched—the *Crédit Foncier*, the *Crédit Mobilier*, and the amalgamation of the railways. The fever for speculation was heightened by the influx of Californian and Australian gold, and the consumer benefited by lower prices and the removal of customs restrictions The Universal Exhibition of 1855 was the apotheosis of French activity The court fêtes at Compiègne, after Napoleon's marriage with Eugénie de Montijo, set the fashion for the admiring *bourgeoisie* who were satisfied with this strong Government which kept such good guard over their bank balances. But though the empire was strong, the emperor was weak. At once headstrong and a dreamer, he was full of rash plans, but too irresolute in action; he remained what his life had made him, a conspirator and a revolutionary by reason of his demagogic imperialism, and his democratic chauvinism. Moreover his foreign policy was as full of contradictions as his home government. *"L'Empire, c'est la paix,"* he declared at Bordeaux. Yet he made war.

Foreign Policy.—While his power lacked a firm basis, Napoleon III. was compelled above all else to reassure opinion in Europe, uneasy as a result of his earlier protests against the treaties of 1815. The leader of a hostile coalition could only be England, and with her he felt impelled to maintain an *entente*

cordiale. So he allied himself with her against Russia in defence of the integrity of the Ottoman empire, and at the same time rallied round him the Catholics who were preoccupied with the question of the Holy Places and the Liberals hostile to the autocratic tsardom.

The Crimean War (*q.v.*) was the prototype of his other wars. Begun without any definite military objective, it was waged with irresolution After the long and costly siege of Sevastopol, the tsar was thrust back far from Constantinople by the terms of peace; and did not forget the injury Intoxicated by his triumph and assured of a dynasty by the birth of the Prince Imperial (1856) Napoleon thought that he had wiped out the disgrace of 1840 He requested the congress of Paris (1856) to take into consideration the questions in which he was most interested, Poland and the Roman question, but England refused Sea-law apart, the sole benefit of the congress was to permit Cavour to bring the Italian question to the notice of Europe.

It was not his attempted assassination by Orsini that recalled the question to Napoleon He had never forgotten the days of his youth He believed that the hour had come for him to execute his chosen mission. Torn between the empress, a fanatical Catholic who was opposed to everything that might menace the papacy, and the prince Napoleon, who, as brother-in-law of Victor Emmanuel, took the side of Piedmont, he hoped to please both by the creation of an Italian federation presided over by Pius IX. At Plombières Napoleon offered to Cavour the sword of France that had been invoked by Orsini on the steps of the scaffold By fighting Austria after the tsar, Napoleon carried out another clause in the Liberal programme On May 3, 1859, he proclaimed his intention of making Italy "free from the Alps to the Adriatic." As four years earlier, so now he raised limitless hopes without counting the cost; hence, two months after the hardly-won victories of Magenta and Solferino, Napoleon signed with Francis Joseph the patched-up armistice of Villafranca Austria ceded Lombardy to Napoleon by whom it was handed over to Victor Emmanuel But Modena and Tuscany were restored to their respective dukes and the Romagna to the Pope, as the president of an Italian federation The war with Austria had thus miscarried A yet disunited Italy spoke of French treason, and from that time believed the emperor too highly rewarded by the cession of Nice and Savoy (May 24, 1860) But the war had also raised the Roman question To refuse Rome to Italy was to violate the principle of nationalities and to arouse the resentment of the French Liberals To give it to Italy was to alienate the French Catholics who, since the *coup d'état*, had always supported Napoleon He was only able to reconcile dynastic interests with those of nationality by a provisional solution—which would hold good only so long as he himself remained master of the situation A powerful Catholic and Protectionist opposition quickly arose The French clericals were greatly incensed by the Italian revolutionaries, who sought to make an end to the temporal power of the pope The Syrian expedition of 1860, in aid of the Maronite Catholics persecuted by the Druses, did nothing to disarm this opposition. On the other hand the emperor who, to satisfy England, had already dismissed his minister of foreign affairs, Walewski, signed with that country on Jan. 23, 1860 a commercial treaty by which the duties in England upon French agricultural produce, and in France upon English manufactured goods, were lowered. By this free trade policy French industry, though accustomed to protection, was suddenly exposed to foreign competition Now indeed the Catholics and the Protectionists perceived dangers in the absolutism that they had admired for just so long as it served their ambitions and their interests. To restore the empire to its balance, Napoleon sought that support from the Left which he was losing on the Right; a general amnesty proclaimed after his return from Italy marked a stage (which lasted for ten years) in the evolution of the autocratic into the liberal and finally the parliamentary empire.

The Liberal Empire (1860–69).—It was the liberals at home who were to be placated by the establishment of the liberal empire. By the reforms of Nov. 24, 1860, Napoleon removed the gag which had kept the country silent, increased the powers of the *corps législatif*, and proceeded, through the grant of an annual vote on the address and the right of voting the budget by sections, towards a parliamentary government. He promised the conservatives, who disliked his policy of *laisser faire* in Italy, an end to interventions in Europe, together with the maintenance of the temporal power, and peace But his support of the Italian cause had aroused in other nationalities a spirit of impatient hope. Would he be able to abandon them without arousing the indignation of the Liberals, and without adding further embarrassments to those already occasioned him by his Italian venture? In 1863 in Poland, Schleswig-Holstein, the Danube Principalities, and in Italy, united even though it lacked frontiers and a capital, the new principle of nationality loudly demanded satisfaction Confronted with the opposition of Europe Napoleon III was once again forced to curb Italian impatience, to permit Poland to be exterminated, and to hand over the Danes to the Austro-Prussian Coalition (*see* SCHLESWIG-HOLSTEIN QUESTION)

These inconsistencies produced in France, under the name of the *Union libérale*, a coalition of all the discontented elements—the Catholics, the leaders of industry, and the anti-Napoleonic parties of the Monarchists and the Republicans In the elections of 1863 the opposition won 40 seats and obtained a leader, Thiers, who in its name, instantly demanded "the necessary liberties"

Industrial Policy.—Confronted with the constitutional opposition of Thiers and the irreconcilable opposition of the Republicans, while the *bourgeoisie* grew daily more ambitious, Napoleon strove to reinforce his threatened authority by turning to the working classes from whom he had received it Nothing seemed more easy of accomplishment than to exploit their old hatred of the capitalist, Chapelier's law (1791) had denied them the right of combination, the limited suffrage had conferred a political monopoly on capital, and the workers remembered how the selfish *bourgeoisie* had called upon them to defend now the Charter, now universal suffrage, and had repaid them only with ingratitude, or with machine-guns The silencing of public opinion under the Empire and the general prosperity had caused a cleavage between the Labour party and the other political parties But the despatch of a Labour delegation to the London exhibition in 1862 had enabled them to resume contact. Henceforth the emperor put no obstacle in the way of consumers' co-operative societies, of the right to strike, or of the development of trade unions, he did not even oppose Tolain's plan for the foundation of an international association of workers (*see* INTERNATIONAL), and even gave his patronage to employers' welfare and friendly societies which had for their object the betterment of the working man's lot. Thus secured in his rear, the emperor believed himself able to reject, through Rouher, every fresh demand of the liberals. always seeking for a success abroad that would establish his dynasty, he returned to the policy of seeking "compensation"

European Politics.—By the expedition to Mexico, Napoleon believed that he had diverted the thoughts of the French Catholics from Rome He even hoped that, in return for the Mexican crown thus conferred on his brother Maximilian, the emperor, Francis Joseph, would peacefully yield Venetia to Italy. At Biarritz, in 1865, in return for vague promises of "compensation," he promised his neutrality to Bismarck, who wished to exclude Austria from Germany. Suddenly there came the news that the Austrian army had been defeated at Sadowa (July 4, 1866). The strength that till then Prussia had prudently concealed was laid bare. An intervention on behalf of Austria would deprive Napoleon of the reward for which he hoped. Moreover he could hardly have intervened, for want of the men and the money thrown away in Mexico. All over France there arose a feeling of surprised irritation against Prussia which, since the days of Frederick the Great, had persistently enjoyed the goodwill of France. By the Treaty of Prague, Prussia eliminated Austria from Germany, united, through the annexation of Schleswig-Holstein and Hanover, the hitherto scattered fragments of the Prussian monarchy, placed herself at the head of a great North German Confederation, and concluded military conventions with the South-German states from which this was only separated by the rubicon of the Main.

All confidence in the superiority of imperialism vanished at

once In the name of the opposition, Thiers and Faure denounced in the *Corps Législatif* the blunders of 1866 Emile Ollivier broke up the official majority by forming a third party between the anti-dynastic opposition and the extreme Bonapartists, and gave it out that a reconciliation with the empire would be impossible until the emperor granted full political liberty Undecided by nature, and rendered still more so by disease, the emperor during three years made concessions on the lines laid down by Ollivier, but destroyed their value by permitting Rouher to mutilate them by the way in which he put them into force Meanwhile in his foreign policy Napoleon met with defeat after defeat.

1867–68.—1867 was a particularly disastrous year. In Mexico the "greatest idea of the reign" ended in a humiliating evacuation in answer to an ultimatum from the United States Supported by a new ally, Prussia, Italy mobilized the forces of revolution to achieve her unity in Rome This time the *chassepots* of Mentana checked the onslaught of Garibaldi's Red Shirts When the emperor tardily recalled the promises made to him at Biarritz and sent Bismarck his "innkeeper's account," in which he first demanded Mainz, then Belgium, and finally said he would be satisfied with Luxembourg (*q v*), his ambassador, Benedetti, added to the mistake of asking at the wrong time the humiliation of obtaining nothing Napoleon dared not resort to force and so laid bare his weakness, and finally courted the mockery of Europe by inviting it to a display of the external magnificence which concealed the decline of France In the new Paris of Haussmann, the *Exposition Universelle* opened with Berezowski's attack upon Alexander III, and closed amid the echoes of the tragic fate of Emperor Maximilian of Mexico Well might Thiers exclaim "There are no blunders left for us to make" Yet the emperor managed to commit still more, entailing irreparable consequences for the dynasty, and for France Old and ailing, stung by the triumph of the opposition in the elections of 1867, he was faced with the choice between a lasting peace and a decisive war He allowed himself to drift in the direction of war without making the necessary preparations to wage it Indifferently supported by the Government, distrusted by an electorate that had allowed commercial or international interests to oust patriotism, and strongly opposed by the Left which feared to strengthen the hands of the emperor, the military reforms of Marshal Niel were defeated By the laws of May–June, 1868 Napoleon sought in vain to preserve his right of action by granting freedom of speech and assembly Everything he did redounded to the credit of his enemies The *Châtiments* of Victor Hugo, the *Lanterne* of Rochefort, and Gambetta's terrible indictment in the law courts proved that the Republicans were irreconcilable. The Ultramontane party grew sulkier and sulkier, the manufacturers grew daily more and more dissatisfied with free trade Worse still, the working-classes, gradually won over to the theories of Karl Marx and Bakunin, had passed to the enemies' camp, and the strikes that grew daily more frequent became, in effect, a review of the fighting strength of the Revolution

The Parliamentary Empire (1869–70).—Held amidst this fevered state of public opinion, the elections of 1869 inflicted a resounding moral defeat upon the emperor He was compelled to come to terms with the victorious Third Party and to entrust to its chief, Ollivier, the Government of the parliamentary empire (Jan 2, 1870). The plébiscite of May 8 sanctioned this transformation by an enormous majority in spite of republican risings and intimidation

This success, which should have consolidated the empire, determined its downfall A diplomatic triumph seemed essential to complete the success To the empress was ascribed the saying "Unless there is a war my son will never be emperor" On July 3, 1870 the opportunity presented itself with the candidature of a Hohenzollern prince for the throne of Spain To the French it seemed that Prussia, barely mistress of Germany, was reviving against France the traditional policy of the Habsburgs. Ollivier's liberal ministry was desirous of showing itself as jealous for the national honour as any of its absolutist predecessors Carried away by the force of public opinion which it had itself set free, it accepted war as inevitable and prepared for it *"d'un coeur léger"*[1] It was in vain that French diplomacy, aided by the uneasiness of Europe, secured the withdrawal of the Hohenzollern candidature This did not suit either the war-party in Paris, or Bismarck, who wanted the other side to declare war To preserve their popularity, Ollivier and Gramont, the minister for foreign affairs, sought to extort from King William one of those promises for the future which are humiliating, but never binding. Thus they afforded Prussia the desired pretext for returning a refusal, which Bismarck in the "edited" telegram from Ems transformed into an insult. The Chamber, which was composed of government deputies, notwithstanding the desperate efforts of Thiers and Gambetta, and the 11th-hour offers of mediation on the part of England, fell into the trap and voted for war, which was declared on July 19, 1870.

The War of 1870–71.—Thanks more to the duplicity of Napoleon than that of Bismarck, France found herself isolated, she did not possess a single ally Through revenge for her defeat in the Crimea, Russia gave Prussia a free hand, while Bismarck's disclosure of the "Benedetti" claim of 1867 on Belgium and Luxembourg, secured for Prussia the benevolent neutrality of England The emperor counted, at least, on the support of Austria and Italy, with whom he had been in negotiation since the Salzburg interview (Aug 1867) Italy did not even wait for the defeat of France before entering Rome, Austria, while concerned to take revenge for Sadowa, was distrustful of Napoleon and conscious of the strength of Prussia The armies of Marshal Leboeuf were no more effective than the alliances of Gramont All was ready in Germany for the mobilization of a well-equipped and disciplined army under the leadership of experienced generals All this was lacking in France, where everything had been left to the good luck that had always attended the emperor, and where the army was badly officered and the supreme command entrusted to incapable hands Thus it was that defeat came with a terrifying swiftness The battles of Froeschwiller and Forbach (Worth and Spicheren) were lost on Aug 6, and on Aug 18 the "Army of the Rhine" was shut up in Metz MacMahon's army, which had been given the task of relieving it, was in its turn surrounded at Sedan (Aug 30) where it surrendered with the emperor on Sept 2 The capitulation of Sedan destroyed the empire by removing its sole support, the army Paris was left unprotected and empty of troops With a helpless woman at the Tuileries, a terrified Assembly at the Palais Bourbon, a ministry, that of Palikao, without authority, and leaders of the opposition who fled at the approach of disaster, the republicans had no need to overthrow the empire It fell of its own accord on Sept 4 without a single hand being raised in its defence (*See* FRANCO-GERMAN WAR)

THE THIRD REPUBLIC

The Government of National Defence.—This overthrow of the empire on Sept. 4 resembled in certain respects the revolution of 1830 After the disappearance of Napoleon, the republicans proclaimed the Republic in the Hotel de Ville, and in order to deprive the revolutionaries of power set up a Government of National Defence, presided over by Trochu But, as in 1830, this bourgeois dictatorship was divided Moderates like Simon, Favre and Picard thought that the greatest need was to end the hopeless war Another section, led by Gambetta, and faithful to Jacobin traditions, desired to carry on to the death. The Moderates held the naive belief that peace could be obtained simply by the payment of a large indemnity. At his interview with Bismarck at Ferrières (Sept. 18), Favre soon realized that, as in 1814, it was against France and not against Napoleon, and for the possession of Alsace, that Germany was waging war The failure to obtain an honourable peace strengthened the hands of warlike party, and the war preparations were resumed. Since Bismarck refused to negotiate for peace except with a constitu-

[1] In the 14th volume of his *L'Empire liberal* (1909) M Emile Ollivier gives a detailed and illuminating account of the events that led up to the war. He indignantly denies that he ever meant that he contemplated it "with a light heart," and says that he disapproved of Gramont's demand for "guarantees" to which he was not privy. His object is to prove that France was entrapped by Bismarck into a position in which she was bound in honour to declare war. (ED.)

tionally-elected Government, and Gambetta feared that elections would result in the return of anti-republicans and pacifists, an election was postponed.

The Siege of Paris.—On Sept. 19 the German armies invested Paris. Isolated from the rest of France, filled with illusions as to the value of the *sortie en masse,* agitated by social revolutionaries, Paris was about to undergo a siege of four months The Government, shut up in the capital, maintained merely a delegation at Tours, which demanded an immediate election To obviate a rupture and put life into the national resistance, Gambetta escaped from Paris in a balloon. A real dictator, he organized, with the help of Freycinet, armies, as in 1793, to raise the siege of Paris and repel the invader. It was a forlorn hope But, at any rate, it preserved the honour of France and taught the Germans prudence

Little by little hope faded away Thiers, who had been sent on a mission to seek the intervention of Europe, everywhere encountered refusals. After this diplomatic defeat, forgetting his duty as a soldier in his ambition to play the politician, Bazaine surrendered the last remaining army at Metz on Oct 27. When the news of his treason, coupled with rumours of an armistice, reached Paris, already disappointed by the failure of the Bourget sortie and suffering acutely from the scarcity of food, feeling rose high in favour of the revolutionaries who, too, were demanding an election and the creation of a Commune On the initiative of Blanqui, a veteran in revolution, there broke out in Paris on Oct 31 a rebellion that was suppressed with difficulty The bad winter of 1870–71 was as dangerous an enemy as the Germans to the armies of *mobiles,* hurriedly raised to relieve Paris Notwithstanding the heroism of the troops and the energy of their commanders, the new armies were successively defeated After a temporary victory at Coulmiers Chanzy was forced to fall back from the Loire to Mans under the pressure of the army of Prince Frederick Charles, freed by the surrender of Metz, at the same time, Champigny, who was marching to his aid, was defeated; and in the same way Faidherbe was defeated in the north, despite a victory at Bapaume, even as Bourbaki was defeated in the east after his success at Villersexel The bombardment of Paris began on Jan 5 and food supplies failed The German empire was proclaimed at Versailles on the 18th, and the failure of a desperate sortie under Buzenval provoked a new insurrection on Jan 21

The Moderates had rejected a proposed Anglo-Austro-Italian intervention at the end of October in the hope that better terms might be obtained by direct negotiation with Bismarck than by imitating Talleyrand's policy in 1814 But they were forced to capitulate by the armistice of Jan. 28, 1871, and to proceed at once to the election of a National Assembly by whom the question of peace or war should be finally decided. The strife between the parties proceeded unabated at Bordeaux Hostile to any suggestion of a loss of territory, Gambetta wished to take advantage of the armistice to prosecute the war to the bitter end But Thiers, whose influence over the Moderates increased daily, replied by pointing out to him the hasty and temporary character of his work; the general desire for peace and order, the unity of the nation in the face of anarchy and the federalist leagues in the south. To avoid adding a civil war to that already in progress Gambetta resigned. The Republican party was, therefore, divided at the ballot. At the ensuing elections (Feb 8, 1871), the war-party, except in Paris, was defeated.

The National Assembly.—The National Assembly contained a Legitimist and Orleanist majority; but the latter were no more successful than in 1851 in restoring the monarchy. Divided as hitherto by memories of 1830, they were specially concerned in leaving a temporary Government to shoulder the responsibility for concluding a peace that would mutilate, and perhaps destroy, France; and they sought to defend the future monarchy from the reproach—which had done such harm to the Bourbons—of having returned in the baggage-wagons of a foreign power; hence they postponed the restoration of the monarchy by the *pacte de Bordeaux.* The provisional Republic continued therefore to exist with Thiers as head of the executive. After the peace the Republic re-established that civil order disrupted by the Commune, and having taken the responsibility, was to reap the reward. Its first task was to conclude peace. In truth Favre and Thiers submitted to the Prussian terms without seeking to take advantage of the support of the neutrals or of the Conference of London They had to cede Alsace, with a part of Lorraine, and submit to a German military occupation pending the payment of a war indemnity of five milliards, despite the protests of representatives of the people thus torn away from France and of the hostile vote of 107 advanced Republicans But to these hard terms, Bismarck added another, equally grave, for no other purpose than the satisfying of Prussian pride, the formal entry of the German army into Paris. Practically all the deputies from the capital had voted against peace, and Paris was hostile to an Assembly composed for the most part of conservative and pacifist representatives from the provinces. She united in a bizarre alliance the traditions of the patriotic Revolution with the ideology of the socialist International The wind of insurrection fanned a population which had been furnished with arms to withstand the siege and which no one had dared to disarm When the Bordeaux Assembly went to Versailles for the same reasons as the States-General in 1789, Paris saw in it a mark of defiance or a threat of a Restoration

Paris responded (March 18) with the insurrection of the Commune (*q v*), and the Government was obliged to retake the city by force of arms, though it was not until May 21 that the Versailles troops entered the city. The merciless repression that followed exceeded that of the June days and destroyed the revolutionary party.

The Treaty of Frankfort.—The treaty of Frankfort was signed on May 10, and both the civil war and the war with Germany terminated on that day. Henceforth one thought alone was present in every French mind—to pay the indemnity and deliver French soil from the heel of the invader To the honour of Thiers' government, aided by the whole nation, the first loan raised for this purpose in June 1871 was oversubscribed two and a half times. Gambetta himself rallied to the conservative republic, and after the supplemental elections of July, 1871, which returned 100 moderate Republicans to the Assembly, founded the Opportunist Party

Thiers.—For a year and a half the Right Centre accepted Thiers' government and collaborated in its work of reorganization, although not without some skirmishes such as the abrogation of the laws which exiled the princes of the blood and interpellations in favour of the temporal power of the pope But little by little they came into disagreement with him over his home policy and the constitutional issue. Once the effacement of the grandson of Louis Philippe in favour of the grandson of Charles X had been effected, they thought the time had come to restore the monarchy Suddenly, however, his manifesto in favour of the White Flag brought about a disagreement between the Comte de Chambord and the Assembly which wished to offer him the crown. For five years France was afforded the spectacle of a majority that could not agree with the legitimate ruler and which, unable to restore the monarchy, sought at least to prevent the establishment of the Republic

The Republic was indeed alive, and, by reason of the propaganda of Gambetta, the country gradually turned towards it and each by-election strengthened its position. The second loan of three milliards, which was 14 times over-subscribed, not only in France but abroad, and the law of conscription, guaranteed to France the early evacuation of her soil by the Germans and the rehabilitation of her army Nevertheless when Thiers, who was a monarchist by conviction, raised the constitutional issue in Nov. 1872 and pronounced in favour of the Republic, the Commission of Thirty, which was charged with the duty of drafting the law for the regulation of public powers, retorted by seeking to exclude his personal intervention in the debates. As he had introduced three Republicans into his cabinet, the coalition of the parties of the Right, by demanding that he should pursue a conservative policy, brought about his resignation (May 24, 1873).

MacMahon.—The coalition replaced Thiers with MacMahon,

and an Orleanist, the duc de Broglie, formed a fighting ministry for the purpose of restoring that "moral order" that had been upset by the Radicals All preparations had been made for the establishment of a constitutional monarchy when, on Oct. 27, the comte de Chambord for a second time refused to become the "legitimist king of the revolution."

While awaiting his abdication or death the astonished Royalists concentrated upon prolonging the temporary character of the Republic, and elected MacMahon to the presidency for seven years that he might act, as they thought, as the lieutenant-governor for the future king. But his government was agreed only on negations It would not suffer the Republicans to come into power; it would not re-establish the Republic, and it would not control the activity of the clergy even when such activity created difficulties with Italy or with Bismarck. But no government can subsist upon negations, and the Bonapartist party took the opportunity to reorganize itself, while at the close of 1874, the elections to the municipal councils amounted to a plébiscite in favour of the Republic, a success due to the appeals made by Gambetta to the *nouvelles couches sociales*

The Constitution of 1875.—In spite of itself the Assembly was forced to make a constitution Despite the Septennat, and a senate that was not even elected by universal suffrage, Gambetta, who had broken with the Radicals, the partisans of a policy of all or nothing, succeeded in persuading the Left to accept a constitution that was drafted by the Monarchists and the Moderates On Jan 30, 1875, Wallon's amendment, in which the name of the Republic was mentioned, was passed by a majority of one Thus came into existence the constitution that has lasted longer than any of those that France has tried since 1792 It preserved to France as indisputable principles of public right the sovereignty of the nation as exercised by the Chamber, the liberty of the press, universal suffrage, trial by jury and the right of public meeting This constitution maintained the social order of the Revolution and the administrative order of Napoleon.

The legislative power was conferred on a senate and a chamber of deputies, which might unite in congress to revise the constitution, if they both agreed that revision was necessary, and which were bound so to meet for the election of the president of the Republic when a vacancy occurred It was enacted that the president so elected should retain office for seven years, and be eligible for re-election at the end of his term He was also held to be irresponsible, except in the case of high treason. The other principal prerogatives bestowed on the presidential office by the constitution of 1875 were the right of initiating laws concurrently with the members of the two chambers; the promulgation of the laws; the right of dissolving the chamber of deputies before its legal term on the advice of the senate, and that of adjourning the sittings of both houses for a month; the right of pardon, the disposal of the armed forces of the country; the reception of diplomatic envoys, and, under certain limitations, the power to ratify treaties The constitution relieved the president of the responsibility of private patronage, by providing that every act of his should be countersigned by a minister. The constitutional law provided that the senate should consist of 300 members, 75 being nominated for life by the National Assembly, and the remaining 225 elected for nine years by the departments and the colonies Vacancies among the life members, after the dissolution of the National Assembly, were filled by the senate until 1884, when the nominative system was abolished, though the survivors of it were not disturbed The law of 1875 enacted that the elected senators, who were distributed among the departments on a rough basis of population, should be elected for nine years, a third of them retiring triennially. It was provided that the senatorial electors in each department should be the deputies, the members of the *conseil général* and of the *conseils d'arrondissement,* and delegates nominated by the municipal councils of each commune. As the municipal delegates composed the majority in each electoral college, Gambetta called the senate the grand council of the communes; but in practice the senators elected have always been the nominees of the local deputies and of the departmental councillors (*conseillers généraux*).

The constitutional law further provided that the deputies shou be elected to the chamber for four years by the direct manhoc suffrage that had been enjoyed in France ever since 1848. Tl laws relating to registration, which is of admirable simplicity France, were left practically the same as under the Secor Empire From 1875 to 1885 the elections were held on the bas of *scrutin d'arrondissement,* each department being divided in single-member districts. In 1885 *scrutin de liste* was tried, tl department being the electoral unit, and each elector having many votes as there were seats ascribed to the department witho the power to cumulate—like the voting in the city of Londc when it returned four members. In 1889 *scrutin d'arrondisseme* was resumed The payment of members continued as under tl Second Empire, the salary now being fixed at 9,000 francs a ye in both houses The senate and the chamber were endowed wi almost identical powers; the only important advantage given the popular house in the paper constitution was its initiative matters of finance, but the right of rejecting or of modifying tl financial proposals of the chamber was successfully upheld b the senate In reality the chamber of deputies has overshadowe the upper house The constitution did not prescribe that ministe should be selected from either house of parliament, but in practi the deputies have been in cabinets in the proportion of five to or in excess of the senators Similarly the very numerous ministeri crises which have taken place under the Third Republic hav with the rarest exceptions, been caused by votes in the low chamber Among minor differences between the two hous ordained by the constitution was the legal minimum age of the members, that of senators being 40, and of deputies 25 It wa enacted, moreover, that the senate, by presidential decree, coul be constituted a high court for the trial of certain offences again the security of the state

The Republicans.—Nevertheless the Republic remained th republic without the republicans President MacMahon who ha been chosen by the monarchical Right, thought himself bound i honour to govern in accordance with their views After the ele tions of Feb 1876, however, although there was a slight conserva tive majority in the senate there was a republican majority more than 200 in the chamber, but the monarchists were not ca down by this defeat. No longer able to discuss the constitutio they struggled to secure control of it in order to prevent it fro functioning, and they pursued their policy on behalf of the clerg The Republicans, on their part, dividing up into the Left Centr Republican Left and Radical Left, took the offensive in order t compel the president to follow a republican policy, and he wa forced to form a ministry from the Left Centre. The chamb restored the liberty of the press and the right of the municipaliti to elect their mayors, and finally pronounced itself strongl against the demonstrations of the Ultramontanes in favour of th temporal power This brought about a rupture. The presider replaced the Simon ministry by the conservative ministry of th duc de Broglie and Fourtou, and caused the senate to dissolv the chamber (May 16, 1877). The Union of the Left immediatel formed itself anew and addressed to the country a common man festo, signed by 363 deputies In this it appeared as the cor servator of peace and order against the revolutionary coalitic of the monarchical and clerical parties and of the sovereignty the people against the personal government of the president I the elections of Oct. 1877 the *Union des Gauches* won the battle MacMahon was forced to give way and then to resign; Grév was elected to succeed him (Jan 1879), and the control of th republic passed into the hands of the republicans who wer masters both of the senate and the chamber.

The republicans, although they had united to defend them selves, split up again when called to office. The Left Centr lacked popular support and was of no importance except in th senate where it combined with the Right to oppose the measure against the clergy. The majority in the Chamber was share between two groups· the Republican Left and Gambetta's ol Extreme Left, now become the *Union Républicaine.* The expe rience of victory had rendered them more moderate, and they ha to fear the possible formation of a party of order directed again

them. President Grévy, in his first public announcement, reassured the propertied classes with a slogan of "liberalism truly conservative," while Gambetta instilled into the Radicals the necessity for discipline and patience. But almost at once there arose from among the Radicals a new Extreme Left, the heir to the Jacobins, which was led by Clemenceau, who reproached Gambetta and his party with opportunism while awaiting the resurrection of Socialism. Henceforth the two parties fought bitterly among themselves, and from this arose the instability of ministries. Anti-clericalism was the sole bond of union between the parties of the Left

Anti-clericalism.—Anti-clericalism came into evidence after 1880 as a means of revenge for the 16th of May and for the support given by the clergy to the enemies of the Republic during the whole life of the National Assembly. It was also inspired by the necessity to protect the rights of the State against a Catholicism that was not only religious, but also political Under the leadership of Jules Ferry, this anti-clericalism was expressed in the decrees by which unauthorized religious houses were ordered to disperse On their refusal they were expelled; and the Jesuits first of all. Henceforth a state of war existed between the Republic and the Catholic Clergy, and the next field of battle was the education question Free, lay and compulsory primary education was organized; later certain of the privileges which had been enjoyed by uncontrolled education under the Falloux law of 1850 and that of 1875, were withdrawn—granting of university degrees, and liberty of teaching for unauthorized congregations. This was the object of the famous article 7 that aroused the fury both of the republicans of the Extreme Left for whom anti-clericalism meant anti-catholicism, and of the monarchists who saw in this clause the prelude to the complete prohibition of education by the clergy Finally the law of 1881 set up entire freedom of the press, and that of 1884 on the trade unions enabled the working classes to create organizations similar to the English trade unions

Republican Divisions.—When anti-clericalism had triumphed the republicans were divided over foreign and home policy One party which accepted, even though temporarily, the defeat of 1870–71, was disposed more or less publicly to come to an understanding with the German empire, and to seek in colonial expansion both fresh economic resources and a relief from a policy of reconstruction that threatened to become one of effacement Others, refusing to accept the *fait accompli*, believed that French policy should remain European, that the danger of invasion—revealed in the war-scare of 1875—still existed, and that a strong army and as many allies as possible were needed to oppose Germany strengthened by the Triple Alliance The same disagreement showed itself in home policy The *Union Républicaine*, being now in power, avoided offending conservative instincts, and toned down the traditional radical demands, but their proffered compromise was rejected by the advanced republicans, who put forward a fighting programme During 1880–84 the internal history of France was dominated by these two warring policies

The conflict with the Extreme Left was brought to a head after 1880 by the voting of the amnesty to the members of the Commune (1880) which it enforced With their return to France began the reconstitution of the Revolutionary Socialist Party In the elections of 1881, in which the republicans once again obtained a majority and eliminated the Conservative Party from the political arena, the Extreme Left were the greatest gainers Formerly the idol of Paris, Gambetta was, with difficulty, returned for Belleville. As leader of the majority he agreed to form what came to be known as the "great cabinet" which lasted for three months; but the Extreme Left immediately displayed its hostility towards his opportunist policy and launched out on a campaign of calumny in which he was accused of desiring war and aspiring to a dictatorship. With his downfall, and a little later his death (1882), there disappeared his dream of a national and free republic.

The successive ministries of Freycinet, Duclerc and Ferry experienced the same pressure from the Extreme Left. To avoid an elective magistracy, they were forced to purge it; to avoid a complete revision of the constitution and the suppression of the senate, they were forced to agree to the suppression of its life members and the increase of those elected (1884). They were successful in substituting the agreements of 1883 for the nationalization of the railways and they abandoned the income tax But it was in the sphere of colonial policy that the fiercest fights were waged, and it was over this question that the unity of the republican party was permanently dissolved.

The expedition to Tongking, after that to Tunis, provoked the long crisis that lasted from 1885–89 The disciples of a patriotic Jacobinism and the minority of the Right formed the enemies of the Ferry government which, as a result of the panic provoked by false news of the check by the Chinese at Langson, they succeeded in overthrowing in May 1885.

The Coalition Ministries (1885–89).—Until 1889 one coalition ministry succeeded another. Since it had come into power the Left had abandoned the wise and conservative financial policy of balanced budgets, redemption of debt and economy Freycinet's grandiose railway scheme and plans for public works, the colonial expeditions and the education laws had disorganized the finances The crash of the *Union Générale* in 1882 had spread anxiety and discontent in the provinces which showed itself in the elections of Oct 1885, held under the *scrutin de liste* by the republicans, who presented two rival lists, and resulting in the victory of 200 deputies of the Right united on a negative policy of liberal opposition. Split up into two almost equal factions, the Republican Party had lost its majority, and in order to carry on the Government, was forced to resort to two policies—the one of concentration against the Right, which was adopted by the ministries of Brisson (who succeeded J. Ferry), Freycinet (Jan 1886) and Goblet (Dec 1886), and the other a lenitive policy by which the conservatives were induced to support the governmental republicans against the Radicals, which was pursued by Rouvier (May 1887) and abandoned by Goblet (Dec 1887) The early ministries (Ferry, Freycinet, Goblet), expelled the pretenders in order to strike at the comte de Paris, the later ministries, too preoccupied in retaining their authority to trouble themselves with reform, endeavoured to terminate the policy of colonial expansion and to balance the budget.

General Boulanger.—A new opposition of a hitherto unknown nature arose to threaten the republic Its hero was General Boulanger To oppose Ferry's colonial policy the Radicals had allied themselves with the Patriots, who were advocates of a war of revenge with Germany, and had pushed into the ministry of war the "only Republican general," Boulanger (Jan 1886) This plausible and handsome adventurer had won renown by his democratic professions and made himself popular in a radical and patriotic Paris by expunging from the list of officers the names of the Orleanist princes Bismarck took advantage of the popularity of Boulanger to extort from the Reichstag fresh military credits, and France was brought within an ace of war by Boulanger's demand of a bold reply to the arrest of the French official, Schnaebele, near the German frontier (April 1887) The Opportunist Party, which took over the Government in May, removed Boulanger to Clermont-Ferrand and broke with the Radicals who were his supporters Unhappily, a scandal over decorations gave fresh impetus to the Boulangist movement and led to the resignation of President Grévy and his replacement in December by the moderate Republican Carnot.

Carnot's ministries, that of Tirard (Dec. 1887) and Floquet (April 1888) followed a policy of concentration of the republicans against the Boulangist movement. Placed on retired pay and, therefore, rendered eligible to the chamber, Boulanger revealed himself little by little as the enemy of the corrupt and incompetent republican Government, and as an aspirant to dictatorship. That old enemy of the empire, Rochefort, who had been involved in the commune, brought to Boulanger's aid all the extreme elements in the population The Conservative Catholic Party joined itself to the Revisionist Party to support Boulanger in "making a hole in the republic," and on Jan. 27, 1889, along with many departments, Paris elected the general by an enormous majority and amidst scenes of delirious enthusiasm

His success killed Boulanger he feared to march on the Elysée in the confidence that the result of the general election would be virtually a plébiscite in his favour. At once the *Union des Gauches* reappeared as on May 16; against him, the Tirard-Constant ministry (Feb 1889) re-established the *scrutin d'arrondissement*, forbade multiple candidatures, and impeached him before the high court of the senate Boulanger fled to Brussels The hostility towards him of the peasants who feared a war, the calming effect induced by the exhibition of 1889, the union of the Republican parties with the result that not 40 Revisionists were elected in Oct 1889, and, finally, the suicide of Boulanger in April 1891, completed the destruction of the movement

The Franco-Russian Alliance.—The elections had been fought by the parliamentary republicans in order to protect the constitution of 1875 from the attacks of the Revisionists and Monarchists, and the education and military laws from that of the Catholics Once in power they pursued a policy of conservation and republican concentration One great political event alone marks the ensuing four years—the establishment of a customs tariff in 1892 in contrast to the commercial treaties of Napoleon III In vanquishing Boulanger they had learnt a lesson that they were prompt to apply in negotiating the Franco-Russian alliance, and so satisfying the national fears that had caused the unpopularity of Ferry and the popularity of Boulanger. Adumbrated by Decazes, planned by Gambetta in 1875, demanded by Boulanger and his party, the alliance was born after the fall of Bismarck in 1890, confirmed at Cronstadt in 1891 and formally recognized in 1893 The Franco-Russian alliance, the purely defensive counterpart of the Triple Alliance, affirmed anew that the safety of France did not depend solely on the goodwill of others, but on herself, her army and her alliances, and at all events not on an *entente* with a Germany which was continuing to arm The alliance strengthened the republic by guaranteeing peace through a balance of power It disarmed the patriotic or nationalist opposition, the Radicals were reduced to an insignificant and unimportant minority, the socialist Labour party became impotent through its own internal divisions into Marxists, Possibilists, Broussists, etc ; the Conservative party was also rendered powerless A number of conservatives, on the suggestion of the comte de Paris, after his identification with the Boulangists, had recognized, as had the Bonapartists, the revolutionary principle of the sovereignty of the people Abandoning the idea of restoring the monarchy, they no longer attacked the republic but solely its administrators and policy Some went still further and, in response to an appeal from Leo XIII , adhered to the republic without strengthening it, accepting the constitution merely to modify the legislation (1892).

The Panama Scandal.—Thanks to this development and to the pursuit of a policy of moderation, a reconciliation was effected between the Conservative Right and the Republican Centre The reconciliation was rendered still more easy of attainment by the willingness of the Right to accept the education and military laws, but it was less easy to effect in the constituencies, where the republican electors were still hostile to the conservatives who had fought the Republic in 1889 The majority of the conservatives remained faithful to the royalist tradition, and protested against the policy of Leo XIII. In the autumn of 1892 they drew attention to the serious Panama scandal; in November the Panama Company was accused of having, in 1888, bribed a minister and certain deputies in order to obtain permission to issue shares The scandal, which was grossly exaggerated in the press, opened up an era of denunciations, enquiries and judicial prosecutions In the result, certain leaders of the Left, including both Clemenceau and Floquet, were forced to retire and a new generation appeared which, never having fought for the Republic, was more disposed to entertain friendly relations with its old enemies.

The Moderate Ministries (1893–98).—For five years almost without a break one moderate ministry succeeded another—Dupuy, Méline, etc —ministries so moderate in policy that, after the assassination of President Carnot by an Italian anarchist in 1894, Casimir-Périer, grandson of Louis Philippe's reactionary minister, was chosen president by a huge majority over the radical candidate, Brisson

This new development was made manifest in the elections of 1893, when the Right won only 93 seats of which 33 were occupied by deputies who supported the Republic; the ministerial Republicans held 300; the Radicals 130; while the socialist opposition, united for once, gained 48 seats and composed the first socialist parliamentary group Moreover the majority of the deputies were new to political life The political balance of power was upset by the Anarchist party who had dissociated themselves from the Socialists after the congress of 1879. Hostile to all parliamentary or electoral government, they carried on propaganda by explosives, after the manner of the Russian terrorists. The exceptional measures passed in 1893 and 1894 made short work of this propaganda Then the Socialists attacked the upper middle classes in the person of Casimir-Périer, who resigned after a few months from a presidency in which he had been rendered powerless, and was succeeded by another moderate bourgeois in Félix Faure The Radical ministry of Léon Bourgeois was overthrown by the enmity of the senate towards the imposition of an income tax, and was succeeded for two years by the moderate coalition ministry of Méline, supported by the neutrality of the Right Despite the attacks of the Radicals on his financial policy, and the coalition between the Socialist factions that was definitely concluded by Millerand at Saint-Mandé (May 1896) on a programme of social reform unaccompanied by revolution, Méline carried out his policy, which was neither revolutionary nor reactionary It required two violent crises to remove the conservative Republicans from power; the one in home affairs, the other in foreign policy

The Dreyfus Case.—Méline was still in office when the Dreyfus case came to upset the balance of power between the parties A Jewish captain on the headquarters staff was accused of having sold military secrets to Germany and was condemned for treason in 1894 France was divided into two camps the supporters and the accusers of Dreyfus A state of civil war was almost reached that resembled in a less violent form the great crises in French history and that brought even the intellectual elements in the nation into the arena For three years the revision of the sentence on Dreyfus, which was demanded by Scheurer-Kestner and by Zola in his letter *J'accuse*, completely dominated French politics Those who believed him guilty nearly all allied themselves with the Right, while his defenders were mainly to be found in the ranks of the left The former took as their motto "Vive l'armée!", the latter exclaimed with Jaurès and Clemenceau "Vive la Republique!" The conflict became acute in 1899, after the sudden death of President Faure, who had secretly opposed a re-trial. Loubet was elected president in face of the opposition of the nationalist *Ligue de la patrie française* and of the conservatives, and was ill-received by a nationalist Paris Déroulède, the president of the League, attempted on the day of Faure's funeral to achieve a *coup d'état*, but failed After the sentence on Dreyfus had been quashed, Loubet was assaulted on the racecourse at Auteuil

As in the days of Boulanger and on May 16, the Left groups coalesced to defend the Republic The moderate, though revisionist, ministry of Waldeck-Rousseau, in which Millerand held the portfolio of commerce, and General de Gallifet that of war, appealed to all the republicans for support. It was nicknamed the Bloc by Clemenceau, and was this time to wander far to the Left (June 1899) Two reasons underlay their policy The first was that the Socialist party in France had become, by the entrance of Millerand into the ministry, the extreme wing of the Republican party The second is to be found in the fact that the Dreyfus case showed that anti-militarism was powerful and greatly aggravated by the boredom of a military life in which no differentiation was made between the peasant and the scholar. Thus it came about that the Republican party, intensely patriotic, in 1870, gradually tended under the pressure both of internationalism and selfishness to allot the second place to national defence

Anti-clericalism and the Combes Ministry.—The Bloc was still held together by anti-clericalism The nationalist agitation against the Jews and the Freemasons had been strongly sup-

ported by the Assumptionists and by the Jesuits The education of the upper classes was passing steadily into the hands of these religious orders Too rich, too powerful and too numerous, these intriguing clerics met with the fate of the Templars in the reign of Philip the Fair The Law of 1901 for the first time granted in France the full right to found free associations; but the formation of religious congregations was permitted only by the passage of a special law, and their dissolution could be effected by decree

When Waldeck-Rousseau was succeeded by E Combes in 1902, the latter, supported by a Radical-Socialist and Socialist majority that had been returned in the elections held on the question of the congregations, abandoned the defensive methods of the republicans and adopted an aggressive policy of anti-clericalism Not content with subjecting them to surveillance, he suppressed nearly all the congregations, took away their right of education, and disposed of their property Following upon a papal protest against President Loubet's visit to the king of Italy and a dispute over the nomination of bishops, Combes broke off diplomatic relations with the Holy See and brought forward in Nov 1904 a plan for the separation of the Churches from the State But the Left coalition, which had been his support, eventually broke up On the right wing of the party many progressive republicans were disturbed by a religious war which divided the country and brought *a priori* suspicion upon Frenchmen who did not share the views of the government Others were offended by the socialist alliance, and a number of Radicals were irritated by the discipline imposed upon them by Combes On the left wing, influenced by the International Socialist Congress of Amsterdam (Aug 1904), the French Socialist party, led by Jaurès and Briand, had been forced to give in to Marxist theories and to transform itself into a united socialist party devoted to class warfare and revolution It at once seceded from the Left. Combes' already diminishing majority vanished with the introduction by General André of politics into the army by the system of espionage, and the prime minister himself was forced to admit that his representatives had acted as a political police in the army In Jan 1905 Doumer, the candidate put forward by the opposition, was elected president of the chamber, and the ministry fell beneath the blows of the socialist, Millerand

Delcassé.—An opportunist, Rouvier, succeeded Combes and continued his anti-clerical policy with less asperity, but with an equal indifference to foreign affairs The separation of the Churches from the State was passed with the support of the socialist, Briand, but its application raised great difficulties During this period of agitation and instability, Delcassé, who was faithful to the Radical tradition of opposition to distant adventures and to *rapprochement* with Germany, worked freely at the ministry of foreign affairs to neutralize this policy. In 1899 he brought about a reconciliation between England and France by the settlement of the Fashoda incident, in 1902 he obtained the neutrality of Italy, in 1904, aided by King Edward VII, he settled all colonial disputes with England, and in exchange for the abandonment of Egypt, obtained the right to complete the French empire in northern Africa by the protectorate of Morocco But, encouraged by the defeat of Russia by the Japanese in Manchuria, the Emperor William II. endeavoured by his visit to Tangiers to inflict a defeat upon the other member of the alliance He was successful in that Delcassé, advocating resistance, was disavowed by his colleagues in the ministry and resigned (June 1905) The Algeciras Conference (*q v*), by recognizing French claims in Morocco, averted a war that France would have found difficult to wage. Henceforth until 1914 France lived in the expectation of an attack on the part of a warlike and imperialist Germany which saw in every diplomatic or military defensive action, justification for believing that she was being encircled and therefore must arm herself still more

Syndicalism.—Meanwhile, French democracy shelved the Alsace-Lorraine question and reduced the period of military service to two years. Full of international ideals, it believed that it would assure peace merely by being pacific Only against itself was it aggressive By establishing the General Confederation of Labour in 1895 the workers had introduced a new method of opposition into political life. Up till that time the Socialists had sought to win political power by gaining a majority in the assembly and the government, the Syndicalists sought to achieve revolution at a blow by a general strike that should shatter both capitalism and the State. They preached social war instead of national wars, and organized strikes in the army, direct action and sabotage.

1906–14.—The elections of May 1906 fought on the Separation policy, resulted in a brilliant, but ephemeral success for the Bloc. The Radical ministry of Clemenceau and Caillaux sought to reconcile two contradictory policies Clemenceau favoured the *entente* with England and Caillaux the *rapprochement* with Germany. The former desired to complete the work of separation; the latter to impose an income tax The ministry met the chamber with a vast programme of reforms not one of which it was able to realize It at once came into conflict with the Confederation of Labour, which stirred up a continual agitation among the workmen and officials first there were strikes of labourers at Draveil and of vine-dressers in the south, which had to be suppressed by force, then the school-teachers and postal workers endeavoured to form a union and claimed the right to strike These events caused Clemenceau to adopt an attitude of growing hostility towards the Socialists It was only by a series of makeshifts that he was enabled to set up an ecclesiastical system on the basis of toleration, but lacking legal title When Caillaux, faced with a financial situation which had again become acute since the return of the Radicals to power, sought to cover the deficit by the imposition of a progressive income tax, he came up against the Moderates The ministry fell in July 1909 The ministerial instability of 1885–89 reappeared in an aggravated form In the period 1910–14 eight ministries succeeded one another, paralyzed rather than supported by majorities obtained by fragile and heterogeneous coalitions The Bloc dissolved in face of the attacks, both of the Socialists led by Jaurès and of the supporters of proportional representation, that is to say, of the right of minorities, against the Radicals who were devoted to the *scrutin d'arrondissement* The two ministries of Briand (July 1909–Feb 1911) were marked by the energetic repression of the general strike of railway workers, and the regulation of the separation of the Churches from the State Then came the ministry of Monis—which was overthrown through an aeroplane accident in which the war minister was killed outright and Monis seriously injured (May 1911)—and of Caillaux, who fell through the Agadir incident As the Left majority gradually diminished Poincaré came into power in Jan 1912, pledged to follow a national policy. When on the expiration of Fallières' term of office, Poincaré was chosen over Pams, the candidate of the Left, to succeed him as president of the republic, a third ministry of Briand lasted two months before giving way to the progressivist Barthou Barthou, alarmed by the extraordinary military credits demanded from the Reichstag for the increase of the army, sought to re-establish the three years' service in face of a coalition of the Radicals and Internationalists This conflict brought about the revival of the *Bloc des Gauches* led by Caillaux, president of the committee of the rue de Valois, who had for their programme two years' military service, the secularization of the Church properties and an income tax Defeated in the chamber Barthou yielded place to Doumergue, whose plan for proportional representation and fiscal reform was rejected by the senate. In the elections in May 1914 the Left group gained a majority, and the ministry of Ribot, after a life of 24 hours, gave way to that of Viviani The thunderbolt of Serajevo shattered this political kaleidoscope (June 1914)

Balkan Unrest.—Whilst these conflicts were taking place, an atmosphere of foreboding was rising in Europe (*q.v*). Germany, threatened by apoplexy in population and industry, was seeking outlets and colonies in all directions Having failed to break either the Franco-Russian Alliance or the Triple Entente, she grew more and more aggressive. She had shown her temper at the two Hague Peace Conferences in 1899 and in 1907, and had piled up incidents in Morocco, at Tangiers, at Casablanca, at Agadir. Each concession only made her more exacting Then from Morocco,

where he had not had even the support of Austria, his "brilliant second," William II turned his attention to the East. The Turkish Revolution of 1908, and the advent of the national (Young Turk) liberals in the place of the Old Turks, had aroused in the Balkans fresh national aspirations dangerous to Austria-Hungary

In this new sphere German influence received a double setback, military and political, which added to her irritation. The one was the defeat of the Turks, the pupils of German generals, by the coalition of Bulgars, Greeks and Serbs (1912), the other was the downfall of the Bulgars, the allies of Austria (1913). The German government could re-establish its prestige only by military action, hence she increased her army partly to support Austria, but partly also through apprehension of France, whose union with Russia was drawn ever closer. These circumstances had determined the Barthou ministry to increase the term of service to three years in spite of the democratic parties in France, who were loud in protestations of sympathy with the German socialists at their joint meetings in Switzerland, where the Germans, in return, promised not to follow William II.

Austria held that the independence of Serbia was incompatible with the maintenance of her own monarchy The German Emperor, impulsive, discredited in the eyes of public opinion, hard pressed by the military Junta, desired war in order to recover his prestige. On June 28, 1914, the assassination at Sarajevo provided a sudden opportunity to resuscitate the entire Balkan problem. The Triple Entente was paralyzed France by the struggles of parties which did not stop short of crime and by "international" propaganda which declared war to be impossible, Russia by widespread strikes; England by the Irish crisis So little did France realize what was on foot that Poincaré and Viviani were actually visiting the tsar, when the Austrian ultimatum, drawn up after *carte blanche* had been given by Germany in terms that precluded acceptance, was presented to Serbia on July 25 Nevertheless, on the advice of France and the friendly powers, Serbia accepted almost the whole Austria however decided not only to break off diplomatic relations, but also to declare war on Serbia (July 28) *See* WAR GUILT for special examination of the facts, also EUROPE.

THE WORLD WAR

Mediation by four powers, direct negotiation, arbitration at The Hague, all were refused The Austrian mobilization provoked Russia, which proceeded from a partial to a full mobilization This led Germany to declare war on Russia She had tried to secure the neutrality of England She also endeavoured to intimidate France, and prescribed the demand of Toul and Verdun as hostages for the renunciation of the Russian alliance The French government declared that it would be guided by its own interests alone, made a last appeal to the king of England, whose intervention might possibly still have made Germany stop to reflect, and, on July 30, in order to avoid all appearance of aggression, withdrew her troops to 10 kilometres from the frontier

On Aug 2, by his violation of Belgian neutrality, and on the 3rd, by his declaration of war on France, William showed that he understood neither the history of England nor that of France The former had never tolerated the presence of a great power at the mouth of the Scheldt, and from the time of Louis XIV. to Napoleon, had shown that she would never retire from a conflict until she had been victorious As for the latter, in one blow, as in all other tragic moments of her destiny, German aggression rebuilt "l'union sacré." On Aug 4 England declared war on Germany "for the sake of a scrap of paper" and Italy declared her neutrality.

Everybody believed that the war would be a short one, on account of the prodigious military and financial effort entailed. It was to last for more than four years (July 28, 1914–Nov. 11, 1918); it took on the character of a fight to the finish, not only between armies, but between whole nations, and, with an aspect increasingly scientific, industrial and economic, grew to undreamt-of proportions. (For all detail, *see* WORLD WAR, etc.)

The first period was one of movement; it lasted for four months. The German plan was to force a decision in France by a series of staggering blows and then to turn against Russia. It nearly succeeded. On Aug. 20 the French offensive was broken at Morhange in Lorraine; on the 22nd the French and the English, who had advanced to help the Belgians, had to withdraw from Mons and Charleroi to the Somme, and thence to the Marne; but there, by one of the most marvellous recoveries known to military history, the foresight of Galliéni, and the imperturbable *sangfroid* of Joffre, they stopped the invasion (Sept. 6–12). The Germans were repulsed a second time, when they attempted to resume their offensive in Flanders, thanks to the battle of the Yser (Oct. 20–Nov. 17)

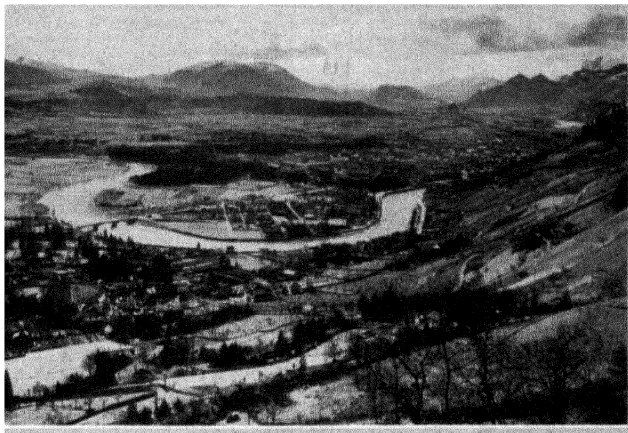
The second phase brought in the subterranean and murderous war of trenches and battles of attrition. To hold on to the death became the order on both sides of the front, which now extended from the North sea to the Suez canal The opposing forces were in equilibrium By reason of her long preparation during years of peace, her splendid organization, her alliance with Turkey, Germany possessed sufficient resources to balance the numerical superiority of the allies and their control of the sea. The year 1915 was spent in fruitless attempts to break through, in Champagne (March–Sept), and in Artois (May–June), and on the Isonzo after Italy had entered the war against Austria (May 25). It was, moreover, a year of reverses for the Allies in the East; *i.e.*, the Dardanelles where Anglo-French forces unsuccessfully tried to force an entrance into Russia after communication had been cut by the Turks, the overwhelming of the Serbs, thanks to Bulgaria, who joined the Central Powers (Oct 5), and finally the immobilization in its turn of the Russian front after the conquest of Poland by German and Austrian troops.

Verdun.—1916 was pre-eminently the year of Verdun, the most formidable battle of the war on account of its length (Feb–Aug) and of its epic tenacity Having put Russia out of action, the Germans determined to pierce the French front, or to drain French manhood, and chose this old city, whose very name at once became a symbol. The reverses which the Germans suffered were very costly, however, and caused a change of tactics They began a series of "peace offensives" Being well supplied with sureties, the Germans hoped to tire out the Allies and to escape from the position with advantage to themselves The intervention of Rumania (Aug 28), the vigorous counter-offensive of the Allies on the Somme, and of the Italians at Gorizia, revived the hopes of the Allies, but in vain; in a few weeks Rumania was crushed; and Greece, under Constantine, brother-in-law of William II, seemed to favour the latter, the Russians conquered Armenia, but again the naval battle of Jutland was indecisive, while an English army, shut up by the Turks in Mesopotamia, was obliged to surrender

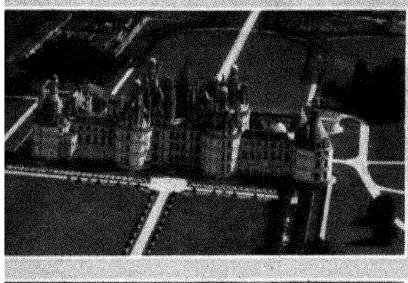
And so the war went on, with ever-growing intensity, costing daily thousands of human lives, and swallowing up the capital accumulated for generations

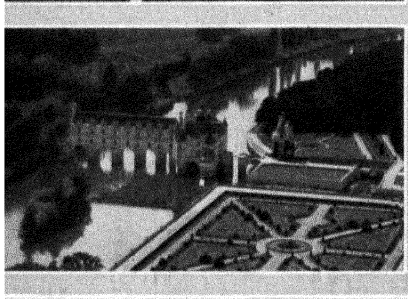
1917.—Under this appalling strain weariness and demoralization—the revolt on which Germany was counting—began to appear among the allies. Hence 1917 was the most difficult year, less on account of the actual course of the war, than because of political and economic events. Exhausted by her losses and by the allied naval blockade, Germany redoubled her intrigues and attempts to impose peace on her adversaries, and gained formidable help from her unrestricted submarine warfare (Jan. 31) and the Russian Revolution (March) Since she dared not use her battle fleet on the high seas after the battle of Jutland, Germany decided to starve England by sinking all food ships, even those flying a neutral flag Instead of bringing her victory, the submarine war was fatal to her, for it brought about the intervention of the United States (April 6) But this ally was far away and without an army. Just at the breaking point of the Entente, the October Russian Revolution, overturning the Kerensky Provisional Government of March, caused the final withdrawal of the Russian army from the Allied front.

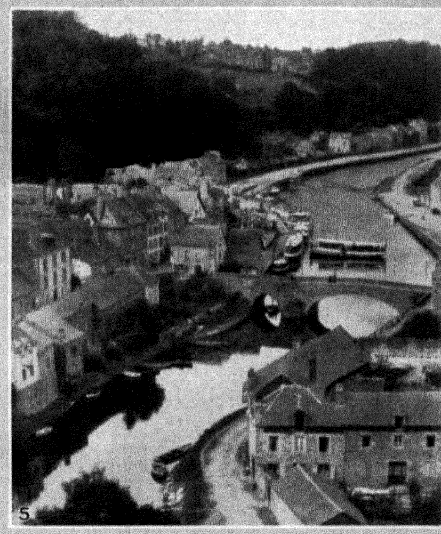
These events naturally affected France, the chief battleground. Following the check of a new offensive on the Aisne, the attrition of English reserves in Flanders, and finally the Italian disaster at Caporetto (*q.v.*), mutinies broke out in the ar[illegible] of 1914 was weakened behind the front, and rival [illegible]

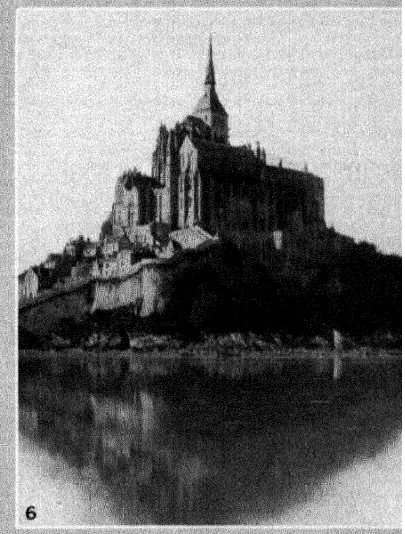




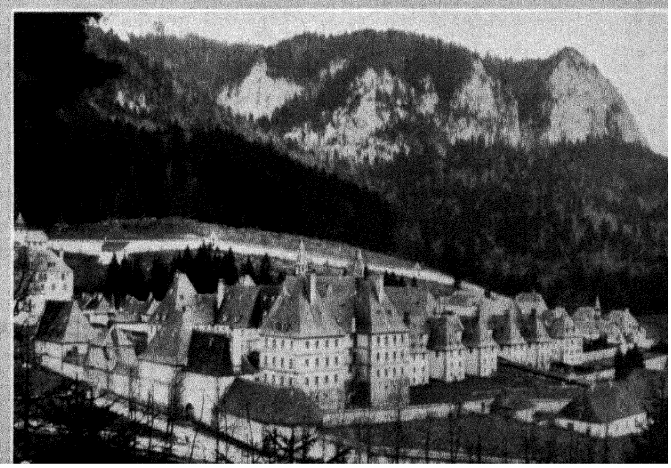












PHOTOGRAPHS, (1, 2, 7, 8) EWING GALLOWAY (3, 4) ORIENT AND OCCIDENT, (5) H. ARMSTRONG ROBERTS (6) THE FRENCH LINE

OLD FRENCH TOWNS, CHÂTEAUX AND MONASTERIES

1 View of Grenoble, the chief town of the department of the Isère, southern France. It is situated on both banks of the river Isere, at the foot of the mountains of the Grande Chartreuse. 2 Chamonix in the French Alps, with Mt. Blanc in the background. 3 Chateau de Chambord, near Blois, in northwestern France. An aerial view, showing the profusion of turrets, pinnacles, elaborately carved chimneys and dormers which compose its roofs and form one of its principal points of interest. The present building was begun in 1526 for Francis I, who spent most of his latter years there. 4 Aerial view of the Château de Chenonceaux, Touraine, built over the river Cher. The château, which was begun in 1515 on the site of a fortified mill, was given by Henry II to Diane de Poitiers. It eventually came into the possession of Catherine de Medicis, who added the gallery above the bridge to the left. 5 Dinan, a mediaeval town in Brittany, at the head of the estuary of the Rance, a favourite resort for foreign visitors. 6 Mont-Saint-Michel, a fortified island abbey on the Norman coast, near the border of Brittany. Tradition places the founding of a monastery here in 708, but the earliest existing remains are from the Benedictine abbey of the 10th century. The Gothic structure called *la Merveille*, of which the long, buttressed wall is seen here, was built in the 13th century. 7 Argentat, a village on the river Dordogne near Tulle, in the south of France. 8 The monastery of La Grande Chartreuse, near Grenoble, until 1901 the parent house of the Carthusian order, founded by St. Bruno in 1084. As a result of repeated fires, few remains of the original monastery exist. The present buildings date from the 17th century.

appeared in parliament. Under a vacillating Government a defeatist peace propaganda, supposed to have been supported by the minister of the interior, was started in the army and behind the front In order to counteract this, not only was a strong Government necessary, but one that was not likely to be pro-German Clemenceau, inheritor of the Jacobin tradition of public safety, president of the council in November, 1917, "made war" both at home and abroad, and swept away all the Malvys and Caillaux, while Pétain took the army in hand

1918.—It was time that something was done. At the beginning of 1918 the eastern front gave way completely. By the peace of Brest-Litovsk (*q v.*) with the Russian communists, and the peace of Bucharest with the Rumanians, Germany was free to concentrate all her forces on the west and to strike a decisive blow on that front before the arrival of the Americans As in 1914 she almost succeeded, thanks to the superiority of her effectives and her unity of command On March 21, 1918, in Picardy, on April 9 in Flanders, and on May 27 on the Aisne, the French and English fronts were overwhelmed and broken under an avalanche of poison-gas shells; the Germans advanced on Calais and Amiens, and pushed to within 65 kilometres of Paris, which they bombarded day and night by aeroplanes and by monstrous and mysterious guns But unity of command grew out of the danger of disaster Foch was opposed to Ludendorff The campaign had now leadership and method; but the final battle was to last more than seven months

Having been checked along the whole line after these passing successes, the Germans were once more defeated on the Marne (July 15–18). Foch in his turn took the offensive Without giving the enemy time to breathe, he piled attack on attack, and forced him to retreat further every day in face of a combined attack of all the allied armies, till on Nov 11 he drove him to capitulate in order to prevent total catastrophe. The armistice had been preceded and hastened by the collapse of Turkey and Bulgaria, and then by the overthrow of the Austro-Hungarian monarchy. Revolution broke out in Berlin and Munich, and William II, followed by the crown prince, fled to Holland French troops re-entered Alsace-Lorraine, and there received, after half a century's absence, an unforgettable reception. Sedan was avenged Victory was achieved, but Europe was in ruins.

AFTER THE WAR

The Conference of Paris.—A people battered in a four and a half years' struggle was swept by a wave of optimism Peace seemed a happy and easy thing But how different was the reality! The allies had no more foreseen the peace than they had anticipated the war. The French programme consisted of a vague formula of "restitution, reparation, guarantee" The Fourteen Points (*q v*) put forward by President Wilson were no less vague and were complicated into the bargain. As soon as their common danger was over the Allies returned to a consideration of their national interests, the English were pre-occupied with the sea, the French with their security on the Continent. And so amid the conflict of interests and traditions, the Conference of Paris elaborated a series of treaties which swept away the old Europe (*See* PARIS, CONFERENCE OF, and VERSAILLES, TREATY OF.)

Germany was required to restore Alsace-Lorraine to France, and to repair the immense and systematic ruins she had made As security for the undetermined milliards of these reparations the left bank of the Rhine was to be occupied by the western States until the day when Germany, having reduced her armaments as directed, should be admitted into the League of Nations, President Wilson's new Holy Alliance. Such were, in its main outlines, the terms of the peace signed on June 29, 1919, in the same Hall of Mirrors at Versailles as had seen the proclamation of the German empire on Jan. 18, 1871. The Treaties of St Germain, Neuilly and the Trianon (*qq.v.*) settled the fate of what was left of Austria, Bulgaria and Hungary. Turkey refused the terms of the Treaty of Sèvres (*q.v.*).

And so a multiple peace grew out of a multiple war. It was a mixture of many principles, including those of the balance of power and of nationality, and it left many problems unsettled for the future. It was not a permanent solution, but only one stage of development. The feeling soon arose that the fatality of French history would reappear; that France once more would be forced to pick her difficult way between an England whose sole pre-occupation was the balance of power on the continent now that her sea power was secure, and a Germany who soon protested against the Treaty of Versailles and whose nature had not changed with her government.

The National Party.—The first essential was to restore to the country its normal political and economic life. Universal suffrage had not been consulted since 1914, the mandate of the existing chamber had expired The elections of Nov. 1919 were conducted on a basis of proportional representation, and were, moreover, fought on a programme of national republican union and the natural Rhine frontier. The parties of the Left paid for their compromising attitude during the war; the Bolshevik menace, which had spread from Russia to Germany, secured the victory to the moderates of the *Bloc National;* the Radicals lost half their seats But Clemenceau in turn was the victim of the disillusionment caused by the peace. he belonged to the past Deschanel was chosen president of the Republic when Poincaré's term of office expired, for he seemed to be the one man capable of presiding over the organization of peace and the future destiny of the country For France, terribly wounded, though victorious, the first consideration, as in 1871, was a programme of national reconstruction.

The Millerand Ministry.—The new year opened with a series of strikes, followed by the unhappy Caillaux (*q.v.*) case For the first six months of 1920, Millerand, recalled from Alsace to form a ministry, set himself to restore order in the city: order in the streets against the General Confederation of Labour (C.G.T), order in the public services, which were claiming the right of association and the right to strike, order in the finances by the vote of eight milliards of new taxes Above all, he strove to extract the best he could from this "treaty, heavy rather with promises than realities" The Allies did not follow him in the interpretation which he put upon it The American senate threw Wilson over and finally refused to ratify the Treaty of Versailles, preferring to conclude a separate peace with Germany The British Cabinet desired to show Germany, a ruined and disarmed enemy, the same leniency which, in 1815, she had shown to France. To lose the fruits of victory or to break the *entente*—such were the horns of the dilemma upon which Millerand found himself, as had Clemenceau before him from the end of 1917 to the armistice. Every attempt to find a favourable solution, every conference, resulted in the repudiation of some part of the debt to France on the part of Germany; for she was astute enough to profit by Allied dissension The Treaty of Versailles became a *"peau de chagrin."*

When allied financial solidarity had been broken, recriminations were made against the falling exchange and the insufficiency of taxation in exhausted France When the working classes replied to the military *coup d'état* at Berlin with a general strike, and the *Reichswehr* entered the Ruhr basin in order to put it down, none of the Allies thought fit to join in Millerand's counteraction consisting of the occupation of Frankfurt (April–Aug.). When the Red armies, in April 1920, were threatening Poland, the England of Lloyd George and the United States of Wilson refused to intervene It was Weygand's army which saved Warsaw, just as it was Gouraud's which enforced the French mandate in Syria. After the sudden appearance of danger in Poland, the successful action of Millerand resulted in his election to the presidency of the Republic, vacant through the illness of Deschanel (Sept.).

Leygues and Briand.—Millerand wished to emulate the president of the United States, who, not content to be a figurehead, actually governed. He claimed to exercise a kind of higher control over the direction of affairs, and hinted at a change in the constitution of 1875 in this sense. His authority, and the cleverness of Leygues, his president of the council, were necessary to bring to an end numerous difficulties in the grave territorial questions dealing with Upper Silesia, the reunion of Austria to Germany, and the question of disarmament In the same way his direction

was essential in all the incidents arising out of the settlement of reparations, the number of which was increased by the deliberations of experts, by conferences of Allied ministers, and by the supreme council After he had re-established a French embassy to the Vatican in the face of Radical and Socialist opposition led by Herriot and Paul Bŏncour, Leygues fell from power in a new Chamber as a result of the grave deficit in the revenue (Jan. 1921).

Briand, his successor, declared that he would not allow himself to be taken in by "the last struggles of German trickery," that France was tired of going from conference to conference—from deception to deception, and even threatened to seize guarantees He allowed himself, however, to be drawn into making more and more concessions to the changeable opinions of Lloyd George The Conference of Cannes followed the CONFERENCE OF LONDON (*qq v*): (Great Britain), Upper Silesia, the Ruhr, Constantinople, Angora, Feisal, Poland and Russia—all these were questions requiring a settlement It was claimed that some kind of compromise could be made between the victors and the vanquished by the admission of Germany to the deliberations; and Soviet Russia was to be asked to attend a future conference at Geneva The chambers and public opinion protested, and Millerand recalled Briand, and asked for his resignation, although he had not been defeated in parliament (Jan 1922)

Poincaré's Ministry.—Poincaré, hostile to all concessions to Germany, while she refused either to disarm or to pay, was chosen to reform French policy His policy was founded on respect for treaties and social order, in his opinion the Treaty of Versailles, although he might have wished it different, was inviolable and he demanded that it should be exactly carried out After the Genoa conference (*q v*) which, thanks to the Russo-German treaty of Rapallo (*q v*) was nothing but another Day of Dupes, after so many experiments which had done nothing but reduce German indebtedness, only one policy, he considered, was left—the policy of safeguards No further reduction of Germany's debt was to be allowed unless the former allies accepted the cancellation of Allied debts, of which they had just demanded payment

At the end of June Poincaré was victorious in the chamber in spite of an *entente cordiale* between communists, socialists and radical-socialists preparatory to the elections of 1924, and in spite of England And so when the repeated and deliberate evasions of her engagements by Germany had been attested under the Treaty of Versailles by the Reparations Commission, Franco-Belgian troops occupied Essen (Jan 11, 1923), and France declared that she would not evacuate either the Ruhr or the left bank of the Rhine so long as Germany refused to fulfil her engagements The likelihood was that foreign pressure or a change of feeling at home would weaken this resolution True to her traditional policy, England several times proposed mediation France declined, maintaining that she claimed nothing but her due and was not seeking the hegemony of Europe She refused to allow the war debts of Germany to be put on the same footing as the inter-Allied debts, contracted for the common purpose of winning the war, or to admit a prior claim to the recovery of these inter-Allied debts before the payment of reparations Hence, faced by the inevitable ruin of German finance and the danger of the collapse of the *Reich*, Stresemann yielded (Sept 24)

This was the moment chosen by the congress of French Radical-Socialists to begin an intensive campaign against the *Bloc National*, in reply to a speech of President Millerand at Evreux, wherein he had restated the vital necessity of unity, if victory was to be achieved Already many radicals, especially in the south, had joined the socialists in forming the *cartel* of the Left, with the object of defeating Poincaré in the elections of May 1924 In the meanwhile, the signing (Sept 23) of an agreement between the representatives of the great industries of the Ruhr and the Franco-Belgian authorities, was both a fresh proof of victory and a proposal for peace But the advent of a labour Government in England stiffened German resistance

Financial Policy.—The reparations on which France had reckoned had not been paid, and it was doubtful whether they ever would be; hence she was obliged to rebuild the ruins by her own efforts. The work, far from being finished, had already used up considerable capital which, joined to the enormous war debts and aggravated by paper currency, had attained fabulous figures. Grave financial difficulties soon became a political danger, as the *ancien régime* and the revolution had shown Very heavy taxation provoked resistance and encouraged demagogy The too easy expedient of paper currency precipitated the crash. The foreign policy of Poincaré was only vulnerable at two points the stability of the franc and the high cost of living. In order to combat an international attack on the franc, economies and taxes such as had been too much neglected during the war, were now necessary, and this was a difficult policy for an election programme. On ground so favourable to its electoral hopes the opposition confronted the Government with obstruction both in and out of parliament, and the Government, as had happened in other war-stricken European countries, reinforced its power and substituted a regime of law by decree for the rules of ordinary parliamentary practice (Feb 1924) The vote of the *double décime* was a financial Verdun In ten days the franc rose from 120 to 80 In April, allied unity was reconstructed on the solid basis of the Dawes plan (*see* REPARATIONS and DAWES PLAN), which set up over Germany a tutelary council invested with very extensive powers

After the battle of the franc, the electoral battle had to be won Poincaré lost it on May 11 1924 It was the result of a movement towards the Left at the very moment when the German elections of May 4 strengthened the parties of the extreme Right and the extreme Left This was not entirely the fault of an electoral law mutilated by Radical amendments; the action of the Government had been weak and vacillating in home politics, neither patriotism nor republicanism was sufficient in itself, and the suffering country listened more readily to those who promised it peace and an end of its difficulties The cartel of the Left began with a parliamentary *coup d'état* the forced resignation of the president of the Republic, for Millerand was sacrificed to the hatred of the radicals and the socialists (July 1924) They had never forgiven him for the *Bloc National* of 1919, for his assumption of increased powers, nor, above all, for the speech at Evreux However, instead of Millerand, and against Painlevé, the candidate of the cartel, Doumergue was elected by a large majority The candidate of the Left for the presidency of the senate, Bienvenu-Martin, was also rejected—a double warning on the part of the senate to the party which for the time possessed the majority in the chamber

The Herriot Ministry.—The Herriot ministry brought once more to the fore the old Radical programme, anti-clericalism extending to Alsace-Lorraine, the withdrawal of the embassy to the Vatican and the income-tax, together with Socialist demands the right of trade unionism for State employees, the capital levy and the reduction of military service The socialists, thanks to their "policy of support," shared in the benefits of office without its responsibilities The new government had to face great financial difficulties From 1924–26 there were no less than seven ministers of finance

The encashment of bonds, the depletion of bank balances, the flight of capital, the fall of the franc, followed in quick succession The ministry's record was no better in foreign policy Having given up the guarantee of the Ruhr in Aug 1924 at the Conference of London (*q v.*), it did indeed at Geneva, by its valuable initiative, secure the triumph of the principle of arbitration But the refusal of the British House of Commons to ratify "the protocol" and the German elections of Dec 7, crowned on April 26 by the election of Hindenburg as president of the *Reich*, were not balanced by the resumption of relations with Bolshevik Russia.

The ministry of Herriot fell on April 11, 1925, when it was discovered that the Government had borrowed from the Banque de France a great deal more than it was legally allowed to borrow, and had secretly inflated the currency. On April 11 the order of the day in the senate demanded the re-establishment, "by the union of republicans, of internal peace and national concord."

The Painlevé Ministry.—The Painlevé-Caillaux-Briand ministry came into office after the socialists had once more refused the responsibilities of government through fear of their supporters joining the Communists. While proclaiming itself a loyal adherent of the radical policy, it had to make concessions to the senate on the subjects of military reform, the capital levy, the embassy to the Vatican and the Alsatian Concordat. Its first consideration was the development of the Protocol of Geneva and financial stability Although its make-up was Cartellist, its policy was quite different

The Locarno Conference.—The Painlevé ministry adopted a policy of relative conciliation At Locarno (Oct 16, 1925) Briand renounced the spirit, though not the letter, of the Treaty of Versailles, and patched up the *entente* between France and England At the same time he opened the way to *rapprochement* with Germany, provided that she remained faithful to her treaties. It was the first step towards a federation of Europe At home, the Government weakly took part in the Radical and Radical-Socialist conference at Nice, at the moment when, amidst the financial distress, the rising of Abd-el-Krim in Morocco, and of the Druses in Syria made it necessary to incur unforeseen expenses. At Nice the suggestion was made that a new Cartel should be formed—a consummation which the Socialists no longer desired The first victim was Caillaux rehabilitated on the strength of his financial reputation, he fell because in his financial projects he sinned against radical doctrine, the Painlevé cabinet patched up after his fall (Nov 22, 1925), fell itself shortly afterwards, on a proposal to stop the payment of French Government Treasury Bonds

After Herriot an inflation of five milliards had to be voted; after Painlevé seven and a half milliards In addition to the double *décime* which the Cartel was to suppress, a quintuple *décime* was raised Meanwhile the cost of living rose higher and higher In Alsace and Lorraine there arose a movement in favour of autonomy Briand could not decide between two possible majorities; concerned with conciliating the Left, he did all in his power to conciliate the Socialist group On the other hand, Doumer, his finance minister, broke with the formula of the Cartel and followed an anti-socialist fiscal policy On March 6, 1926 the ministry fell, being deserted by the Left and the Right

The Geneva Ministry.—On March 10, 1926 Briand patched up the "Geneva" ministry, since it was impossible to keep waiting 45 nations assembled to decide upon the admission of Germany to the League of Nations The same ministers, therefore, reappeared, but with a third and different finance minister, Peret But Malvy's inclusion as minister of the interior did not help in the formation of a new majority, a task rendered yet more difficult by by-elections in Paris, in which appeared a new Cartel, including the Communists, and by the speech of Herriot at Châteauroux

In spite of fresh taxation, the balancing of the budget was as precarious as ever, the problem of stabilization had not yet been faced, and the question of debts owed to the Anglo-Saxon countries, in spite of Caillaux's efforts at London and Washington, followed by those of Berenger, had not reached a satisfactory settlement. This was slight material upon which to resume the "battle of the franc," which was beginning again as in 1924. On May 20 it had fallen to 170 to the pound sterling The expedient of throwing in the Morgan funds as *masse de manoeuvre* failed The struggle was still political rather than financial, the refusal of the Banque de France to pledge its gold reserve without political union in face of the common danger, brought about the fall of the second Briand ministry (June 15, 1926).

On June 23 Briand returned to power, this time with Caillaux as financial dictator, in order to rectify the finances. An isolated interpellation by Herriot, the president of the chamber, and one by L. Marin, president of the Republic-Democratic Union overthrew it over the question of the full powers claimed by Caillaux, the financial dictator.

The Ministry of National Union.—The announcement of a possible return of Herriot to power produced a general panic: the franc fell to 240. The State had only 60 millions in the treasury. The bankruptcy of the Cartel restored Poincaré A ministry of National Union was composed of the leaders of the chief groups in both chambers It needed the evidence of danger, and the authority of Poincaré to effect a truce between the two opposing parties in order to save the national finances, and with them the system of government

The opposition recruited from Cachin's Communists, Blum's Socialists, and the extreme Left Radical-Socialist group led by Caillaux, was more or less resigned to allowing "the Poincaré experiment" to have its way, in the secret hope of seeing it fail, or of profiting, as in 1924, by the unpopularity of fresh taxation and a new economic crisis At the re-election of the third of the Senate in Jan. 1927, the party forces remained unchanged, despite the small schism of the Radical-Nationalists of Franklin-Bouillon. Nevertheless, Poincaré was, at last, able to carry out a logical programme, proceeding from the simple to the composite, and resolved to awaken general confidence in the country and among its allies.

Foreign Policy.—Two years of the Cartel had led foreign States to believe that the Government of the Republic was prepared to yield on all hands Germany, after her admission to the League of Nations in Sept. 1926, and the meeting at Thoiry, (Italy) under the expansionist sway of Mussolini, and even Spain, under Primo de Rivera, with a view to Tangiers, had not resisted the temptation to exploit the weakness of France With regard to Germany, Poincaré declared himself ready to adopt a policy of *rapprochement* without sacrificing French contractual rights, and without withdrawing from an attitude of watchfulness or allowing any doubt to arise as to the responsibility for the war The reparations question had been settled by the Dawes scheme. He therefore settled the question of disarmament by supporting the suppression of the inter-allied mission of military control on Jan 21, 1927, and then signed a Franco-German treaty of commerce on Aug 17. But he refused the desired evacuation of the Rhineland and a proposal for a revision of the Dawes scheme

The visit of the president to London in May was a solemn affirmation of the *entente* with regard not only to the questions of eastern Europe but to the world-wide problems entailed by Bolshevik propaganda Poincaré also helped to strengthen the Little Entente (*q v*) against all attempts to call in question the settlement of territories in the Balkans Having learnt by experience in 1925, at Washington, he refused to play what he considered the part of dupe at the naval conference at Geneva, for in his eyes disarmament was of necessity dependent on security.

Financial Reconstruction.—Thanks to this stability, long a stranger in home politics, financial recovery was carried through by regular steps The budget was balanced by means of nine milliards of new taxation, and voted twice before Jan 1, 1927 The floating debt was gradually consolidated and the value of money, pending its legal stabilization, stabilized *de facto*. Hence France gradually settled down on a firm economic basis, and progressed along the path of financial reconstruction. The final step was taken in 1928 by the re-establishment of the gold standard at about one-fifth of pre-war parity. (P W.)

1928.—In Jan. 1928 the chamber decided to reduce the period for compulsory military service from 18 months to 12 months. In February an arbitration treaty was signed between France and the United States In April the general election showed a decisive victory for the Poincaré ministry. The earlier part of the year was as a whole disturbed by the autonomist agitation in Alsace-Lorraine (*q v*) and by the subsequent arrest and trials of the leaders of that party. For some time the question of a pact for the "outlawry of war" (*q.v*) had been under negotiation between the United States and France; it was brought to a successful conclusion when on Aug. 27 the "Kellogg Pact" was signed at Paris by 15 nations. Although of no greater binding force than any other treaty it was rightly regarded throughout the world as a deliberate step in the direction of disarmament Shortly afterwards some apprehension was caused by the premature revelation in the Press (Oct 5) of the Anglo-French Naval Compromise,

which was immediately subjected to heavy criticism—especially in America—in spite of disclaimers to the effect that the agreement was purely provisional.

France was still opposed to any change of policy of the Rhineland (*q v*), but early in September the question of evacuation at least received particular discussion between Briand and Herr Muller at Geneva On Nov. 7, the Poincaré Cabinet resigned as a consequence of a clause in the manifesto passed by the Socialist-Radical Congress at Angers which obliged four ministers, members of that party, to withdraw from the Government Poincaré, however, was able immediately to reform his cabinet, and his ministry received a substantial vote of confidence, which again was repeated during the early part of the new year 1929 (*See* also SECURITY, EUROPE, RUHR, RHINELAND, REPARATIONS AND DAWES SCHEME)

BIBLIOGRAPHY AND HISTORIOGRAPHY

The scientific study of the history of France only begins with the 16th century It was hampered at first by the traditions of the middle ages and by a servile imitation of antiquity. Paulus Aemilius of Verona (*De rebus gestis Francorum,* 1517), who may be called the first of modern historians, merely applies the oratorical methods of the Latin historiographers. It is not till the second half of the century that history emancipates itself; Catholics and Protestants alike turn to it for arguments in their religious and political controversies François Hotman published (1574) his *Franco-Gallia;* Claude Fauchet his *Antiquités gauloises et françoises* (1579), Étienne Pasquier his *Recherches de la France* (1611), "the only work of erudition of the 16th century which one can read through without being bored" Amateurs like Petau, A de Thou, Bongars and Peiresc collected libraries to which men of learning went to draw their knowledge of the past, Pierre Pithou, one of the authors of the *Satire Ménippée,* published the earliest annals of France (*Annales Francorum,* 1588, and *Historiae Francorum scriptores coetanei XI,* 1596), Jacques Bongars collected in his *Gesta Dei per Francos* (1611–17) the principal chroniclers of the Crusades. Others made a study of chronology like J. J. Scaliger (*De emendatione temporum,* 1583, *Thesaurus temporum,* 1606), sketched the history of literature, like François Grudé, sieur of La Croix in Maine (*Bibliothèque française,* 1584), and Antoine du Verdier (*Catalogue de tous les auteurs qui ont écrit ou traduit en françois,* 1585), or discussed the actual principles of historical research, like Jean Bodin (*Methodus ad facilem historiarum cognitionem,* 1566) and Henri Lancelot Voisin de La Popelinière (*Histoire des histoires,* 1599).

But the writers of history are as yet very inexpert, the *Histoire générale des rois de France* of Bernard de Girard, seigneur de Haillan (1576), the *Grandes Annales de France* of François de Belleforest (1579), the *Inventaire général de l'histoire de France* of Jean de Serres (1597), the *Histoire générale de France depuis Pharamond* of Scipion Dupleix (1621–45), the *Histoire de France* (1643–51) of François Eudes de Mézeray, and above all his *Abrégé chronologique de l'histoire de France* (1668), are compilations which were eagerly read when they appeared, but are worthless nowadays Historical research lacked method, leaders and trained workers; it found them all in the 17th century, the golden age of learning which was honoured alike by laymen, priests and members of the monastic orders, especially the Benedictines of the congregation of St Maur. The publication of original documents was carried on with enthusiasm To André Duchesne we owe two great collections of chronicles· the *Historiae Normannorum scriptores antiqui* (1619) and the *Historiae Francorum scriptores,* continued by his son François (5 vols, 1636–49). These publications were due to a part only of his prodigious activity; his papers and manuscripts, preserved in the Bibliothèque Nationale at Paris, are an inexhaustible mine Charles du Fresne, seigneur du Cange, published Villehardouin (1657) and Joinville (1668); Étienne Baluze, the *Capitularia regum Francorum* (1674), the *Nova collectio conciliorum* (1677), the *Vitae paparum Avenionensium* (1693) The clergy were very much aided in their work by their private libraries and by their co-operation; Père Philippe Labbe published his *Bibliotheca nova manuscriptorum* (1657), and began (1671) his *Collection des conciles,* which was successfully completed by his colleague Père Cossart (18 vols) In 1643 the Jesuit Jean Bolland brought out vol. 1 of the *Acta sanctorum,* a vast collection of stories and legends which has not yet been completed beyond Nov. 10 (*see* BOLLANDISTS) The Benedictines, for their part, published the *Acta sanctorum ordinis sancti Benedicti* (9 vols., 1668–1701). One of the chief editors of this collection, Dom Jean Mabillon, published on his own account the *Vetera analecta* (4 vols., 1675–85) and prepared the *Annales ordinis sancti Benedicti* (6 vols., 1703–93). To Dom Thierri Ruinart we owe good editions of Gregory of Tours and Fredegarius (1699) The learning of the 17th century further inaugurated those specialized studies which are important aids to history. Mabillon in his *De re diplomatica* (1681) creates the science of documents or diplomatics Adrien de Valois lays a sound foundation for historical geography by his critical edition of the *Notitia Galliarum* (1675) Numismatics finds an enlightened pioneer in François Leblanc (*Traité historique des monnaies de France,* 1690). Du Cange, one of the greatest of the French scholars who have studied the middle ages, has defined terms bearing on institutions in his *Glossarium mediae et infimae latinitatis* (1678), recast by the Benedictines (1733), with an important supplement by Dom Carpentier (1768), republished twice during the 19th century, with additions, by F Didot (1840–50), and by L. Favre at Niort (1883–88); this work is still indispensable to every student of mediaeval history. Finally, great biographical or bibliographical works were undertaken; the *Gallia christiana,* which gave a chronological list of the archbishops, bishops and abbots of the Gauls and of France, was compiled by two twin brothers, Scévole and Louis de Sainte-Marthe, and by the two sons of Louis (4 vols., 1656); a fresh edition, on a better plan, and with great additions, was begun in 1715 by Denys de Sainte-Marthe, continued throughout the 18th century by the Benedictines, and finished in the 19th century by J Barthélemy Hauréau (1856–61).

As to the nobility, a series of researches and publications, begun by Pierre d'Hozier (d 1660) and continued well on into the 19th century by several of his descendants, developed into the *Armorial général de la France,* which was remodelled several times, extracts are often reprinted, the last volume to date being published in 1905 A similar work, of a more critical nature, was carried out by Père Anselme (*Histoire généalogique de la maison de France et des grands officiers de la couronne,* 1674) and by Père Ange and Père Simplicien, who completed the work (3rd ed., 9 vols, 1726–33). Critical bibliography is especially represented by certain Protestants, expelled from France by the revocation of the Edict of Nantes. Pierre Bayle, the sceptic, famous for his *Dictionnaire critique* (1699), which is in part a refutation of the *Dictionnaire historique et géographique* published in 1673 by the Abbé Louis Moréri, was the first to publish the *Nouvelles de la république des lettres* (1684–87), which was continued by Henri Basnage de Beauval under the title of *Histoire des ouvrages des savants* (24 vols). In imitation of this, Jean Le Clerc successively edited a *Bibliothèque universelle et historique* (1686–93), a *Bibliothèque choisie* (1703–13), and a *Bibliothèque ancienne et moderne* (1714–27). These were the first of our "periodicals"

The 18th century continues the traditions of the 17th. The Benedictines still for some time hold the first place. Dom Edmond Martène visited numerous archives (which were then closed) in France and neighbouring countries, and drew from them the material for two important collections *Thesaurus novus anecdotorum* (9 vols., 1717, in collaboration with Dom Ursin Durand) and *Veterum scriptorum collectio* (9 vols, 1724–33) Dom Bernard de Montfaucon also travelled in search of illustrated records of antiquity, private collections, among others the celebrated collection of Gaignières (now in the Bibliothèque Nationale), provided him with the illustrations which he published in his *Monuments de la monarchie française* (5 vols, 1729–33) The text is in Latin and French Dom Martin Bouquet took up the work begun by the two Duchesnes, and in 1738 published vol 1 of the Historians of France (*Rerum Gallicarum et Francicarum scriptores*), an enormous collection which was intended to include all the sources of the history of France, grouped under centuries and reigns He produced the first eight volumes himself, his work was continued by several collaborators, the most active of whom was Dom Michel J Brial, and already comprised 13 volumes when it was interrupted by the Revolution In 1733, Antoine Rivet de La Grange produced vol 1 of the *Histoire littéraire de la France,* which in 1789 numbered 12 volumes While Dom C François Toustaint and Dom René Prosper Tassin published a *Nouveau Traité de diplomatique* (6 vols, 1750–65), others were undertaking the *Art de vérifier les dates* (1750; new and much enlarged edition in 1770) Still others, with more or less success, attempted histories of the provinces

In the second half of the 18th century, the ardour of the Benedictines of St Maur diminished, and scientific work passed more and more into the hands of laymen The Académie des Inscriptions et Belles-lettres, founded in 1663 and reorganized in 1701, became its chief instrument, numbering among its members Denis François Secousse, who continued the collection of *Ordonnances des rois de France,* begun (1723) by J. de Laurière, J -B de La Curne de Sainte Palaye (*Mémoires sur l'ancienne chevalerie,* 1759–81, *Glossaire de la langue française depuis son origine jusqu'à la fin de Louis XIV.,* printed only in 1875–82?); J -B. d'Anville (*Notice sur l'ancienne Gaule tirée des monuments,* 1760); and L G. de Bréquigny, the greatest of them all, who continued the publication of the *Ordonnances,* began the *Table chronologique des diplômes concernant l'histoire de France* (3 vols., 1769–83), published the *Diplomata, chartae, ad res Francicas spectantia* (1791, with the collaboration of La Porte du Theil), and directed fruitful researches in the archives in London to enrich the *Cabinet des chartes,* where Henri Bertin (1719–92), an enlightened minister of Louis XV, had in 1764 set himself the task of collecting the documentary sources of the national history. The example set by the religious orders and the government bore fruit. The general assembly of the clergy gave orders that its *Procès verbaux* (9 vols., 1767–89) should be printed; some of the provinces decided to have their history written, and mostly applied to the Benedictines; Brittany was treated by Dom Lobineau (1707) and Dom Morice (1742); the duchy of Burgundy by Dom Urbain Plancher (1739–48); Languedoc by Dom Dominique Vaissète (1730–49, in collaboration with Dom Claude de Vic; new ed. 1873–93); for Paris, its secular history was treated by Dom Michel Félibien and Dom Lobineau (1725), and its ecclesiastical by the abbé Lebeuf (1745–60; new ed. 1883–90).

This ever-increasing stream of new evidence aroused curiosity, gave rise to pregnant comparisons, developed and sharpened the critical sense, but further led to a more and more urgent need for exact information. The Academie des Inscriptions brought out its *Histoire de l'Académie avec les mémoires de littérature tirés de ses registres* (vol i 1717; 51 vols. appeared before the Revolution, with five indexes; *see* the *Bibliographie* of Lasteyrie, vol. iii. pp. 256 *et seq.*). Other collections, mostly of the nature of bibliographies, were the *Journal des savants* (111 vols., from 1665 to 1792, *see* the *Table méthodique* by H Cocheris, 1860); the *Journal de Trévoux*, or *Mémoires pour l'histoire des sciences et des beaux-arts*, edited by Jesuits (265 vols, 1701–90), the *Mercure de France* (977 vols., 1724–91). To these must be added the dictionaries and encyclopaedias the *Dictionnaire de Morén*, the last edition of which numbers 10 vols (1759); the *Dictionnaire géographique, historique et politique des Gaules et de la France*, by the abbé J. J. Expilly (6 vols, 1762–70, unfinished); the *Répertoire universel et raisonné de jurisprudence civile, criminelle, canonique et bénéficiale*, by Guyot (64 vols, 1775–86; supplement in 17 vols., 1784–85), reorganized and continued by Merlin de Douai, who was afterwards one of the *Montagnards*, a member of the Directory, and a count under the Empire.

The historians did not use to the greatest advantage the treasures of learning provided for them, they were for the most part superficial, and dominated by their political or religious prejudices Thus works like that of Père Gabriel Daniel (*Histoire de France*, 3 vols., 1713), of Président Hénault (*Abrégé chronologique*, 1744; 25 editions between 1770 and 1834), of the abbé Paul François Velly and those who completed his work (*Histoire de France*, 33 vols, 1765–83), of G H Gaillard (*Histoire de la rivalité de la France et de l'Angleterre*, 11 vols, 1771–77), and of L P Anquetil (1805), in spite of the brilliant success with which they met at first, have fallen into a just oblivion A separate place must be given to the works of the theorists and philosophers *Histoire de l'ancien gouvernement de la France*, by the Comte de Boulainvilliers (1727), *Histoire critique de l'établissement de la monarchie françoise dans les deux Gaules*, by the abbé J B Dubos (1734), *L'Esprit des lois*, by the président de Montesquieu (1748); the *Observations sur l'histoire de France*, by the abbé de Mably (1765); the *Théorie de la politique de la monarchie française*, by Marie Pauline de Lézardière (1792) These works have, if nothing else, the merit of provoking reflection

At the time of the Revolution this activity was checked The religious communities and royal academies were suppressed, and France violently broke with even her most recent past, which was considered to belong to the *ancien regime* When peace was re-established, she began the task of making good the damage which had been done, but a greater effort was now necessary in order to revive the spirit of the institutions which had been overthrown The new State, which was, in spite of all, bound by so many ties to the former order of things, seconded this effort, and during the whole of the 19th century, and even longer, had a strong influence on historical production The section of the Institut de France, which in 1816 assumed the old name of Académie des Inscriptions et Belles-lettres, began to reissue the two series of the *Memoires* and of the *Notices et extraits des manuscrits tirés de la bibliothèque royale* (the first volume had appeared in 1787), began (1844) that of the *Mémoires présentés par divers savants* and the *Comptes rendus* (subject index 1857–1900, by G Ledos, 1906), and continued the *Recueil des historiens de France*, the plan of which was enlarged by degrees (*Historiens des croisades, obituaires, poullés, comptes, etc.*), the *Ordonnances* and the *Table chronologique des diplômes*. During the reign of Louis Philippe, the ministry of the interior reorganized the administration of the archives of the departments, communes and hospitals, of which the *Inventaires sommaires* are a mine of precious information (*see* the *Rapport au ministre*, by G Servois, 1902) In 1834 the ministry of public instruction founded a committee, which has been called since 1881 the "Comité des Travaux historiques et scientifiques," under the direction of which have been published: (1) the *Collection des documents inédits sur l'histoire de France* (since 1835); (2) the *Catalogue général des manuscrits des bibliothèques de France*, (3) the *Dictionnaires topographiques*, and the *Répertoires archéologiques* of the French departments (1861, etc), (4) several series of *Bulletins*, the details of which will be found in the *Bibliographie* of R Lasteyrie At the same time were founded or reorganized, both in Paris and the departments, numerous societies, devoted sometimes partially and sometimes exclusively to history and archaeology; the Académie Celtique (1804), which in 1813 became the Société des Antiquaires de France (general index by M Prou, 1894); the Société de l'Histoire de France (1834), the Société de l'École des Chartes (1839), the Société de l'Histoire de Paris et de l'Île-de-France (1874; four decennial indexes), etc. The details will be found in the excellent *Bibliographie générale des travaux historiques et archéologiques publiés par les sociétés savantes de France*, which appeared 1885–1911, under the direction of Robert de Lasteyrie and others. *See* also the *Bibliographie annuelle des travaux historiques* (1906, etc)

Individual scholars also associated themselves with this great literary movement. F. P. J. Guizot published a *Collection de mémoires relatifs à l'histoire de France* (31 vols., 1824–35); J. A. C. Buchon, a *Collection des chroniques nationales françaises écrites en langue vulgaire du XIIIe au XVIe siècle* (47 vols., 1824–29), and a *Choix de chroniques et mémoires sur l'histoire de France* (14 vols., 1836–41); A. Petitot and L. J N. Monmerqué, a *Collection de mémoires relatifs à l'histoire de France* (131 vols., 1819–29); J. F. Michaud and J. J. F. Poujoulat, a *Nouvelle Collection de mémoires pour servir à l'histoire de France* (32 vols, 1836–39), J F Barrière and M. F. A. de Lescure, a *Bibliothèque de mémoires relatifs à l'histoire de France pendant le XVIIIe siècle* (30 vols, 1855–75), and finally Sr A Berville and J. F. Barrière, a *Collection des memoires relatifs à la Révolution Française* (55 vols., 1820–27). The details are to be found in the *Sources de l'histoire de France*, by Alfred Franklin (1876) The abbé J P Migne in his *Patrologia Latina* (221 vols., 1844–64) re-edited a number of texts anterior to the 13th century Under the Second Empire, the administration of the imperial archives at Paris published ten volumes of documents (*Monuments historiques*, 1866; *Layettes du trésor des chartes*, 1863, which were afterwards continued up to 1270; *Actes du parlement de Paris*, 1863–67), not to mention several volumes of *Inventaires* The administration of the Bibliothèque impériale had printed the *Catalogue général de l'histoire de France* (10 vols., 1855–70, vol. xi., containing the alphabetical index to the names of the authors, appeared in 1895). Other countries also supplied a number of useful texts, there is much in the English Rolls series, in the collection of *Chroniques belges*, and especially in the *Monumenta Germaniae historica*

At the same time the scope of history and its auxiliary sciences becomes more clearly defined; the École des Chartes produces some excellent palaeographers, as for instance Natalis de Wailly (*Eléments de paléographie*, 1838), and L Delisle (*q.v.*), who has also left traces of his profound researches in the most varied departments of mediaeval history (*Bibliographie des travaux de M Léopold Delisle*, 1902); Anatole de Barthélemy made a study of coins and medals, Douet d'Arcq and G. Demay of seals The works of Alexandre Lenoir (*Musée des monuments français*, 1800–22), of Arcisse de Caumont (*Histoire de l'architecture du moyen âge*, 1837, *Abécédaire ou rudiment d'archéologie*, 1850), of A Napoléon Didron (*Annales archéologiques*, 1844), of Jules Quicherat (*Mélanges d'archéologie et d'histoire*, published after his death, 1886), and the dictionaries of E. E. Viollet le Duc (*Dictionnaire raisonné de l'architecture française*, 1853–68; *Dictionnaire du mobilier français*, 1855) displayed to the best advantage one of the most brilliant sides of the French intellect, while the other sciences, such as geology, anthropology, the comparative study of languages, religions and folk-lore, and political economy, continued to enlarge the horizon of history. The task of writing the general history of a country became more and more difficult, especially for one man, but the task was none the less undertaken by several historians, and by some of eminence François Guizot treated of the *Histoire de la civilisation en France* (1828–30), Augustin Thierry after the *Récits des temps mérovingiens* (1840) published the *Monuments de l'histoire du tiers état* (1849–56), the introduction to which was expanded into a book (1855), Charles Simonde de Sismondi produced a mediocre *Histoire des français* in 31 vols (1821–44), and Henri Martin a *Histoire de France* in 16 vols (1847–54), now of small use except for the two or three last centuries of the *ancien régime*. Finally J. Richelet, in his *Histoire de France* (17 vols, 1833–56) and his *Histoire de la Révolution* (7 vols, 1847–53), aimed at reviving the very soul of the nation's past

After the Franco-German War begins a better organization of scientific studies, modelled on that of Germany. The École des Hautes Etudes, established in, 1868, included in its programme the critical study of the sources, both Latin and French, of the history of France, and from the *séminaire* of Gabriel Monod came men of learning, already prepared by study at the École des Chartes: Paul Viollet, who revived the study of the history of French law; Julien Havet, who revived that of Merovingian diplomatics; Arthur Giry, who, resuming the study of municipal institutions where it had been left by A. Thierry, prepared the *Annales carolingiennes* (written by his pupils, Eckel, Favre, Lauer, Lot, Poupardin), and brought back into honour the study of diplomatics (*Manuel de diplomatique*, 1894); Auguste Molinier, author of the *Sources de l'histoire de France* (1902–1904; general index, 1906), etc Auguste Longnon introduced at the École des Hautes Études the study of historical geography (*Atlas historique de la France* [1885–89] [no more published]). The universities, at last reorganized, popularized the employment of the new methods The books of Fustel de Coulanges and Achille Luchaire on the middle ages, and those of A. Aulard on the Revolution, gave a strong, though well-regulated, impetus to historical production. The École de Louvre (1881) increased the value of the museums and placed the history of art among the studies of higher education, while the Musée archéologique of St -Germain-en-Laye offered a fruitful field for research on Gallic and Gallo-Roman antiquities. Rich archives, hitherto inaccessible, were thrown open to students; at Rome those of the Vatican (*Registres pontificaux*, published by students at the French school of archaeology, since 1884), at Paris, those of the Foreign Office (*Recueil des instructions données aux ambassadeurs depuis le traité de Westphalie*, 16 vols, 1885–1901; besides various collections of diplomatic papers, inventories, etc.). Those of the War Office were used by officers who published numerous documents bearing on the wars of the Revolution and the Empire, and on that of 1870–71. In 1904 a commission, generously endowed by the French parlement, was entrusted with the task of publishing documents relating to economic and social life of the time of the Revolution, and the work is still in progress. Certain towns,

Paris, Bordeaux, etc, have made it a point of honour to have their chief historical monuments printed. The work now becomes more and more specialized *L'Histoire de France,* edited by Ernest Lavisse (1900–22), is the work of a number of authors The *Manuel de bibliographie historique* of Ch V. Langlois (2nd edition, 1901–04) is a good guide, as is his *Archives de l'histoire de France* (1891, in collaboration with H. Stein)

Besides the special bibliographies mentioned above, it will be useful to consult the *Bibliothèque historique* of Père Jacques Lelong (1719, new ed by Fevret de Fontette, 5 vols, 1768–78); the *Geschichte der historischen Forschung und Kunst* of Ludwig Wachler (2 vols, 1812–1816), the *Bibliographie de la France,* established in 1811 (1st series, 1811–56, 45 vols, 2nd series, 1 vol per annum since 1857 as *Journal général de l'Imprimerie et de la Librairie*), the publications of the Société *Bibliographique* (*Polybiblion* from 1868), the *Bibliographie de l'histoire de France,* by Gabriel Monod (1888), the *Répertoire* of the abbé Ulysse Chevalier (*Biobibliographie,* new ed 1903–07, and *Topobibliographie,* 1894–99) Bearing exclusively on the middle ages are the *Bibliotheca historica medii aevi* of August Potthast (new ed 1896) and the *Manuel* (*Les Sources de l'histoire de France,* 1901) of A Molinier, but the latter is to be continued up to modern times, by H Hauser (since 1906), and is still in progress Finally, various special reviews, besides teaching historical method by criticism and example, try to keep their readers *au courant* with literary production, the *Revue critique d'histoire et de littérature* and *Revue des questions historiques* (both since 1866), the *Revue historique* (since 1876), the *Revue d'histoire moderne et contemporaine,* accompanied annually by a valuable *Répertoire méthodique* (since 1898), the *Revue de synthèse historique* (since 1900), etc (C BEM)

Since the above bibliography was compiled the following works have appeared E Bourgeois, *Manuel historique de la politique étrangère* (1892–1906); A Gauvain, *L'Europe avant la guerre* (1917), and *L'Europe au jour le jour* (1917–23), A Albert-Petit, *La France de la guerre* (3 vols 1918–19); E. Lavisse, *Histoire de France contemporaine* (10 vols, 1920–22); J Aulneau, *Le Rhin et la France* (1921), E Bourgeois et G Pagès, *Les origines et les responsabilités de la Grande Guerre* (1921), J Caillaux, *Mes Prisons* (1921); A Dumaine, *La Dernière Ambassade de France en Autriche* (1921); A Breton, *Les Commissions et la réforme de la procédure parlementaire* (1922), R H Soltan *French Parties and Politics* (World of To-day Series, 1922), J Carrère and G Bourgin, *Manuel des parties politiques en France* (1924), P Renouvier, *Les origines immédiates de la Guerre* (1925); Denis Gwynn, *The "Action Française" Condemnation* (1928) *See* also bibliography to article EUROPEAN WAR; also *Les Recueils diplomatiques;* and the Yellow, Blue, Red, Orange, Green and White Books, published by the Governments concerned since 1914

FRANCESCHI, JEAN BAPTISTE, BARON (1766–1813), French general, was born at Bastia, Corsica, on Dec. 5, 1766, and entered the French service in 1793 He served in Italy from 1795 to 1799, again as a general officer in the campaign of Marengo, in the Naples campaign of 1805–06, and in the Peninsular War from 1807 to 1809 He commanded a Neapolitan brigade in the Russian war of 1812, and died at Danzig on March 19, 1813

Two other generals of brigade in Napoleon's wars bore the name of Franceschi, and the three have often been mistaken for each other JEAN BAPTISTE MARIE FRANCESCHI-DELONNE (1767–1810), who served throughout the revolutionary campaign on the Rhine, took part in the campaign of Zürich in 1799, and escaped from, and returned to, Genoa, when in 1800 Masséna was besieged there In the Peninsular War he won distinction as a cavalry general. He died, a prisoner of the Spaniards, at Carthagena on Oct. 23, 1810 FRANÇOIS FRANCESCHI-LOSIO (1770–1810), born at Milan, served through the Italian campaign of 1796–97, and subsequently, like Franceschi-Delonne, with Masséna at Zürich and at Genoa, and at the headquarters of King Joseph in Italy and Spain He was killed in a duel by the Neapolitan colonel Filangieri in 1810

FRANCESCHI, PIERO DE', called PIERO DELLA FRANCESCA (*c.* 1418–1492), Italian painter of the Umbrian school He was born at Borgo San Sepolcro in Umbria His father, a well-to-do cloth merchant, was married twice, and it is supposed that the second wife, Francesca Cenci of Arezzo, was Piero's mother—hence his name "della Francesca" From early youth he showed a bent for mathematical sciences His first studies in art were probably made in his native town He may have chosen Sasetta as his master, the naive and graceful inheritor of the decorative aims of the early school of Siena, who was then employed on an altarpiece for San Francesco in Borgo The earliest record of Piero (1439) describes him as assisting Domenico Veneziano in painting the choir of Sta Maria Nuova in Florence His stay in that city brought him into touch with a group of artists, who were absorbed in problems of form and perspective, which naturally appealed to his mathematical mind. He was indeed able to carry investigations farther than Brunelleschi and Uccello, for he was a great mathematician and he applied his science to his art. Vasari, who speaks of him with admiration, does not fail to emphasize his twofold accomplishment, and calls him the greatest geometrician of his time In his first extant work, an altarpiece which he was commissioned to paint in 1445 for the Compagnia della Misericordia of Borgo san Sepolcro (now in the Palazzo Comunale), his style is already fully developed In 1451 he was at Rimini painting Sigismondo Malatesta kneeling before his patron saint, on a fresco in the church of San Francesco According to Vasari he then worked in Pesaro and in Ancona He was called to Ferrara by Duke Borso d'Este, and to Rome by Pope Nicholas V; but the paintings then executed by him no longer exist Between 1452 and 1466 he was at work on his great masterpiece, the series of frescoes illustrating the "History of the Cross" in the choir of S Francesco in Arezzo. This legend gave scope to many picturesque and suggestive incidents The planting of the tree on Adam's grave at the beginning of things, the recognition of its destiny by the queen of Sheba on her visit to King Solomon, the dream of Constantine in his tent; his victorious battle, the finding of the cross by St. Helena, and finally its recovery from the Persians, 300 years later, by the emperor Heraclius Here Piero can be seen at the height of his powers The scenes are scientifically composed arrangements. Art and geometry combined in the creation of a severe and monumental style Natural form was simplified and translated into decorative design Moreover, his art reveals an interest in effects of light and "plein air", and in more than one respect tends towards naturalism, when compared with the art of his predecessors About this time Piero painted the impressive "Resurrection" in the Palazzo Comunale in Borgo, mystic in conception, considered by Vasari to be his masterpiece In the '60s, we find him employed on work for Federigo of Montefeltro, the art-loving and cultured duke of Urbino He painted Federigo's portrait and that of his wife, Battista Sforza, two clear-cut profiles facing each other in a diptych (Uffizi, Florence); also the "Flagellation" in the cathedral of Urbino, and the altarpiece representing the duke kneeling before the Madonna surrounded by saints (Brera, Milan). At the end of his life Piero retired to his native town in Umbria and wrote two mathematical treatises, one on perspective, and another on the five regular solids, with the object of providing a guide and mathematical foundation for the coming generation of artists. Fra Luca Pacioli, the mathematician and friend of Leonardo da Vinci, was his compatriot and pupil Indeed Vasari accused the friar of plagiarizing Piero's mathematical writings. According to Vasari, Piero became blind at the age of sixty In his will, however, dated July 5, 1487 he is described as fit both in body and mind He died in Oct 1492 and was buried on the 12th of that month in the family tomb in the Badia of Borgo San Sepolcro.

He was one of the greatest personalities of the Quattrocento, exercising a widespread influence on the development of art. Luca Signorelli was his most distinguished pupil. Though Piero was for some time neglected and forgotten, he has of late come into his own again, for his art, which so happily combines the decorative element of two-dimensional design with the representation of three-dimensional space, seems to contain much that certain modernists are striving after The following works, besides those mentioned above, are generally recognized as being by the master:—"St Jerome with a man kneeling in a landscape" (Academy at Venice); an altarpiece representing the "Madonna and Saints" and the "Annunciation" (Pinacoteca at Perugia), "St. Thomas of Aquinas" (Poldi-Pezzoli collection at Milan) and St Louis of Toulouse (Palazzo Comunale at Borgo) Only very few of his pictures have left Italy. The National Gallery, London, is the fortunate possessor of two of these:—"The Baptism of Christ," an early work, the "Nativity," a late work. In Mrs. Gardner's collection at Boston is a young Hercules, a fresco from a palace in Borgo San Sepolcro

See Vasari, Milanesi II.; Crowe-Cavalcaselle, III. (ed. 1914), W. G. Waters, *Piero della Francesca* (2nd ed., 1901); C. Ricci, *P. della*

Francesca (1912); Evelyn, *P. della Francesca* (1912) Piero's theoretical writings.—*De prospectiva pingendi;* published by C. Winterberg (1899), manuscripts in the Royal library at Parma, in the Ambrosiana at Milan, in the Bibliothèque Nationale in Paris, and in the library at Bordeaux, *Libellus de V corporibus regularibus,* manuscript in the Vatican library. (I. A. R)

FRANCESCHINI, BALDASSARE (1611–1689), Italian painter of the Tuscan school, named, from Volterra the place of his birth, Il Volterrano, was the son of a sculptor in alabaster. At a very early age he started as an assistant to his father and then studied under the Florentine painter Matteo Rosselli. From 1652–1660 he was employed on paintings in the cupola of the Niccolini chapel in S. Croce, Florence, which constitute his most noted performance. Among his best oil paintings of large scale is the "St John the Evangelist" in the church of S. Chiara at Volterra. One of his latest works was the fresco of the cupola of the Annunziata, Florence, which occupied him for two years towards 1683 Franceschini died of apoplexy at Volterra on Jan 6, 1689. He is not to be confounded with Marco Antonio Franceschini (1648–1729), who was a Bolognese, a pupil of Carlo Cignani and a famous painter in his time

FRANCESCHINI, MARCO ANTONIO (1648–1729), Italian painter, born at Bologna on April 5, 1648. He studied under G. M Galli Bibiena and Carlo Cignani, whose assistant and collaborator he was for some time in works at Bologna, Forlì, Piacenza, Modena and Reggio He rose to be one of the most favoured artists of his time, his reputation spreading beyond his native town He received commissions from churches and monasteries all over the country, from the duke of Parma, from the elector of the Palatinate, the prince of Liechtenstein and others Pope Clement XI. made him a knight of the order of Christ in 1712 in recognition of his services after he had designed two cartoons for mosaics in St. Peter's He was called to Genoa twice, in 1702 and in 1714; and there decorated the Council palace with frescoes, no longer extant, representing scenes from the history of the republic, and there also painted pictures for the palaces of Pallavicini and Fil Durazzo and frescoes for the church of the Padri Filippini His most famous work was done for the church of Corpus Domini at Bologna (1687–94), where with the assistance of Luigi Quaini and Enrico Haffner, he decorated the cupola and ceiling with frescoes and painted a number of altarpieces, the most notable being the one representing the "Death of St Joseph." He was elected director of the Academia Clementina at Bologna. He died on Dec. 14, 1729. Franceschini was the last great representative of the Bolognese school. He possessed a refined sense of colour and a power of disposing pictorially over vast surfaces with great variety and freedom of composition, with effective grouping of figures graceful in movement with boldly foreshortened poses. However, his style was somewhat superficial and not free from mannerism.

See G P. Zanotti, *Storia dell' Academia Clementina* (1745)

FRANCHE-COMTÉ, a province of France from 1674 to the Revolution It was bounded on the east by Switzerland, on the south by Bresse and Bugey, on the north by Lorraine, and on the west by the duchy of Burgundy and by Bassigny, embracing to the east of the Jura the valley of the Saône and most of that of the Doubs. Under the Romans it corresponded to *Maxima Sequanorum,* and after having formed part of the kingdom of Burgundy was in the early part of the middle ages split up into the four countships of Portois, Varais, Amons and Escuens In the 10th century these were united to form a whole, which came to be called the countship of Burgundy, and belonged at that time to the counts of Mâcon.

The limits of the countship were definitely settled under Otto William, son of Albert or Adalbert, king of Italy (d. 1027), who on the death of his father-in-law, Henry (1002) tried to seize the duchy of Burgundy, but without success. The countship, which formed a fief dependent on the kingdom of Burgundy, passed to Renaud I., the second son of Otto William. When the kingdom of Burgundy was joined to the Germanic empire, he refused to pay homage to the emperor Henry III, whose suzerainty over him never existed except in theory. William I. (1059–1087) still further added to the power of his house by marrying Etiennette, heiress of the count of Vienne, and by acquiring from his cousin Guy, when the latter became a monk at Cluny, the countship of Mâcon One of his sons, Guy, became pope, under the name of Calixtus II. His grandson, Renaud III. (1097–1148) in his turn refused to pay homage to the emperor Lothair, who retaliated by confiscating his dominions and giving them to Conrad of Zähringen Renaud, however, succeeded in maintaining until his death his possession of the countships of Burgundy, Vienne, and Mâcon. He left as sole heiress a daughter, Beatrix, whom his brother William III. imprisoned in order to make an attempt on her inheritance; she was set free, however, by the emperor Frederick Barbarossa, who married her in 1156

On the death of Beatrix (1185) the countship of Burgundy passed to Otto I (1190–1200) the youngest but one of her sons, who had to dispute its possession with Stephen, count of Auxonne the grandson of William III Beatrix, the daughter and heiress of Otto I (1200–31), married Otto, duke of Meran (d. 1234), under whose government the inhabitants of Besançon, which had been since the time of Frederick Barbarossa an imperial city, formed themselves definitely into a *commune.* Alix, daughter of Beatrix and of Otto of Meran, and heiress to the countship of Burgundy, married Hugh of Chalon, son of John the Ancient or the Wise (d 1248), a descendant of William III., restoring the countship to the family of its former lords His son Otto IV. (1279–1303) engaged in war against the Bishop of Basle, and the German king Rudolph I, who supported the latter, entered Franche-Comté and besieged Besançon, but without success (1289) Otto, in fulfilment of the treaties of Ervennes and Vincennes (1291–95) gave Jeanne, his daughter by Mahaut of Artois, in marriage to Philip, count of Poitiers, son of Philip the Fair. The latter took over the administration of the countship, in spite of strong opposition from the nobles of the country. Another of Otto's daughters married Charles IV, the Handsome, and both princesses, together with their sister-in-law Margaret of Burgundy, were concerned in the celebrated trial of the Tour de Nesle. Jeanne, however, continued to govern her countship when her husband became king of France (Philip V., "the Long") Jeanne, their daughter and heiress, married Odo IV, duke of Burgundy (1330–47), and her sister Margaret became the wife of Louis II., count of Flanders. The countship returned to Margaret at the death of Odo IV., who was succeeded in his duchy by his grandson Philip of Rouvre.

The marriage of Philip the Bold with Margaret, daughter of Louis of Mâle, caused Franche-Comté to pass to the princes of the ducal house of Burgundy, who kept it until the death of Charles the Bold (1477). On his death Louis XI claimed the government of the countship as well as of the duchy, as trustee for the property of the princess Mary, who was closely related to him and destined to marry the dauphin (later Charles VIII) French garrisons occupied the principal towns, and the lord of Craon was appointed governor of the county. In consequence of his severity there was a general rising, and at the same time Mary married Maximilian, archduke of Austria, to whom her father had formerly betrothed her (Aug. 1477). The French were expelled from the fortified towns and Craon beaten by the people of Dôle Charles of Amboise, who took his place, reconquered the province, and even Besançon submitted to the authority of the king of France, who promised to respect its privileges.

On the death of Louis XI. (1483), the estates of Franche-Comté recognized as sovereign his son Charles, who was betrothed to the little Margaret of Burgundy, daughter of Maximilian and Mary (d 1482) but when Charles VIII. refused Margaret's hand in order to marry Anne of Brittany there was a fresh rising, and the French were again driven out. The treaty of Senlis (May 23, 1483) put an end to the struggle Charles abandoned all his pretensions, and Maximilian was thus left in possession of Franche-Comté, the sovereignty of which he handed on to his son Philip and ultimately to the crown of Spain. He had, however, constituted his daughter Margaret sovereign-governess of Franche-Comté for life, and under the administration of this princess (d. 1530) as under the rule of Charles V., the county enjoyed comparative independence, paying a *don gratuit* of 200,000 livres

every three years, and being actually governed by the parliament of Dôle, and by governors chosen from the nobility of the country Franche-Comté furnished Philip II of Spain with one of his best counsellors, Cardinal Perrenot de Granvella

In the 16th century the country was disturbed by the preaching of Protestant doctrines, which gained adherents especially in the district of Montbéliard, and later by the wars between France and Spain In 1595 the armies of Henry IV levied contributions on Besançon and other towns, but the people of Franche-Comté succeeded in obtaining special terms of neutrality in order to shelter themselves from injury from either of the parties in the war, and enjoyed a period of calm under the government of the infanta Isabella Clara Eugénie and the archduke Albert (1599–1621) But the country suffered greatly from the ravages of the Thirty Years' War, from the presence of the army of the Condés, which besieged Dôle, from the devastation of the troops of Gallas, and later of those of Bernard of Saxe-Weimar. The Peace of Westphalia (1648) confirmed Spain in the possession of Franche-Comté. In 1668 the French again entered it, and the conquest, of which the foundations had been laid by the intrigues of the abbot of Watteville and the French party constituted by him, was easily accomplished by Condé and Luxemburg, Louis XIV. directing the army in Franche-Comté for some time in person None the less, the country was restored to Spain at the Peace of Aix-la-Chapelle (1668), but in 1674 Louis headed another expedition there Besançon capitulated after a siege of 27 days, and Dôle and Salins also fell into the hands of the invaders

In 1678 the treaty of Nijmwegen gave Franche-Comté to France (the principality of Montbéliard remaining in the possession of the house of Wurttemberg which had acquired it by marriage Franche-Comté became a military government (*gouvernement*) The estates ceased to meet, and the old *don gratuit* was replaced by a tax which became increasingly heavy Louis made Besançon, which Vauban fortified, into the capital of the province, and transferred to it the parliament and the university, the seat of which had hitherto been Dôle For purposes of administration, the county was divided among the four great *bailliages* of Besançon, Dôle, Amont, (chief town Vesoul) and Aval (chief town Salins) At the Revolution were formed from it the departments of Jura, Doubs, and Haute-Saône

See Dunod, *Histoire de Sequanois. Hist. du comté de Bourgogne* (Dijon, 1735–40), E Clerc, *Essai sur l'histoire de la Franche Comté* (2nd ed., Besançon 1870). (R P)

FRANCHET D'ESPEREY, LOUIS (1856–), French soldier, was born at Mostaganem in Algeria on May 25, 1856 Commissioned to the infantry in 1876, he saw active service in Tunisia, Tongking and N China In 1908 he became general of brigade and made a careful study on the spot of Balkan conditions In 1913, as general of division, he fought in Morocco, after which he was appointed to the I. Army Corps at Lille. This corps he commanded during the battle of the Frontiers, Aug 1914, and on the eve of the battle of the Marne he succeeded Gen. Lanrezac as commander of the V. Army. In March 1916 he was advanced to command the eastern group of armies, and later the northern group. On the recall of Guillaumat in June 1918, Franchet d'Esperey was sent out to replace him as commander-in-chief at Salonika. Adopting and developing his predecessor's plan for an offensive in the Balkans, he ensured the success of his break-through by the skill with which he denuded the rest of the front to concentrate an overwhelming preponderance on the narrow Sokol-Dobropolye sector, west of the Vardar Success beyond anticipation crowned the stroke; with their reserves pinned down by vigorous pressure elsewhere the Bulgarians were unable to repair the breach, and as the Serbian spearhead drove in deeper, the whole Bulgarian front collapsed, and on Sept. 29 Bulgaria capitulated—the first defection among the Central Powers He cleared Serbia of the Austrian troops and later, on Jan. 5, 1919, took prisoner the German Marshal von Mackensen, in Hungary. He commanded the Allied forces in Turkey until Nov. 1920, and was created a marshal of France on Feb 21, 1921

See Graffet, *Le maréchal Franchet d'Esperey* (1922).

FRANCHISE, in English law, a royal privilege or branch of the Crown's prerogative subsisting in the hands of a subject A franchise arises either from royal grants or from prescription which presupposes a grant Such franchises are bodies corporate, the right to hold a fair, market, ferry, free fishery, etc. The term is also applied to the right of voting at elections and the qualifications upon which that right is based (*see* REGISTRATION; REPRESENTATION; VOTE). In the United States the term is especially applied to the right or powers of partial appropriation of public property by exclusive use, or to a privilege of a public nature conferred on a corporation created for the purpose, and also to the right of voting at elections

FRANCIA (*c* 1450–1517), a Bolognese painter and goldsmith, whose real name was Francesco Raibolini, his father being Marco di Giacomo Raibolini, a carpenter, descended from an old and creditable family, was born at Bologna about 1450 Francia was originally a goldsmith and also an engraver of dies and niellos; in these arts he became eminent Two niello Paxes executed between 1480–85 are to be seen at the Bologna academy He was particularly famed for his dies for medals, he rose to be mint-master at Bologna, and retained that office to the end of his life. As a type-founder he made for Aldus Manutius the first italic type.

He may have studied painting under Francesco Cossa, who settled at Bologna in 1470 His earliest known picture, dated 1492, is the "Virgin and Child" in the Mond Collection, National Gallery, London Another early work, dated 1494, is now in the Bologna gallery—the "Virgin enthroned, with Augustine and five other saints" It is an oil picture, and was originally painted for the church of St Maria della Misericordia, at the desire of the Bentivoglio family, the rulers of Bologna. The same patrons employed him upon frescoes in their own palace; one of "Judith and Holophernes" is especially noted Unfortunately these works were destroyed Francia probably studied likewise the works of Perugino, and he became a friend and ardent admirer of Raphael, to whom he addressed an enthusiastic sonnet Raphael cordially responded to the Bolognese master's admiration, and said, in a letter dated in 1508, that few painters or none had produced Madonnas more beautiful, more devout, or better portrayed than those of Francia If we may trust Vasari the exceeding value which Francia set on Raphael's art brought him to his grave Raphael had consigned to Francia his famous picture of "St Cecilia," destined for the church of S Giovanni in Monte, Bologna; and Francia, on inspecting it, took so much to heart his own inferiority, at the advanced age of about 66, to the youthful Umbrian, that he sickened and died on Jan 6, 1517.

Distanced though he may have been by Raphael, Francia is rightly regarded as the greatest painter of the earlier Bolognese school His style in some respects recalls the art of Lorenzo Costa His figures are graceful and his work beautifully finished The National Gallery contains two remarkably fine specimens of Francia, combined together as principal picture and lunette—the "Virgin and Child and St Anna" enthroned, surrounded by saints, and (in the lunette) the "Pietà" They come from the Buonvisi chapel in the church of S. Frediano, Lucca, and were among the master's latest paintings Other leading works are. in Munich "The Madonna within the Rose Garden"; in the Borghese gallery, Rome, "St. Stephen the Martyr", in Bologna the frescoes in the church of St. Cecilia, illustrating the life of the saint, all of them from the design of Francia, but not all executed by himself His landscape backgrounds are of uncommon excellence. The finest extant drawing of the master is the "Judgment of Paris" in the Albertina at Vienna Francia had many scholars. Marcantonio Raimondi, the famous engraver, is the most renowned of them; next to him Amico Aspertini, and Francia's own sons Giacomo and Giulio. Lorenzo Costa was much associated with Francia in pictorial work.

BIBLIOGRAPHY.—G. Vasari, *Vite de' Pittore*, Milanesi vol. iii.; Malvasia, *Felsina pittrice* (1678); J. A. Calvi, *Mem. della vita di Francesco Raibolini* (1812); Crowe and Cavalcasella, *Painting in North Italy* (ed Borenius, 1912), J. Cartwright, *Mantegna and Francia* (1881); G C. Williamson, *Francia* (1901); J. P. Richter, *Mond Collection* (1910); G Lipparini, *Fr. Francia* (1913). On Francia's engravings *see* A. M. Hind, *History of Engravings and Etchings* (1923); P. Kristeller, *Kupferstich und Holzschnitt* (1905).

On Francia's medals *see* Hill, *Portrait Medals of Italian Artists* (1912). Raphael's letter to Francia is published in E. Muntz, *Raphael*, p 321 f. (1886)

FRANCIA, JOSÉ GASPAR RODRÍGUEZ (*c* 1766–1840), "El Supremo," dictator of Paraguay, was born in Paraguay, about 1766, probably the son of a Brazilian coffee grower He studied at the university of Córdova de Tucumán, and obtained there the degrees of master of philosophy and doctor of theology Relinquishing his intention of taking orders, he studied law and practised in Asunción, where he acquired a reputation for ability, energy and integrity. Under the colonial Government he filled several important posts, and when independence was declared in 1811, he became secretary to the national *junta*, exerting an influence far out of proportion to his position In 1813, when a duumvirate replaced the national congress, Francia and Gen Yegros, a gaucho, were chosen to fill the office. In 1814 he secured his election as dictator for three years, and in 1817 obtained the dictatorship for life In his administration we find a strange mixture of far-sighted statesmanship and petty despotism Seeing his precarious position among powerful neighbours, he pursued a policy of strict isolation; realizing that he must make the country self-supporting, he carefully fostered internal industries He put a stop to foreign commerce; usurped the national revenues, organized and equipped an army, and imported modern methods of agriculture. Imbued with the principles of the French Revolution, he abolished the Inquisition, suppressed the college of theology, did away with the tithes, and deprived the aristocracy of their social and political privileges While practising republican simplicity in his private life, he exacted imperial deference wherever he went, isolated himself in the most stringent manner, and punished with Draconian severity the slightest violation of his assumed prerogatives or hint of conspiracy against him On Sept 20, 1840, he was seized with a fit in Asunción, and died. Whatever may be the accusations brought against his rule, it is unlikely that except for him the country could have escaped incorporation in either Argentina or Brazil (W B P)

The first and fullest account of Dr Francia was given to the world by two Swiss surgeons, Rengger and Longchamp, whom he had detained from 1819 to 1825—*Essai historique sur la révolution de Paraguay et la gouvernement dictatorial du docteur Francia* (Paris, 1827). Their work was almost immediately translated into English under the title of *The Reign of Doctor Joseph G R. De Francia in Paraguay* (1827). About eleven years after there appeared at London *Letters on Paraguay*, by J P. and W P. Robertson, two young Scotsmen whose hopes of commercial success had been rudely destroyed by the dictator's interference The account which they gave of his character and government was of the most unfavourable description, and they rehearsed and emphasized their accusations in *Francia's Reign of Terror* (1839) and *Letters on South America* (3 vols, 1843). From the very pages of his detractors Thomas Carlyle succeeded in extracting materials for a brilliant defence of the dictator "as a man or sovereign of iron energy and industry, of great and severe labour" It appeared in the *Foreign Quarterly Review* for 1843, and is reprinted in his *Critical and Miscellaneous Essays* Sir Richard F Burton gives a graphic sketch of Francia's life and a favourable notice of his character in his *Letters from the Battlefields of Paraguay* (1870), while C A Washburn takes up a hostile position in his *History of Paraguay* (1871).

FRANCIABIGIO (1482–1525), Florentine painter. His real name was Francesco di Cristofano; and he was currently termed Francia Bigio, Francia standing for Francesco and Bigio being the surname His father was a Milanese weaver, settled in Florence. According to Vasari, Franciabigio when young worked in the company of Andrea del Sarto. He studied under Albertinelli for a few months, and he was devoted to the study of perspective. One of his early works is the so-called Madonna del Pozzo in the Uffizi gallery which was for some time ascribed to Raphael. In the Atrium of the Annunziata in Florence he painted in 1513 the "Marriage of the Virgin," as a portion of a series wherein Andrea del Sarto was chiefly concerned The friars having uncovered this work before it was quite finished, Franciabigio was so incensed that, seizing a mason's hammer, he struck at the head of the Virgin, and some other heads; and the fresco, which would otherwise be his masterpiece in that method, remains thus mutilated At the Chiostro dello Scalzo, in another series of frescoes in which Andrea was likewise employed, he executed in 1518–19 the "Departure of John the Baptist for the Desert," and the "Meeting of the Baptist with Jesus"; and, at the Medici palace at Poggio a Caiano, in 1521, the "Triumph of Cicero" Franciabigio was a first-rate portrait painter (Berlin, Pitti, National Gallery, London). The Dresden gallery contains one of his masterpieces, the "Bath of Bathsheba" (1523).

FRANCIS, a masculine proper name meaning "Frenchman" (Lat *Franciscus*, Ital. *Francesco*, Fr. *François*, Ger. *Franz*). As a Christian name it originated with St. Francis of Assisi, whose baptismal name was Giovanni, but who was called Francesco by his father on returning from a journey in France. The saint's fame made the name exceedingly popular from his day onwards.

FRANCIS I. (1708–1765), Roman emperor and grand duke of Tuscany, second son of Leopold Joseph, duke of Lorraine, was born on Dec. 8, 1708. He married in 1736 Maria Theresa (*q v*), daughter of the emperor Charles VI. He succeeded his father as duke of Lorraine in 1729, but the emperor, at the end of the Polish War of Succession, desiring to compensate Stanislaus Leszczynski for the loss of his crown in 1735, persuaded Francis to exchange Lorraine for the reversion of the grand duchy of Tuscany His wife secured his election to the Empire on Sept 13, 1745, in succession to Charles VII, and she made him co-regent of her hereditary dominions Francis was well content to leave the reality of power to his able wife He died at Innsbruck on Aug. 18, 1765 *See* MARIA THERESA.

FRANCIS II. (1768–1835), the last Roman emperor, and, as Francis I, first emperor of Austria, was the son of Leopold II., grand-duke of Tuscany, afterwards emperor, and of his wife Maria Louisa, daughter of Charles III. of Spain. He was born at Florence on Feb 12, 1768 In 1784 he was brought to Vienna to complete his education under the eye of his uncle the emperor Joseph II Joseph is said to have treated his nephew with an impatient contempt which confirmed his natural timidity; but after the marriage of Francis to Elizabeth of Württemberg (1788) their relations improved The death of his wife in childbirth on Feb 18, 1790 was followed by the death of his uncle on the 20th; and Francis acted as regent with Prince Kaunitz until his father came from Florence On Sept 19, he married his first cousin Maria Theresa, daughter of Ferdinand, king of Naples, by whom he was the father of his successor Ferdinand I, of Maria Louisa, wife of Napoleon, and of the archduke Francis, father of the emperor Francis Joseph After her death (1807) he married Maria Ludovica Beatrix of Este (1808), and when she died he made a fourth marriage with Carolina Augusta of Bavaria (1816)

He succeeded in his twenty-fifth year to the Austrian dominions and the empire on the death of his father on March 1, 1792 The dominions of the house of Austria, widely scattered in the Low Countries, Germany and Italy, were exposed to the attacks of the French revolutionary governments and of Napoleon He was dragged into all the coalitions against France, and in the early days of his reign he had to guard against the ambition of Prussia, and the aggressions of Russia in Poland and Turkey. For long he had no adviser save such diplomatists as Prince Kaunitz and Thugut, who had been trained in the Old Austrian diplomacy His own best quality was an invincible patience supported by reliance on the loyalty of his subjects, and a sense of his duty to the State (For the general events of this reign till 1815 *see* EUROPE, AUSTRIA, NAPOLEON, FRENCH REVOLUTIONARY WARS, etc) Seeing that the Empire was in the last stage of dissolution, and that, even were it to survive, it would pass from the house of Habsburg to that of Bonaparte, he in 1804 assumed the title of hereditary emperor of Austria, thus giving some semblance of unity to his complex dominions in Germany, Bohemia, Hungary and Italy, by providing a common title for the supreme ruler. His action was justified when, in 1806, the establishment of the Confederation of the Rhine forced him to abdicate the empty title of Holy Roman emperor

In 1805 he changed the basis of his administration. He had hitherto been assisted by a cabinet minister who was in direct relation with all the "chanceries" and boards which formed

the executive government, and who acted as the channel of communication between them and the emperor and was in fact a prime minister In 1805 Napoleon insisted on the removal of Count Colloredo, who held the post From that time forward the emperor Francis acted as his own prime minister, superintending every detail of his administration In foreign affairs after 1809 he reposed full confidence in Prince Metternich But Metternich himself declared at the close of his life that he had sometimes held Europe in the palm of his hand, but never Austria Francis was sole master, and the history of the Austrian empire under his rule and after his death bears testimony to both his merits and his limitations His indomitable patience and loyalty to his inherited task enable him to triumph over Napoleon By consenting to the marriage of his daughter, Marie Louise, to Napoleon in 1810, he gained a respite which he turned to good account By following the guidance of Metternich in foreign affairs he was able to intervene with decisive effect in 1813 The settlement of Europe in 1815 left Austria stronger and more compact than she had been in 1792, and that this was the case was largely due to the emperor

During the 20 years which preceded his death in 1835, Francis was wholly in sympathy with the policy of "repression" which came, in popular view, to be identified with the Holy Alliance; and though Metternich was primarily responsible for the part played by Austria in the "policing" of Europe, Francis cannot but be held personally responsible for the cruel and impolitic severities, associated especially with the sinister name of the fortress prison of the Spielberg, which made so many martyrs to freedom He was denounced by Liberals throughout Europe as a tyrant and an obscurantist Nevertheless he was always popular among the mass of his subjects, who called him "our good Kaiser Franz" His capital error as a ruler of Austria was that he persisted in a system of administration which depended upon the indefatigable industry of a single man Government in Austria broke down under a successor who had not his capacity for work Francis died on March 2, 1835

See Wolfsgruber, *Franz I Kaiser von Österreich* (2 vols, 1899). Ample bibliographies will be found in Krones von Marchland's *Grundriss der osterreichischen Geschichte* (Berlin, 1882) *See* also HABSBURG

FRANCIS I. (1494–1547), king of France, son of Charles of Valois, count of Angoulême, and Louise of Savoy, was born at Cognac on Sept 12, 1494 On the accession of Louis XII in 1498, Francis became heir-presumptive. Louis invested him with the duchy of Valois, and gave him as tutor Marshal de Gié, and, after Gié's disgrace in 1503, the sieur de Boisy, Artus Gouffier François de Rochefort, abbot of St Mesmin, instructed Francis and his sister Marguerite in Latin and history, Louise herself taught them Italian and Spanish.

The Knight.—Francis showed a great love for violent exercises, such as hunting, which was his ruling passion, and tennis, and for tournaments, masquerades and amusements of all kinds His earliest gallantries are described by his sister in the 25th and 42nd stories of the *Heptameron.* He married Claude, daughter of Louis XII, on May 18, 1514, and succeeded to the throne on Jan 1, 1515. In the early years of his reign the government was chiefly in the hands of Louise of Savoy, Chancellor Antoine Duprat, Secretary Florimond Robertet, and the two Gouffiers, Boisy and Bonnivet The royal favour then elevated Anne de Montmorency and Philippe de Chabot, and in the last years of the reign Marshal d'Annebaud and Cardinal de Tournon. Women had a great influence over Francis—his sister, Marguerite d'Angoulême, and his mistresses Whatever the number of these, he had only two titular mistresses—at the beginning of the reign Françoise de Châteaubriant, and from about 1526 to his death Anne de Pisseleu, whom he created duchesse d'Etampes and who entirely dominated him. It has not been proved that he was the lover of Diane de Poitiers, nor does the story of "La belle Ferronnière" appear to rest on any historical foundation. (*See* Paulin Paris, *Études sur le règne de François Ier.*)

The Statesman.—Circumstances alone gave a homogeneous character to the foreign policy of Francis The struggle against the emperor Charles V. filled the greater part of the reign. In reality, the policy of Francis, save for some flashes of sagacity, was irresolute and vacillating. Attracted at first by Italy, he led the triumphal Marignano expedition (1515), which gained him reputation as a knightly king and as the most powerful prince in Europe In 1519, in spite of wise counsels, he stood as candidate for the imperial crown The election of Charles V. caused an inevitable rivalry between the two monarchs which accentuated the light and chivalrous temper of the king and the cold and politic character of the emperor Francis's personal intervention in this struggle was seldom happy He did not succeed in gaining the support of Henry VIII of England in 1520, his want of tact goaded the Constable de Bourbon to extreme measures in 1522–1523, and in the Italian campaign of 1525 he proved himself a vacillating and foolhardy leader, and by his blundering led the army to the disaster of Pavia (Feb 25, 1525), where, however, he fought with great bravery (*see* ITALY *History*) "Of all things," he wrote to his mother after the defeat, "nothing remains to me but honour and life, which is safe"—the authentic version of the legendary phrase "All is lost save honour" He strove to play the part of royal captive heroically, but the prison life galled him He fell ill at Madrid and was on the point of death For a moment he thought of abdicating rather than of ceding Burgundy But this was too great a demand upon his fortitude, and he yielded and signed the treaty of Madrid (1526) After Madrid he wavered unceasingly between two courses that of continuing hostilities, and the policy favoured by Montmorency of peace and understanding with the emperor At times he had the sagacity to recognize the utility of alliances, as was shown by those he concluded with the Porte and with the Protestant princes of Germany But he could never pledge himself frankly in one sense or the other, and this vacillation prevented him from attaining any decisive results At his death, however, France was in possession of Savoy and Piedmont

Religion.—In his religious policy Francis showed the same instability Drawn between various influences, that of Marguerite d'Angoulême, the du Bellays, and the duchesse d'Etampes, who was in favour of the Reformation or at least of toleration, and the contrary influence of the uncompromising Catholics, Duprat, and then Montmorency and de Tournon, he gave pledges successively to both parties In the first years of the reign, following the counsels of Marguerite, he protected Jacques Lefèvre of Etaples and Louis de Berquin, and showed some favour to the new doctrines. But the violence of the Reformers threw him into the arms of the opposite party. The affair of the Placards in 1534 determined him to adopt a policy of severity From that time, in spite of occasional indulgences shown to the Reformers, due to his desire to conciliate the Protestant powers, Francis gave a free hand to the party of repression, of which the most active and most pitiless member was Cardinal de Tournon, and the end of the reign was sullied by the massacre of the Waldenses (1545)

The Ruler.—Francis introduced new methods into government. In his reign the monarchical authority became more imperious and more absolute His was the government *"du bon plaisir."* By the unusual development he gave to the court he converted the nobility into a brilliant household of dependents The Concordat brought the clergy into subjection, and enabled him to distribute benefices at his pleasure among the most docile of his courtiers He governed in the midst of a group of favourites, who formed the *conseil des affaires.* The states-general did not meet, and the remonstrances of the *parlement* were scarcely tolerated. By centralizing the financial administration by the creation of the *Trésor de l'Épargne,* and by developing the military establishments, Francis still further strengthened the royal power. His government had the vices of his foreign policy. It was uncertain, irregular and disorderly. The finances were squandered in gratifying the king's unbridled prodigality, and the treasury was drained by his luxurious habits, by the innumerable gifts and pensions he distributed among his mistresses and courtiers, by his war expenses and by his magnificent buildings. His government, too, weighed heavily upon the people, and he was less popular than is sometimes imagined.

Francis owes the greater measure of his glory to the artists and

men of letters who vied in celebrating his praises He was pre-eminently the king of the Renaissance. Of a quick and cultivated intelligence, he had a sincere love of letters and art. He holds a high place in the history of humanism by the foundation of the Collège de France, he did not found an actual college, but after much hesitation instituted in 1530, at the instance of Guillaume Budé (Budaeus), *Lecteurs royaux,* who in spite of the opposition of the Sorbonne were granted full liberty to teach Hebrew, Greek, Latin, mathematics, etc. The humanists Budé, Jacques Colin and Pierre Duchâtel were the king's intimates, and Clément Marot was his favourite poet. Francis sent to Italy for artists and for works of art, but he protected his own countrymen also. Here, too, he showed his customary indecision, wavering between the two schools. At his court he installed Benvenuto Cellini, Francesco Primaticcio and Rosso del Rosso, but in the buildings at Chambord, St Germain, Villers-Cotterets and Fontainebleau the French tradition triumphed over the Italian

Francis died on March 31, 1547 By his first wife Claude (d 1524) he had three sons and four daughters. Louise, who died in infancy; Charlotte, who died at the age of eight; Francis (d 1536); Henry, who came to the throne as Henry II ; Madeleine, who became queen of Scotland; Charles (d. 1545); and Margaret, duchess of Savoy In 1530 he married Eleanor, the sister of the emperor Charles V.

Bibliography —For the official acts of the reign, the *Catalogue des actes de François Ier,* published by the Académie des Sciences morales et politiques (1887–1907), is a valuable guide The Bibliothèque Nationale, the National Archives, etc , contain a mass of unpublished documents Of the published documents, *see* N Camuzat, *Meslanges historiques* . . . (Troyes, 1619), G Ribier, *Lettres et mémoires d'estat* (1666), *Lettres de Marguerite d'Angoulême,* ed by F. Genin (1841 and 1842), the *Correspondance de Castillon et Marillac* (ed Kaulek, 1885), of *Odet de Selve* (ed by Lefèvre-Pontalis, 1888), and of *Guillaume Pellicier* (ed. Tausserat-Radel, 1900), *Captivité du roi François Ier, and Poésies de François Ier* (both ed. by Champollion-Figeac, 1847, of doubtful authenticity), *Relations des ambassadeurs vénitiens,* etc Of the memoirs and chronicles, *see* the journal of Louise of Savoy in S Guichenon's *Histoire de la maison de Savoie,* vol. iv. (ed of 1778–80); *Journal d'un bourgeois de Paris,* ed by Lalanne (1854); *Cronique du roy François Ier,* ed. by Guiffrey (1868); *Journal de Jean Barillon,* ed by de Vaissière (1897–99); and the memoirs of Fleuranges, Montluc, Tavannes, Vieilleville, Brantôme and especially Martin du Bellay (coll Michaud and Poujoulat). Of the innumerable secondary authorities, *see* especially Paulin Paris, *Études sur le règne de François Ier* (1885), in which the apologetic tendency is excessive, and H. Lemonnier in vol v (1903–04) of E Lavisse's *Histoire de France,* which gives a list of the principal secondary authorities There is a more complete bibliographical study by V. L Bourrilly in the *Revue d'histoire moderne et contemporaine,* vol iv (1902–03) The printed sources have been catalogued by H. Hauser, *Les Sources de l'histoire de France, XVIe siècle,* tome ii (1907)

(J. I ; X)

FRANCIS II. (1544–1560), king of France, eldest son of Henry II. and of Catherine de' Medici, was born at Fontainebleau on Jan 19, 1544. He married Mary Stuart (*see* Mary, Queen of Scots), daughter of James V of Scotland, on Aug 25, 1558, and ascended the French throne on July 10, 1559 During his short reign the young king, a sickly youth and of feeble understanding, was the mere tool of his uncles Francis, duke of Guise, and Charles, cardinal of Lorraine, into whose hands he virtually delivered the reins of government After the failure of the conspiracy of Amboise, directed against the Guises the duke of Guise became lieutenant-general of the kingdom, but his Catholic leanings were somewhat held in check by the chancellor Michel de l'Hôpital (*q v*). Francis II died on March 5, 1560

See Ernest Lavisse, *Histoire de France* (vol vi by J. H. Mariéjol, 1904), which contains a bibliography.

FRANCIS I. (1777–1830), king of the Two Sicilies, was the son of Ferdinand IV. (I) and Maria Carolina of Austria He married Clementina, daughter of the emperor Leopold II. of Austria, in 1796, and at her death Isabella, daughter of Charles IV. of Spain. Francis was appointed regent in Sicily in 1812. On the fall of Napoleon his father returned to Naples and suppressed the Sicilian constitution and autonomy, incorporating his two kingdoms into that of the Two Sicilies (1816); Francis then assumed the revived title of duke of Calabria. On succeeding to the throne in 1825 he showed himself as reactionary as his father. He left the government in the hands of favourites and police officials, and lived with his mistresses, surrounded by soldiers, ever in dread of assassination. During his reign the only revolutionary movement was the outbreak on the Cilento (1828), savagely repressed by the marquis Delcarretto, an ex-Liberal turned reactionary.

See N Nisco, *Il Reame di Napoli sotto Francesco I.* (Naples, 1893).

FRANCIS II. (1836–1894), king of the Two Sicilies, son of Ferdinand II and Maria Cristina of Savoy, was the last of the Bourbon kings of Naples He ascended the throne on May 22, 1859. He at once appointed Carlo Filangieri (*q v*), as prime minister but did not take his sensible advice, and Filangieri soon resigned On June 7 a part of the Swiss Guard mutinied, and while the king mollified them by promising to redress their grievances, General Nunziante collected other troops, who surrounded the mutineers and shot them down Cavour repeated an earlier proposal for an alliance to divide the papal states between Piedmont and Naples, the province of Rome excepted, but Francis rejected an idea which to him savoured of sacrilege. Meanwhile the revolutionary parties were conspiring for the overthrow of the Bourbons in Calabria and Sicily, and Garibaldi was preparing for the conquest of Sicily (*see* Garibaldi) These events at last frightened Francis into granting a constitution, but its promulgation was followed by disorders in Naples and the resignation of ministers, and Liborio Romano became head of the government. Garibaldi who had crossed the straits of Messina, was advancing northwards. Francis, after long hesitations and even an appeal to Garibaldi himself, left Naples (Sept 6) with his wife Maria Sophia, the court, the diplomatic corps (the French and English ministers excepted), and went by sea to Gaeta, where a large part of the army was concentrated. The next day Garibaldi entered Naples, was enthusiastically welcomed, and formed a provisional government Garibaldi's troops defeated the Neapolitan royalists on the Volturno (Oct. 1–2), while the Piedmontese under Victor Emmanuel captured Capua. The siege of Gaeta by the Piedmontese began on Nov. 6, 1860 The fortress capitulated on Feb 12, 1861, and Francis was driven from his kingdom He died on Dec 27, 1894 at Arco in Tirol.

Bibliography —R. de Cesare, *La Fine d' un regno,* vol. ii. (Città di Castello, 1900) gives a detailed account of the reign of Francis II., while H. R. Whitehouse's *Collapse of the Kingdom of Naples* (1899) may be recommended to English readers, G Nisco's *Francesco II.* (Naples, 1887) should also be consulted. *See* under Naples, Garibaldi, Bixio Nino, Cavour, Italy, Filangieri; etc.

FRANCIS IV. (1779–1846), duke of Modena, was the son of the archduke Ferdinand, Austrian governor of Lombardy, who acquired the duchy of Modena through his wife Marie Beatrice, heiress of the house of Este as well as of many fiefs of the Malaspina, Pio da Carpi, Pico della Mirandola, Cibò, and other families At the time of the French invasion (1796) Francis was sent to Vienna to be educated, and in 1809 was appointed governor of Galicia He married the daughter of the exiled king of Sardinia, Victor Emmanuel I , and a secret family compact was made whereby if the king and his two brothers died without male issue, the Salic law would be changed so that Francis should succeed to the kingdom instead of Charles Albert of Carignano (N. Bianchi, *Storia della diplomazia europea in Italia,* vol i 42–43; 1865–72) (For the family connection *see* the genealogical table *s v.* Savoy) On the fall of Napoleon in 1814 Francis received the duchy of Modena, including Massa-Carrara and Lunigiana.

The duke soon showed himself one of the most reactionary despots in Italy. Against the Carbonari and other Liberals he issued the severest edicts, and although there was no revolt at Modena in 1821 as in Piedmont and Naples, he immediately instituted judicial proceedings against the supposed conspirators. Some 350 persons were arrested and tortured, 56 being condemned to death (only a few of them were executed) and 237 to imprisonment; a large number, however, escaped, including Antonio Panizzi (afterwards director of the British Museum). The ferocious police official Besini who conducted the trials was afterwards murdered The duke actually proposed to Prince Metternich, the Austrian chancellor, an agreement whereby the various Italian rulers were to arrest every Liberal in the country on a

certain day, but the project fell through owing to opposition from the courts of Florence and Rome At the congress of Verona Metternich made another attempt to secure the Piedmontese succession for Francis, but without success Modena swarmed with spies and informers, and the least expression of liberalism, or even failure to denounce a Carbonaro, involved arrest and imprisonment

But strange to say, in 1830 we find Francis actually coquetting with revolution, in the person of Ciro Menotti, who seems to have offered help in the matter of the Piedmontese succession But Menotti failed, and after the abortive revolution of 1831 Francis had him executed

On Feb 20, 1846, Francis died He was certainly the ablest of the Italian despots, but Liberalism was in his eyes the most heinous of crimes, and his reign is one long record of barbarous persecution

FRANCIS V. (1819–1875), duke of Modena, son of Francis IV, succeeded his father in 1846 His reign began with disturbances at Fivizzano and Pontremoli, which Tuscany surrendered to him according to treaty but against the wishes of the inhabitants (1847), and also at Massa and Carrara, where the troops shot down the people The duke asked for and obtained an Austrian garrison, but on the outbreak of revolution throughout Italy and at Vienna in 1848, he fled with his family to Mantua A provisional government was formed, and volunteers were raised who fought with the Piedmontese against Austria After the Piedmontese defeat Francis returned to Modena, with Austrian assistance, in August and conferred many appointments on Austrian officers The disturbances at Carrara were ruthlessly suppressed, and the prisons filled with "politicals" In 1859 numbers of young Modenese fled across the frontier to join the Piedmontese army, as war with Austria seemed imminent, and after the Austrian defeat at Magenta the duke left Modena to lead his army in person against the Piedmontese The events of 1859–1860 made his return impossible, and after a short spell of provisional government the duchy was united to Italy He retired to Austria, and died at Munich in November 1875

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FRANCIS, SIR PHILIP (1740–1818), English politician and pamphleteer, the supposed author of the *Letters of Junius*, and the chief antagonist of Warren Hastings, was born in Dublin on Oct 22, 1740 He was educated at a Dublin free school, privately, and at St Paul's school, London In 1756, immediately on his leaving school, he was appointed to a junior clerkship in the secretary of State's office by Henry Fox (afterwards Lord Holland), and this post he retained under the succeeding administration In 1758 he was employed as secretary to Gen Bligh in the expedition against Cherbourg, and in the same capacity he accompanied the earl of Kinnoul on his special embassy to the court of Portugal in 1760

In 1762 he was appointed to a principal clerkship in the War Office, where he formed an intimate friendship with Christopher D'Oyly, the secretary of State's deputy, whose dismissal from office in 1772 was hotly resented by "Junius"; and in the same year he married Miss Macrabie, the daughter of a retired London merchant In 1763 the great constitutional questions arising out of the arrest of Wilkes began to be sharply canvassed It was natural that Francis, who from a very early age had been in the habit of writing occasionally to the newspapers, should be eager to take an active part in the discussion, though his position as a Government official made it necessary that his intervention should be carefully disguised He is known to have written to the *Public Ledger* and *Public Advertiser*, as an advocate of the popular cause, on many occasions about and after the year 1763. His chief title to fame as a writer, however, is his supposed authorship of the *Letters of Junius*, of which the first appeared in Jan. 1769, and the series was continued till Jan. 21, 1772 (*see* JUNIUS).

In March 1772 Francis finally left the War Office, and in the following July started a continental tour which lasted until Dec 1772. In June 1773 Lord North appointed him a member of the newly constituted supreme council of Bengal at a salary of £10,000 per annum Along with his colleagues Monson and Clavering he reached Calcutta in Oct 1774, and a long struggle with Warren Hastings, the governor-general, immediately began These three formed a majority of the council in opposition to the governor-general's policy, accusing him of corruption, mainly on the evidence of Nuncomar The death of Monson (1776) and of Clavering (1777) made Hastings again supreme in the council, and a dispute with Francis, led in Aug 1780 to a minute being delivered to the council board by Hastings, in which he stated that "he judged of the public conduct of Mr Francis by his experience of his private, which he had found to be void of truth and honour" A duel was the consequence, in which Francis received a dangerous wound (*see* HASTINGS, WARREN) His recovery was rapid and complete and he left for England where, on his arrival in Oct 1781, he was received with little favour

In 1784 Francis was returned by the borough of Yarmouth, Isle of Wight, and on the return of Hastings in 1785, did all in his power to bring forward and support the charges which ultimately led to the impeachment resolutions of 1787 He sympathized warmly with the French revolutionary doctrines, in 1793 supported Grey's motion for a return to the old constitutional system of representation, and was one of the founders of the "Society of the Friends of the People" The acquittal of Hastings in April 1795 disappointed Francis of the governor-generalship, and in 1798 he had to submit to the additional mortification of a defeat in the general election He was once more successful, however, in 1802, when he sat for Appleby, but was not offered the governor-generalship on the Whig success in 1806, though he accepted a K C B He was not re-elected for Appleby in 1807 and the remainder of his life was spent in comparative privacy

Among the later productions of his pen were, besides the *Plan of a Reform in the Election of the House of Commons*, pamphlets entitled *Proceedings in the House of Commons on the Slave Trade* (1796), *Reflections on the Abundance of Paper in Circulation and the Scarcity of Specie* (1810), *Historical Questions Exhibited* (1818), and a *Letter to Earl Grey on the Policy of Great Britain and the Allies towards Norway* (1814) His first wife, by whom he had six children, died in 1806, and in 1814 he married his second wife, Emma Watkins, who long survived him, and who left voluminous manuscripts relating to his biography Francis died on Dec 23, 1818

BIBLIOGRAPHY —For the evidence identifying Francis with Junius see the article JUNIUS, and the authorities there cited. *See* also *Memoirs of Sir Philip Francis, with Correspondence and Journals*, by Joseph Parkes and Herman Merivale (2 vols., London, 1867), *The Francis Letters*, edited by Beata Francis and Eliza Keary (2 vols., London, 1901), Sir J. F Stephen, *The Story of Nuncomar and the Impeachment of Sir E Impey* (2 vols, London, 1885), Macaulay's *Essay* on "Warren Hastings", G. B. Malleson, *Life of Warren Hastings* (London, 1894); G. W Forrest, *The Administration of Warren Hastings, 1772–85* (Calcutta, 1892), Sir Leslie Stephen's article on Francis in *Dict of Nat Biog*, vol xx

FRANCISCANS (otherwise called Friars Minor, or Minorites, and in England Grey Friars, from the colour of the habit, which, however, is now brown rather than grey), a religious order founded by St Francis of Assisi (*q v*). It was in 1206 that St Francis left his father's house and devoted himself to a life of poverty and to the service of the poor, the sick and the lepers; and in 1209 that he felt the call to add preaching to his other ministrations, and to lead a life in the closest imitation of Christ's Within a few weeks disciples began to join themselves to him; the condition was that they should dispose of all their possessions When their number was twelve Francis led the little flock to Rome to obtain the pope's sanction for their undertaking. Innocent III received them kindly, but with some misgivings as to the feasibility of the proposed manner of life; these difficulties were overcome, and the pope accorded a provisional approval by word of mouth: they were to become clerics and to elect a superior Francis was elected and made a promise of obedience to the pope, and the others promised obedience to Francis

An Unorganized Fraternity.—This formal inauguration of the institute was in 1209 or (as seems more probable) 1210. On their return to Assisi they obtained from the Benedictine abbey on Mount Subasio the use of the little chapel of St Mary of the Angels, called the Portiuncula, in the plain below Assisi, which became the cradle and headquarters of the order Around the Portiuncula they built themselves huts of branches and twigs, but they had no fixed abode, they wandered in pairs over the country, dressed in the ordinary clothes of the peasants, working in the fields to earn their daily bread, sleeping in barns or in the hedgerows or in the porches of the churches, mixing with the labourers and the poor, with the lepers and the outcasts The key-note of the movement was the imitation of the public life of Christ, especially the poverty of Christ. Francis and his disciples were to aim at possessing nothing, absolutely nothing, so far as was compatible with life, they were to earn their bread from day to day by the work of their hands, and only when they could not do so were they to beg; they were to make no provision for the morrow, lay by no store, accumulate no capital, possess no land, but no austerities were practised beyond those inseparable from the life they lived

Thus the institute in its original conception was a confraternity rather than an order, and there was no formal novitiate, no organization But the number of brothers increased with extraordinary rapidity, and the field of work soon extended itself beyond the neighbourhood of Assisi and even beyond Umbria—within three or four years there were settlements in Perugia, Cortona, Pisa, Florence and elsewhere, and missions to the Saracens and Moors were attempted by Francis himself About 1217 Franciscan missions set out for Germany, France, Spain, Hungary and the Holy Land, and in 1219 a number of provinces were formed, each governed by a provincial minister These developments, whereby the little band of Umbrian apostles had grown into an institute, spread all over Europe and even penetrating to the East, and numbering thousands of members, rendered impossible the continuance of the original free organization whereby Francis's word and example were the sufficient practical rule of life for all: it was necessary as a condition of efficiency and even of existence and permanence that some kind of organization should be provided.

A Monastic Order.—From an early date yearly meetings or chapters had been held at the Portiuncula, at first attended by the whole body of friars, but as the institute extended this became unworkable, and after 1219 the chapter consisted only of the officials, provincial ministers and others. During Francis's absence in the East (1219–1220) a deliberate movement was initiated by the two vicars whom he had left in charge of the order, towards assimilating it to the monastic orders Francis hurried back, bringing with him Elias of Cortona, the provincial minister of Syria, and immediately summoned an extraordinary general chapter (September 1220). Before it met he had an interview on the situation with Cardinal Hugolino of Ostia (afterwards Gregory IX), the great friend and supporter of both Francis and Dominic, and he went to Honorius III. at Orvieto and begged that Hugolino should be appointed the official protector of the order. The request was granted, and a bull was issued formally approving the order of Friars Minor, and decreeing that before admission every one must pass a year's novitiate, and that after profession it was not lawful to leave the order. By this bull the Friars Minor were constituted an order in the technical sense of the word. When the chapter assembled, Francis, no doubt from a genuine feeling that he was not able to govern a great world-wide order, practically abdicated the post of minister-general by appointing a vicar, and the policy of turning the Friars Minor into a great religious order was consistently pursued, especially by Elias, who a year later became Francis's vicar (*see* FRANCIS OF ASSISI; ELIAS OF CORTONA).

On Francis's death in 1226 the government of the order rested in the hands of Elias until the chapter of 1227. At this chapter Elias was not elected minister-general; the building of the great basilica and monastery at Assisi was so manifest a violation of St. Francis's ideas and precepts that it produced a reaction, and John Parenti became St. Francis's first successor. He held fast to St. Francis's ideas, but was not a strong man. At the chapter of 1230 a discussion arose concerning the binding force of St. Francis's Testament, and the interpretation of certain portions of the Rule, especially concerning poverty, and it was determined to submit the questions to Pope Gregory IX. (formerly the cardinal Hugolino mentioned above) He issued a bull, *Quo elongati*, which declared that as the Testament had not received the sanction of the general chapter it was not binding on the order, and also allowed trustees to hold and administer money for the order.

Wealth.—John Parenti and those who wished to maintain St. Francis's institute intact were greatly disturbed by these relaxations, but a majority of the chapter of 1232, by a sort of *coup d'état*, proclaimed Elias minister-general, and John retired, though in those days the office was for life Under Elias the order entered on a period of extraordinary extension and prosperity the number of friars in all parts of the world increased wonderfully, new provinces were formed, new missions to the heathen organized, the Franciscans entered the universities and vied with the Dominicans as teachers of theology and canon law, and as a body they became influential in church and state With all this side of Elias's policy the great bulk of the order sympathized; but his rule was despotic and tyrannical and his private life was lax—at least according to any Franciscan standard, for no charge of grave irregularity was ever brought against him. And so a widespread movement against his government arose, the backbone of which was the university element at Paris and Oxford, and at a dramatic scene in a chapter held in the presence of Gregory IX. Elias was deposed (1239)

At this time the Franciscans were divided into three parties: there were the Zealots, or Spirituals, who called for a literal observance of St Francis's Rule and Testament. They deplored all the developments since 1219, and protested against turning the institute into an order, the frequentation of the universities and the pursuit of learning, in a word, they wished to restore the life to what it had been during the first few years—the hermitages and the huts of twigs, and the care of the lepers and the nomadic preaching The Zealots were few in number but of great consequence from the fact that to them belonged most of the first disciples and the most intimate companions of St. Francis At the other extreme was a party of relaxation, that abandoned any serious effort to practise Franciscan poverty and simplicity of life Between these two stood the great middle party of Moderates, who desired indeed that the Franciscans should be really poor and simple in their manner of life, and really pious, but on the other hand approved of the development of the order on the lines of other orders, of the acquisition of influence, of the cultivation of theology and other sciences, and of the frequenting of the universities

Moderates and Spirituals.—The Moderate party was by far the largest, and embraced nearly all the friars of France, England and Germany It was the Moderates and not the Zealots that brought about Elias's deposition, and the next general ministers belonged to this party Further relaxations of the law of poverty, however, caused a reaction, and John of Parma, one of the Zealots, became minister-general, 1247–1257. Under him the more extreme of the Zealots took up and exaggerated the theories of the Eternal Gospel of the Calabrian Cistercian abbot Joachim of Floris (*q v.*); some of their writings were condemned as heretical, and John of Parma, who was implicated in these apocalyptic tendencies, had to resign. He was succeeded by St. Bonaventura (1257–1274), one of the best type of the middle party. He was a man of high character, a theologian, a mystic, a holy man and a strong ruler He set himself with determination to effect a working compromise, and proceeded with firmness against the extremists on both sides But controversy and recrimination and persecution had stiffened the more ardent among the Zealots into obstinate fanatics—some of them threw themselves into a movement that may best be briefly described as a recrudescence of Montanism (*see* Émile Gebhart's *Italie mystique*, 1899, cc. v. and vi.), and developed into a number of sects, some on the fringe of Catholic Christianity and others beyond its pale (*see* FRATICELLI). But the majority of the Zealot party,

or Spirituals, did not go so far, and adopted as the principle of Franciscan poverty the formula "a poor and scanty use" (*usus pauper et tenuis*) of earthly goods, as opposed to the "moderate use" advocated by the less strict party

The question thus posed came before the Council of Vienne, 1312, and was determined, on the whole, decidedly in favour of the stricter view. Some of the French Zealots were not satisfied and formed a semi-schismatical body in Provence; twenty-five of them were tried before the Inquisition, and four were burned alive at Marseilles as obstinate heretics, 1318 After this the schism in the Order subsided But the disintegrating forces produced by the papal schism and other disorders of the 14th century caused among the Franciscans the same relaxations and corruptions, and also the same reactions and reform movements, as among the other orders

The chief of these reforms was that of the Observants, which began at Foligno about 1370 The Observant reform was on the basis of the "poor and scanty use" of worldly goods, but it was organized as an order and its members freely pursued theological studies, thus it did not represent the position of the original Zealot party, nor was it the continuation of it The Observant reform spread widely throughout Italy and into France, Spain and Germany The great promoters of the movement were St Bernardine of Siena and St. John Capistran The council of Constance, 1415, allowed the French Observant friars to be ruled by a vicar of their own, under the minister-general, and the same privilege was soon accorded to other countries By the end of the middle ages the Observants had some 1,400 houses divided into 50 provinces This movement produced a "half-reform" among the Conventuals or friars of the mitigated observance, it also called forth a number of lesser imitations or congregations of strict observance

Division.—After many attempts had been made to bring about a working union among the many observances, in 1517 Leo X divided the Franciscan order into two distinct and independent bodies, each with its own minister-general, its own provinces and provincials and its own general chapter (1) The Conventuals, who were authorized to use the various papal dispensations in regard to the observance of poverty, and were allowed to possess property and fixed income, corporately, like the monastic orders. (2) The Observants, who were bound to as close an observance of St Francis's Rule in regard to poverty and all else as was practically possible

At this time a great number of the Conventuals went over to the Observants, who have ever since been by far the more numerous and influential branch of the order Among the Observants in the course of the sixteenth century arose various reforms, each striving to approach more and more nearly to St Francis's ideal, the chief of these reforms were the Alcantarines in Spain (St Peter of Alcantara, St Teresa's friend, d 1562), the Riformati in Italy and the Recollects in France. all of these were semi-independent congregations The Capuchins (*q v*), established *c* 1525, who claim to be the reform which approaches nearest in its conception to the original type, became a distinct order of Franciscans in 1619 Finally Leo XIII. grouped the Franciscans into three bodies or orders—the Conventuals; the Observants, embracing all branches of the strict observance, except the Capuchins, and the Capuchins—which together constitute the "First Order" For the "Second Order," or the nuns, *see* CLARA, ST, and CLARES, POOR, and for the "Third Order" *see* TERTIARIES. Many of the Tertiaries live a fully monastic life in community under the usual vows, and are formed into Congregations of Regular Tertiaries, both men and women They have been and are still very numerous, and give themselves up to education, to the care of the sick and of orphans and to good works of all kinds.

No order has had so stormy an internal history as the Franciscans; yet in spite of all the troubles and dissensions and strivings that have marred Franciscan history, the Friars Minor of every kind have in each age faithfully and zealously carried on St. Francis's great work of ministering to the spiritual needs of the poor. Always recruited in large measure from among the poor, they have ever been the order of the poor, and in their preaching and missions and ministrations they have ever laid themselves out to meet the needs of the poor. Another great work of the Franciscans throughout the whole course of their history has been their missions to the Mohammedans, both in western Asia and in North Africa, and to the heathens in China, Japan and India, and North and South America; a great number of the friars were martyred The news of the martyrdom of five of his friars in Morocco was one of the joys of St Francis's closing years. Many of these missions exist to this day. In the universities, too, the Franciscans made themselves felt alongside of the Dominicans, and created a rival school of theology, wherein, as contrasted with Dominican Aristotelianism, the Platonism of the early Christian doctors has been perpetuated

The Franciscans came to England in 1224 and immediately made foundations in Canterbury, London and Oxford (for lists *see* Gasquet, *English Monastic Life*) Though nearly all the English houses belonged to what has been called the "middle party," as a matter of fact they practised great poverty, and the commissioners of Henry VIII often remark that the Franciscan Friary was the poorest of the religious houses of a town. The English province was one of the most remarkable in the order, especially in intellectual achievement, it produced Friar Roger Bacon, and, with the single exception of St Bonaventure, all the greatest doctors of the Franciscan theological school—Alexander Hales, Duns Scotus and Occam

The Franciscans have always been the most numerous by far of the religious orders, it is estimated that about the period of the Reformation the Friars Minor must have numbered nearly 100,000 At the present day the statistics are roughly (including lay-brothers) Observants, 17,000, Conventuals, 2,400, to these should be added 16,000 Capuchins, making the total number of Franciscan friars about 35,000 There are various houses of Observants and Capuchins in England and Ireland, and the old Irish Conventuals survived the penal times and still exist.

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FRANCIS FERDINAND (1863–1914), archduke of Austria, was born at Graz on Dec 18, 1863. The eldest son of the Archduke Charles Louis and a nephew of the Emperor Francis Joseph, he became, after the death of the Crown Prince Rudolph, the heir to the Austro-Hungarian monarchy. In 1875 he took the title of archduke of Austria-Este, as heir to his uncle the duke of Modena, with whose death the male line of this branch of the house became extinct, and to his possessions in Austria-Hungary and Italy.

Until the death on Jan 30, 1889, of the Crown Prince Rudolph, Francis Ferdinand was only known in limited circles and even then he was not invited by the Emperor Francis Joseph to take part in State affairs. On July 1, 1900, he married Countess Sophie

Chotek (1868–1914), after having overcome, by tenacious persistence, the obstacle due to the fact that the lady was not of royal family, and renounced a few days before the ceremony the succession rights of any children of the union This renunciation was not only inscribed in the records of the imperial family, but ratified in the Austrian and Hungarian parliaments and sanctioned by a law of Dec 4, 1900

After that time the emperor gradually allotted to him responsibilities of his own, not only in military matters but occasionally in questions of domestic politics The difference of outlook of the two men, however, became more and more marked, for with advancing age Francis Joseph was less and less willing to consider far-reaching reforms and was anxious to avoid any conflict with the nationalities Francis Ferdinand was convinced that the Magyar preponderance in the affairs of the dual monarchy must be broken in the interests of the monarchy and the dynasty For some time he held that Federalism was the best solution At another period he inclined to "Trialism" Later, influenced by the Hungarian minister Kristoffy, he inclined to strengthen unity by changing the Delegations into a central parliament and attaching the annexed provinces Bosnia and Hercegovina, with a State organization of their own, to the empire. The opposition which he met on all sides from the ruling party in Hungary strengthened his conviction that here lay the essential obstacle to the healthy recovery of the monarchy In the severe conflicts between the Magyars and the Crown from the beginning of the 20th century onwards he, therefore, maintained the opinion that no concession must be made, and that there should be no shrinking even from the use of armed force for the defence of the rights of the monarchy and the dynasty.

The zeal with which he sought the solution of domestic political problems by strengthening the central power is explained by his firm conviction that this was the indispensable condition of the monarchy as a Great Power, which he desired to maintain and to increase He considered that friendly relations with Great Britain were desirable, but towards France, and still more towards Italy, his attitude was cool and negative He was convinced that there must inevitably be a day of reckoning between the monarchy and Italy. He never adopted an anti-Slav policy. He wished to avoid conflicts with the principal representatives of the Slav nationalities, and recognized in the tsar of Russia the strongest support against revolutionary movements in monarchical States At the same time he expressed the decided opinion that the encroachments of the Greater Serbia movement on Austro-Hungarian soil should be resisted with all the forces of the monarchy He stood by Germany, yet was determined that the monarchy should not fall into dependence on her powerful ally

Francis Ferdinand was a man of more than average ability He would immediately recognize the essential point in any business in which he was engaged What he lacked was knowledge of men and calmness and constancy in his relations with the men who had been placed in high offices of State by his influence He asked from the citizens of the monarchy not affection, but submission to the will of the ruler. To him the State was identified with the divinely appointed person of the monarch. He was shot on June 28, 1914, with his wife, by Bosnians of Serbian nationality at Serajevo. (*See* EUROPE)

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FRANCIS JOSEPH I. (1830–1916), emperor of Austria and king of Hungary, was born on Aug. 18, 1830, eldest son of the archduke Francis Charles, second son of the reigning emperor Francis I., and Sophia, daughter of Maximilian I., king of Bavaria. Francis Joseph was educated in a severe and clerical atmosphere, his preceptors including Metternich himself. On the outbreak of the revolution of 1848 he served in Italy, under Radetzky; and when the revolution was crushed, as the leaders of the reaction, Schwarzenberg and Windischgratz, wished to start afresh with a monarch not compromised by any concessions or promises to the revolutionaries, Ferdinand was persuaded to abdicate in favour of his nephew (Dec 2, 1848) During the first years of his reign (for details *see* AUSTRIA) Francis Joseph was wholly under the influence of Schwarzenberg, his mother, and his tutor, Cardinal Rauscher His rule began unauspiciously with the suppression of liberty in Germany, in Italy and in Hungary, where Russian help was called in to crush the Magyars. Even in Austria, the parliament of Kremsier was suppressed, and on Dec 31, 1851, the young sovereign revoked the constitution which he himself had enacted two years previously to establish a centralist absolutism in which the monarch assumed the entire weight and responsibility of government After Schwarzenberg's death (April 1852), Francis Joseph appointed no successor, but acted as his own Minister President His conscientious diligence was untiring, and this period of his reign, for all its lack of liberty, did not lack wise administrative reforms. Unfortunately, in his youth even more than his age, Francis Joseph was convinced both of the impossibility and the impiety of constitutional methods While leaving his bureaucracy to control a docile people, he embarked himself on an ambitious foreign policy The army was increased, and his natural piety heightened by his escape from an assassin's knife in 1853, and combined with visions of a revival of the old Holy Roman Empire, found vent in the conclusion of the Concordat of 1855 Francis Joseph dreamed of a brilliant autocracy, resting on the church and the sword, but the foreign ventures of his early years was as unlucky as they were ambitious His vacillating policy in the Crimean War left Austria isolated, and earned him the personal antagonism of the Tsar; the war of 1859 ended ill; his most brilliant plan of all, the convocation of a *Furstentag* in Frankfurt, under his own presidency, to discuss German affairs, was frustrated by the shrewdness of Bismarck in preventing the king of Prussia from attending. The hegemony in Germany passed definitively to Prussia at the end of the Seven Weeks War of 1866

These 18 years of misfortune constitute the first period of Francis Joseph's career—the period of hope, ambition and self-confidence at home and abroad During this period he might have justly been called a militarist, acts of repression and severity amounting to cruelty were perpetrated in his name, and the responsibility for them must lie with him, since he claimed the right to autocracy Hitherto, also, he had believed in his ability (he always believed in his right) to enforce an absolute system, and to be sole judge of his peoples' welfare But the consistent failure of his ambitions, involving Austria, as it did, in a disastrous financial crisis, compelled him to come to terms with his subjects, first and foremost the Magyars, but also the Poles, Czechs and Germans With the plainest reluctance and opposition, he was forced step by step into the path of constitutionalism. Francis Joseph's inner resistance to this necessity was manifested in the impatience and instability of his decisions He was still far from the idea of letting the *people* govern; the idea of sharing responsibility with the centralizing German bureaucracy alternated in his mind with that of concessions to the politically less desirable, but socially intelligible Magyar magnates. As each in turn disappointed him, and seemed intolerably distasteful, he flew to the extreme of the other, so that all the period 1859–67 was marked by extraordinary vacillations which revealed another of the Emperor's weaknesses; he never trusted his ministers fully or for long, and looking on the most faithful of them only as servants and instruments, he threw them aside without a second thought when he was done with them

The years 1866–67 formed the turning-point in Francis Joseph's life. He had been forced to accept the constitutional principle, had come to terms with the Magyars, in token of which he was at last crowned king in Hungary, and to admit definitively a constitutional regime in Austria. The period of adventure was over at home, and to a large extent abroad, for if up to 1870 he dreamed of revenge on Prussia, the decisive step was never taken, and after the foundation of the German Empire, Francis

Joseph accommodated himself—joylessly but without resistance—to his diminished rôle in the west In his private life, too, a period was closed His marriage (April 24, 1854) with the beautiful Elizabeth of Wittelsbach had been a true love-match, but the couple soon became estranged, partly owing to the Emperor's fault, and partly to his mother's intrigues His brother Maximilian perished in Mexico in 1867; his only son Rudolph was no joy to him

His word once pledged to Constitutionalism, Francis Joseph stood by it In his heart he probably always looked on the Magyars as rebels, but he was socially sympathetic to their magnates, and held loyally by the compromise of 1867, the prolonged crisis of 1903 on was caused by Magyar endeavours to alter the basis of the compromise, particularly of that prerogative to which Francis Joseph held above all others—his undisputed control over the army His natural sympathies were for the German race; but the leading German party was that of the Liberals—middle-class, anti-clerical and opposed to military expenditure—while the Slav districts were the stronghold of the feudal magnates. So Francis Joseph stood above party, at heart unsympathetic to all, and playing off one against the other with a sole eye to the integrity of the monarchy So far did his indifference to parliamentarism go, that he was actually largely instrumental in the introduction of general suffrage into Austria, as a last attempt to play off a new factor against all the unsatisfactory parties alike

His foreign policy became increasingly frantic. He did, indeed, seek some compensation for his early losses in the occupation, and later annexation, of Bosnia and the Hercegovina, but these measures, especially the latter, were far more defensive than is generally admitted His personal influence was always on the side of peace, and although deeply shocked by the murder of the Archduke, he would probably have found some means of averting war with Serbia in 1914, had the conduct of foreign policy not slipped from his hands with advancing age War once declared, he remained wholly loyal to his German ally, although he would gladly have seen peace restored For his illusions regarding successful war were gone; and he declared now that Austria "would be lucky if she got off with a black eye"

His disillusionment was due in part to the unceasing bickering of his subjects, in part to the increasing loneliness of his private life, for his wife was assassinated in 1897, his son Rudolph (*q v*) committed suicide in 1889, his nephew and heir, Francis Ferdinand (*q v*), was unsympathetic to him In his old age he consorted with few persons except his lifelong friend, Katharine Schratt, and his young grandchildren The hostility between him and his subjects (to whose welfare he was always devoted) had vanished; but their reverence for him was too remote to become active affection

Francis Joseph's invariable reserve, due partly to his consciousness of his exalted position, was such that character-sketches or even anecdotes of him are rare In his old age his character softened, and he was always courteous, conscientious, industrious, and above all dignified He had a prodigious memory and experience, but an intellect not above the average, and a cold and somewhat ungenial nature, with no taste for the arts His only passion was the chase His great failing as a rule was his distrust of ability Two of his phrases are illuminating. to the citizens of Frankfurt, in 1866, he said "I have an unlucky hand"; and to the Field Marshal Conrad, at the end of his life "Believe me, this realm cannot be ruled constitutionally" He died peacefully on Nov 21, 1916 (C. A M.)

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FRANCIS OF ASSISI, ST. (1181/82–1226), founder of the Franciscans (*q.v*), was born at Assisi, his father, Pietro Bernardone, being one of the larger merchants. His education appears to have been of the slightest, even for those days, and it is difficult to decide whether the early biographers imply that his youth was not free from irregularities. In any case, he was the recognized leader of the young men of the town in their revels, though he was always conspicuous for his charity to the poor.

After a serious illness in 1202 during which he became dissatisfied with his way of life, he set out on a military expedition, but at the end of the first day fell ill, and had to return to Assisi. This disappointment brought on again the spiritual crisis experienced in his illness. One day he gave a banquet to his friends, and after it they sallied forth through the streets, Francis being crowned as the king of the revellers; after a time they missed him, and on retracing their steps they found him in a trance, a permanently altered man He devoted himself to solitude, prayer and the service of the poor, and before long went on a pilgrimage to Rome The determining episode of his life followed soon after his return to Assisi Having a special horror of lepers, he passed by a begging leper, but immediately an heroic act of self-conquest made him return, give the leper his money, and kiss his hand From that day he gave himself to the service of the lepers and the hospitals In consequence of his profuse alms to the poor and to the restoration of the church of St Damian, his father fearing the dissipation of his property took Francis before the bishop of Assisi to have him legally disinherited; but without waiting for the documents to be drawn up, Francis cast off his clothes and having received a cloak from the bishop, went off to the woods of Mount Subasio.

The next three years he spent in abject poverty, ministering to lepers and outcasts He began to frequent the ruined little chapel of St Mary of the Angels, known as the Portiuncula, and one day during Mass, the words of the Gospel came to him as a call: "Everywhere on your road preach and say—The kingdom of God is at hand Cure the sick, raise the dead, cleanse the lepers, drive out devils Freely have you received, freely give. Carry neither gold nor silver nor money in your girdles, nor bag, nor two coats, nor sandals, nor staff, for the workman is worthy of his hire" (Matt x. 7–10) Layman as he was, he went up to Assisi to preach to the poor (1209) Disciples joined him, and when they were twelve in number they obtained the sanction of Innocent III, and gave themselves up to apostolic preaching and work among the poor

The character and development of the order are traced in the article FRANCISCANS, here the story of Francis will be attempted. To delineate his character in a few words is a difficult task There is such a many-sided richness, such a tenderness, such a poetry, such an originality, such a distinction revealed by the innumerable anecdotes in the memoirs of his disciples, that his personality is brought home to us as one of the most lovable and one of the strongest of men Probably no one has ever set himself so seriously to imitate the life of Christ and to carry out so literally Christ's work in Christ's own way His enthusiastic love of poverty is certainly the keynote of St. Francis's spirit, hence one of his disciples in an allegorical poem (Eng. trans, as *The Lady of Poverty* by Montgomery Carmichael, 1901), and Giotto in one of the frescoes at Assisi, celebrated the "holy nuptials of Francis with Lady Poverty"

Another striking feature was his constant joyousness, a precept in his rule, and one that he enforced strictly His love of nature, animate and inanimate, was keen and manifested itself in ways that appear somewhat naive His preaching to the birds is a favourite theme in art All creatures he called his "brothers" or "sisters" and in the poem, "Praises of the Creatures," calls on "brother Sun," "sister Moon," "brother Wind," and "sister Water" to praise God. In his last illness he was cauterized, and on seeing the burning iron he addressed "brother Fire," reminding him how he had always loved him and asking him to deal kindly with him. It would be an anachronism to think of Francis as a philanthropist or a "social worker" or a revivalist preacher, though he fulfilled the best functions of all these. Before everything he was an ascetic and a mystic—an ascetic who, though gentle to others, wore out his body by self-denial, so much so that when he came to die he begged pardon of "brother Ass the body" for having unduly ill-treated it. He was a mystic irradiated with the

love of God, and endowed in an extraordinary degree with the spirit of prayer.

The effect of the preaching of the friars, and their example and their work among the poor, was a great religious revival throughout Umbria and many new members for the order In 1212 Francis invested St Clara (*q.v*) with the Franciscan habit, and so instituted the "Second Order," that of the nuns As the friars became more numerous their labours extended to other countries Francis himself set out, probably in 1212, for the Holy Land, but he was shipwrecked and had to return A year or two later he went to the Moors in Spain, but had again to return without accomplishing his object In 1219, he went to Egypt, where the crusaders were besieging Damietta, and on being taken prisoner was led before the sultan, to whom he preached the Gospel The sultan sent him back to the Christian camp, and he passed on to the Holy Land where he remained until Sept 1220 During his absence the troubles in the order that were to attain to such magnitude after his death began The circumstances under which, at an extraordinary general chapter, he resigned the office of minister-general (Sept. 1220) are explained in the article FRANCISCANS. here, as illustrating the spirit of the man, it is in place to cite the words of his abdication. "Lord, I give Thee back this family which Thou didst entrust to me Thou knowest, most sweet Jesus, that I have no more the power and the qualities to continue to take care of it I entrust it, therefore, to the ministers Let them be responsible before Thee at the Day of Judgment, if any brother by their negligence, or their bad example, or by a too severe punishment, shall go astray" These words seem to contain the mere truth Francis's peculiar religious genius was probably not adapted for the government of an enormous society

The chief works of the next years were the revision and final redaction of the Rule and the formation of the "Third Order" "Brothers and Sisters of Penance," a vast lay confraternity trying to carry out, without withdrawing from the world, the fundamental principles of Franciscan life (see TERTIARIES).

If for no other reason than the prominent place they hold in art, the Stigmata must be mentioned Two years before his death Francis went up Mount Alverno in the Apennines with some of his disciples, and after forty days of fasting and prayer and contemplation, on Sept 14, 1224 (to use Sabatier's words), "he had a vision. in the warm rays of the rising sun he discerned suddenly a strange figure A seraph with wings extended flew towards him from the horizon and inundated him with pleasure unutterable At the centre of the vision appeared a cross, and the seraph was nailed to it When the vision disappeared Francis felt sharp pains mingling with the delights of the first moment Disturbed to the centre of his being he anxiously sought the meaning of it all, and then he saw on his body the Stigmata of the Crucified" The early authorities represent the Stigmata not as bleeding wounds, but as fleshy excrescences resembling the nails In the first edition of the *Vie,* Sabatier rejected the Stigmata; but in the later editions he accepts their objective reality as historically established and gives the evidence. There exists what is most probably an autograph of Br. Leo, the saint's favourite disciple and companion on Mount Alverno at the time, which describes the circumstances of the stigmatization Elias of Cortona (*q.v.*), the acting superior, wrote on the day after his death a circular letter wherein he clearly implies that he himself had seen the Stigmata There is also much contemporary second hand evidence.

Francis was so exhausted by the sojourn on Mount Alverno that he had to be carried back to Assisi His remaining months were passed in great bodily suffering, and though he became almost blind, he worked on with joyousness He died in the Portiuncula on Oct. 3, 1226. Two years later he was canonized by Gregory IX., whom, as Cardinal Hugolino of Ostia, he had chosen as protector of his order.

The works of St. Francis consisting of the Rule (in two redactions), the Testament, spiritual admonitions, canticles and a few letters were first edited by Wadding (Antwerp 1623). In 1904 critical editions were published by the Franciscans of Quaracchi (near Florence) and by H Boehmer of Bonn. (Eng. trs Philadelphia 1906 and London 1907.) Besides the works, there is a considerable amount of traditional matter—anecdotes, sayings, sermons—preserved in the biographies and in the *Fioretti* (ed Sabatier, 1902. Eng trs in Everyman's Library, 1910)

Of the numerous sources for the life of St Francis and early Franciscan history the chief materials are in the following collections. *Archiv fur Literatur und Kirchengeschichte des Mittelalters* (ed Ehrle and Denifle, 1885, etc.); publications of the Franciscans of Quaracchi (list to be obtained from Herder, Freiburg im Breisgau), and Sabatier, *Collection d'études et de documents sur l'histoire religieuse et littéraire du moyen âge* (5 vols 1898 fol) and *Opuscules de critique historique* (12 fascicules). the easiest and most consecutive way of following the controversy is by the aid of the "Bulletin Hagiographique" in *Analecta Bollandiana* Popular accounts of the sources are given in Sabatier's *Vie de S François* and *Speculum perfectionis,* and Lempp's *Frère Élie de Cortone*

Concerning the life of St Francis and the beginnings of the order, the chief documents are. the two *Lives* by Thomas of Celano (1228 and 1248 respectively, Eng trans A G Ferrers Howell, 1908), critical edition by Ed d'Alençon 1906 and the Quaracchi Franciscans (1926); the so-called *Legenda trium sociorum* (ed. Foligno 1898, Eng trans by G Gurney Salter, 1902); the *Speculum perfectionis,* discovered by Sabatier and edited in 1898 (Eng trans by De la Warr 1902, and in Everyman's Library, 1910) Sabatier contended that the *Speculum perfectionis* was the first of all the Lives of the saint, written in 1227 by Br Leo, his favourite disciple, and that the *Legenda 3 Soc.* was the handiwork of Leo and the two other intimate companions of Francis, compiled in 1246, these are the most authentic accounts, Celano's Lives being written in opposition and in the interests of those who favoured mitigations of the Rule The whole ground was reviewed by W Goetz in *Die Quellen zur Geschichte des hl Franz von Assisi* (1904) His conclusions are substantially those of van Ortroy, the Bollandist, and Friar Lemmens, and the direct contrary of Sabatier's. the *Legenda 3 Soc* is a forgery, the *Speculum perfectionis* is a compilation of the 14th century, also largely a forgery, but containing an element derived from Br Leo; on the other hand, Celano's two Lives are free from the "tendencies" ascribed to them by Sabatier, and that of 1248 was written with the collaboration of Leo and the other companions Thus the best sources are those portions of the *Speculum* that can with certainty be carried back to Br Leo, and the Lives by Thomas of Celano, especially the second *Life* The official life of St. Francis is St. Bonaventura's *Legenda,* published by the Franciscans of Quaracchi (1898), Eng trs in Everyman's Library (1910)

Sabatier's fascinating and in many ways sympathetic *Vie de S. François* (1893, 33rd ed, 1906, Eng trans by L S Houghton, 1901) seems to depict St Francis too much from the standpoint of modern religiosity, and has exaggerated his attitude to the church In articles in the *Hist. Vierteljahrsschrift* (1902, 1903) Goetz has shown that Sabatier's presentation of St. Francis's relations with the ecclesiastical authority in general, and with Cardinal Hugolino (Gregory IX) in particular, is misconceived; that the development of the order was not forced on Francis against his will, and that the differences in the order did not during Francis's lifetime attain to such a magnitude as to cause him the suffering depicted by Sabatier. This from a Protestant historian like Goetz is most valuable criticism. In truth Sabatier's St Francis as a modern pietistic French Protestant of the most liberal type, with a veneer of 13th century Catholicism, is an anachronism.

See also· Van den Borne, *Die Franziskus-Forschung* (Munich, 1917); Cuthbert, *Life of St Francis* (3rd ed 1921), and *Romanticism of St Francis* (2nd ed 1924), Facchinetti, *San Francesco d'Assisi* (Milan, 1921); G. K Chesterton, *St. Francis of Assisi* (1923), M. Beaufreton, *S François d'Assisi* (1925); J Jörgensen, *San Francesco de Asis,* 2 vols (2nd ed. Madrid, 1925); H. Felder, *The Ideal of St. Francis* (Eng. trs., 1925), and *St. Francis of Assisi, Essays in Commemoration* (1926). (E. C. B.; X.)

FRANCIS OF PAOLA (or PAULA), **ST.** (*c* 1416–1507), founder of the Minims, one of the Mendicant orders of the Roman Catholic Church, was born of humble parentage at Paola in Calabria. He entered a Franciscan friary, but left it to live as a hermit Soon disciples joined him, and with the bishop's

approval he built a church and monastery. They proposed to go beyond even the strict Franciscans in fasts and bodily austerities, in poverty and in humility, and therefore, as the Franciscans were the Minors (*minores*, less), the new order took the name of Minims (*minimi*, least) By 1474 the order was approved by the pope. In 1482 Louis XI of France, being on his deathbed sent for Francis to attend him Louis' successor, Charles VIII, held him in such high esteem that he kept him in Paris, and enabled him to found various houses of his order He died in the monastery at Plessis-les-Tours, and his feast is celebrated on April 2nd

The Rule was so strict that it was not finally sanctioned until 1506. It enjoins perpetual abstinence, even from such animal products as eggs, milk, butter, cheese The strongly ascetical spirit of the Minims manifested itself in the title borne by the superiors—not abbot (father), or prior, or guardian, or minister, or rector, but corrector At the death of the founder, the order had five provinces—Italy, France, Tours, Germany, Spain.

See Helyot, *Hist. des ordres religieux* (1714), vii ; M Heimbucher, *Orden und Kongregationen* (1896), 1., Wetzer und Welte, *Kirchenlexicon* and Herzog, *Realencyklopadie*

FRANCIS (FRANÇOIS) OF SALES, ST. (1567–1622), noted bishop of Geneva and doctor of the Church, was born in Aug 1567 at the castle of Sales, near Annecy, Savoy He studied at the Jesuit College of Clermont at Paris and then at Padua, where in 1588 he took his degree in law. He returned to Savoy in 1592, and took the diploma of advocate to the senate He was then made provost of the chapter of Geneva, and a year later, was sent by the bishop, Claude de Granier, to win back the province of Chablais, which had embraced Calvinism in 1535 By 1598 the whole country was Catholic again In Oct of this year, Duke Charles Emmanuel of Savoy, who participated in the celebrations of the return of the country to the faith, expatriated such of the leading men as obstinately refused even to listen to the Catholic arguments He also forbade Calvinist ministers to reside in the Chablais, and substituted Catholic for Huguenot officials St Francis concurred in these measures, and, three years later, even requested that those who, as he said, "follow their heresy, rather as a party than a religion," should be ordered either to conform or to leave their country, with leave to sell their goods At this time Francis was nominated to the pope as coadjutor of Geneva, with the title of Nicopolis *in partibus*, and after a visit to Rome he assisted Bishop de Granier in the administration of the newly converted countries

In 1602 he re-visited Paris where he came into the closest relations with the court of Henry IV In Sept. of the same year he succeeded De Granier as bishop With Jeanne Françoise Frémyot (1572–1641), widow of the baron de Chantal, he founded the order of the Visitation, in favour of "strong souls with weak bodies," as he said, deterred from entering other orders because of physical weakness In 1618 he again went to Paris to assist in negotiating the marriage of the prince of Piedmont with Chrétienne of France, but nearly all his time was spent in preaching and works of mercy, spiritual or corporal St Vincent has given the most extraordinary testimonies (as yet unpublished) of his heroic virtues, and Mère Angélique Arnaud put herself under his direction and wished to join the Order of the Visitation He returned to Savoy, and after three years of unwearying labour died at Lyons on Dec. 28, 1622 He was canonized in 1665

The first edition of his complete works was published at Toulouse in 1637 A critical edition was published by the Visitation of Annecy (21 vols., 1892). There are Eng translations of various selections of his works, of the *Spiritual Conferences* (1868) and of the *Introduction to the Devout Life* (1924)

A biography of St Francis de Sales was produced immediately after his death by the celebrated P de La Rivière and Dom John de St. François (Goulu), and another by his nephew, Charles Auguste de Sales, in 1635 (reprinted Paris, 1866). M. Hamon's *Vie de S François* (1856, 7th ed., 1922) has been adapted by H. Burton as *The Life of St. Francis de Sales* (1925). *See* also H. B. Mackey, *Four Essays on St Francis de Sales* (1883) ; A. Delplanque, *S. François de Sales, Humaniste et Écrivain* (Lille, 1907) ; and article in Herzog-Hauck, *Realencyklopädie.*

FRANCIS OF MAYRONE (d. *c.* 1326), scholastic philosopher, was born at Mayrone, Provence. He joined the Franciscans and subsequently went to Paris, where he was a pupil of Duns Scotus. At the Sorbonne his teaching and ability in discussion gained him the title *Doctor Illuminatus.* He died at Piacenza *c* 1326. Depreciating Aristotle, he developed the Platonic theory of ideas and declared that universals are prior in nature to individuals His elaborate subtleties made him the real producer of the system known as Scotism His numerous works include the *De Primo Principio, De univocatione entis, Quodlibeta,* and commentaries on the *Isagoge* of Porphyry, on the logical works and *Physics* of Aristotle, and on the *Sentences.* Partial collections appeared at Venice in 1517 and 1520.

FRANCK. The name of Franck has been given indiscriminately but improperly to painters of the school of Antwerp who belong to the families of Francken (*q v*) and of Vrancx One artist truly entitled to be called Franck is Gabriel, who entered the gild of Antwerp in 1605, became its president in 1636 and died in 1639 But his works cannot now be traced

FRANCK, CÉSAR (1822–1890), French musical composer, a Belgian by birth, who came of German stock, was born at Liége on Dec 10, 1822 After some studies at Liége he came to Paris in 1837 and entered the conservatoire His early compositions date from this period, and include four trios for piano and strings, besides several piano pieces *Ruth,* a biblical cantata was produced with success at the conservatoire in 1846 An opera entitled *Le Valet de ferme* was written about this time, but has never been performed For many years Franck led a retired life, devoting himself to teaching and to his duties as organist, first at Saint-Jean-Saint-François, then at Ste Clotilde, where he acquired a great reputation as an improvisor He also wrote a mass, heard in 1861, and a quantity of motets, organ pieces and other works of a religious character

Franck was appointed professor of the organ at the Paris conservatoire, in succession to Benoist, his old master, in 1872, and the next year he was naturalized a Frenchman A revival of his early oratorio, *Ruth,* had brought his name again before the public, and this was followed by the production of *Rédemption,* a work for solo, chorus and orchestra, given under the direction of M Colonne on the 10th of April 1873 The unconventionality of the music rather disconcerted the general public, but the work nevertheless made its mark The following is a list of his subsequent compositions. *Rebecca* (1881), a biblical idyll for solo, chorus and orchestra; *Les Béatitudes,* an oratorio composed between 1870 and 1880, perhaps his greatest work; the symphonic poems, *Les Éolides* (1876), *Le Chasseur maudit* (1883), *Les Djinns* (1884), for piano and orchestra, *Psyche* (1888), for orchestra and chorus; symphonic variations for piano and orchestra (1885); symphony in D (1889); quintet for piano and strings (1880); sonata for piano and violin (1886); string quartet (1889); prelude, choral and fugue for piano (1884); prelude, aria and finale for piano (1889); various songs, notably "La Procession" and "Les Cloches du Soir." Franck also composed two four-act operas, *Hulda* and *Ghiselle,* both of which were produced at Monte Carlo after his death, which took place in Paris on the 8th of November 1890 The second of these was left by the master in an unfinished state, and the instrumentation was completed by several of his pupils

César Franck's influence on his younger contemporaries was very great An inspiring teacher, who by the simplicity and beauty of his own nature won the love and devotion of all who came in contact with him, he numbered among his own actual pupils D'Indy, Duparc, Chaussan, Ropartz, Pierné, de Bréville, Bordes and LeKeu. A more sincere, modest, self-respecting composer probably never existed In the centre of the brilliant French capital he was able to lead a laborious existence consecrated to his threefold career of organist, teacher and composer. He never sought to gain the suffrages of the public by unworthy concessions, but kept straight on his path, ever mindful of an ideal to be reached and never swerving therefrom. A statue was erected to his memory in Paris on Oct. 22, 1904, the occasion producing a panegyric from Alfred Bruneau, in which he spoke of the composer's works as "cathedrals in sound."

See H. Imbert, *Portraits et Études, César Franck,* etc. (1896); G.

Derepas, *César Franck* (1897); V. d'Indy, *César Franck* (1906, Eng trans., 1910).

FRANCK or **FRANK** (latinized FRANCUS), **SEBASTIAN** (*c.* 1499–*c.* 1543), German freethinker, was born about 1499 at Donauwörth, whence he styled himself Franck von Word He entered the university of Ingoldstadt (1515) and proceeded thence to the Dominican College, incorporated with the university, at Heidelberg Having taken priest's orders, he held in 1524 a cure in the neighbourhood of Augsburg, but in 1525 went over to the Reformed party at Nuremberg and became preacher at Gustenfelden. His first work was a German translation with additions (1528) of the first part of the *Diallage,* or *Conciliatio locorum Scripturae,* directed against Sacramentarians and Anabaptists by Andrew Althamer, then deacon of St Sebald's at Nuremberg. On March 17, 1528 he married Ottilie Beham, whose brothers, pupils of Albrecht Dürer, had got into trouble through Anabaptist leanings In 1529 he produced a free version (*Klagbrief der armen Dürftigen in England*) of the famous *Supplycacyon of the Beggers,* of Simon Fish In the autumn of 1529 he went to Strasbourg, and here began his intimacy with Caspar Schwenkfeld Here, too, he published, in 1531, his most important work, the *Chronica, Zeitbuch und Geschichtsbibel,* largely a compilation on the basis of the Nuremberg Chronicle (1493) It is too much to call him "the first of German historians"; he is a forerunner of Gottfried Arnold, with more vigour and directness of purpose Driven from Strasbourg by the authorities, after a short imprisonment in 1531, he tried to make a living as a soapboiler at Esslingen, removing in 1533 for a better market to Ulm, where (1534) he was admitted as a burgess

His *Weltbuch,* a supplement to his *Chronica,* was printed at Tubingen in 1534; the publication, in the same year, of his *Paradoxa* at Ulm brought him into trouble with the authorities, and after the publication of his *Guldin Arch* (with pagan parallels to Christian sentiments) (Augsburg 1538) and *Germaniae chronicon* (Frankfort 1538) he had to leave Ulm (1539) At Basel he found work as a printer, and here, probably, he died in the winter of 1542–43 He had published in 1539 *Kriegbuchlein des Friedens* (pseudonymous), *Schrifftliche und ganz grundliche Auslegung des 64 Psalms,* and *Das verbütschierte mit sieben Siegeln verschlossene Buch* (a biblical index, exhibiting the dissonance of Scripture), in 1541 his *Spruchworter* (a collection of proverbs, several times reprinted with variations); in 1542 a new edition of his *Paradoxa;* and some smaller works

Franck combined the humanist's passion for freedom with the mystic's devotion to the religion of the spirit His breadth of human sympathy led him to positions which the comparative study of religions has made familiar, but for which his age was unprepared Luther contemptuously dismissed him as a "devil's mouth" Pastor Frecht of Nuremberg pursued him with bitter zeal. In his last year, in a public Latin letter, he exhorted his friend John Campanus to maintain freedom of thought in face of the charge of heresy

See Hegler, in Hauck's *Realencyklopadie* (1899); C. A Hase, *Sebastian Franck von Word* (1869); J F Smith, in *Theological Review* (April 1874), E Tausch, *Sebastian Franck von Donauworth und seine Lehrer* (1893); Prenzel, *Kritische Untersuchung und Wurdigung von Sebastian Francks "Chronicon Germaniae"* (1908); R. Jones, *Spiritual Reformers* (1914); A Reimann, *Sebastian Franck als Geschichtsphilosoph* (1921).

FRANCKE, AUGUST HERMANN (1663–1727), German Protestant divine, was born on Mar 22, 1663, at Lübeck. He studied at Erfurt and at Kiel, where he came under the influence of the pietist Christian Kortholt (1633–94), then at Leipzig where he graduated and where, in 1685 he became a *Privatdocent.* A year later, by the help of his friend P. Anton, and with the approval and encouragement of P. J. Spener, he founded the Collegium Philobiblicum for the systematic study of the Bible, philologically and practically. Interdicted from preaching at Erfurt and Dresden, he found a place in the new university of Halle, first as professor of Greek and oriental languages, and then as professor of theology. Here he continued to teach and preach for the next 36 years, until his death on June 8, 1727, and Halle became a centre of pietism.

At Halle in 1695 he instituted what is often called a "ragged school," supported by public charity In 1698 there were 100 orphans under his charge to be clothed and fed, besides 500 children who were taught as day scholars The schools grew in importance and are still known as the *Francke'sche Stiftungen*

See H. E. F. Guericke, *A. H Francke* (1827 Eng. trs, 1837), A. Stein, *A. H. Francke* (3rd ed, 1894), Herzog-Hauck's *Realencyklopadie* (ed, 1899); Knuth, *Die Francke'schen Stiftungen* (2nd ed., 1903)

FRANCKE, MEISTER, German painter, active in Hamburg during the first half of the 15th century His name occurs in a contract with the travellers to England, dated 1424, in which the artist undertakes to paint an altarpiece for a chapel in the church of St John at Hamburg Nine separate portions of this work are now in the museum at Hamburg Two represent scenes from the life of Thomas of Canterbury, and seven scenes from the life of Christ, including a fragment of "the Crucifixion" Besides these, but few pictures can with certainty be ascribed to him One of these is the "Christ as the Man of Sorrows" in the museum at Leipzig, an early work, and another is a later representation of the same subject in the museum at Hamburg Meister Francke's style, though doubtless the product of the art of his time, is that of a strong personality, and all attempts to relate it to other schools have failed With feeling for the decorative value of colour and for two dimensional design he combined a realistic rendering of detail and a somewhat exaggerated expression of emotions To judge from numerous altarpieces in the north of Germany, which recall his style, his influence must have been widespread.

See A Lichtwark, *Meister Francke* (Hamburg, 1899).

FRANCKEN. Eleven painters of this family cultivated their art in Antwerp during the 16th and 17th centuries Several of these were related to each other, whilst many bore the same Christian name in succession Hence unavoidable confusion in the subsequent classification of paintings not widely differing in style or execution When Franz Francken the first found a rival in Franz Francken the second, he described himself as the "elder," in contradistinction to his son, who signed himself the "younger" But when Franz the second was threatened with competition from Franz the third, he took the name of "the elder," whilst Franz the third adopted that of Franz "the younger." It is possible, though not by any means easy, to sift the works of these artists. The eldest of the Franckens, Nicholas of Herenthals, died at Antwerp in 1596, but none of his works have survived

Jerom Francken, the eldest son, after leaving his father's house, studied under Franz Floris In 1566 he was one of the masters employed to decorate the palace of Fontainebleau, and in 1574 he obtained the appointment of court painter from Henry III, who had just returned from Poland and visited Titian at Venice. In 1603, when Van Mander wrote his biography of Flemish artists, Jerom Francken was still in Paris Among his earliest works we should distinguish a "Nativity" in the Dresden museum, executed in co-operation with Franz Floris Another of his important pieces is the "Abdication of Charles V" in the Amsterdam museum Equally interesting is a "Portrait of a Falconer," dated 1558, in the Brunswick gallery.

Franz, the second son of Nicholas of Herenthals, is to be kept in memory as Franz Francken the first He was born about 1544, matriculated at Antwerp in 1567, and died there in 1616 He, too, studied under Floris Several of his pictures are in the museum of Antwerp; one dated 1597 in the Dresden museum represents "Christ on the Road to Golgotha," and is signed by him as D ō (Den ouden) F Franck

Ambrose, the third son of Nicholas of Herenthals, has bequeathed to us more specimens of his skill than Jerom or Franz the first He first started as a partner with Jerom at Fontainebleau, then he returned to Antwerp, where he passed for his gild in 1573, and he lived at Antwerp till 1618 His best works are the "Miracle of the Loaves and Fishes" and the "Martyrdom of St. Crispin," both in the Antwerp museum.

Franz Francken the first trained three sons to his profession, the eldest of whom, though he practised as a master of gild at

Antwerp from 1600 to 1610, left no visible trace of his labours behind Jerom the second took service with his uncle Ambrose. He was born in 1578, passed for his gild in 1607, and in 1620 produced that curious picture of "Horatius Cocles defending the Sublician Bridge" in the Antwerp museum.

The third son of Franz Francken the first is Franz Francken the second, who signed himself in pictures till 1616 "the younger," from 1630 till his death "the elder" F Francken.

Franz Francken the second was born in 1581 In 1605 he entered the gild, of which he subsequently became the president, and in 1642 he died His earliest composition is the "Crucifixion" in the Belvedere at Vienna, dated 1606 His latest compositions as "the younger" F Francken are the "Adoration of the Virgin" (1616) in the gallery of Amsterdam, and the "Woman taken in Adultery" (1628) in Dresden From 1616 to 1630 many of his pieces are signed F Francken, then come the "Seven Works of Charity" (1630) at Munich, signed "the elder F. F," the "Prodigal Son" (1633) at the Louvre

F Francken the third, the last of his name who deserves to be recorded, passed in the Antwerp gild in 1639 and died at Antwerp in 1667 His practice was chiefly confined to adding figures to the architectural or landscape pieces of other artists As Franz Pourbus sometimes put in the portrait figures for Franz Francken the second, so Franz Francken the third often introduced the necessary personages into the works of Pieter Neefs the younger (museums of St Petersburg, Dresden and The Hague) In a "Moses striking the Rock," dated 1654, of the Augsburg gallery, this last of the Franckens signs D ō (Den ouden) F. Franck

FRANCO, an expression in foreign commerce, meaning that a price quoted includes not only the cost of the goods, but all the costs entailed in delivering them to the purchaser's address, *i e*, cost, insurance, shipping freight, the import duty levied by the importing country, foreign carriage, etc.

FRANCO-GERMAN WAR (1870–1871) The victories of Prussia in 1866 over the Austrians and their German allies (*see* SEVEN WEEKS' WAR) rendered it evident to the statesmen and soldiers of France that a struggle between the two nations could only be a question of time. Belated measures were initiated in France to place the armament and equipment of the troops on a level with the requirements of the times. The chassepot, a new breech-loading rifle, immensely superior to the Prussian needle-gun, was issued, the artillery trains were overhauled, and a new machine-gun, the *mitrailleuse,* from which much was expected, introduced Wide schemes of reorganization (due mainly to Marshal Niel) were formulated, but little was done to put them into effect The emperor Napoleon III also nourished illusory hopes of an alliance with Austria and Italy In the first week of June 1870, General Lebrun, as his confidential agent, was sent to Vienna to try to concert a plan of joint operations with Austria against Prussia Italy was also to be included in the alliance

What grounds there were for Napoleon's trust in the project remains uncertain, but in any case they were discounted by the fact that Moltke's plans were based on an accurate estimate of the time it would take Austria to mobilize and on the effect of a series of victories on French soil In strong contrast to the French, plans for the strategic deployment of the Prussian army were prepared by the General Staff and kept up to date year by year as fresh circumstances (*e g.,* the co-operation of the minor German armies) arose and new means of communication came into existence The campaign was actually opened on a revise of 1868–1869, to which was added, on May 6, 1870, a secret memorandum for the General Staff

Strategic Deployment of German Armies.—Under the German organization then existing the preliminary to all active operations was of necessity full and complete mobilization. Then followed transport by road and rail to the line selected for the "strategic deployment," and it was essential that no part of these operations should be disturbed by action on the part of the enemy But no such delay imposed itself of necessity upon the French, and a vigorous offensive was so much in harmony with their traditions that the German plan had to be framed so as to meet such emergencies. On the whole, Moltke concluded that the enemy could not undertake this offensive before the eighth day after mobilization. At that date about five French army corps (150,000 men) could be collected near Metz, and two corps (70,000) near Strasbourg; and as it was six days' march from Metz to the Rhine, no serious attack could be delivered before the fourteenth day, by which day it could be met by superior forces near Kirchheimbolanden As, however, the transport of the bulk of the Prussian forces could not begin till the ninth day, their ultimate line of detrainment need not be fixed until the French plans were disclosed, and, as it was important to strike at the earliest moment possible, the deployment was provisionally fixed to be beyond the Rhine on the line Wittlich-Neunkirchen-Landau Of the thirteen North German corps three had to be left behind to guard the eastern frontier and the coast, one other, the VIII, was practically on the ground already and could concentrate by road, and the remaining nine were distributed to the nine through railway lines available These ten corps were grouped in three armies, and as the French might violate Belgian neutrality or endeavour to break into southern Germany, two corps (Prussian Guard and Saxon XII corps) were temporarily held back at a central position around Mainz, whence they could move rapidly up or down the Rhine valley If Belgian neutrality remained unmolested, the reserve would join the III army on the left wing, giving it a two to one superiority over its adversary; all three armies would then wheel to the right and combine in an effort to force the French army into a decisive battle on the Saar on or about the twenty-third day. As in this wheel the army on the right formed the pivot and was required only to stand fast, two corps only were allotted to it, two corps for the present formed the III army, and the remaining five were assigned to the II. army in the centre

When (16th–17th July) the South German states decided to throw in their lot with the rest, their three corps were allotted to the III. army, the Guards and Saxons to the II army, whilst the three corps originally left behind were finally distributed one to each army, so that up to the investment of Metz the order of battle was as follows:

Headquarters : The king of Prussia (General v. Moltke, chief of staff).		
I Army General v Steinmetz (C of S., Sperling)	(I. corps, Manteuffel) VII „ Zastrow VIII „ Goeben (1st) and 3rd cavalry divisions . . . . . Total	85,000
II Army: Prince Frederick Charles (C of S, Stiehle)	Guard Pr August of Wurttemberg (II corps, Fransecky) III „ Alvensleben II. IV „ Alvensleben I. IX. „ Manstein X „ Voigts-Rhetz XII „ (Saxons) crown prince of Saxony 5th and 6th cavalry divisions . . Total	210,000
III Army: crown prince of Prussia (C of S, Blumenthal)	V corps, Kirchbach (VI) „ Tümpling XI „ Bose I. Bavarian, der Tann II „ Hartmann Württemberg div } Werder Baden div. } (2nd) and 4th cavalry divisions . . Total	180,000
	Grand Total .	475,000

(The units within brackets were those at first retained in Germany)

Positions of the French Forces.—On the French side no such plan of operations was in existence when on the night of the 15th of July *Krieg mobil* was telegraphed all over Prussia. An outline scheme had indeed been prepared as a basis for agreement with Austria and Italy, but practically no details were fixed, and the troops were without transport and supplies. Nevertheless, as speed was the essence of the contract, the troops were hurried up without waiting for their reserves—whose mobilization was then a

slow and complicated system—and the Prussian Intelligence Department was able to inform Moltke on the 22nd of July (seventh day of mobilization) that the French stood from right to left in the following order, on or near the frontier:

I. Corps .	Marshal MacMahon, duke of Magenta (Strasbourg)
V ,,	General de Failly (Saargemund and Bitche)
II ,,	General Frossard (St Avold)
IV. ,,	General de Ladmirault (Thionville)
	With, behind them
III. ,,	Marshal Bazaine (Metz)
Guard	General Bourbaki (Nancy)
VI Corps	Marshal Canrobert (Châlons)
VII ,,	General Félix Douay (Belfort)

If therefore they began a forward movement on the 23rd (eighth day) the case foreseen by Moltke had arisen, and it became necessary to detrain the II army upon the Rhine Without waiting for further confirmation of this intelligence, Moltke, with the consent of the king, altered the arrangements accordingly, a decision which, though foreseen, exercised the gravest influence on the course of events As it happened this decision was premature, for the French could not yet move The French rear services were chaotic Supply trains had to be organized by requisition from the inhabitants, and even arms and ammunition procured for such reserves as had succeeded in joining Nevertheless, by almost superhuman exertions on the part of the railways and administrative services, all essential deficiencies were made good, and by July 28 (13th day) the troops had received all that was absolutely indispensable and might well have been led against the enemy, who, thanks to Moltke's premature action, were for the moment at a very serious disadvantage But the French generals did not utilise this opportunity to concentrate upon the heads of the Prussian columns as they struggled through the defiles of the Hardt

To meet the possible danger, which came to his knowledge during the course of the 29th, Moltke sent a confidential staff officer, Colonel v Verdy du Vernois, to the III army to impress upon the crown prince the necessity of an immediate advance to distract the enemy's attention from the I. and II armies; but, like the French generals, the crown prince pleaded that he could not move until his trains were complete Fortunately for the Germans, the French intelligence service not only failed to inform the staff of this opportunity, but it allowed itself to be hypnotized by rumours In imagination they saw oncoming men behind every forest, and, to guard against these dangers, the French troops were marched and counter-marched along the frontiers in the vain hope of discovering an ideal defensive position which should afford full scope to the power of their new weapons.

As these delays were exerting a most unfavourable effect on public opinion not only in France but throughout Europe, the emperor decided on Aug 1 to initiate a movement towards the Saar, for its moral effect

On this day the French corps held the following positions from right to left:

I. Corps .	Hagenau
II. ,,	Forbach
III ,,	St Avold
IV. ,,	Bouzonville
V. ,, . .	Bitche
VI. ,, . .	Châlons
VII. ,,	Belfort and Colmar
Guard .	near Metz

Saarbrücken.—The French II corps was directed to advance on the following morning direct on Saarbrucken, supported on the flanks by two divisions from the V. and III. corps. The order was duly carried out, and the Prussians (one battalion, two squadrons and a battery), seeing the overwhelming numbers opposed to them, fell back fighting and vanished to the northward, having given a very excellent example of steadiness and discipline to their enemy The latter contented themselves by occupying Saarbrücken and its suburb St. Johann, and here, as far as the troops were concerned, the incident closed. Its effect, however, proved far-reaching. The Prussian staff could not conceive that nothing lay behind this display of five whole divisions, and immediately took steps to meet the expected danger In their excitement, although they had announced the beginning of the action to the king's headquarters at Mainz, they forgot to notify the close and its results, so that Moltke was not in possession of the facts till noon on the 3rd of August Meanwhile, Steinmetz, left without instructions and fearing for the safety of the II army, the heads of whose columns were still in the defiles of the Hardt, moved the I army from the neighbourhood of Merzig obliquely to his left front, so as to strike the flank of the French army if it continued its march towards Kaiserslautern, in which direction it appeared to be heading

Whilst this order was in process of execution, Moltke, aware that the II army was behind time in its march, issued instructions to Steinmetz for Aug 4, which entailed a withdrawal to the rear, the idea being that both armies should, if the French advanced, fight a defensive battle in a selected position farther back. Steinmetz obeyed, though bitterly resenting the idea of retreat This movement, further, drew his left across the roads reserved for the right column of the II army, and on receipt of a peremptory order from Prince Frederick Charles to evacuate the road, Steinmetz telegraphed for instructions direct to the king, over Moltke's head. In reply he received a telegram from Moltke, ordering him to clear the road at once, and couched in terms which he considered as a severe reprimand An explanatory letter, meant to soften the rebuke, was delayed in transmission and did not reach him till too late to modify the orders he had already issued It must be remembered that Steinmetz at the front was in a better position to judge the apparent situation than was Moltke at Mainz, and that all through the day of Aug 5 he had received intelligence indicating a change of attitude in the French army

Battle of Spicheren.—The news of the German victory at Weissenburg on the 4th (*see* below) had in fact completely paralysed the French headquarters, and orders were issued by them during the course of the 5th to concentrate the whole army of the Rhine on the selected position of Cadenbronn As a preliminary, Frossard's corps withdrew from Saarbrucken and began to entrench a position on the Spicheren heights, 3,000 yd to the southward. Steinmetz, therefore, being quite unaware of the scheme for a great battle on the Saar about Aug. 9, felt that the situation would best be met, and the letter of his instructions strictly obeyed, by moving his whole command forward to the line of the Saar, and orders to this effect were issued on the evening of the 5th In pursuance of these orders, the advance guard of the 14th division (Lieutenant General von Kameke) reached Saarbrucken about 9 A.M. on the 6th, where the Germans found to their amazement that the bridges were intact To secure this advantage was the obvious duty of the commander on the spot, and he at once ordered his troops to occupy a line of low heights beyond the town to serve as a bridge-head. As the leading troops deployed on the heights Frossard's guns on the Spicheren Plateau opened fire, and the advanced guard battery replied The sound of these guns unchained the whole fighting instinct carefully developed by a long course of Prussian manoeuvre training. Everywhere, generals and troops hurried towards the cannon thunder. Kameke, even more in the dark than Steinmetz as to Moltke's intentions and the strength of his adversaries, attacked at once, precisely as he would have done at manoeuvres, and in half an hour his men were committed beyond recall As each fresh unit reached the field it was hurried into action where its services were most needed, and each fresh general as he arrived took a new view of the combat and issued new orders On the other side, Frossard, knowing the strength of his position, called on his neighbours for support, and determined to hold his ground Victory seemed certain There were sufficient troops within easy reach to have ensured a crushing numerical superiority. But the other generals had not been trained to mutual support, and thought only of their own immediate security, and their staffs were too inexperienced to act upon even good intentions; and, finding himself in the course of the afternoon left to his own devices, Frossard began gradually to withdraw, even before the pressure

of the 13th German division on his left flank (about 8 P M) compelled his retirement When darkness ended the battle the Prussians were scarcely aware of their victory Steinmetz, who had reached the field about 6 P M , rode back to his headquarters without issuing any orders, while the troops bivouacked where they stood, the units of three army corps being mixed up in almost inextricable confusion But whereas out of 42,900 Prussians with 120 guns, who in the morning lay within striking distance of the enemy, no fewer than 27,000, with 78 guns were actually engaged, of the French, out of 64,000 with 210 guns only 24,000 with 90 guns took part in the action

Action of Weissenburg.—Meanwhile on the German left wing the III army had begun its advance Early on Aug 4 it crossed the frontier and fell upon a French detachment under Abel Douay, which had been placed near Weissenburg, partly to cover the Pigeonnier pass, but principally to consume the supplies accumulated in the little dismantled fortress, as these could not easily be moved Against this force of under 4,000 men of all arms, the Germans brought into action successively portions of three corps, in all over 25,000 men with 90 guns After six hours' fighting, in which the Germans lost some 1,500 men, the gallant remnant of the French withdrew deliberately and in good order, notwithstanding the death of their leader at the critical moment The Germans were so elated by their victory over the enemy, whose strength they naturally overestimated, that they forgot to send cavalry in pursuit, and thus entirely lost touch with the enemy

Next day the advance was resumed, the two Bavarian corps moving via Mattstall through the foothills of the Vosges, the V corps on their left towards Preuschdorf, and the XI farther to the left again, through the wooded plain of the Rhine valley The 4th cavalry division scouted in advance, and army headquarters moved to Sulz About noon the advanced patrols discovered MacMahon's corps in position on the left bank of the Sauer (*see* WORTH. *Battle of*) As his army was dispersed over a wide area, the crown prince determined to devote the 6th to concentrating the troops, and, probably to avoid alarming the enemy, ordered the cavalry to stand fast

At night the outposts of the I Bavarians and V corps on the Sauer saw the fires of the French encampment and heard the noise of railway traffic, and rightly conjectured the approach of reinforcements MacMahon had in fact determined to stand in the very formidable position he had selected, and he counted on receiving support both from the VII corps (two divisions of which were being railed up from Colmar) and from the V corps, which lay around Bitche

Battle of Wörth.—At dawn on Aug 6 the commander of the V corps outposts noticed certain movements in the French lines, and to clear up the situation brought his guns into action As at Spicheren, the sound of the guns set the whole machinery of battle in motion The French artillery immediately accepted the Prussian challenge The I. Bavarians, having been ordered to be ready to move if they heard artillery fire, immediately advanced against the French left, encountering presently such a stubborn resistance that parts of their line began to give way. The Prussians of the V corps felt that they could not abandon their allies, and Kirchbach, calling on the XI corps for support, attacked with the troops at hand When the crown prince tried to break off the fight it was too late Both sides were feeding troops into the firing line, as and where they could lay hands on them Up to 2 P M the French fairly held their own, but shortly afterwards their right yielded to the overwhelming pressure of the XI corps, and by 3 30 it was in full retreat The centre held on for another hour, but in its turn was compelled to yield, and by 4 30 all organized resistance was at an end. The débris of the French army was hotly pursued by the German divisional squadrons towards Reichshofen, where serious panic showed itself. When at this stage the tardy supports sent by de Failly from Bitche came on the ground they saw the hopelessness of intervention, and retired whence they had come. Fortunately for the French, the German 4th cavalry division, on which the pursuit should have devolved, had been forgotten by the German staff, and did not reach the front before darkness fell. Out of a total of 82,000 within reach of the battlefield, the Germans succeeded in bringing into action 77,500. The French, who might have had 50,000 on the field, deployed only 37,000, and these suffered a collective loss of no less than 20,100, some regiments losing up to 90% and still retaining some semblance of discipline and order

Under cover of darkness the remnants of the French army escaped When at length the 4th cavalry division had succeeded in forcing a way through the confusion of the battlefield, all touch with the enemy had been lost, and being without firearms the troopers were checked by the French stragglers in the woods and the villages, and thus failed to establish the true line of retreat of the French Ultimately the latter, having gained the railway near Lunéville, disappeared from the German front altogether, and all trace of them was lost until they were discovered, about Aug 26, forming part of the army of Châlons, whither they had been conveyed by rail via Paris This is a remarkable example of the strategical value of railways to an army operating in its own country

In the absence of all resistance, the III army now proceeded to carry out the original programme of marches laid down in Moltke's memorandum of May 6, events having nullified the plan for a battle on the Saar, and marching on a broad front through a fertile district it reached the line of the Moselle in excellent order about Aug 17, where it halted to await the result of the great battle of Gravelotte-St Privat

Movements on the Saar.—We return now to the I army at Saarbrucken. Its position on the morning of Aug 7 gave cause for the gravest anxiety At daylight a dense fog lay over the country, and through the mist sounds of heavy firing came from the direction of Forbach, where French stragglers had rallied during the night The confusion on the battlefield was appalling, and the troops in no condition to go forward Except the 3rd, 5th and 6th cavalry divisions no closed troops were within a day's march; hence Steinmetz decided to spend the day in reorganizing his infantry, under cover of his available cavalry But the German cavalry and staff were unequal to their task The 6th cavalry division, which had bivouacked on the battlefield, sent on only one brigade towards Forbach, retaining the remainder in reserve The 5th, thinking that the 6th had already undertaken all that was necessary, withdrew behind the Saar, and the 3rd, also behind the Saar, reported that the country in its front was unsuited to cavalry movements, and only sent out a few officers' patrols These were well led, but were too few in number, and their reports were consequently unconvincing

In the course of the day Steinmetz became very uneasy, and ultimately he decided to concentrate his army by retiring the VII and VIII corps behind the river on to the I. (which had arrived near Saarlouis), thus clearing the Saarbrucken-Metz road for the use of the II army But at this moment Prince Frederick Charles suddenly modified his views. During the 6th of August his scouts had reported considerable French forces near Bitche (these were the V, de Failly's corps), and early in the morning of the 7th he received a telegram from Moltke informing him that MacMahon's beaten army was retreating on the same place (the troops observed were in fact those which had marched to MacMahon's assistance) The prince forthwith deflected the march of the Guards, IV and X corps, towards Rohrbach, whilst the IX and XII closed up to supporting distance behind them Thus, as Steinmetz moved away to the west and north, Frederick Charles was diverging to the south and east, and a great gap was opening in the very centre of the German front This was closed only by the III corps, still on the battlefield, and by portions of the X near Saargemünd, whilst within striking distance lay 130,000 French troops, prevented only by the incapacity of their chiefs from a decisive counter-stroke.

Fortunately for the Prussians, Moltke at Mainz took a different view. Receiving absolutely no intelligence from the front during the 7th, he telegraphed orders to the I. and II. armies (10.25 P M.) to halt on the 8th, and impressed on Steinmetz the necessity of employing his cavalry to clear up the situation. The I. army had already begun the marches ordered by Steinmetz. It was now

led back practically to its old bivouacs amongst the unburied dead. Prince Frederick Charles only conformed to Moltke's order with the III and X. corps; the remainder executed their concentration towards the south and east

During the night of Aug 7 Moltke decided that the French army must be in retreat towards the Moselle and forthwith busied himself with the preparation of fresh tables of march for the two armies, his object being to swing up the left wing to outflank the enemy from the south. This work, and the transfer of headquarters to Homburg, needed time, hence no fresh orders were issued to either army, and neither commander would incur the responsibility of moving without any The I army therefore spent a fourth night in bivouac on the battle-field But Constantin von Alvensleben, commanding the III corps, a man of very different stamp from his colleagues, hearing at first hand that the French had evacuated St Avold, set his corps in motion early in the morning of Aug 10 down the St Avold-Metz road, reached St. Avold and obtained conclusive evidence that the French were retreating

Advance to the Moselle.—During the 9th after 48 wasted hours the orders for the advance to the Moselle were issued These were based, not on an exact knowledge of where the French army actually stood, but on the opinion Moltke had formed as to where it ought to have been on military grounds solely.

Actually on Aug 7 the emperor had decided to attack the Germans on the 8th with the whole Rhine Army, but this decision was upset by alarmist reports from the beaten army of MacMahon He then decided to retreat to the Moselle, as Moltke had calculated, and there to draw to himself the remnants of MacMahon's army (now near Lunéville) At the same time he assigned the strictly executive command of the Rhine Army to Marshal Bazaine This retreat was begun during the course of Aug. 8 and 9, but on the night of the 9th urgent telegrams from Paris induced the emperor to suspend the movement, and during the 10th the whole army took up a strong position on the French Nied

Meanwhile the II. German army had received its orders to march in a line of army corps on a broad front in the general direction of Pont-à-Mousson, well to the south of Metz The I army was to follow by short marches in échelon on the right; only the III. corps was directed on Falkenberg, a day's march farther towards Metz along the St Avold-Metz road The movement was begun on the 10th, and towards evening the French army was located on the right front of the III. corps. This entirely upset Moltke's hypothesis, and called for a complete modification of his plans, as the III corps alone could not be expected to resist the impact of Bazaine's five corps The III corps therefore received orders to stand fast for the moment, and the remainder of the II. army was instructed to wheel to the right and concentrate for a great battle to the east of Metz on the 16th or 17th. Before, however, these orders had been received the sudden retreat of the French completely changed the situation The Germans therefore continued their movement towards the Moselle On the 12th Bazaine had been definitely invested with the command-in-chief of the Army of the Rhine and next day the French took up a fresh position 5 m. to the east of Metz, where they were located by the cavalry and the advanced guards of the German I. army

Battle of Colombey-Borny.—Again Moltke ordered the I. army to observe and hold the enemy, whilst the II was to swing round to the north. The cavalry was to scout beyond the Moselle and intercept all communication with the heart of France (*see* METZ) By this time the whole German army had imbibed the idea that the French were in full retreat and endeavouring to evade a decisive struggle. When therefore during the 14th their outposts observed signs of retreat in the French position, their impatience could no longer be restrained; as at Wörth and Spicheren, an outpost commander brought up his guns, and at the sound of their fire, every unit within reach spontaneously got under arms (battle of Colombey-Borny). In a short time, with or without orders, the I., VII, VIII. and IX corps were in full march to the battle-field. But the French, too, turned back to fight, and an obstinate engagement ensued, at the close of which the Germans barely held the ground and the French withdrew during the night under cover of the Metz forts

Still, though the fighting had been indecisive, the conviction of victory remained with the Germans, and the idea of a French retreat became an obsession To this idea Moltke gave expression in his orders issued early on the 15th, in which he laid down that the "fruits of the victory" of the previous evening could only be reaped by a vigorous pursuit towards the passages of the Meuse, where it was hoped the French might yet be overtaken This order, however, did not allow for the hopeless inability of the French staff to regulate the movement of congested masses of men, horses and vehicles, such as were now accumulated in the streets and environs of Metz Whilst Bazaine had come to no definite decision whether to stand and fight or continue to retreat, and was merely drifting under the impressions of the moment, the Prussian leaders, in particular Prince Frederick Charles, saw in imagination the French columns in rapid orderly movement towards the west, and calculated that at best they could not be overtaken short of Verdun

In this order of ideas the whole of the II army, followed on its right rear by two-thirds of the I army (the I corps being detached to observe the eastern side of the fortress), were pushed on towards the Moselle, the cavalry far in advance towards the Meuse, whilst only the 5th cavalry division was ordered to scout towards the Metz-Verdun road, and even that was disseminated over far too wide an area

Later in the day (15th) Frederick Charles sent orders to the III corps, which was on the right flank of his long line of columns and approaching the Moselle at Corny and Novéant, to march via Gorze to Mars-la-Tour on the Metz-Verdun road; to the X corps, strung out along the road from Thiaucourt to Pont-à-Mousson, to move to Jarny, and for the remainder to push on westward to seize the Meuse crossings No definite information as to the French army reached him in time to modify these instructions

Meanwhile the 5th (Rheinbaben's) cavalry division, at about three in the afternoon, had come into contact with the French cavalry in the vicinity of Mars-la-Tour, and gleaned intelligence enough to show that no French infantry had as yet reached Rezonville The commander of the X corps at Thiaucourt, informed of this, became anxious for the security of his flank during the next day's march and decided to push out a strong flanking detachment under Caprivi, to support Rheinbaben and maintain touch with the III corps marching on his right rear

Battle of Vionville-Mars-la-Tour.—Alvensleben, to whom the 6th cavalry division had meanwhile been assigned, seems to have received no local intelligence whatsoever; and at daybreak on the 16th he began his march in two columns, the 6th division on Mars-la-Tour, the 5th towards the Rezonville-Vionville plateau And shortly after 9 15 A.M. he suddenly discovered the truth The entire French army lay on his right flank, and his nearest supports were almost a day's march distant In this crisis he made up his mind at once to attack with every available man, and to continue to attack, in the conviction that his audacity would serve to conceal his weakness. All day long, therefore, the Brandenburgers of the III corps, supported ultimately by the X corps and part of the IX, attacked again and again, despite repulse The enemy was thrice their strength, but very differently led, and made no adequate use of his superiority (battle of Vionville-Mars-la-Tour)

Meanwhile Prince Frederick Charles, at Pont-à-Mousson, was still confident in the French retreat to the Meuse, and had even issued orders for the 17th on that assumption Firing had been heard since 9 15 A.M., and about noon Alvensleben's first report had reached him, but it was not till after 2 that he realized the situation. Then, mounting his horse, he covered the 15 m to Flavigny over crowded and difficult roads within the hour, and on his arrival abundantly atoned for his strategic errors by his unconquerable determination and tactical skill. When darkness put a stop to the fighting, he considered the position Cancelling

all previous orders, he called all troops within reach to the battle-field and resigned himself to wait for them The situation was indeed critical The whole French army of five corps, only half of which had been engaged, lay in front of him His own army lay scattered over an area of 30 m by 20, and only some 20,000 fresh troops—of the IX corps—could reach the field during the forenoon of the 17th He did not then know that Moltke had already intervened and had ordered the VII , VIII and II corps[1] to his assistance Daylight revealed the extreme exhaustion of both men and horses The men lay around in hopeless confusion amongst the killed and wounded, each where sleep had overtaken him, and thus the extent of the actual losses, heavy enough, could not be estimated Across the valley, bugle sounds revealed the French already alert, and presently a long line of skirmishers approached the Prussian position But they halted just beyond rifle range, and it was soon evident that they were only intended to cover a further withdrawal Presently came the welcome intelligence that the reinforcements were well on their way.

About noon the king and Moltke drove up to the ground, and there was an animated discussion as to what the French would do next Aware of their withdrawal from his immediate front, Prince Frederick Charles reverted to his previous idea and insisted that they were in full retreat towards the north, and that their entrenchments near Point du Jour and St Hubert (*see* map in article Metz) were at most a rearguard position Moltke was inclined to the same view, but considered the alternative possibility of a withdrawal towards Metz, and about 2 P M orders were issued to meet these divergent opinions The whole army was to be drawn up at 6 A M on the 18th in an échelon facing north, so as to be ready for action in either direction The king and Moltke then drove to Pont-à-Mousson, and the troops bivouacked in a state of readiness The rest of the 17th was spent in restoring order in the shattered III and X corps, and by nightfall both corps were reported fit for action Strangely enough, there were no organized cavalry reconnaissances, and no intelligence of importance was collected during the night of the 17th–18th

Battle of Gravelotte-Saint Privat.—Early on the 18th the troops began to move into position in the following order from left to right XII (Saxons), Guards, IX , VIII and VII The X and III were retained in reserve

The idea of the French retreat was still uppermost in the prince's mind, and the whole army therefore moved north But between 10 and 11 A M part of the truth—viz , that the French had their backs to Metz and stood in battle order from St Hubert northwards—become evident, and the II army, pivoting on the I , wheeled to the right and moved eastward Suddenly the IX corps fell right on the centre of the French line at Amanvillers, where it had been imagined that the French flank rested, and a most desperate encounter began, superior control, as before, ceasing after the guns had opened fire Prince Frederick Charles, however, a little farther north, again asserted his tactical ability, and about 7 P M he brought into position three fresh army corps for the final attack The sudden collapse of French resistance, due to the frontal attack of the Guards (St Privat) and the turning movement of the Saxons (Roncourt), rendered the use of this mass unnecessary, but the resolution to use it was there On the German right (I army), about Gravelotte, all superior leading ceased quite early in the afternoon, and at night the French still showed an unbroken front Until midnight, when the prince's victory was reported the suspense at headquarters was terrible The I army was exhausted, no steps had been taken to ensure support from the III. army, and the IV corps (II army) lay inactive 30 m away

Having let slip the great opportunity of August 16 and 17 which fortune had flung into his hands, Bazaine had now allowed himself to be driven back into Metz, where he was content to stay His motives and the question of his conduct are discussed under Bazaine

[1]Of the I army the I corps was retained on the east side of Metz. The II corps belonged to the II army, but had not yet reached the front

On the German side the victory at St Privat was at once followed up by the headquarters Early on the 19th the investment of Bazaine's army in Metz was commenced. A new army, the Army of the Meuse (often called the IV), was as soon as possible formed of all troops not required for the maintenance of the investment, and, under the command of the crown prince of Saxony, marched on towards Châlons, where MacMahon was known to be reorganizing the remainder of the French field army. The III army also continued its assigned course in the direction of Paris

Campaign of Sedan.—The operations which led to the capture of MacMahon's army in Sedan call for little explanation Given seven corps, each capable of averaging 15 m a day for a week in succession, opposed to four corps only, shaken by defeat and unable as a whole to cover more than 5 m a day, the result could hardly be doubtful But Moltke's method of conducting operations left his opponent many openings which could only be closed by excessive demands on the marching power of the men Trusting only to his cavalry screen to secure information, he was always without any definite fixed point about which to manoeuvre, for whilst the reports of the screen and orders based thereon were being transmitted, the enemy was free to move, and Moltke based his calculations of such movements on strictly military grounds

Thus whilst the German army, on a front of nearly 50 m , was marching due west on Paris, MacMahon, under political pressure, was moving parallel to them, but on a northerly route, to attempt the relief of Metz

So unexpected was this move and so uncertain the information which called attention to it, that Moltke did not venture to change at once the direction of march of the whole army, but he directed the Army of the Meuse northward on Damvillers and ordered Prince Frederick Charles to detach two corps from the forces investing Metz to reinforce it For the moment, therefore, MacMahon's move had succeeded, and the opportunity existed for Bazaine to break out But at the critical moment the hopeless want of real efficiency in MacMahon's army compelled the latter so to delay his advance that it became evident to the Germans that there was no longer any necessity for the III army to maintain the direction towards Paris, and that the probable point of contact between the Meuse army and the French lay nearer to the right wing of the III army than to Prince Frederick Charles's investing force before Metz

The detachment from the II army was therefore countermanded, and the whole III army changed front to the north, while the Meuse army headed the French off from the east The latter came into contact with the head of the French columns, during the 29th, about Nouart, and on the 30th at Buzancy (battle of Beaumont), and the French, yielding to the force of numbers combined with superior moral, were driven northwestward upon Sedan (*q v*), right across the front of the III. army, which was now rapidly coming up from the south

The morning of Sept 1 found the French crowded around the little fortress of Sedan, with only one line of retreat to the northwest still open By 11 A.M the XI corps (III. army) had already closed that line, and about noon the Saxons (Army of the Meuse) moving round between the town and the Belgian frontier joined hands with the XI , and the circle of investment was complete The battle of Sedan was closed about 4 15 P M by the hoisting of the white flag Terms were agreed upon during the night, and the whole French army, with the emperor, passed into captivity

(F N. M.)

Later Operations.—Thus in five weeks one of the French field armies was imprisoned in Metz, the other destroyed, and the Germans were free to march upon Paris. This seemed easy There could be no organized opposition to their progress,[1] and Paris, if not so defenceless as in 1814, was more populous Starvation was the best method of attacking an over-crowded fortress, and the Parisians were not thought to be proof against the deprivation of

[1]The XIII. corps (Vinoy), which had followed MacMahon's army at some distance, was not involved in the catastrophe of Sedan, and by good luck as well as good management evaded the German pursuit and returned safely to Paris.

their accustomed luxuries. Even Moltke hoped that by the end of October he would be "shooting hares at Creisau," and with this confidence the German III. and IV. armies left the vicinity of Sedan on the 4th of September. The march called for no more than good staff arrangements, and the two armies arrived before Paris a fortnight later and gradually encircled the place—the III. army on the south, the IV. on the north side—in the last days of September Headquarters were established at Versailles Meanwhile the Third Empire had fallen, giving place on Sept 4 to a republican Government of National Defence, which made its appeal to, and evoked, the spirit of 1792. Henceforward the French nation, which had left the conduct of the war to the regular army and had been little more than an excited spectator, took the burden upon itself.

Although of the regular army units only six regiments of infantry and ten of cavalry were left—outside Metz and other beleaguered garrisons—a great number of regular recruits and reservists were available From these the government organized 280 battalions of infantry, or 280,000 men, 31 regiments of the Garde Mobile, framed by Marshal Niel in 1868, totalling 110,000 men, and 80,000 formed in battalions of the Garde Nationale, called into existence on Sept. 15, and including all able-bodied men of from 31 to 60 years of age With cavalry regiments and corps of francs-tireurs the total was 583,000, and this initial figure was far exceeded before the war finished. The German staff had of course to reckon on the Garde Mobile, and did so beforehand, but they wholly underestimated both its effective members and its willingness, while, possessing themselves a system in which all the military elements of the German nation stood close behind the troops of the active army, they ignored the potentialities of the Garde Nationale.

Meanwhile, both as a contrast to the events that centered on Paris and because in point of time they were decided for the most part in the weeks immediately following Sedan, we must briefly allude to the sieges conducted by the Germans—Paris (*q.v.*), Metz (*q.v.*) and Belfort (*q.v.*) excepted Old and ruined as many of them were, the French fortresses possessed considerable importance in the eyes of the Germans. Strassburg, in particular, the key of Alsace, the standing menace to South Germany and the most conspicuous of the spoils of Louis XIV.'s *Raubkriege*, was an obvious target. Operations were begun on Aug 9, three days after Wörth, Werder's corps (Baden troops and Prussian Landwehr) making the siege The French commandant, Uhrich, surrendered after a stubborn resistance on Sept. 28. Of the smaller fortresses many, being practically unarmed and without garrisons, capitulated at once Toul, defended by Major Huck with 2,000 mobiles, resisted for forty days, and drew upon itself the efforts of 13,000 men and 100 guns. Verdun, commanded by Guérin de Waldersbach, held out till after the fall of Metz. Some of the fortresses lying to the north of the Prussian line of advance on Paris, *e.g.*, Mézières, resisted up to January 1871, though of course this was very largely due to the diminution of pressure caused by the appearance of new French field armies in October. On Sept 9 a strange incident took place at the surrender of Laon A powder magazine was blown up by the soldiers in charge and 300 French and a few German soldiers were killed by the explosion But as the Germans advanced, their lines of communication were thoroughly organized, and the belt of country between Paris and the Prussian frontier subdued and garrisoned Most of these fortresses were small town enceintes, dating from Vauban's time, and open, under the new conditions of warfare, to concentric bombardment from positions formerly out of range, upon which the besieger could place as many guns as he chose to employ. In addition they were usually deficient in armament and stores and garrisoned by newly-raised troops Belfort, where the defenders strained every nerve to keep the besiegers out of bombarding range, and Paris formed the only exceptions to this general rule.

The "Defense Nationale."—The policy of the new French government was defined by Jules Favre on the 6th of September. "It is for the king of Prussia, who has declared that he is making war on the Empire and not on France, to stay his hand; we shall not cede an inch of our territory or a stone of our fortresses." These proud words, so often ridiculed as empty bombast, were the prelude of a national effort which re-established France in the eyes of Europe as a great power, even though provinces and fortresses were ceded in the peace that that effort proved unable to avert They were translated into action by Léon Gambetta, who escaped from Paris in a balloon on Oct. 7, and established the headquarters of the defence at Tours, where already the "Delegation" of the central government—which had decided to remain in Paris—had concentrated the machinery of government Thenceforward Gambetta and his principal assistant de Freycinet directed the whole war in the open country, co-ordinating it, as best they could with the precarious means of communication at their disposal, with Trochu's military operations in and round the capital. His critics—Gambetta's personality was such as to ensure him numerous enemies among the higher civil and military officials, over whom, in the interests of *La Patrie*, he rode rough-shod—have acknowledged the fact, which is patent enough in any case, that nothing but Gambetta's driving energy enabled France in a few weeks to create and to equip twelve army corps, representing thirty-six divisions (600,000 rifles and 1,400 guns), after all her organized regular field troops had been destroyed or neutralized It is claimed that by undue interference with the generals at the front, by presuming to dictate their plans of campaign, and by forcing them to act when the troops were unready, Gambetta and de Freycinet nullified the efforts of themselves and the rest of the nation and subjected France to a humiliating treaty of peace. But even the brief narrative given below must at least suggest to the reader the existence amongst the generals and higher officials of a dead weight of passive resistance to the Delegation's orders, of unnecessary distrust of the qualities of the improvised troops, and above all of the utter fear of responsibility that twenty years of literal obedience had bred The closest study of the war cannot lead to any other conclusion than this, that whether or not Gambetta as a strategist took the right course in general or in particular cases, no one else would have taken any course whatever

On the approach of the enemy Paris hastened its preparations for defence to the utmost, while in the provinces, out of reach of the German cavalry, new army corps were rapidly organized out of the few constituted regular units not involved in the previous catastrophes, the depot troops and the mobile national guard The first-fruits of these efforts were seen in Beauce, where early in October important masses of French troops prepared not only to bar the further progress of the invader but actually to relieve Paris The so-called "fog of war"—the armed inhabitants, francs-tireurs, sedentary national guard and volunteers—prevented the German cavalry from venturing far out from the infantry camps around Paris, and behind this screen the new XV army corps assembled on the Loire But an untimely demonstration of force alarmed the Germans, all of whom, from Moltke downwards, had hitherto disbelieved in the existence of the French new formations, and the still unready XV corps found itself the target of an expedition of the I. Bavarian corps, which drove the defenders out of Orleans after a sharp struggle, while at the same time another expedition swept the western part of Beauce, sacked Châteaudun as a punishment for its brave defence, and returned via Chartres, which was occupied

After these events the French forces disappeared from German eyes for some weeks D'Aurelle de Paladines, the commander of the "Army of the Loire" (XV and XVI corps), improvised a camp of instruction at Salbris in Sologne, several marches out of reach, and subjected his raw troops to a stern régime of drill and discipline At the same time an "Army of the West" began to gather on the side of Le Mans. This army was almost imaginary, yet rumours of its existence and numbers led the German commanders into the gravest errors, for they soon came to suspect that the main army lay on that side and not on the Loire, and this mistaken impression governed the German dispositions up to the very eve of the decisive events around Orleans in December Thus when at last D'Aurelle took the offensive from Tours (whither he had transported his forces, now 100,000 strong) against the posi-

tion of the I. Bavarian corps near Orleans, he found his task easy. The Bavarians, outnumbered and unsupported, were defeated with heavy losses in the battle of Coulmiers (November 9), and, had it not been for the inexperience, want of combination, and other technical weaknesses of the French, they would have been annihilated What the results of such a victory as Coulmiers might have been, had it been won by a fully organized, smoothly working army of the same strength, it is difficult to overestimate. As it was, the retirement of the Bavarians rang the alarm bell all along the line of the German positions, and that was all

Then once again, instead of following up its success, the French army disappeared from view The victory had emboldened the "fog of war" to make renewed efforts, and resistance to the pressure of the German cavalry grew day by day. The Bavarians were reinforced by two Prussian divisions and by all available cavalry commands, and constituted as an "army detachment" under the grand-duke Friedrich Franz of Mecklenburg-Schwerin to deal with the Army of the Loire, the strength of which was far from being accurately known Meantime the capitulation of Metz on Oct. 28 had set free the veterans of Prince Frederick Charles, the best troops in the German army, for field operations The latter were at first misdirected to the upper Seine, and yet another opportunity arose for the French to raise the siege of Paris. But D'Aurelle utilized the time he had gained in strengthening the army and in imparting drill and discipline to the new units which gathered round the original nucleus of the XV and XVI. corps All this was, however, unknown and even unsuspected at the German headquarters, and the invaders, feeling the approaching crisis, became more than uneasy as to their prospects of maintaining the siege of Paris

The Orleans Campaign.—At this moment, in the middle of November, the general situation was as follows the German III and Meuse armies, investing Paris, had had to throw off important detachments to protect the enterprise, which they had undertaken on the assumption that no further field armies of the enemy were to be encountered The maintenance of their communications with Germany, relatively unimportant when the struggle took place in the circumstances of field warfare, had become supremely necessary, now that the army had come to a standstill and undertaken a great siege, which required heavy guns and constant replenishment of ammunition and stores. The rapidity of the German invasion had left no time for the proper organization and full garrisoning of these communications, which were now threatened, not merely by the Army of the Loire, but by other forces assembling on the area protected by Langres and Belfort The latter, under General Cambriels, were held in check and no more by the Baden troops and reserve units (XIV. German corps) under Werder, and eventually without arousing attention they were able to send 40,000 men to the Army of the Loire This army, still around Orleans, thus came to number perhaps 150,000 men, and opposed to it, about Nov. 14 the Germans had only the Army Detachment of about 40,000, the II army being still distant It was under these conditions that the famous Orleans campaign took place After many vicissitudes of fortune, and with many misunderstandings between Prince Frederick Charles, Moltke and the grand-duke, the Germans were ultimately victorious, thanks principally to the brilliant fighting of the X. corps at Beaune-la-Rolande (Nov 28), which was followed by the battle of Loigny-Poupry on Dec 2 and the second capture of Orleans after heavy fighting on Dec 4

The result of the capture of Orleans was the severance of the two wings of the French army, henceforward commanded respectively by Chanzy and Bourbaki The latter fell back at once and hastily, though not closely pursued, to Bourges But Chanzy, opposing the detachment between Beaugency and the Forest of Marchenoir, was of sterner metal, and in the five days' general engagement around Beaugency (December 7–11) the Germans gained little or no real advantage. Indeed their solitary material success, the capture of Beaugency, was due chiefly to the fact that the French there were subjected to conflicting orders from the military and the governmental authorities. Chanzy then abandoned little but the field of battle, and on the grand-duke's representations Prince Frederick Charles, leaving a mere screen to impose upon Bourbaki (who allowed himself to be deceived and remained inactive), hurried thither with the II. army. After that Chanzy was rapidly driven north-westward, though always presenting a stubborn front. The Delegation left Tours and betook itself to Bordeaux, whence it directed the government for the rest of the war. But all this continuous marching and fighting, and the growing severity of the weather, compelled Prince Frederick Charles to call a halt for a few days. About Dec 19, therefore, the Germans (II army and Detachment) were closed up in the region of Chartres, Orleans, Auxerre and Fontainebleau, Chanzy along the river Sarthe about Le Mans and Bourbaki still passive towards Bourges

During this, as during other halts, the French government and its generals occupied themselves with fresh plans of campaign, the former with an eager desire for results, the latter (Chanzy excepted) with many misgivings. Ultimately, and fatally, it was decided that Bourbaki, whom nothing could move towards Orleans, should depart for the south-east, with a view to relieving Belfort and striking perpendicularly against the long line of the Germans' communications. This movement, bold to the point of rashness with such raw troops, seems to have been suggested by de Freycinet. As the execution of it fell actually into incapable hands, it is difficult to judge what would have been the result had a Chanzy or a Faidherbe been in command of the French. At any rate it was vicious in so far as immediate advantages were sacrificed to hopes of ultimate success which Gambetta and de Freycinet did wrong to base on Bourbaki's powers of generalship. Late in December, for good or evil, Bourbaki marched off into Franche-Comté and ceased to be a factor in the Loire campaign A mere calculation of time and space sufficed to show the German headquarters that the moment had arrived to demolish the stubborn Chanzy.

Le Mans.—Prince Frederick Charles resumed the interrupted offensive, pushing westward with four corps and four cavalry divisions which converged on Le Mans. There on Jan. 10, 11, and 12, 1871, a stubbornly contested battle, in which the Germans engaged 75,000 against 90,000 French "improvised" troops, ended with the retreat of the French, who owed their defeat solely to the misbehaviour of the Breton mobiles. These, after deserting their post on the battlefield at a mere threat of the enemy's infantry, fled in disorder and infected with their terrors the men in the reserve camps of instruction, which broke up in turn But Chanzy, resolute as ever, drew off his field army intact towards Laval, where a freshly raised corps joined him The prince's army was far too exhausted to deliver another effective blow, and the main body of it gradually drew back into better quarters, while the grand duke departed for the north to aid in opposing Faidherbe Some idea of the strain to which the invaders had been subjected may be gathered from the fact that army corps, originally 30,000 strong, were in some cases reduced to 10,000 and even fewer bayonets. And at this moment Bourbaki was at the head of 120,000 men! Indeed, so threatening seemed the situation on the Loire, though the French south of that river between Gien and Blois were mere isolated brigades, that the prince hurried back from Le Mans to Orleans to take personal command. A fresh French corps, bearing the number XXV., and being the twenty-first actually raised during the war, appeared in the field towards Blois Chanzy was again at the head of 156,000 men. He was about to take the offensive against the 40,000 Germans left near Le Mans when to his bitter disappointment he received the news of the armistice. "We have still France," he had said to his staff, undeterred by the news of the capitulation of Paris, but now he had to submit, for even if his improvised army was still cheerful, there were many significant tokens that the people at large had sunk into apathy and hoped to avoid worse terms of peace by discontinuing the contest at once.

So ended the critical period of the "*Défense nationale.*" It may be taken to have lasted from the day of Coulmiers to the last day of Le Mans, and its central point was the battle of Beaune-la-Rolande. Its characteristics were, on the German side, inadequacy of the system of strategy practised, which became palpable as soon

as the organs of reconnaissance met with serious resistance, misjudgment of and indeed contempt for the fighting powers of "new formations," and the rise of a spirit of ferocity in the man in the ranks, born of his resentment at the continuance of the war and the ceaseless sniping of the franc-tireur's rifle and the peasant's shot-gun On the French side the continual efforts of the statesmen to stimulate the generals to decisive efforts, coupled with actual suggestions as to the plans of the campaign to be followed (in default, be it said, of the generals themselves producing such plans), and the professional soldiers' distrust of half-trained troops, acted and reacted upon one another in such a way as to neutralize the powerful, if disconnected and erratic, forces that the war and the Republic had unchained As for the soldiers themselves, their most conspicuous qualities were their uncomplaining endurance of fatigues and wet bivouacs during an unusually bitter winter, and in action their capacity for a single great effort and no more But they were unreliable in the hands of the veteran regular general, because they were heterogeneous in recruiting, and unequal in experience and military qualities, and the French staff was wholly incapable of moving masses of troops with the rapidity demanded by the enemy's methods of war, so that on the whole it is difficult to know whether to wonder more at their missing success or at their so nearly achieving it

Faidherbe's Campaign.—The decision, as we have said, was fought out on the Loire and the Sarthe Nevertheless the glorious story of the *"Défense nationale"* includes two other important campaigns—that of Faidherbe in the north and that of Bourbaki in the east

In the north the organization of the new formations was begun by Dr Testelin and General Farre Bourbaki held the command for a short time in November before proceeding to Tours, but the active command in field operations came into the hands of Faidherbe, a general whose natural powers, so far from being cramped by years of peace routine and court repression, had been developed by a career of pioneer warfare and colonial administration General Farre was his capable chief of staff. Troops were raised from fugitives from Metz and Sedan, as well as from depot troops and the Garde Mobile, and several minor successes were won by the national troops in the Seine valley, for here, as on the side of the Loire, mere detachments of the investing army round Paris were almost powerless But the capitulation of Metz came too soon for the full development of these sources of military strength, and the German I army under Manteuffel, released from duty at Metz, marched north-eastward, capturing the minor fortresses on its way. Before Faidherbe assumed command, Farre had fought several severe actions near Amiens, but, greatly outnumbered, had been defeated and forced to retire behind the Somme. Another French general, Friand, had also engaged the enemy without success near Rouen Faidherbe assumed the command on Dec 3, and promptly moved forward A general engagement on the little river Hallue (Dec. 23), east-north-east of Amiens, was fought with no decisive results, but Faidherbe, feeling that his troops were only capable of winning victories in the first rush, drew them off on the 24th His next effort, at Bapaûme (Jan. 2–3, 1871), was more successful, but its effects were counterbalanced by the surrender of the fortress of Péronne (Jan. 9) and the consequent establishment of the Germans on the line of the Somme Meanwhile the Rouen troops had been contained by a strong German detachment, and there was no further chance of succouring Paris from the north. But Faidherbe, like Chanzy, was far from despair, and in spite of the deficiencies of his troops in equipment (50,000 pairs of shoes, supplied by English contractors, proved to have paper soles), he risked a third great battle at St. Quentin (Jan 19) This time he was severely defeated, though his loss in killed and wounded was about equal to that of the Germans, who were commanded by Goeben. Still the attempt of the Germans to surround him failed and he drew off his forces with his artillery and trains unharmed The Germans, who had been greatly impressed by the solidity of his army, did not pursue him far, and Faidherbe was preparing for a fresh effort when he received orders to suspend hostilities.

The last episode is Bourbaki's campaign in the east, with its mournful close at Pontarlier. Before the crisis of the last week of November, the French forces under General Crémer, Cambriels' successor, had been so far successful in minor enterprises that, as mentioned above, the right wing of the Loire army, severed from the left by the battle of Orleans and subsequently held inactive at Bourges and Nevers, was ordered to Franche Comté to take the offensive against the XIV corps and other German troops there, to relieve Belfort and to strike a blow across the invaders' line of communications But there were many delays in execution The staff work, which was at no time satisfactory in the French armies of 1870, was complicated by the snow, the bad state of the roads, and the mountainous nature of the country, and Bourbaki, a brave general of division in action, but irresolute and pretentious as a commander-in-chief, was not the man to cope with the situation Only the furious courage and patient endurance of hardships of the rank and file, and the good qualities of some of the generals, such as Clinchant, Crémer and Billot, and junior staff officers such as Major Brugère (afterwards generalissimo of the French army), secured what success was attained

The Campaign in the East.—Werder, the German commander, warned of the imposing concentration of the French, evacuated Dijon and Dôle just in time to avoid the blow and rapidly drew together his forces behind the Ognon above Vesoul A furious attack on one of his divisions at Villersexel (Jan 9) cost him 2,000 prisoners as well as his killed and wounded, and Bourbaki, heading for Belfort, was actually nearer to the fortress than the Germans But at the crisis more time was wasted, Werder (who had almost lost hope of maintaining himself and had received both encouragement and stringent instructions to do so) slipped in front of the French, and took up a long weak line of defense on the river Lisaine, almost within cannon shot of Belfort The cumbrous French army moved up and attacked him there with 150,000 against 60,000 (Jan 15–17, 1871). It was at last repulsed, thanks chiefly to Bourbaki's inability to handle his forces, and, to the bitter disappointment of officers and men alike, he ordered a retreat, leaving Belfort to its fate

Ere this, so urgent was the necessity of assisting Werder, Manteuffel had been placed at the head of a new Army of the South Bringing two corps from the I army opposing Faidherbe and calling up a third from the armies around Paris, and a fourth from the II army, Manteuffel hurried southward by Langres to the Saône Then, hearing of Werder's victory on the Lisaine, he deflected the march so as to cut off Bourbaki's retreat, drawing off the left flank guard of the latter (commanded with much *éclat* and little real effect by Garibaldi) by a sharp feint attack on Dijon. The pressure of Werder in front and Manteuffel in flank gradually forced the now thoroughly disheartened French forces towards the Swiss frontier, and Bourbaki, realizing at once the ruin of his army and his own incapacity to re-establish its efficiency, shot himself, though not fatally, on Jan 26. Clinchant, his successor, acted promptly enough to remove the immediate danger, but on the 29th he was informed of the armistice without at the same time being told that Belfort and the eastern theatre of war had been on Jules Favre's demand expressly excepted from its operation. Jules Favre, it appears, neglected to inform Gambetta of the exception Thus the French, the leaders distracted by doubts and the worn-out soldiers fully aware that the war was practically over, stood still, while Manteuffel completed his preparations for hemming them in On Feb. 1 General Clinchant led his troops into Switzerland, where they were disarmed, interned and well cared for by the authorities of the neutral state. The rearguard fought a last action with the advancing Germans before passing the frontier. On the 16th, by order of the French government, Belfort capitulated, but it was not until the 11th of March that the Germans took possession of Bitche, the little fortress on the Vosges, where in the early days of the war de Failly had illustrated so signally the want of concerted action and the neglect of opportunities which had throughout proved the bane of the French armies.

The losses of the Germans during the whole war were 28,000 dead and 101,000 wounded and disabled, those of the French, 156,000 dead (17,000 of whom died of sickness and wounds, as

prisoners in German hands) and 143,000 wounded and disabled. 720,000 men surrendered to the Germans or to the authorities of neutral states, and at the close of the war there were still 250,000 troops on foot, with further resources not immediately available to the number of 280,000 more. In this connection, and as evidence of the respective numerical yields of the German system working normally and of the French improvised for the emergency, we quote from Berndt (*Zahl im Kriege*) the following comparative figures —

End of July	French 250,000,	Germans	384,000	under arms	
Middle of November	„ 500,000,	„	425,000	„	„
After the surrender of Paris and the disarmament of Bourbaki's army	„ 534,000,	„	835,000	„	„

The date of the armistice was Jan 28, and that of the ratification of the treaty of Frankfurt May 23, 1871

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FRANÇOIS (1717–1769), French etcher and engraver, born at Nancy He studied art under Claude Charles at Nancy He experimented on his own in copper engraving, worked at Dijon and Lyons, where he published in 1740 the *Principes de dessein faciles*, with descriptions of a new process imitating the effect of crayon drawings in engraving He perfected this process in the following years and in 1758 he received a pension of 100 livres from the king with the title "graveur des desseins du Cabinet du Roi" His most important work is the series of portraits for Saverien's *Histoire des Philosophes modernes* (1761–69) Francois' work is not artistic Its importance is due to his claim of having introduced the crayon method He himself stated in a letter addressed to Saverien (1760) that he made experiments in the method in 1740; and the fact that he attained recognition from the French Royal Academy in 1757 seems to substantiate his statement Two other engravers claimed for themselves the honour of the discovery, Gilles Demarteau and L M Bonnet.

FRANÇOIS DE NEUFCHÂTEAU, NICOLAS LOUIS, COUNT (1750–1828), French statesman and poet, was born at Saffais, Lorraine, on April 17, 1750, the son of a school-teacher, He studied at the Jesuit college of Neufchâteau in the Vosges, and at 14 published verses which were praised by Rousseau and Voltaire Neufchâteau conferred on him its name, and he was elected member of some of the principal academies of France. From 1783 to 1789 he was *procureur-général* to the council of Santo Domingo After the Revolution he was elected deputy *suppléant* to the National Assembly, organized the Department of the Vosges, and was elected later to the Legislative Assembly, of which he first became secretary and then president In 1793 he was imprisoned on account of his drama *Pamela ou la vertu récompensée* (Théâtre de la Nation, Aug 1, 1793), but was set free a few days afterwards at the revolution of the 9th Thermidor. In 1797 he became minister of the interior, he developed inland navigation, inaugurated the museum of the Louvre, and was one of the promoters of the first universal exhibition of industrial products From 1804 to 1806 he was president of the Senate, and in 1808 he received the dignity of count Retiring from public life in 1814, he occupied himself chiefly in the study of agriculture, until his death on Jan 10, 1828

François de Neufchâteau edited the *Lettres Provinciales* and *Pensées* of Pascal (1822–26) and *Gil Blas* (1820) His principal poetical works are *Poésies diverses* (1765), *Ode sur les parlements* (1771), *Nouveaux Contes moraux* (1781), *Les Vosges* (1796); *Fables et contes* (1814), and *Les Tropes, ou les figures de mots* (1817) He was also the author of a large number of works on agriculture

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FRANCOLIN, the name for birds of the genus *Francolinus* and allied genera, related to the partridge (*q v*) There are upwards of 50 forms, which inhabit Asia and Africa The type species (*F francolinus*) is found in Cyprus, Palestine, Asia Minor and thence through Persia and India

FRANCONIA, one of the stem-duchies of mediaeval Germany It stretched along the valley of the Main from the Rhine to Bohemia, and was bounded on the north by Saxony and Thuringia, and on the south by Suabia and Bavaria It also included a district around Mainz, Spires and Worms, on the left bank of the Rhine.

This territory, occupied by the most easterly portion of the Frankish people, formed part of the kingdom of Austrasia After the treaty of Verdun in 843 it became the centre of the East Frankish or German kingdom, and remained for a time the most important of the duchies which arose on the ruins of the Carolingian empire Its influence began to decline under the kings of the Saxon house (*see* GERMANY) It lacked political unity, had no opportunities for extension, and soon became divided into Rhenish Franconia and Eastern Franconia The most influential family in Rhenish Franconia was that of the Salians, the head of which early in the 10th century was Conrad the Red, duke of Lorraine and son-in-law of Otto the Great In 1024 his great-grandson Conrad, duke of Franconia, was elected German king as Conrad II. and founded the line of Franconian or Salian emperors Rhenish Franconia gradually became a land of free towns and lesser nobles, and under the earlier Franconian emperors considerable portions passed to the count palatine of the Rhine, the archbishop of Mainz and the bishops of Worms and Spires, and the name Franconia was confined to the eastern portion of the duchy. Clerical authority was becoming predominant in this region A series of charters dating from 822 to 1025 had granted considerable powers to the bishops of Würzburg, who, by the time of the emperor Henry II, possessed judicial authority over the whole of Eastern Franconia The duchy was nominally retained by the emperors in their own hands until 1115, when the emperor Henry V, wishing to curb the episcopal influence in this neighbourhood, appointed his nephew Conrad of Hohenstaufen as duke of Franconia Conrad's son Frederick took the title of duke of Rothenburg instead of duke of Franconia, but in 1196, on the death of Conrad of Hohenstaufen,

son of the emperor Frederick I., the title fell into disuse. Meanwhile the bishop of Wurzburg had regained his formal power in the duchy, and this was confirmed in 1168 by the emperor Frederick I.

The title was assumed by John II., bishop of Würzburg early in the 15th century, and retained by his successors until the bishopric was secularized in 1802 The name Franconia was revived in 1837, when Louis I, king of Bavaria, gave to three northern portions of his kingdom the names of Upper, Middle and Lower Franconia When Germany was divided into circles by the emperor Maximilian I. in 1500, the name Franconia was given to that circle which included the eastern part of the old duchy. The lands formerly comprised in the duchy of Franconia are now divided among Bavaria, Wurttemberg, Baden, Hesse and the Prussian province of Hesse-Nassau

See T Henner, *Die herzogliche Gewalt der Bischofe von Wurzburg* (Wurzburg, 1874), F Stein, *Geschichte Frankens* (Schweinfurt, 1885–86)

FRANCS-ARCHERS. The institution of the *francs-archers* was the first attempt at the formation of regular infantry in France They were created by the ordinance of Montils-les-Tours on Aug 28, 1448, which prescribed that in each parish an archer should be chosen from among the most apt in the use of arms; this archer to be exempt from the *taille* and certain obligations, to practise shooting with the bow on Sundays and feast-days and to hold himself ready to march fully equipped at the first signal Under Charles VII the *francs-archers* distinguished themselves in numerous battles with the English During the succeeding reigns the institution languished and finally disappeared in the middle of the 16th century The *francs-archers* were also called *francs-taupins*

See Daniel, *Histoire de la milice française* (1721), and E Boutaric, *Institutions militaires de la France avant les armées permanentes* (1863)

FRANCS-TIREURS, irregular troops, almost exclusively infantry ("free-shooters"), employed by the French in the war of 1870–71 They were originally rifle clubs or unofficial military societies formed in the east of France at the time of the Luxembourg crisis of 1867 The members were chiefly concerned with the practice of rifle-shooting, and were expected in war to act as light troops As under the then system of conscription the greater part of the nation's military energy was allowed to run to waste, the francs-tireurs were not only popular, but efficient workers in their sphere of action As they wore no uniforms, were armed with the best rifles and elected their own officers, the Government made repeated attempts to bring the societies, which were at once a valuable asset to the armed strength of France and a possible menace to internal order, under military discipline This was strenuously resisted by the societies, to their sorrow as it turned out, for the Germans treated captured francs-tireurs as irresponsible non-combatants found with arms in their hands and usually exacted the death penalty In July 1870, at the outbreak of the war, the societies were brought under the control of the minister of war and organized for field service, but it was not until November—by which time the *levée en masse* was in force —that they were placed under the orders of the generals in the field. After that they were sometimes organized in large bodies and incorporated in the mass of the armies, but more usually they continued to work in small bands, blowing up culverts on the invaders' lines of communication, cutting off small reconnoitring parties, surprising small posts, etc It is now acknowledged, even by the Germans, that though the francs-tireurs did relatively little active mischief, they paralyzed large detachments of the enemy, contested every step of his advance (as in the Loire campaign), and prevented him from gaining information. Their most celebrated feats were the blowing up of the Moselle railway bridge at Fontenoy on Jan. 22, 1871 (see *Les Chasseurs des Vosges* by St. Étienne, Toul, 1906), and the heroic defence of Châteaudun by Lipowski's Paris corps and the francs-tireurs of Cannes and Nantes (Oct. 18, 1870). Although the original members of the rifle clubs were joined by many bad characters, the patriotism of the majority was unquestionable, for little mercy was shown by the Germans to those francs-tireurs who fell into their hands. The severity of the German reprisals is itself the best testimony to the fear and anxiety inspired by the presence of active bands of francs-tireurs on the flanks and in rear of the invaders

FRANEKER, in the province of Friesland, Holland, 5 m. E. of Harlingen. Pop. (1927) 8,239 It was at one time a favourite residence of the Frisian nobility, and it possessed a celebrated university, founded by the Frisian estates in 1585 This was suppressed by Napoleon I in 1811, and the endowments diverted to support an athenaeum, and afterwards a gymnasium. Franeker also possesses a town hall (1591) The fine observatory was founded about 1780 The church of St Martin (1420) contains several fine tombs of the 15th–17th centuries There is a market for agricultural produce

FRANK, FRANZ HERMANN REINHOLD VON (1827–1894), German Lutheran theologian, was born on March 25, 1827, at Altenburg, and educated at Leipzig university. After teaching at Ratzeburg and Altenburg, in 1857 he was appointed professor of theology at Erlangen, where he died on Feb 7, 1894

Frank's chief works are: *System der christlichen Gewissheit* (1870–73, 2nd ed, 1881–83, Eng trans, 1886), in which he discusses the basis of belief, *System der christlichen Wahrheit* (1878–80, 3rd ed, 1893–94); *System der christlichen Sittlichkeit* (1884–87; Eng trans, 1886); *Zur Theologie A Ritschls* (3rd ed, 1891), in which he attacks Ritschls' theology, and *Gesch und Kritik der neueren Theologie* (1894; 3rd ed, 1898)

See Herzog's *Realencyklopadie*

FRANK, JAKOB (1726–1791), a Jewish theologian, founded in Poland a sect which emanated from Judaism but ended by merging with Christianity The sect, the outcome of the Messianic mysticism of Sabbetai Zebi, was an antinomian movement in which the authority of the Jewish law was held to be superseded by personal freedom It posed as an anti-Talmudic protest in behalf of a spiritual religion The Frankists in 1759 were baptized *en masse*, amid much pomp, but the Church soon became convinced that Frank was not a genuine convert. He was imprisoned on a charge of heresy, but on his release in 1763 the empress Maria Theresa patronized him, regarding him as a propagandist of Christianity among the Jews He thenceforth lived in state as baron of Offenbach, and on his death his daughter Eva succeeded him as head of the sect

FRANK, JOHANN PETER (1745–1821), German physician, was born on March 19, 1745, at Rodalben, Bavaria, and studied at Heidelberg and Strasbourg He became court and garrison physician in Rastadt (1769), professor in Gottingen (1784), in Pavia (1785), director of sanitation in Lombardy (1786), and in 1795 sanitary officer to the Vienna hospitals In 1804, after a short time in St Petersburg as ordinary physician and counsellor of State, he returned to practise in Vienna, where he died on April 24, 1821. Frank's fame rests on his *System der medicinischen Policey* (1779), which covers the hygiene of all the stages of a man's life. His treatise on therapeutics, *De Curandis Morbis*, appeared in 1792

His autobiography was published in Vienna (1802). *See* also K. Doll, *Dr. J. P Frank* (Karlsruhe, 1909).

FRANK, LEONHARD (1882–), German writer, was born in Wurzburg on Sept. 4, 1882, the son of a carpenter. His early works *Die Rauberbande* (1914) and *Die Ursache* (1915) caused a considerable sensation The latter which was written in an expressionistic style and revealed the influence of psychoanalytical doctrines, consisted of a bitter attack on tyrannical schoolmasters. In 1917 Frank published *Der Mensch ist gut*, a violently pacifist book most imperfect in form, but of such strong feeling that its revolutionary effect was great. His later works include *Der Burger* (1924) and *Das Ochsenfuster Männerquartett* (1927), pictures of post-war conditions in Germany Frank's work is vivid and interesting, but his success was largely due to circumstance He was elected a member of the German Academy of Letters in 1928

FRANK-ALMOIGN, in the English law of real property, a species of spiritual tenure, whereby a religious corporation, aggregate or sole, holds lands of the donor to them and their succes-

sors for ever. It was a tenure dating from Saxon times, held not on the ordinary feudal conditions, but discharged of all services except the *trinoda necessitas* But "they which hold in frank-almoign are bound of right before God to make orisons, prayers, masses and other divine services for the souls of their grantor or feoffor, and for the souls of their heirs which are dead, and for the prosperity and good life and good health of their heirs which are alive And therefore they shall do no fealty to their lord, because that this divine service is better for them before God than any doing of fealty" (Litt s 135) It was the tenure by which the greater number of the monasteries and religious houses held their lands, it was expressly exempted from the statute 12 Car II c. 24 (1660), by which the other ancient tenures were abolished, and it is the tenure by which the parochial clergy and many ecclesiastical and eleemosynary foundations hold their lands at the present day As a form of donation, however, it came to an end by the passing of the statute *Quia Emptores,* for by that statute no new tenure of frank-almoign could be created, except by the Crown

See Pollock and Maitland, *Hist of Eng. Law,* vol. i 218–30.

FRANKEL, ZECHARIAS (1801–1875), Jewish theologian, one of the founders of the Breslau school of "historical Judaism," which attempts to harmonize critical treatment of the documents of religion with fidelity to tradition For a time at least, the compromise succeeded in staying the disintegrating effects of the liberal movement in Judaism He became head of the Breslau seminary, founded in 1854 for the training of rabbis who should combine their rabbinic studies with secular courses at the university

His writings include *Septuagint Studies,* an *Introduction to the Mishnah* (1859), and a similar work on the Palestinian Talmud (1870)

FRANKENBERG, a manufacturing town of Germany, in the republic of Saxony, on the Zschopau, 7 m N E of Chemnitz Pop (1925) 13,646 Its industries include extensive woollen, calico-printing, cotton and silk weaving, dyeing, the manufacture of brushes, furniture and cigars, iron-founding and machine building It has a school of weaving

FRANKENHAUSEN, a town of Germany, in Thuringia, on an artificial arm of the Wipper, a tributary of the Saale, 36 m N N E of Gotha Pop (1925) 7,641 It consists of an old and a new town, the latter mostly rebuilt since a destructive fire in 1833, and has an old château of the princes of Schwarzburg Its industries include the manufacture of organs, cigars and buttons, and there are brine springs, with baths, in the vicinity

FRANKENIACEAE, in botany, the sea-heath family, comprising four genera and 60 species of salt-loving herbs, with jointed stems There is one British species, *Frankenia laevis,* the sea-heath, and in North America, there are three species, *F Jamesii,* found from Colorado to Texas, and *F grandifolia,* the alkali-heath, and *F. Palmeri,* the *yerba reuma* of the Spanish Californians, both native to California

FRANKENSTEIN, a town of Germany, in the Prussian province of Silesia, on the Pausebach, 35 m S by W of Breslau Pop (1925) 10,106. It is still surrounded by its mediaeval walls, has a parish church with a curious overhanging tower, and a monastery. The industries include the manufacture of soap and straw hats There are also mills for grinding the magnesite found in the neighbourhood, and it is engaged in the grain trade.

FRANKENTHAL, a town of Germany, in the Bavarian Palatinate, on the Isenach, connected with the Rhine by a canal 3 m in length, 6 m N W from Mannheim. Pop. (1925) 24,647 Frankenthal (Franconodal) is mentioned as a village in the 8th century. A house of Augustinian canons established here in 1119 was suppressed in 1562 by the elector palatine, who gave its possessions to Protestant refugees from the Netherlands. In 1577 this colony received town rights from the elector John Casimir, whose successor fortified the place, and under the elector Charles Theodore it became the capital of the Palatinate It has a fine mediaeval town-hall, two interesting old gates and remains of its former environing walls Its industries include the manufacture of machinery, casks, corks, soap, dolls and furniture, sugar-refining, iron-founding and bell-founding—the famous "Kaiserglocke" of the Cologne cathedral was cast here Frankenthal was formerly famous for its porcelain factory, making figures and groups, established here in 1755 In 1795 the factory was removed to Grünstadt.

FRANKENWALD, a mountainous district of southern Germany, connecting geologically the Fichtelgebirge and the Thuringian Forest. It is a broad well-wooded plateau, about 30 m long descending gently on the north and east sides towards the Saale, but more precipitously to the Bavarian plain in the west Its highest point is the Kieferle near Steinheid (2,900 ft) Along the centre lies the watershed between the basins of the Main and the Saale, of the Rhine and Elbe systems, respectively The principal tributaries of the Main from the Frankenwald are the Rodach and Hasslach; of the Saale, the Selbitz.

FRANKFORT, a city of Indiana, U S A., 40m N W of Indianapolis; the county seat of Clinton county It is served by the Chicago, Indianapolis and Louisville, the Nickel Plate and the Pennsylvania railways and by two inter-urban trolley lines The population was 11,585 in 1920 (98% native white) and was estimated locally at 14,000 in 1928 It is the trade centre for a fertile farming region with products valued at $7,000,000 annually, and the annual value of the city's factory output is estimated at $10,000,000 The largest industry is the railroad shops of the Clover Leaf division of the Nickel Plate road, employing 1,000 persons Others of importance are manufactures of kitchen cabinets, "porceliron" table-tops, plumbers' brass goods, cigars, butter, meat products, flour and children's play garments The city owns its electric light and power plant, and hydro-electric power is available from the development on the Tippecanoe river The first settlement in this vicinity was made in 1826 In 1830 the town was founded, and in 1875 it was incorporated as a city

FRANKFORT, the capital city of Kentucky, U S A , and the county seat of Franklin county, on the Kentucky river, 52m E of Louisville It is on Federal highway 60, and is served by the Chesapeake and Ohio, the Frankfort and Cincinnati and the Louisville and Nashville railways The population was 9,805 in 1920 (23% negroes) and was estimated locally at 12,000 in 1928 It is in the heart of the "blue grass" region, and surrounded by picturesque hills on both sides of the river The State capitol (built in 1905–07 at a cost of $2,000,000) is of granite and white limestone, 400ft long by 185ft wide, finished on the interior entirely in white marble The old capitol (1829) is occupied by the State historical society. The State arsenal, the State institution for feeble-minded children and the State industrial college (for negroes) are situated here The city is a trading centre for the rich surrounding country, which produces hemp and tobacco and raises thorough-bred trotting horses The manufactures include twine, lumber, furniture, brooms and shoes Frankfort was founded in 1786 by Gen. James Wilkinson, became the capital of the State in 1792 (when its population was less than 500) and was chartered as a city in 1839 During the Civil War it was occupied for a short time (in 1862) by Gen Braxton Bragg (Confederate), who was driven out by Gen D C Buell In 1900 there was a bitter contest for the governorship, in connection with which the Democratic claimant, William Goebel, was assassinated Daniel Boone and other national heroes are buried in Frankfort Cemetery

FRANKFURT-ON-MAIN, a city in the Prussian province of Hesse-Nassau, principally on the right bank of the Main, 24 m. above its confluence with the Rhine at Mainz Always a place of great trading importance, long the place of election for the German kings, and until 1866, together with Hamburg, Bremen and Lubeck, one of the four free cities of Germany, it is one of the leading commercial centres of Germany The various stages in the development of the city are clearly indicated in its general plan and the surviving names of many of its streets The line of the original 12th century walls and moat is marked by street names ending in *-graben,* from the Hirschgraben on the west to the Wollgraben on the east These and the river on the south enclose the "old town" (*Altstadt*). The "new town" (*Neustadt*), added in 1333, extends to the *Anlagen,* the gardens and promenades laid out (1806–1812) on the site of the 17th century fortifications, of which they preserve the general ground plan. Of

the mediaeval fortifications the Eschenheimer Tor, a round tower 155 ft. high, dating from 1400 to 1428, the Rententurm (1456) on the Main and the Kuhhirtenturm (*c.* 1490) in Sachsenhausen, are the sole remains Its boundaries have been extended in all directions and include Sachsenhausen, where stand the Church and House of the Teutonic Order, Bornheim, and the former Hessian town of Bockenheim

The main development has been to the north of the river The Altstadt still preserves many of its mediaeval features The Judengasse (Ghetto), down to 1806 the sole Jews' quarter, has been pulled down, with the exception of the ancestral house of the Rothschild family As the Altstadt is mainly occupied by artisans and petty tradesmen, so the Neustadt is the principal business quarter of the city, containing the chief public buildings and the principal hotels

Churches.—The cathedral (Dom) built of red sandstone, has a massive tower 300 ft in height. This building, in which the Roman emperors were formerly elected and, since 1562, crowned, was founded in 852 by King Louis the German, and was later known as the Salvatorkirche After its reconstruction (1235–1239), it was dedicated to St Bartholomew Nave and side aisles are of 1235–39 choir 1315–38, long transepts 1346–54, cloisters rebuilt 1348–1447, electoral chapel south of the choir 1355, tower (unfinished) 1415 In 1867 the tower and roof were destroyed by fire and considerable other damage was done The restoration was finished in 1881, including the completion of the tower, according to the original plans The Leonhardskirche (restored in 1882) was begun in 1219, it is said on the site of the palace of Charlemagne It was originally a three-aisled basilica, but is now a five-aisled *Hallenkirche*, the choir was added in 1314 It has two Romanesque towers The Liebfrauenkirche is first mentioned in 1314 as a collegiate church, the nave was consecrated in 1340 The choir was added in 1506–1509 and the whole church restored in the second half of the 18th century, when the tower was built (1770) Of the Protestant churches, the Nikolaikirche dates from the 13th century The Katharinenkirche, built 1678–1681 on the site of an older building, is famous in Frankfort history as the place where the first Protestant sermon was preached in 1522

Public Buildings.—The Romer, for almost five hundred years the Rathaus (town hall), lies on the Romerberg, a square flanked by mediaeval houses. It is first mentioned in 1322, was bought with the adjacent hostelry in 1405 by the city and rearranged as a town hall, and has since, from time to time, been enlarged by the purchase of adjoining patrician houses, forming a complex of buildings of various styles and dates surmounted by a clock tower The façade was rebuilt (1896–1898) in late Gothic style Here, in the Wahlzimmer (or election-chamber) the electors or their plenipotentiaries chose the German kings New municipal buildings adjoining the "Romer" on the north side were erected in 1900–1903 The palace of the princes of Thurn and Taxis in the Eschenheimer Gasse was built 1732–1741 From 1816 to 1866 it was the seat of the German federal diet It is now annexed to the principal post office (built 1892–1894), which lies close to it on the Zeil The Saalhof, built on the site of the palace erected by Louis the Pious in 822, overlooking the Main, has a chapel of the 12th century, the substructure dating from Carolingian times The Leinwandhaus (linendrapers' hall), a 15th century building was reconstructed in 1892 as a municipal museum. In the Grosser Hirschgraben is the Goethehaus, a 16th century building in which Goethe lived from his birth in 1749 until 1775 In 1863 the house was acquired by the *Freies deutsche Hochstift* and was opened to the public, and is now connected with a Goethe-museum (1897), with archives and a library representative of the Goethe period of German literature

Literary and Scientific Institutions.—The opera house is a magnificent edifice in the style of the Italian Renaissance. The public picture gallery in the Saalhof possesses works by Hans Holbein, Grünewald, Van Dyck, Teniers, Van der Neer, Hans von Kulmbach, Lucas Cranach and other masters The Städel Art Institute (Städel'sches Kunstinstitut) in Sachsenhausen, contains a picture gallery and a rich collection of German engravings. The municipal library has a Gutenberg Bible printed at Mainz between 1450 and 1455, another on parchment dated 1462, the *Institutiones Justiniani* (Mainz, 1468), the *Theuerdank*, with woodcuts by Hans Schäufelein, and numerous valuable autographs It also contains a fine collection of coins. The *Senckenberg'sches naturhistorisches Museum* contains valuable collections of birds and shells The Royal Institute for experimental therapeutics (*Königl. Institut fur experimentelle Therapie*) moved to Frankfurt in 1899, is especially concerned with the study of bacteriology and serums In 1914 a university was founded, and in connection with it is an academy of labour

The Alte Mainbrucke, a red sandstone structure of fourteen arches, 815 ft long, dates from the 14th century. On it are a mill, a statue of Charlemagne and an iron crucifix surmounted by a gilded cock Frankfurt lies at the junction of lines from Berlin to Basel, from Cologne to Wurzburg and Vienna, from Hamburg and Cassel, and from Dresden and Leipzig to France and Switzerland The river Main has been dredged so as to afford heavy barge traffic with the towns of the upper Main and with the Rhine Frankfurt is now an important inland port, heavy barges can navigate the Main as far as Aschaffenburg, and canalization is being carried as far as Wurzburg The Rhine-Main-Danube canal is under reconstruction, and a scheme has been prepared for a waterway to the Weser, which will link Frankfurt with Bremen.

Trade, Commerce and Industries.—Frankfurt, formerly more a commercial than an industrial town, has developed its industries considerably The famous banking houses weathered the period of inflation well, and have led the way to the restoration of Germany's economic position in the world The suburbs of Sachsenhausen and Bockenheim have developed particularly in publishing and printing, brewing and the manufacture of quinine. It also produces type, machinery, rolling stock, asbestos, rubber, gutta-percha, soap, ready-made clothing, chemicals, electrotechnical apparatus and metal wares Market gardening is extensively carried on in the neighbourhood and much cider manufactured There are two great fairs held in the town—the Ostermesse, or spring fair, and the Herbstmesse, or autumn fair The former, the original nucleus of all the commercial prosperity of the city, begins on the second Wednesday before Easter, and the latter on the second Wednesday before the 8th of September They last three weeks, and the last day save one, called the *Nickelchestag*, is distinguished by the influx of people from the neighbouring country The trade in leather is of great and growing importance A horse fair has been held twice a year since 1862 under the patronage of the agricultural society, and the wool market was reinstituted in 1872 by the German Trade Society (Deutscher Handelsverein) In the 17th century the town was the seat of a great book trade, but is now eclipsed by Leipzig. The *Frankfurter Zeitung* circulates widely A memorial monument was erected in 1858 in honour of the early German printers The statue of Goethe (1844) in the Goetheplatz is by Ludwig von Schwanthaler The Schiller statue, erected in 1863, is the work of a Frankfurt artist, Johann Dielmann.

Government.—The present municipal constitution of the city dates from 1867 Bismarck was desirous of giving the city a more liberal constitution than is usual in ordinary cases Formerly fifty-four representatives were elected, but provision was made for increasing the number Since 1885 the city has been supplied with water from the Stadtwald, Goldstein and Hinkelstein The population of Frankfurt has steadily increased since the beginning of the 19th century; it amounted in 1817 to 41,458, and in 1925 was 466,311 During the World War Frankfurt was several times bombed, and it was occupied for a short time by the French in 1920 during the invasion of the Ruhr area by German militarists.

HISTORY

Excavations around the cathedral have suggested that Frankfurt-on-Main (*Traiectum ad Moenum*) was probably founded in the 1st century of the Christian era The first genuine historical notice of the town occurs in 793, when Einhard, Charlemagne's biographer, tells us that he spent the winter in the villa Frankonovurd. The name "Frankfurt" is also found in several official

documents of Charlemagne's reign; and from the notices that occur in the early chronicles and charters it would appear that the place was the most populous at least of the numerous villages of the Main district During the Carolingian period it was the seat of no fewer than 16 imperial councils of colloquies.

Under the Hohenstaufens many brilliant diets were held within its walls. That of 1147 saw, also, the first election of a German king at Frankfurt, in the person of Henry, son of Conrad III. But as the father outlived the son, it was Frederick I, Barbarossa, who was actually the first reigning king to be elected here (in 1152) With the beginning of the 13th century the municipal constitution appears to have taken definite shape The chief official was the royal bailiff (*Schultheiss*), who is first mentioned in 1193, and whose powers were subsequently enlarged by the abolition, in 1219, of the office of the royal *Vogt* or *advocatus* About this time a body of *Schoffen* (*scabini*, jurats), 14 in number, was formed to assist in the control of municipal affairs, and with their appointment the first step was taken towards civic representative government. Soon, however, the activity of the *Schoffen* became specifically confined to the determination of legal disputes, and in their place a new body (*Collegium*) of counsellors—*Ratmannen*—also 14 in number, was appointed for the general administration of local matters In 1311, the two burgomasters, now chiefs of the municipality, take the place of the royal *Schultheiss*. In the 13th century Frankfurt Fair (first mentioned in 1150, but clearly of greater antiquity) was largely frequented By the famous Golden Bull of 1356 Frankfurt was declared the seat of the imperial elections, and it still preserves an official contemporaneous copy of the original document as the most precious of the eight imperial bulls in its possession At the Reformation Frankfurt heartily joined the Protestant party, and in consequence it was hardly treated both by the emperor Charles V and by the archbishop of Mainz Between 1612 and 1616 occurred the great Fettmilch insurrection, perhaps the most remarkable episode in the internal history of Frankfurt. The magistracy had been acquiring more and more the character of an oligarchy, all power was practically in the hands of a few closely-related families, and the gravest peculation and malversation took place without hindrance The ordinary citizens were roused to assert their rights, and they found a leader in Vincenz Fettmilch, who carried the contest to dangerous excesses, but lacked ability to bring it to a successful issue An imperial commission was ultimately appointed, and the three principal rebels and several of their associates were executed in 1616 It was not till 1801 that the last mouldering head of the Fettmilch company dropped unnoticed from the Rententurm, the old tower near the bridge The insurrection completely destroyed the political power of the guilds, gave new strength to the supremacy of the patriciate, and brought no further advantage to the rest of the citizens than a few improvements in the organization and administration of the magistracy The Jews, who had been attacked by the popular party, were solemnly reinstated by imperial command in all their previous privileges, and received full compensation for their losses

The independence of Frankfurt was brought to an end in 1806, on the formation of the Confederation of the Rhine; but on the reconstitution of Germany in 1815 it again became a free city, and in the following year it was declared the seat of the German Confederation In April 1833 occurred what is known as the Frankfurt Insurrection (*Frankfurter Attentat*), in which a number of insurgents led by Georg Bunsen attempted to break up the diet. During the revolutionary period of 1848 the people of Frankfurt, where the united German parliament held its sessions, took a chief part in political movements, and the streets of the town were more than once the scene of conflict In the war of 1866 they were on the Austrian side On July 16 the Prussian troops, under Gen Vogel von Falkenstein, entered the town, and on Oct. 18 it was formally incorporated with the Prussian State A fine of 6,000,000 florins was exacted On May 10, 1871 the treaty which concluded the Franco-German War was signed in the Swan hotel by Prince Bismarck and Jules Favre, and it is consequently known as the Peace of Frankfurt.

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FRANKFURT-ON-ODER, a town of Germany, in the Prussian province of Brandenburg, 50 m S E. from Berlin by rail Pop (1925) 70,725 It owes its origin and name to a settlement of Franconian merchants, in the 13th century, on land conquered from the Wends. In 1253 it was made a town by the margrave John I and borrowed from Berlin the Magdeburg civic constitution In 1379 it received the right to free navigation of the Oder, it belonged (1368–*c* 1450) to the Hanseatic League. The university, opened in 1506, was removed in 1516 to Kottbus and restored again to Frankfurt in 1539 It was dispersed during the Thirty Years' War and again restored by the Great Elector, but finally transferred to Breslau in 1811

In the 15th century Frankfurt successfully withstood sieges by the Hussites (1429 and 1432), by the Poles (1450) and by the duke of Sagan (1477) Also in the Thirty Years' War and Napoleonic Wars it suffered much

The town proper lies on the left bank of the river Oder and is connected by a stone bridge 900 ft long, with the suburb of Damm The Evangelical Marienkirche (Oberkirche), a brick edifice of the 13th century with five aisles, and the Rathhaus dating from 1607, and bearing the device of a member of the Hanseatic League, are notable. Frankfurt-on-Oder was long the seat of the court of appeal for the province, but of this it was deprived in 1879 Its industries include the manufacture of machinery, metal ware, chemicals, paper, leather and soap It has an extensive system of water communication by means of the Oder and its canals to the Vistula and the Elbe Trade in corn, cattle and wine is fostered by its three annual fairs, held respectively at *Reminiscere* (the second Sunday in Lent), St Margaret's day and at Martinmas. In the neighbourhood are extensive coal fields.

FRANKINCENSE or **OLIBANUM,** a gum-resin obtained from certain species of trees of the genus *Boswellia*, and natural order *Burseraceae* Sir George Birdwood distinguishes five species of *Boswellia*: (A) *B thurifera*, Colebr (*B glabra* and *B serrata*, Roxb), indigenous to the mountainous tracts of central India and the Coromandel coast, and *B papyrifera* (*Plösslea floribunda*, Endl) of Abyssinia, which, though both thuriferous, are not known to yield any of the olibanum of commerce, and (B) *B Frereana*, *B Bhua-Dajiana*, and *B Carterii*, the "Yegaar," "Mohr Add," and "Mohr Madow" of the Somali country, in East Africa, the last species including a variety, the "Maghrayt d'Sheehaz" of Hadramaut, Arabia, all of which are sources of true frankincense or olibanum To obtain the frankincense a deep incision is made in the trunk of the tree, and below it a narrow strip of bark 5 in in length is peeled off When the milk-like juice ("spuma pinguis," Pliny) which exudes has hardened by exposure to the atmosphere, the incision is deepened In about three months the resin has attained the required degree of consistency The season for gathering lasts from May until the first rains in September The large clear globules are scraped off into baskets, and the inferior quality that has run down the tree is collected separately Much as formerly described by Arrian, in the region of Sakhalites in Arabia (the tract between Ras Makalla and Ras Agab), so now on the seacoast of the Somali country, the frankincense when collected is stored in heaps at various stations. Thence, packed in sheep- and goat-skins, in quantities of 20 to 40 lb., it is carried on camels to Berbera, for shipment either to Aden, Makalla and other Arabian ports, or directly to Bombay At Bombay, like gum-acacia, it is assorted, and is then packed for re-exportation to Europe, China and elsewhere Olibanum is a reputed natural product of China.

Frankincense, or olibanum, occurs in commerce in semi-opaque, round, ovate or oblong tears or irregular lumps, which are covered externally with a white dust, the result of their friction against

one another. It has an amorphous internal structure, a dull fracture, is of a yellow to yellowish-brown hue, the purer varieties being almost colourless, or possessing a greenish tinge, and has a somewhat bitter aromatic taste, and a balsamic odour, which is developed by heating. Immersed in alcohol it becomes opaque, and with water it yields an emulsion It contains about 72% of resin soluble in alcohol (Kurbatow); a large proportion of gum soluble in water, and apparently identical with gum arabic, and a small quantity of a colourless inflammable essential oil, one of the constituents of which is the body oliben, $C_{10}H_{16}$ Frankincense burns with a bright white flame, leaving an ash consisting mainly of calcium carbonate, the remainder being calcium phosphate, and the sulphate, chloride and carbonate of potassium (Braconnot). Good frankincense, Pliny tells us, is recognized by its whiteness, size, brittleness and ready inflammability. That which occurs in globular drops is, he says, termed "male frankincense", the most esteemed, he further remarks, is in breast-shaped drops, formed each by the union of two tears. The best frankincense, as we learn from Arrian, was formerly exported from the neighbourhood of Cape Elephant in Africa (the modern Ras Fiel), and A von Kremer, in his description of the commerce of the Red Sea (*Aegypten*, etc , p. 185, ii. Theil, Leipzig, 1863), observes that the African frankincense, called by the Arabs "asli," is of twice the value of the Arabian "luban" Frankincense was used by the ancient Egyptians in their religious rites, but, as Herodotus tells us (ii 86), not in embalming It constituted a fourth part of the Jewish incense of the sanctuary (Ex xxx 34), and is frequently mentioned in the Pentateuch. With other spices it was stored in a great chamber of the house of God at Jerusalem (1 Chron ix 29, Neh. xiii. 5–9).

As a medicine it was in former times in high repute Pliny (*Nat. Hist.* xxv. 82) mentions it as an antidote to hemlock Avicenna (ed. Plempii, lib ii p. 161, Lovanii, 1658, fol) recommends it for tumours, ulcers of the head and ears, affections of the breast, vomiting, dysentery and fevers. In the East frankincense has been found efficacious as an external application on carbuncles, blind boils and gangrenous sores, and as an internal agent is given in gonorrhoea In China it was an old internal remedy for leprosy and struma, and is accredited with stimulant, tonic, sedative, astringent and vulnerary properties It is not used in modern medicine, being destitute of any special virtues (*See* Waring, *Pharm of India*, p 443, etc ; and F Porter Smith, *op cit*, p 162)

Common frankincense or thus, *Abietis resina*, is the term applied to a resin which exudes from fissures in the bark of the Norway spruce fir, *Abies excelsa*, D C ; when melted in hot water and strained it constitutes "Burgundy pitch," *Pix abietina*.

FRANKING. A term used for the right of sending letters or postal packages free (Fr *franc*) of charge. The privilege was claimed by the House of Commons in 1660 in "a Bill for erecting and establishing a Post Office," their demand being that all letters addressed to or sent by members during the session should be carried free The clause embodying this claim was struck out by the Lords, but with the proviso in the Act as passed for the free carriage of all letters to and from the King and the great officers of state, and also the single inland letters of the members of that present parliament during that session only It seems, however, that the practice was tolerated until 1764, when, by an Act dealing with postage, it was legalized, every peer and each member of the House of Commons being allowed to send free ten letters a day, not exceeding an ounce in weight, to any part of the United Kingdom, and to receive 15 The Act did not restrict the privilege to letters either actually written by or to the member, and thus the right was very easily abused, members sending and receiving letters for friends, all that was necessary being the signature of the peer or M P. in the corner of the envelope. Wholesale franking grew usual, and M.P.'s supplied their friends with envelopes already signed to be used at any time. In 1837 the scandal had become so great that more strict regulations came into force. The franker had to write the full address, to which he had to add his name, the post-town and the day of the month; the letter had to be posted on the day written or the following day at the latest, and in a post-town not more than 20m. from the place where the peer or M P. was then living. On Jan 10, 1840, parliamentary franking was abolished on the introduction of the uniform penny rate

In the United States the franking privilege was first granted in Jan 1776 to the soldiers engaged in the American War of Independence. The right was gradually extended till it included nearly all officials and members of the public service. By special Acts the privilege was bestowed on Presidents and their widows By an Act of March 3, 1845, franking was limited to the President, vice-president, members and delegates in Congress and postmasters, other officers being required to keep quarterly accounts of postage and pay it from their contingent funds. In 1851 free exchange of newspapers was re-established. By an act of March 3rd, 1863, the privilege was granted the President and his private secretary, the vice-president, chiefs of executive departments, such heads of bureaus and chief clerks as might be designated by the postmaster-general for official letters only, senators and representatives in Congress for all correspondence, senders of petitions to either branch of the legislature and to publishers of newspapers for their exchanges There was a limit as to weight Members of Congress could also frank, in matters concerning the federal department of agriculture, "seeds, roots, and cuttings," the weight to be fixed by the postmaster-general This Act remained in force till Jan 31, 1873, when franking was abolished. Since 1875 by sundry Acts, franking for official correspondence, government publications, seeds, etc., has been allowed to congressmen, ex-congressmen (for nine months after the close of their term), congressmen-elect and other government officials By special acts the franking privilege was granted to the widows of Presidents Garfield, Grant, McKinley, Cleveland, Roosevelt, Harding and Wilson.

FRANKL, LUDWIG AUGUST, Ritter von Hochwart (1810–1894), Austrian poet, was born at Chrast, Bohemia, on Feb 3, 1810 In 1838 he became secretary of the Jewish community in Vienna In the revolutionary year of 1848 his poem, *Die Universitat*, had an enormous circulation He wrote lyrics, epic and many excellent critical works on his contemporaries. He is perhaps best remembered for his services to Jewish education. He established the first Jewish school in Jerusalem, and wrote an account of his eastern travels, *Nach Jerusalem* (2 vols , 1858).

See his *Briefwechsel* (1907), edit. Bruno Frankl; his *Erinnerungen* (1910), edit St. Hock.

FRANKLAND, SIR EDWARD (1825–1899), English chemist, was born at Churchtown, near Lancaster, on Jan. 18, 1825. In 1845 he entered Lyon Playfair's laboratory in London, subsequently working under R. W Bunsen at Marburg In 1847 he was appointed science-master at Queenwood school, Hampshire, where he met J Tyndall, and in 1851 first professor of chemistry at Owens college, Manchester Returning to London six years later he became lecturer in chemistry at St. Bartholomew's hospital, and in 1863 professor of chemistry at the Royal Institution. In 1865 he succeeded A. W. von Hofmann at the School of Mines, where he remained for twenty years. In 1894 he received the Copley medal, the highest honour of the Royal Society He was made a K.C B. in 1897 and died while on holiday at Golaa (Norway) on Aug 9, 1899.

Analytical problems, such as the isolation of certain organic radicles, attracted his attention to begin with, but he soon turned to synthetical studies, and he was only about twenty-five years of age when he discovered the organo-metallic compound A consideration of these and other substances led Frankland, in 1852, to the conception that the atoms of each elementary substance can only combine with a certain limited number of the atoms of other elements The theory of valency thus founded dominated the subsequent development of chemical doctrine, and formed the basis of modern structural chemistry.

In applied chemistry Frankland's great work was in connection with water-supply. He was appointed a member of the second royal commission on the pollution of rivers in 1868, and in the course of six years he brought to light an enormous amount of valuable information respecting the contamination of rivers by sewage, trade-refuse, etc , and the purification of water for domes-

tic use He also showed that the luminosity of a flame was not only connected with the presence of solid particles, but also with the pressure of the burning gas or vapour; even hydrogen at a pressure of 10 to 20 atmospheres burns with a luminous flame Further, he showed that the spectrum of a dense ignited gas resembles that of an incandescent liquid or solid, and he traced a gradual change in the spectrum of an incandescent gas under increasing pressure An application of these results to solar physics in conjunction with Sir Norman Lockyer led to the view that at least the external layers of the sun cannot consist of matter in the liquid or solid forms, but must be composed of gases or vapours Frankland and Lockyer were also the first to realise the existence of helium (*q v*)

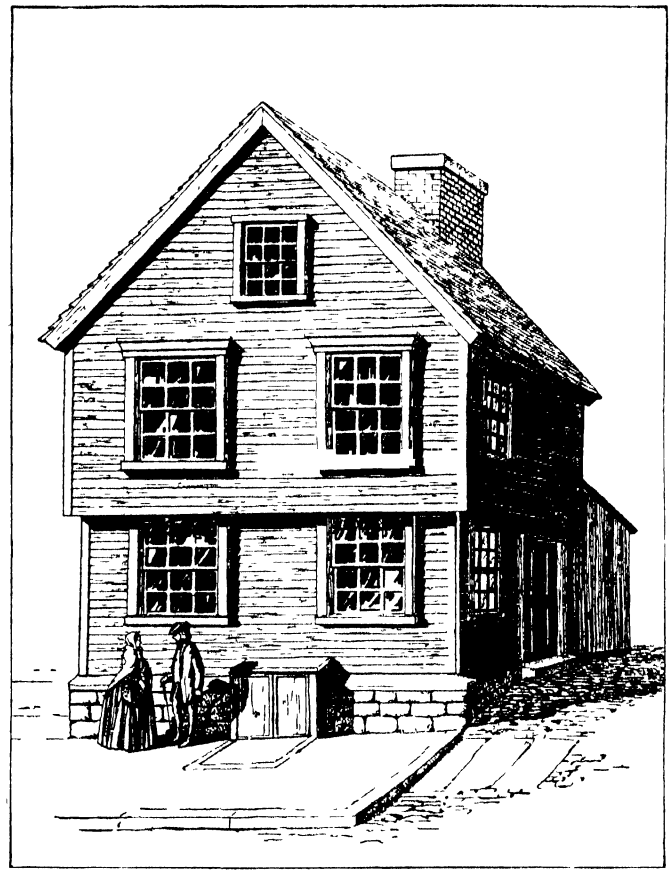
See memorial lecture delivered by Professor H E Armstrong before the London Chemical Society on Oct 31, 1901, also *Journal of the Chemical Society* (1905), *Autobiographical Sketches* (1902), W A Tilden, *Famous Chemists* (1902) His original papers, down to 1877, were collected and published as *Experimental Researches in Pure, Applied and Physical Chemistry.*

FRANKLAND, PERCY FARADAY (1858–), British chemist, second son of Sir Edward Frankland, was born in London on Oct 3, 1858 He was educated at the Royal School of Mines and at Wurzburg In 1888 he was appointed professor of chemistry at Dundee, and then occupied the chair at Mason college, Birmingham, from 1893 to 1918 He was awarded the Davy medal of the Royal Society in 1919 His work in pure chemistry was concerned chiefly with optical activity and stereo-chemistry He has also been interested in problems of water purification and sewage treatment, and made a special study of micro-organisms in connection with these matters He has also worked on the subject of fermentation and gave the Pasteur Memorial lecture to the Chemical Society in 1897

He has written a number of books including, *Micro-organisms in Water* (1894) and *Life of Pasteur* (1897)

FRANKLIN, BENJAMIN (1706–1790), American philosopher, statesman and man of letters, was born in Boston on Jan 6, 1706 (new style, Jan 17), and was baptized at once in the Old South church, thus beginning his life in a thoroughly puritan environment His father, Josiah Franklin, had come from England where he had worked first at Banbury as a dyer There he married and had three children About the year 1685 he left England and settled in Boston, Mass., then a city of 5,000–6,000 inhabitants He gave up his trade of dyer and became a tallow chandler and soap boiler He was a hardworking, serious and strong man, always much respected by his son Benjamin, who describes him minutely and affectionately in his autobiography "He had an excellent constitution of body, was of middle stature, but well set and very strong, he was ingenious, could draw prettily, was skilled a little in music, and had a clear, pleasing voice, so that when he played psalm tunes on his violin and sung withal, as he sometimes did in an evening after the business of the day was over, it was extremely agreeable to hear He had a mechanical genius, too, and, on occasion, was very handy in the use of other tradesmen's tools, but his great excellence lay in prudential matters, both in private and public affairs" The family had been Protestant for a long time and Josiah Franklin was a Nonconformist

Boyhood.—The first wife of Josiah Franklin died in 1689 and he married very soon after Abiah Folger, daughter of Peter Folger, one of the first settlers of the island of Nantucket, a broad-minded, "godly, learned Englishman" By her Josiah Franklin had ten children, six boys and four girls Benjamin was the last one of the boys Boston was then a small city but a thriving and growing one, and Josiah Franklin gave a good education to each of his children He sent Benjamin to a grammar school at the age of eight, intending him for the Church, there he kept him a year, sending him afterwards to George Brownell's school for writing and arithmetic When the boy was ten his father apprenticed him to his own business, but Benjamin did not like it. He dreamed restlessly of the sea, and his father became aware that if something were not done quickly the boy would follow the example of one of his elder brothers and leave suddenly. To prevent this he tried to find some business which would suit the character and fancy of his son Finally he put him as apprentice with his half-brother James, who was a printer in Boston Benjamin was then a healthy, sturdy and bold little boy He was equally strong physically and mentally He had learned to swim and do all kinds of physical exercises But at the same time he had become a bookish lad and had read all the books he had been able to find or to buy, especially Bunyan's *Pilgrim's Progress*, Locke, *On the*



BY COURTESY OF THE METROPOLITAN MUSEUM OF ART

THE BIRTHPLACE OF BENJAMIN FRANKLIN MILK STREET, BOSTON, FROM A LITHOGRAPH BY J H BUFFORDS, 1858

Human Understanding, the *Spectator* (3rd vol), Plutarch's *Lives*, Defoe's *Essay on Projects* and Mather's *Essay to do Good*

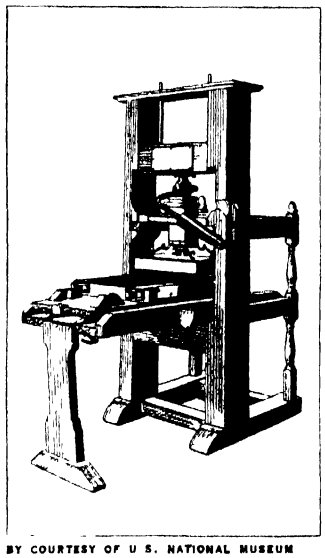
From the age of 12 to the age of 17 he worked with his brother James Franklin was young, eager to make a success and daring He established a newspaper which was the rallying centre of the liberal minds of Boston at a time when theocracy and the ruling aristocracy of puritans were beginning to lose their supremacy The *New England Courant* (established Aug 1721) has been called the "first sensational newspaper of America" It was often in trouble with the Government and James found himself at one time in such difficulties that he had to ask the boy to publish the sheet under his name (Feb 11, 1723)

In this atmosphere of intellectual excitement and political struggle Benjamin developed quickly His first articles, the famous *Dogood Papers*, are full of juvenile charm, and, although in close imitation of the English *Spectator*, have a certain quality of intelligent realism and accuracy which is all their own. He quarrelled with his brother and would not listen to his father who tried to reconcile them Finally he left the city with a young friend, Collins He sailed for New York and Philadelphia, arriving in the latter city in Oct 1723 He found a job as printer with a certain Keimer, a rather queer and unreliable man The governor of Pennsylvania, William Keith, noticing him for his appearance, his industry and his reputation of learning, offered to help the boy to set up a printing press for himself. Benjamin went to Boston to try to get the permission and backing of his father, but the latter thought him too young and inexperienced Having returned to Philadelphia he was persuaded by Keith to go to London

to finish his education as a printer and collect the things needed to establish a printing firm at Philadelphia The governor had promised to give him a letter of credit and some useful letters of introduction, but being himself in trouble with the Penn family and having apparently a weak character, Keith failed to fulfil his promise and Franklin found himself in London with little money, no English friend, and no other means of livelihood than his trade (Dec. 1724)

Early Life as Printer.—He worked as a journeyman printer at Palmer's printing house for about a year, then at Watt's printing house, where he met a number of the men who became great in the English publishing world of the 18th century He had sailed from Philadelphia with a friend, Ralph, a dissolute boy, who spent all their money, until they separated At this period Franklin seems to have been nearly an unbeliever He wrote then and printed himself in a small edition his *Dissertation on Liberty and Necessity, Pleasure and Pain* (1725), in which he endeavoured to prove that everything we do is according to fate The booklet attracted some attention and gave him a chance to meet some of the leaders of the deists, especially Mandeville His pleasant appearance, his industry, cleverness and skill in swimming made him many friends and, had he stayed in England, he would doubtless have had a successful English career. He chose to go back to Philadelphia

He accepted the proposal of Denham, a wealthy Quaker merchant who became interested in him and offered him a situation as clerk and bookkeeper in the store he intended to open in Philadelphia After about 19 months in England Franklin sailed from Gravesend (July 21, 1726), and landed in Philadelphia on Oct 11 He was then 20 years old, but the formative period of his life was ended He had seen and learned much From his family he had received that earnest, hardworking temperament which helped him so much in his long life of struggle, difficulties and well-earned success From the same origin and the Boston culture he seems to have derived that deep feeling for religion, prayer and morality, which after a short crisis was never to leave him From his early readings, from the little group of Liberals in Boston, from his associations in London, he secured that intellectual impetus, that clearness and boldness of mind, too enthusiastic at the beginning of his life, but later tempered by moderation and good sense, which made him the most acute and broadminded thinker of his time By 1726 Benjamin Franklin had all these qualities and he continued to show them steadily for more than 60 years After a few months in Denham's store both were taken ill and Denham died When Franklin recovered, he went back to the printing business and hired out again to Keimer who used him to run his printing house while he himself took care of the stationer's shop (1727). The following year, with the co-operation of Hugh Meredith, a fellow workman, he established a printing house for himself and was able in ten years to make it the most flourishing business of this kind in the English colonies It was not only the co-operation of a few friends, his untiring activity and common sense, which made his success, but also his imagination and initiative He had planned to create a newspaper and purchased the *Pennsylvania Gazette* in Sept 1728. It was then a dull, poorly printed sheet, appearing weekly Franklin made it alive, liberal and amusing. Besides the news items, which were entertaining, well chosen or well invented, he wrote various articles and essays. The circulation at the beginning was small but finally became the largest in America, 8,000–10,000, and the advertisements, which he had developed from the time he took control of the paper, proved very profitable In 1732 he wrote and sold his first *Poor Richard's Almanack,* the book which was to make his fortune. For many Americans of that time the Almanacks were the only publications bought regularly and read carefully Franklin's Almanack, full of wisdom, wit and useful hints, was soon the most widely read in all the colonies Later he collected the best of his maxims (1757) and published them as the "Speech of Father Abraham" in the Almanack of that year



BY COURTESY OF U S. NATIONAL MUSEUM
THE PRINTING PRESS USED BY BENJAMIN FRANKLIN

Activity in Philadelphia.—In 1730 Franklin became public printer for Pennsylvania, a position which added not a little to his social prominence and to his business The same year (Sept 1730) he married Deborah Read whom he had loved as early as 1723 But when he went to England she thought he had deserted her (and he was not far from agreeing) and she married another man This man having disappeared the two young people decided to become husband and wife She seems to have made him a good wife, and Franklin reciprocated her affection When they married Franklin already had a son (maybe by her?) to whom she was kind Later they had another boy who died of smallpox (Francis Folger Franklin, 1732–36) and a girl, Sarah Franklin, born in 1744, who married Richard Bache, a young merchant in 1767 Franklin was a tender father and the death of his son was a lifelong sorrow to him At the time that he was building his business and his fortune he did not forget his great moral and social aims In 1727 he founded with several young men of Philadelphia a kind of club, resembling very much a freemason lodge This little group known at first as the Leathernapron club, but always called by him "The Junto," played a great part in Franklin's life It was there that he learned to be a leader of men and acquired his first group of staunch friends With the help of this group, which grew rapidly, Franklin began to be known as a public man in Philadelphia The pamphlet he published in favour of paper money (*A Modest Inquiry into the Nature and Necessity of a Paper Currency,* 1729), at a time when the colony was in great need of more currency attracted much attention Gradually he became one of the most influential citizens of the growing city, respected for his thrift, his public-spirited activities and his wisdom In 1731 he founded the Library Company, the first circulating library established in America He had become a freemason (Feb. 1731) and in 1732 was elected grand master of the grand lodge of Pennsylvania, which broadened his scope of activity and influence In 1736 he was chosen clerk of the Pennsylvania Assembly (1736–1751) and the same year he organized the first fire company in Philadelphia, a much-needed institution where nearly all the buildings were of wood In 1737 he was appointed postmaster at Philadelphia, a position which enabled him quite honestly to give a new impetus to his newspaper and distribute it more easily

The field of his activities was constantly broadening He was not only the first printer and bookseller of Philadelphia, he also established a printing office in New York in partnership with James Parker (1741), having previously done the same thing, in Charleston, S C , in 1733, and later he sent an outfit to Antigua. He was also interested in a printing office in Kingston, Jamaica, and subsequently helped two of his nephews who had been his apprentices to establish themselves as printers In the end he had business connections with most of the English colonies in America Boston, New Haven, New York, Charleston, etc. By these means and by a careful economy he acquired a competence and thought of retiring from active business A Scotch journeyman, David Hall, who had been sent to him by his English friend, Peter Collinson, became his partner in 1748 "The partnership continued 18 years successfully for us both," Franklin wrote later. To give an idea of the prosperity of their industry one need simply quote the profits of his printing office, which during that time amounted to about £1,000 a year

As soon as he had Hall with him he found time to start a new line of activity Franklin had always a curious and fertile mind and occasionally in the *New England Courant,* and the *Pennsylvania Gazette* he printed little philosophical or scientific essays of his own, on earthquakes for instance, but he had previously

never been able to devote much time to research, although since 1733 he had studied in his spare hours French, Italian, Spanish and Latin In 1743 he founded the American Philosophical Society He had invented a new kind of open stove, a great improvement on its predecessors, but he was tempted to the more recondite kinds of research At a time when the discoveries of Musschenbroek and his disciples and the recent experiments of the Leyden jar had attracted the attention of the whole world, Franklin, in his modest and remote home in Philadelphia, began to experiment with a small apparatus sent to him from England by Peter Collinson (1745) He was naturally versatile and as electricity was still in its very infancy, and the theories to explain it were most unsatisfactory, his accuracy and common sense led him to the discovery of the identity of lightning and electricity (1752) He was not the first to think of it but he was the first to prove it He framed a new theory of electricity, involving the existence of two different kinds of electricity, which he called positive and negative, a division which still holds good He finally invented a means of avoiding the disastrous effects of lightning, the lightning rod, which gave him a public prestige equalled by few scientists of the 18th century (1749–52) In 1749 he retired from printing but continued to advise, help and back Hall During his 21 years of active business he had been a good, progressive printer, issuing such interesting and useful books as the medical treatises of Cadvalader Colden, *Essay on the Iliac Passion, Essay on the West India Dry Gripes*, or the reprint of Richardson's *Pamela* (1744), the first novel printed in America; but his *Poor Richard's Almanack* was his best venture, as is proved by the innumerable translations and reprints By 1900 75 English editions of the "Sayings of Poor Richard" were known, 56 French, 11 German and nine Italian, and the list is by no means complete (*See* ALMANAC)

Entry into Politics.—His political career was equally brilliant and eventful He was elected in 1748 a member of the city council and in 1750 a member of the assembly of Pennsylvania, to which office he was re-elected annually for 14 years During that time he was one of the most active and efficient members He sided with what might be called the popular and progressive party. The most important question at issue was whether the estates of the proprietaries, the Penn family, should or should not pay taxes, as did the other landowners The popular party and Franklin contended that they should, but the Penns flatly refused Consequently parliamentary life in Pennsylvania was a long conflict The enemies of the proprietaries were at the same time ardent patriots and looked to the Crown to make Pennsylvania a royal province In the middle of this struggle two wars came and made the situation critical at times (1744–48 and 1755–63) The Quakers, in accordance with their principles, would not serve as soldiers or appropriate money for arms and ammunitions; the Penns would give no money or scarcely any, the remaining inhabitants saw no reason to pay money or fight for people who did not want to fight, and finally the Germans, who had settled in large colonies in the western parts of Pennsylvania, were suspected of being pro-French, because many of them were Roman Catholics In the midst of all these difficulties Franklin proved himself a faithful subject of the king and a staunch loyalist With the help of the middle class of Philadelphia and of his friends (the "Junto" and the Freemasons) he stimulated interest in the establishment of a militia and fostered the organization of an association of volunteers for the defence of the city and province To achieve this aim he wrote a strong pamphlet. *Plain truth, or Serious Considerations on the present state of the city of Philadelphia and Province of Pennsylvania* (1747) In 1753 he was sent as a member of the commission from the council and assembly to confer with the Indians of Carlisle with respect to a treaty to protect the western frontiers of Pennsylvania In 1754 again he went to Albany as a commissioner for Pennsylvania at the congress which met to confer with the chiefs of the "Six Nations" and to get their help against the French Struck by the magnitude of the danger Franklin wrote his famous *Plan for a Union of the English Colonies in America*, which was finally turned down in London In 1755 he aided Gen Braddock, who had been sent from England to attack the French in the west, to transport his army to the theatre of operations by establishing a system of transport He did it at his own risk, as the province was occupied with internal disputes, which left no time for the war. After Braddock's defeat and at a moment of panic he entered the military service and accepted the dangerous mission of organizing the north-western frontier which was constantly subjected to bloody raids by the Indians When this danger disappeared the popular party decided to send Franklin to England to see if an agreement could be made with the proprietaries He had planned for several years to go to London; see his old friends, meet his new scientific friends who had received with such warm enthusiasm the papers he had sent them· *Experiments and Observations on Electricity made at Philadelphia in America* (1751), *Supplemental Experiments and Observations on Electricity* (London, 1753); *New Experiments and Observations on Electricity made at Philadelphia in America* (1754) These books had attracted so much attention that he had received the Copley medal from the Royal Society in London, and a complimentary letter from Louis XV. (1753)

He was then a rich and influential man. His *Gazette*, to which he still contributed, was very widely read, and having been deputy postmaster-general for America since 1753 he could do much to circulate it all over the colonies, from Carolina to Massachusetts Although this post was a very difficult one, he hoped to make it useful both for himself and his country He succeeded After a few years the American post office, which had never brought any income to the English administration, began to prosper From Aug 1753 to Aug. 1756 there was a deficit of £678 7s 2d From Aug 1761 to the beginning of 1764 there was a surplus of £2,070 12s 3d One of the most valuable evidences of Franklin's devotion to the public interest (besides an improvement in Philadelphia street paving, street lamps and a hospital) was the Academy of Philadelphia, called first "The Academy and Charitable School of the Province of Pennsylvania," and later the "University of Pennsylvania" As early as 1743 Franklin had printed and circulated a paper *Proposals for establishing an Academy* In 1749 he succeeded in getting the necessary support and the academy was established. Franklin delighted in it, although it was to be also a great source of annoyance He had in mind when he proposed it the organization of a new and up-to-date institution, where the children of Philadelphia should be taught practical things and, especially, instructed in English The English language was for him the centre of the proposed education But there he ran against a general prejudice of the upper classes of the 18th century. His money, his activity and his support were accepted but little by little his plan was changed, the academy was made a classical school, Latin was given the first place and English gradually allowed to drop All Franklin's efforts against this only made him unpopular and were used against him by his enemies, mainly by William Smith, a clergyman, whom he had himself generously and imprudently introduced into the academy and made provost

Visits to England.—England received him cordially (1757) The University of St Andrews conferred upon him the degree of doctor of laws in 1759 and the University of Oxford the degree of doctor of civil laws in 1762 He was already a member of the Royal Society (elected 1752), where he became influential He had innumerable friends, some political or fashionable like Sir Francis Dashwood (Lord Le Despenser), Lord Shelburne, Sir Grey Cooper and later the elder Pitt, others more intimate and intellectual, like Priestley, Price and Sir John Pringle (the king's physician) His activities were manifold But the most important was his work for Pennsylvania, for in 1760 he succeeded in persuading the Penn family to agree finally to some taxation of their estates He published in London *Some account of the Success of Inoculation for the Smallpox in England and America* (1760), and in the same year his *Parable against Persecution*, In 1760 also he took part in the discussion concerning the conditions of peace England should ask or rather impose and wrote his famous pamphlet, *The Interest of Great Britain considered with regard to her Colonies*, which is thought to have had great weight in the de-

cision of the English ministry to retain Canada rather than Guadeloupe In 1761 he made a tour of Holland and then returned to Philadelphia (Nov 1, 1762). His return was triumphant, but this was not to continue long. In the midst of the happiness of the peace of 1763 the English colonies of America were thunderstruck by the bloody Pontiac war and other Indian troubles. At the same time the new governor, John Penn, repudiated the agreement of 1760 The old quarrel started again and this time Franklin came out openly in favour of a radical change in the status of the province to that of a royal province. The election of 1764 was most bitterly disputed. Franklin and his intimate friend and adviser, Galloway, failed of re-election, but their party kept its majority and he was sent again to England, this time to ask openly that the king take over Pennsylvania

He sailed in November and started to work at once only to find himself in an awkward position Just at the time when Pennsylvania was throwing itself into the arms of the king the ministers of the king imposed upon the colonies a Stamp Act, the very idea of which was hated throughout America So Franklin had at once to combat the ministers and to treat them as chosen patrons. Small wonder that things were not easy during these years When the Stamp Act was passed, he thought that the best thing would be to accept it temporarily This, however, was not the view of the people at home and he had to change his point of view, not without bitter criticism Finally he was fortunate enough to see the Stamp Act repealed in 1766, largely through his efforts, and as a result of his famous examination before the House of Commons (Feb 1766) This success made him the best known of all Americans both in Europe and the New World. Georgia appointed him her agent in London in 1768 and Massachusetts in 1770. He visited Ireland and Scotland in 1771, where he was received with the utmost courtesy, especially by the learned circles of Edinburgh He went to France in Aug–Sept 1767 and July–Aug. 1769, and to Germany (June, 1766) He found everywhere the same enthusiastic welcome

His work did not give him much leisure. Immediately after the repeal of the Stamp Act new schemes and methods of taxing the American colonies were devised in England (Townshend's Acts, 1767). Franklin fought tirelessly against them, but every day his attitude as an ardent American, a faithful subject of the king and a good British citizen became more difficult to sustain He thought he had found a way when he laid hands on a bunch of papers which proved that many of the most objectionable measures against the colonies had been taken on the advice of certain "American tories," especially Gov Hutchinson of Massachusetts Franklin thought it would be a master stroke to show the Americans that if the English king, ministry and people had done offensive things against America, they had at least the excuse of having been incited by people in America itself If the English ministers had been farsighted they could have derived great advantage from this, but they saw in Franklin's act only an attack upon some of the most faithful servants of the Crown. Franklin had sent the letters to Massachusetts and had allowed his friends to circulate them The assembly of Massachusetts had written a "Petition to the King for the removal of Gov Hutchinson" This document was at once loyal to the king and bitter against Hutchinson, whose friends lost no time in instigating a counter intrigue. As a result Franklin was called before the privy council, examined, and insulted by Wedderburn, the attorney-general, who called him a thief (Jan 1774). A few days later he was dismissed from his office of deputy postmaster-general, and it was rumoured that his arrest was contemplated He nevertheless stayed a little longer in England, then sailed for Philadelphia a famous but a beaten man. He had failed in what had been one of his chief purposes in life. to keep the British empire united and help America to grow inside the empire

His Mission to France.—He came back to America with the prestige of having lost a high position and thrown away a brilliant career for the sake of his country His situation, at one time rather unsafe because of the hostility of the upper classes in Pennsylvania and Massachusetts, was again prominent and solid. He was at once made a member of Congress, elected postmaster-general of the colonies (1775), then chosen as one of the three commissioners of Congress to Canada (1776). He went to Montreal but could not stir up any enthusiasm in favour of independence or an alliance with the Protestant colonies, and, after many dangers and great fatigue, returned to Philadelphia, where he presided over the constitutional convention of Pennsylvania. Congress elected him one of a committee to frame the Declaration of Independence, which was written by Jefferson, but corrected by Franklin. In Sept. 1776 he was chosen as one of three commissioners to France, whose help was sorely needed And although the English cruisers, the winter weather and his old age made it a most dangerous enterprise, he sailed at once.

He arrived in France in Dec. 1776. His reputation as a scientist and Liberal philosopher had preceded him and he was at once popular, but his task was not easy He knew that the war would be prolonged and the help of France most needed But he came to this absolute, Catholic and traditional monarchy as the envoy of rebel provinces to ask the assistance of Louis XVI against a legitimate king, in favour of insurgents, who were Protestants, and had been for a century and a half the bitterest enemies of France in the New World. He had against him many prejudices, many principles; the prestige of England, the peaceful temper of Louis XVI and his ministers, and the situation of France, which was in dire need of financial reforms and economy Moreover, he had no assistance other than that of ignorant, clumsy or jealous Americans, and his grandson William Temple Franklin, a boy of 18, illegitimate son of William Franklin, governor of New Jersey for the king of England and a staunch Tory.

Franklin had lost his wife in Jan 1773 His only son had deserted him for the other side, his house and property were at times in the hands of his enemies He was cut off from his English friends and many of his old friends in America were dead or had become Tories In these tragic circumstances Franklin worked as courageously and as efficiently as if he had been a man in the prime of life He had been a member of the French Academy of Sciences since 1772, and had many friends among the French scientists and philosophers at a time when philosophy was the fashion in France He made use of them and met through them all kinds of people He fascinated everybody, mostly the ladies, who were not a negligible part of high society at the time He accepted the hospitality of a wealthy French financier, Le Ray de Chaumont, and lived at Passy near Paris, in wise obscurity Vergennes esteemed him He went to Versailles regularly and was able to keep in touch with the French administration. He persuaded them to help America financially and materially by sending foodstuffs, arms and ammunition, and led them into an alliance which was signed at Versailles in Feb 1778[1] A few weeks later (March 20) he was received by the king and queen who treated him most civilly But this was not the end of his troubles The war was slower, longer and more difficult than the French had expected, and Franklin was obliged to ask constantly for more money. He received from the king and his Government about 10 million French *livres* as a gift and 45 million *livres* in loans, a large sum for the time He had at the same time to fight English propaganda To achieve this he gave out many articles and news items, particularly to the curious newspaper *Les Affaires de l'Angleterre et de l'Amérique* (1776–79), and published several of his famous and successful hoaxes, *An Edict of the King of Prussia* (1773), *Letter of the Count de Schaumberg to the Baron Hohendorf Commanding the Hessian troops in America* (1777), the fictitious *Supplement to the Boston Chronicle* (1782), etc At the same time he wrote and distributed amongst a few chosen friends his charming little pieces called *Bagatelles*, full of wit, emotion and wisdom He dedicated some of them to Madame Helvétius, the still beautiful widow of the famous philosopher (whom he had tried to marry), and some to Madame Brillon, the charming wife of a French financier, who had taken the title and position of "his daughter," but all these pleasures were disturbed by the sour jealousy of his American colleagues, espe-

[1] To tell the truth the department of foreign affairs in France had been hoping for the American revolution for years, and was very willing to help it.

cially Arthur Lee and John Adams Both were suspicious of the French and could not agree with Franklin on anything. In 1781 when he was appointed a member of the commission to negotiate a treaty of peace between England and the United States he was overruled by his colleagues, who obliged him to ignore the instructions Congress had given and to negotiate with England without consulting Vergennes Finally the treaty was signed at Versailles on Sept 3, 1783 Franklin's last two years in France are really a curious spectacle of a popularity that was almost like an apotheosis He was so prominent that the king of France made him one of the commissioners to report on Mesmer and animal magnetism (1784) His position as one of the highest dignitaries in freemasonry (he was "venerable" of the lodge of the Nine Sisters—the most intellectual and seemingly the most important in France in 1779–81) put him in contact with all the philosophers and future revolutionaries, and he did much to develop and clarify their ideas He wished to see France more liberal but was opposed to any violent revolution

Later Life.—His resignation as minister to France was accepted by Congress in 1785 and he returned at once to Philadelphia where he arrived in Sept after spending a few days on the English coast with old friends and his son, with whom he was reconciled, although his attitude during the war had deeply hurt him

He was elected president of the commonwealth of Pennsylvania and re-elected thrice Surrounded by his children (his daughter and his son-in-law, Mr and Mrs Bache and their family) he led a happy and busy life, building three houses, trying to finish his autobiography (commenced in England in 1771, continued in France in 1784, but brought up only to 1757) In 1787 he was appointed a delegate to the constitutional convention and in it he played an important part He suggested or advocated only a few of the final articles, but his influence, constantly exerted in favour of co-operation and compromise, contributed strongly to the final agreement He had not forgotten his old scientific interests and published in 1786 *Maritime Observations in a letter from Dr Franklin to Mr Alphonsus le Roy*, in 1787 *Observations on the causes and cures of Smoky Chimneys* His unabated zeal for the welfare of mankind led him to publish in the last months of his life several papers on behalf of the abolition of slavery

But his time had come The strong body which had withstood so many tests and fights was breaking down He had been a great sufferer from gallstones for several years and was afflicted also with gout He was slow to recover from a fall on the stairs Finally he died in Philadelphia on April 17, 1790, after a short illness. Philadelphia gave him a magnificent funeral The French assembly went into mourning for three days The whole civilized world was moved by the disappearance of the old sage who had done so much good during his long life

His Character and Achievements.—Franklin's achievements are so great and so numerous that it is impossible to sum up all of them We can say, nevertheless, that recent documents disprove most of the accusations which were hurled at him He did not advise the English Government in favour of the Stamp Act, as many have said, he did not betray his country in favour of France as Adams thought, he was not a plotter and a deceitful politician as too many people in England and France have believed The only justifiable reproaches would be that he seems to have been too fond of his family and too eager to work in their behalf and that, when he had a difficult and honest aim, he did not hesitate to use roundabout methods to achieve it Nobody in the 18th century knew so well as he how to pull the wires of public opinion and make use of newspapers, secret societies, academies and so on He was one of the broadest as well as one of the most creative minds of his time, his theory of electricity was not original, but was surprisingly clear and accurate, and the ideas he expressed on the Aurora Borealis, the origin of the north-east storms in America, earthquakes and sundry subjects of natural history or mathematics are always precise and interesting even when facts have not confirmed them The scientists of the 18th century, unable to experiment and too absorbed in logic, admired him for his practical and realistic talents His medical theories were equally esteemed, and received much recognition, particularly his theory on the origin of colds

He was less fortunate in politics He had broad, generous and progressive ideas. His great hope was to see America grow and develop within the British empire and become so strong that it would be *ipso facto* and without struggle the centre of the empire, or, at any rate, free He wished to avoid a bloody revolution, and thought that if the Americans were patient enough they would be sure to win simply by waiting and without using force. But when the war began he showed a splendid spirit of energy He offered all the money he had to Congress He gave up all his English affiliations, thoroughly changed his point of view, was strongly in favour of the French alliance, and felt deep gratitude to the French Government

His economic ideas were not original He took them at first from the English writers of the mercantile school (mostly William Petty) and after 1766 was much under the influence of the French physiocrats But he was always clearer, less abstract and more practical than the theorists he followed In politics he was radical, believing in universal suffrage and preferring one chamber to the bicameral system In religion he was a moderate deist, respectful of all religions but more attracted by the moral side of them than by their dogmas He did not believe in revelation But this point of view, which seems to have been the typical point of view of the freemasons of his time, at least in England and America, he gradually changed towards the end of his life, under the influence of age and of the sentimental atmosphere which prevailed in the fashionable circles of France He spoke more often of Christ and seems to have been nearer to Presbyterianism than before

As a writer he shows a remarkable logic, elegance and felicity of expression, his style is dignified without being pompous, and precise without being dry or cold He excels in wit, but is able to express strong feelings When he gave vent to his indignation against the Government of England in particular, he wrote some forceful pages (*Rules for reducing a great Empire to a small one*) Nobody could approach him without being charmed by his conversation, his humour, wisdom and kindness He had been a strong, tall, good looking youth, he was a large, rather heavy old man but with very keen eyes and great dignity He had a way of telling stories that delighted all his friends and was well liked by the ladies because he seemed equally to enjoy listening to them He was certainly ambitious, possibly a little more so than he himself realized, but he was never led by his ambition to dishonesty or baseness He was thrifty and made good use of the money he earned, but he knew how to be generous and especially in the later period of his life enjoyed helping many people Other men may have been greater, but very few have been more human

BIBLIOGRAPHY.—The first edition of Franklin's works was published long after his death by his grandson William Temple Franklin (1817–19, 6 vols), to whom he bequeathed nearly all his papers But Temple did not take reasonable care of them and used them rather indiscriminately, eliminating things of great importance Jared Sparks in 1836–42 made another edition in 10 vols which added a great deal and included many interesting letters addressed to Franklin John Bigelow in 1887–89 made the so-called "Complete edition" with more material and a great number of letters to Franklin (10 vols). The best edition of his writings is the Centennial edition made by Smyth (1905–07, 10 vols) It is a remarkable piece of work, the only drawback is the suppression of nearly all the letters addressed to Franklin, which Smyth was obliged to omit because of the great abundance of new Franklin material

The Calendar of the Papers of Benjamin Franklin in the Library of the American Philosophical Society, edit by I. Minis Hays (Philadelphia, 1908, 5 vols) and the *Calendar of the Papers of Benjamin Franklin in the Library of the University of Pennsylvania*, are necessary for a complete study of Franklin's work and life

There are still many unpublished letters of Franklin, 500–600 of which are known There is also an immense number of vitally interesting papers concerning Franklin, as yet unpublished, owned by the American Philosophical Society, Philadelphia Other important centres of Franklin documents are first of all at Evanston, Ill, the collection of the University of Pennsylvania, the Huntington library in Pasadena (which possesses the original manuscript of the autobiography), the Clements library in Ann Arbor, Mich, the Library of Congress, the Public Record office in London, and the *Archives du ministère des Affaires Etrangères in Paris*.

A great many lives of Franklin have been written Parton's "Life

of Franklin" is old but remarkably well documented (2 vols., 1864) and exceedingly interesting Paul Leicester Ford wrote two excellent books on Franklin His *Manysided Franklin,* perhaps the most intelligent interpretation of Franklin's supple and rich personality, also very rich in original information, and his excellent *Bibliography of Benjamin Franklin* (1889) But the essential document is Franklin's own *Autobiography,* famous all over the world Paul Elmer More's book, *Benjamin Franklin,* and Sidney Fisher's *The true Benjamin Franklin,* are interesting Professor MacMaster's *Benjamin Franklin as a man of Letters* is useful, Mason Weems, *Life of Benjamin Franklin* (1818) and Phillips Russell's *Franklin the First Civilized American* (1927) are entertaining. W S Mason has published a most interesting and illuminating essay on "Franklin and Galloway" (American Antiquarian Society, *Proceedings,* Oct 1924). The *Collections* and *Proceedings* of the Massachusetts Historical Society and the files of the Pennsylvania Magazine of History are full of valuable information about Franklin There is no really up-to-date study of his scientific and philosophic achievements (B F)

FRANKLIN, EDWARD CURTIS (1862–), American chemist, was born on Mar 1, 1862, at Geary City, Kansas He was educated at the University of Kansas (B S, 1888, M S, 1890) and Johns Hopkins university (Ph D, 1894) He was assistant in chemistry at the University of Kansas, 1889–94, associate professor, 1894–99, and professor, 1899–1903 In 1903 he became associate professor of organic chemistry at Stanford university, Calif, and in 1906 was made professor He served on the U S Assay Commission in 1907, in 1911–12 was professor at the hygienic laboratory of the U S Public Health Service and in 1918 was physical chemist of the Bureau of Standards His chief researches have been on the ammonia system of compounds, and liquid ammonia as an electrolytic solvent, and are published in the *American Chemical Journal* and *Journal of the American Chemical Society*

FRANKLIN, SIR JOHN (1786–1847), English rear-admiral and explorer, was born at Spilsby, Lincolnshire, on April 16, 1786 He was educated at St Ives and Louth grammar school, and entered as a midshipman on board the "Polyphemus," in which he served at the battle of Copenhagen (April 2, 1801). Two months later he joined the "Investigator," and took part, under his cousin Capt Flinders, in the exploration of the Australian coast He was on board the "Porpoise" when she and the "Cato" were wrecked there in 1803, returned to England, and joined the "Bellerophon" in time to take part in the battle of Trafalgar For the rest of the war he was on the "Bedford" In 1818 he was in command of the "Trent" in Capt Buchan's Arctic expedition, which was cut short by Buchan's ship being damaged by pack-ice He had done enough, however, to establish his fitness for such work, and in 1819 he was put in command of an expedition that was to proceed overland from Hudson bay to the shores of the Arctic ocean, and explore the coast eastwards from the mouth of the Coppermine This, and the mouth of the Mackenzie, far to the West, were then the only points known on the north coast of America Franklin and his party arrived at the Hudson's Bay Co's depot at the end of August 1819, and after a journey of 700m wintered on the Saskatchewan Failure of the promised supplies held them up the next summer, but in 1821 they descended the Coppermine to its mouth, and surveyed part of the coast to the eastward They returned over the Barren Ground, and after severe suffering, and the death of Hood, they reached York Factory in June 1822, and returned to England the same year Franklin was promoted post-captain on his return The narrative of the expedition was published in 1823, and soon after he married Eleanor, daughter of William Porden, an architect Early in 1825 he was given command of a second overland expedition, his wife, who was dying, herself urging him to sail without delay In 1826 he traced the North American coast from the Mackenzie to 149° 37′ W. long, while Richardson with another party connected the mouths of the Mackenzie and the Coppermine. The two expeditions together had added 1,200m. of coastline to the American continent He returned in 1827 and in 1828 married Jane, daughter of John Griffin In 1829 he was knighted. In 1836 he was appointed lieutenant-governor of Van Diemen's land, Tasmania, a post he held until 1843 During this time convicts from all over the empire were sent to Tasmania. He founded a college there, and established a scientific society at Hobart Town. Years later the colony voted £1,700 to Lady Franklin's efforts for the search for and relief of her husband

At the time of his return to England there was a renewal of interest in Polar exploration, and he took command of a new expedition for the discovery of the North-West passage Under him were Capt Crozier, who had been with Parry and Ross, and Capt. Fitzjames, in command of the "Erebus" Victualled for



FROM ROSS, "VOYAGE TO THE SOUTHERN SEAS" (1847)

THE EREBUS AND "TERROR" OF SIR FRANKLIN'S ILL-FATED ARCTIC EXPEDITION (1845–1848) WEATHERING A GALE IN THE PACK

three years, and equipped with every appliance then known, the expedition, consisting of the "Erebus" and "Terror" (129 officers and men), sailed from Greenhithe on May 19, 1845 The ships were last seen at the entrance to Lancaster sound, on July 26, and it was 14 years before the mystery of their subsequent movements was finally solved. Franklin's instructions were to push through Lancaster sound and Barrow strait as far as Cape Walker (*c* long 98° W), and thence southwards, with the alternative of Wellington channel, if navigable No news arrived of their doings, and from 1848 onwards a series of expeditions was sent to search for them, which between them explored thousands of miles in the Arctic regions The first traces were found by Capt Ommanney in Aug 1851, at Franklin's winter quarters at Beechey island In 1854, Dr Rae, on a sledging expedition from Repulse bay, learned from Eskimos that some white men had been seen dragging a boat southward along the west shore of King William's island He also obtained from them various articles which were identified as belonging to members of the expedition In 1855 a party went down the Mackenzie in canoes, and established that an attempt had been made to reach the Hudson's Bay Co's settlement by the Fish river route from the "Erebus" and "Terror" With this the Government was content, but Lady Franklin organized another attempt Capt M'Clintock in the "Fox" left Aberdeen in July 1857, and in the spring of 1859 the fate of Franklin's expedition was revealed. In addition to skeletons and other remains in King William's island, and reports from the Eskimo in Boothia, a record was found in a cairn at Point Victory telling the history of the expedition up to April 25, 1848 In 1845–1846 the "Erebus" and "Terror" had wintered at Beechey island, on the south-west coast of North Devon, after having ascended Wellington channel to lat 77°, and returned by the west side of Cornwallis island In 1846 he followed the route specially assigned to him He had navigated Peel and Franklin straits southward, but had been stopped by ice coming down M'Clintock channel (then unknown) On the margin of this was an addendum dated April 25, 1848, signed by Fitzjames and Crozier telling that the "Erebus" and "Terror" were deserted on April 22, 1848, having been ice-beset since Sept. 12, 1846. Franklin had died on June 11, 1847, and the total loss to date had been nine officers and 15 men It was added that they would start the next day for Back's Fish river Strength must have failed, an Eskimo woman said that they fell down and died as they walked Franklin is certainly entitled to the

honour of being the discoverer of the North-West passage. The point the ships reached was within a few miles of the known waters of America Lady Franklin died in 1875, aged 83, and a monument in Westminster Abbey commemorates both her husband's fame and her own connection with it

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FRANKLIN, WILLIAM BUEL (1823–1903), Federal general in the American Civil War, was born at York, Pa, on Feb 27, 1823 He graduated at West Point, at the head of his class, in 1843, and served with distinction in the Mexican War After the war he was engaged in miscellaneous engineering work, becoming a first lieutenant in 1853 and a captain in 1857. Soon after the outbreak of the Civil War in 1861 he was made colonel of a regular infantry regiment, and a few days later brigadier-general of volunteers He led a brigade in the first battle of Bull Run, and on the organization by McClellan of the army of the Potomac he received a divisional command He commanded first a division and then a corps in the operations before Richmond in 1862, was promoted major-general, U S.V, in July, 1862; commanded a corps at South mountain and Antietam; and at Fredericksburg commanded the "Left Grand Division" of two corps. His part in the last battle led to charges of disobedience and negligence being preferred against him by the commanding general, A E Burnside, on which the congressional committee on the conduct of the war reported unfavourably for Franklin, largely, it seems, because Burnside's orders to Franklin were not put in evidence Franklin was a corps commander in the abortive Red River Expedition In this expedition he received a severe wound at the action of Sabine Cross Roads (April 8, 1864), in consequence of which he took no further active part in the war. After the war Franklin was vice-president of the Colt's Patent Firearms Manufacturing Co; 1880 to 1899, president of the board of managers of the national home for disabled volunteer soldiers; and he was for a time a director of the Panama railway He died at Hartford, Conn, on March 8, 1903 He wrote a pamphlet, *The Gatling Gun for Service Ashore and Afloat* (1874).

See *A Reply of Major-General William B Franklin to the Report of the Joint Committee of Congress on the Conduct of the War* (1863, 2nd ed, 1867), Jacob L Greene, *Gen W B Franklin and the Operations of the Left Wing at the Battle of Fredericksburg* (Hartford, 1900), and James H England, "William Buell Franklin," *U S Engineers' Department*, vol x., p 485–89 (1918).

FRANKLIN, WILLIAM SUDDARDS (1863–), American physicist, was born in Geary City, Kansas, on Oct 27, 1863 He was educated at the University of Kansas (A B, 1887, M S, 1888) and Cornell university (Sc D, 1901) He was assistant professor of physics at the University of Kansas, 1887–90, and professor of physics at Iowa State college, 1892–97 and at Lehigh university 1897–1915 In 1917 he became professor of physics at the Massachusetts Institute of Technology. While having carried on research in many fields of physics, especially in the theory of alternating currents, his chief contribution has been in the field of technical education.

He published *Elements of Alternating Currents* (2nd ed, 1901); *Elements of Mechanics, Elements of Electricity and Magnetism; Light and Sound, Practical Physics, Electric Waves* (1909), *Electric Lighting* (1912), *Elements of Calculus, Bill's School and Mine* (1913), and was joint author of *Elements of Electrical Engineering* (1906); *Dynamos and Motors* (1909); *Advanced Theory of Electricity and Magnetism* (1915); *Lessons in Heat* (1920), *Transmission Line Theory* (1926)

FRANKLIN, a division of the North-West Territories, Canada, extending from the Arctic Circle to the North Pole It was formed into an organized district by order-in-council in Oct. 1895, and includes numerous islands and peninsulas, such as Banks, Prince Albert, Victoria, Wollaston, King Edward and Baffin Land, Melville, Bathurst, Prince of Wales and Cockburn islands. Of these, Baffin Land alone extends south of the Arctic Circle. The district was re-organized in 1905 and its limits were definitely fixed in 1920. The area is 554,032 sq.m, but the inhabitants consist of a few Indians, Eskimo and fur-traders. Musk-oxen, polar bears, foxes and other valuable fur-bearing animals are found in large numbers The district is named after Sir John Franklin

FRANKLIN, a city of central Indiana, U S A, 20m S by E of Indianapolis; the county seat of Johnson county. It is on Federal highway 31, and is served by the Big Four, the Pennsylvania and the Interstate Public Service Company (electric) railways The population was 4,909 in 1920 (93% native white) It has sundry manufacturing industries, and is the seat of the State Masonic Home and of Franklin college (Baptist), founded in 1834 Franklin was settled about 1823 and was chartered as a city in 1861

FRANKLIN, a city of Merrimack county, New Hampshire, at the confluence of the Pemigewasset and the Winnepesaukee rivers to form the Merrimack It is on Federal highways 3 and 4, and is served by the Boston and Maine railroad The area is 14·4 sq m, and the population in 1920 was 6,318 (24% foreign-born white). It is a centre for summer touring and winter sports, and has important manufactures (for which the rivers supply good water power), especially paper, woollen stockings and suitings, knitting machines and latch needles Franklin was the birthplace of Daniel Webster, and the house, still in good condition, is kept as a museum On the Webster farm is the New Hampshire orphans' home (established 1871) The earliest settlement within the limits of Franklin was made in 1748 The town was formed in 1828, from parts of four others, and was incorporated as a city in 1895

FRANKLIN, a town of Norfolk county, Massachusetts, 27m S W of Boston, served by the New York, New Haven and Hartford railroad The population was 7,055 in 1925 It has important manufactures of cotton and woollen goods, carpets, rugs, felt, rubber products and printing presses The town was formed from part of Wrentham and incorporated in 1778 It was the first of the many places named after Benjamin Franklin, and was the birthplace of Horace Mann

FRANKLIN, a city of north-western Pennsylvania, U S A, 70m N by E of Pittsburgh, at the confluence of French creek with the Allegheny river; the county seat of Venango county It is on Federal highway 322, and is served by the Erie, the New York Central and the Pennsylvania railways and by motorbus lines in every direction The population was 9,970 in 1920 (91% native white). Including the suburbs of Rocky Grove and Prospect park, the local estimate for 1928 was 15,000 Franklin is picturesquely situated among the foot-hills of the Alleghenies, at an altitude varying from 985 to 1,500 feet It is in the chief oil and gas region of the State, and its refineries have a daily capacity of 12,000 barrels Other important manufactures are oil-well supplies, gagger irons, mine-car loaders, portable cranes, brake beams, gas and oil engines, pneumatic tools, castings (grey iron, brass and bronze), silica sand, paints and printing The aggregate value of these products in 1927 was estimated at $35,600,000 At Polk, 6m S W, is the State school for the feeble-minded (established 1897), with 2,225 inmates and grounds covering 2,014 acres

There was an Indian village here about 1735. In 1749 the French took possession of the region, burying leaden plates at various points in token of their claim, and in 1753 they built Fort Machault, on a site in the heart of the present city, which they abandoned and burned after the capture of Fort Duquesne by the British in 1759. The British in 1760 built Fort Venango, near by This was taken by the Indians in 1763, during the Conspiracy of Pontiac, and the entire garrison was massacred Venango county and the surrounding territory was purchased by the State from the Six Nations in 1784. In 1787 Fort Franklin was built by American soldiers, about 1m above the mouth of French creek It was abandoned in 1796 for a stronger fortification, known as "Old Garrison," and in 1803 the troops were permanently withdrawn. The importance of the site as a frontier station led to the establishment of a town in 1795 by act of the State legislature, which named it in honour of Benjamin Franklin. It was platted the same year by Andrew Ellicott, the surveyor of Washington,

D.C.; was incorporated as a borough in 1823, and as a city in 1868. Oil was discovered 30m. N. in 1859, and soon became the basis of the region's prosperity. The peak of production in Venango county was in 1882, when the output was 30,460,000 bbl. from 3,269 wells In recent years the annual output of the county has been about 1,300,000 barrels.

FRANKLIN, a town of central Tennessee, U S.A., 20m. S. of Nashville, on the Harpeth river, the county seat of Williamson county. It is on Federal highway 31, and is served by the Louisville and Nashville railroad. The population was 3,123 in 1920 (46% negroes). During the Civil War Franklin was the scene of a minor engagement on April 10, 1863; and on Nov. 30, 1864, of one of the fiercest battles of the war, when the Confederate general, J. B. Hood, with an army of 27,000, attacked Gen Schofield, whose forces numbered about 28,000 The engagement was indecisive, but the losses were very heavy· 6,500 on the Confederate, 2,326 on the Union side.

FRANKLIN, a word derived from the Late Lat. *francus*, free, meaning primarily a freeman, and more specifically a free landholder who was not of noble birth It appears in England soon after the Norman Conquest, but is rarely found in private charters, and never became a legal term Some of the older English writers occasionally use it to mean a liberal host.

FRANKLIN INSTITUTE, THE, of the State of Pennsylvania, U S A., founded in 1824, is the oldest institution in the United States devoted to the study and promotion of the mechanic arts and applied sciences The cornerstone of the quaint old building it occupies in Philadelphia on the east side of Seventh below Market street was laid in 1825, the structure being occupied the next year. Classes were opened, Dr Keating, one of the leading scientists of the University of Pennsylvania, teaching chemistry, and William Strickland, then America's most noted architect, occupying the chair of architecture. Exhibitions of American manufactures were promptly undertaken and held regularly for many years, and the publication of a journal devoted to the progress of the useful arts and sciences was also begun Up to 1832, when the city started a high school, the institute served as the forerunner of the central high school Through its committees the institute conducts considerable scientific research Its library of over 86,800 volumes and 27,000 pamphlets (1928) is the richest technical library of its kind in the country. Its record of American invention is the most complete outside the files of the Patent Office Its medals and certificates of award, given to advance physical science, in its application, discovery or original research or the perfection of a useful invention or showing of skilled workmanship, are prizes of world recognition. Associated with the institute now is the Bartol Research Foundation, established in 1921 as a result of a munificent bequest from Henry W. Bartol, a life member, for the purpose of studying the fundamental problems of physical science, particularly electrical, and for investigating all scientific problems that may happen to arise in the industries.

FRANKLINITE, a member of the spinel group of minerals, consisting of oxides of iron, manganese and zinc in varying proportions $(Fe, Zn, Mn)''$ $(Fe, Mn)_2'''O_4$. It occurs as octahedral crystals often with rounded edges, and as granular masses The colour is iron-black and the lustre metallic; hardness 6, specific gravity 5·2. It thus resembles magnetite, but is readily distinguished by the fact that it is only slightly magnetic It is found in considerable amount, associated with zinc and manganese minerals in crystalline limestone, at Franklin Furnace, N.J, where it is mined as an ore of zinc (containing 5 to 20% of the metal); after the extraction of the zinc, the residue is used in the manufacture of spiegeleisen.

FRANK-MARRIAGE (*liberum maritagium*), in real property law, a species of estate tail, now obsolete When a man was seized of land in fee simple, and gave it to a daughter on marriage, the daughter and her husband were termed the donees in frank-marriage, because they held the land granted to them, and the heirs of their two bodies free from all manner of service, except fealty, to the donor or his heirs, until the fourth degree of consanguinity from the donor was passed.

FRANKPLEDGE. The frankpledge system provided that all men not in the household of some great man, who would be responsible for their good behaviour and appearance in court in case of necessity, should be in frankpledge or tithing. The frankpledge was an association of men, generally twelve in number, the members of which were mutually responsible for the production of any one of them in court If a man fled rather than pay for his crime the frankpledge of which he was a member had to pay. This idea of keeping the peace by a system of mutual responsibility goes back to very remote times. In the 12th century the greater efficiency of the central administration enabled the system to be regularly enforced. Originally the frankpledge was confined to free men, the unfree were left to their lord. By the time records began to be kept the system embraced all but persons of established position The word frankpledge was not used uniformly all over England to describe these associations In some parts they were known as tithings or *decennæ*. The custom ruling the arrangements of the frankpledges and tithings, too, varied considerably. Sometimes the frankpledge was known by the name of the chief member, the chief pledge or the tithing man. Sometimes it was known by the name of the village or hamlet. It is possible that the density of population had much to do with deciding the local practice. The View of Frankpledge was a bi-annual enquiry as to the proper observance of the law with regard to frankpledges; an enquiry whether everyone was in frankpledge, whether the frankpledges were of an adequate size, and were performing their duty. Originally the sheriff held the view of frankpledge in the shire court twice a year It is clear that he made the view an occasion for extortion and in the 1217 issue of Magna Carta the holding of this court is regulated. In the 13th century this franchise, the view of frankpledge, was often in private hands. This did not prevent the law with regard to frankpledges being enforced, since the franchise was a valuable one and it paid the lords of the courts to conduct the enquiry

See W. A. Morris, *The Frankpledge System* (1910). (D. M. S.)

FRANKS, SIR AUGUSTUS WOLLASTON (1826–1897), English antiquary, was born on March 20, 1826, and was educated at Eton and at Trinity college, Cambridge In 1851 he was appointed assistant in the antiquities department of the British Museum Here, and as director of the Society of Antiquaries, an appointment he received in 1858, he made himself the first authority in England upon mediaeval antiquities of all descriptions, upon porcelain, glass, the manufactures of savage nations, and in general upon all Oriental curiosities and works of art later than the Classical period In 1866 the British and mediaeval antiquities, with the ethnographical collections, were formed into a distinct department under his superintendence, and the Christy collection of ethnography in Victoria street, London, afterwards transferred to the British Museum was also under his care He retired in 1896, and died on May 21, 1897. His fortune was largely devoted to the collection of ceramics and precious objects of mediaeval art, most of which became the property of the nation, either by donation in his lifetime or by bequest at his death The most famous of the objects bequeathed by him to the British Museum is the carved bone casket, Northumbrian work of the 8th century, known as the "Franks Casket."

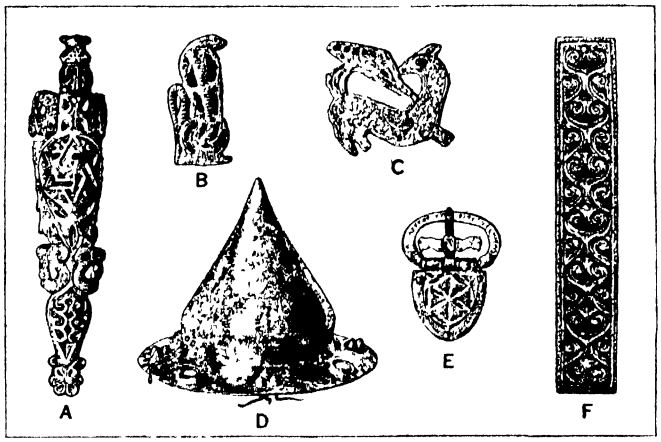
FRANKS. The earliest mention in history of the name Franks is an entry on the *Tabula Peutingeriana*, "Chamavi qui et Pranci." The earliest occurrence of the name in any author is in the *Vita Aureliani* of Vopiscus, referring to the year 241.

All the Germanic tribes, which were known from this time onwards by the generic name of Franks, doubtless spoke a similar dialect and were governed by customs which must scarcely have differed from one tribe to another—all they had in common. Each tribe was politically independent; they formed no confederations. Sometimes two or three tribes joined forces to wage a war; but, the struggle over, the bond was broken, and each tribe resumed its isolated life.

Of these tribes the Salians were to become most prominent. They are mentioned for the first time in 358, by Ammianus Marcellinus (xvii. 8, 3). At this time they occupied the region south of the Meuse, between that river and the Scheldt. The Caesar

Julian defeated them completely, but allowed them to remain as *foederati* of the Romans They perhaps paid tribute, and they certainly furnished Rome with soldiers, *Salii seniores* and *Salii juniores* are mentioned in the *Notitia dignitatum,* and Salii appear among the *auxilia palatina*

At the beginning of the 5th century, when the Roman legions withdrew from the banks of the Rhine, the Salians installed themselves in the district as an independent people The place-names became entirely Germanic, the Latin language disappeared, and the Christian religion suffered a check, for the Franks were to a man pagans The Salians were subdivided into a certain number of tribes, each tribe placing at its head a king, distinguished by his long hair and chosen from the most noble family (*Historia Francorum,* II 9)



FROM SEYMOUR DE RICCI, "THE J P MORGAN MEROVINGIAN COLLECTION"

FRANKISH METALWORK OF THE 4TH TO THE 8TH CENTURIES A D

A Gilt silver plaque from spear with Seal of Solomon in centre; B One of a pair of flat bronze sacred serpents (uraei) covered with red cloisonne paste; C One of a pair of bird or dragon-shaped fibulae of bronze coated with gold; D Iron umbo of a shield covered with gilt silver, E Gilt silver belt buckle inlaid with niello, F Gilt silver plaque from spear

The most ancient of these kings, reigning over the principal tribe, who is known to us is Chlodio Towards 431 he crossed the great Roman road from Bavay to Cologne, which was protected by numerous forts and had long arrested the invasions of the barbarians He then invaded the territory of Arras, but was severely defeated at Hesdin-le-Vieux by Aetius, the commander of the Roman army in Gaul Chlodio, however, soon took his revenge He explored the region of Cambrai, seized that town and occupied all the country as far as the Somme At this time Tournai became the capital of the Salian Franks

After Chlodio a certain Meroveus was king of the Salian Franks Perhaps the remarks of the Byzantine historian Priscus may refer to Meroveus A king of the Franks having died, his two sons disputed the power The elder journeyed into Pannonia to obtain support from Attila, the younger betook himself to the imperial court at Rome "I have seen him," writes Priscus, "he was still very young, and we all remarked his fair hair which fell upon his shoulders" Aetius welcomed him warmly and sent him back a friend and *foederatus* In any case, Franks fought (451) in the Roman ranks at the great battle of the Catalaunian fields, which arrested the progress of Attila, and there is some evidence that Meroveus was among the combatants Towards 457 Meroveus was succeeded by his son Childeric At first Childeric was a faithful *foederatus* of the Romans, fighting for them against the Visigoths and the Saxons south of the Loire; but he soon sought to make himself independent and to extend his conquests He died in 481 and was succeeded by his son Clovis, who conquered the whole of Gaul with the exception of the kingdom of Burgundy and Provence Clovis imposed his authority on the other Salian tribes, and put an end to the domination of the Ripuarian Franks

These Ripuarians had settled in the 5th century on the left bank of the Rhine, but their progress was slow It was not until the middle of the century that they occupied Cologne, which was not permanently in their possession until 463. The Ripuarians subsequently occupied all the country from Cologne to Trier. Aix-la-Chapelle, Bonn and Zülpich were their principal centres, and they even advanced southward as far as Metz, which appears to have resisted their attacks The Roman civilization and the Latin language disappeared from the countries which they occupied, indeed it seems that the actual boundaries of the German and French languages nearly coincide with those of their dominion. In their southward progress the Ripuarians encountered the Alamanni, who, already masters of Alsace, were endeavouring to extend their conquests in all directions The Ripuarians long remained allies of Clovis, the son of their king fighting under him at Vouillé in 507 Ultimately, however, Clovis destroyed the Ripuarian dynasty and was himself chosen as king of this people. Thus the Salian Franks united under their rule all the Franks on the left bank of the Rhine During the reigns of Clovis' sons they again turned their eyes on Germany, and imposed their suzerainty upon the Franks on the right bank This country, north of the Main and the first residence of the Franks, then received the name of *Francia Orientalis,* and became the origin of one of the duchies into which Germany was divided in the 10th century—the duchy of Franconia (Franken)

The Franks were redoubtable warriors, and were generally of great stature Their fair or red hair was brought forward from the crown of the head towards the forehead, leaving the nape of the neck uncovered, they shaved the face except the upper lip They wore fairly close breeches reaching to the knee and a tunic fastened by brooches Round the waist over the tunic was worn a leathern girdle having a broad iron buckle damascened with silver From the girdle hung the single-edged missile axe or *francisca,* the *scramasax* or short knife, a poniard and such articles of toilet as scissors, a comb (of wood or bone), etc The Franks also used a weapon called the *framea* (an iron lance set firmly in a wooden shaft), and bows and arrows They protected themselves in battle with a large wooden or wicker shield, the centre of which was ornamented with an iron boss (*umbo*) Frankish arms and armour have been found in the cemeteries which abound throughout northern France, the warriors being buried fully armed

See E von Wietersheim, *Geschichte der Volkerwanderung,* 2nd ed, edit by F Dahn (Leipzig, 1880–81), R Schroder, "Die Ausbreitung der salischen Franken," in *Forschungen zur deutschen Geschichte,* vol XIX, K Lamprecht, *Frankische Wanderungen und Ansiedelungen* (Aix-la-Chapelle, 1882), K Mullenhoff, *Deutsche Altertumskunde* (1883–1900), Fustel de Coulanges, *Histoire des institutions politiques de l'ancienne France—l'invasion germanique* (1891), W Schultz, *Deutsche Geschichte von der Urzeit bis zu den Karolingern,* vol II (Stuttgart, 1896) Also the article SALIC AND EARLY GERMANIC LAWS

(C PF)

FRANZ, ROBERT (1815–1892), German composer, whose original name was KNAUTH, born at Halle on June 28, 1815, was one of the most gifted of German song writers He was 20 years old when his father reluctantly allowed him to go to Dessau to study organ-playing under Schneider The two years of dry study under that famous teacher made him intimate with the works of Bach and Handel, his knowledge of which he used in later life in his considerably criticized editions of the *Matthew Passion, Magnificat,* ten cantatas, and of the *Messiah* and *L'Allegro* In 1843 he published his first book of 12 songs, which ultimately was followed by some 50 more books, containing in all about 250 songs The first book was warmly praised by Schumann and Liszt, the latter, of whom wrote a long review of it in Schumann's paper, *Die Neue Zeitschrift* Deafness had begun to make itself apparent as early as 1841, and Franz suffered also from a nervous disorder, which in 1868 compelled him to resign his offices His future was then provided for by Liszt, Joachim, and others, who gave him the receipts of a concert tour, amounting to some 100,000 marks. Franz died on Oct 24, 1892 On his 70th birthday he published his first and only pianoforte piece It is easy to find here and there among his songs gems that are hardly less brilliant than the best of Schumann's

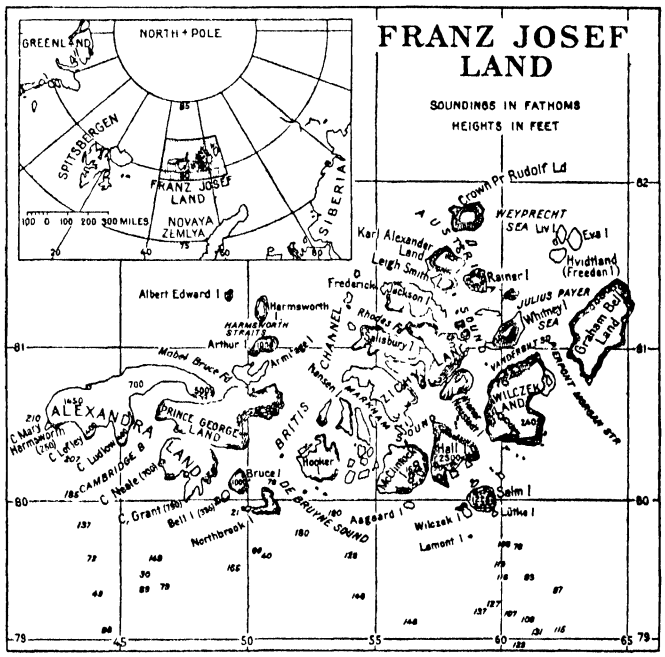
See A. Saran, *Robert Franz und das deutsche Volks und Kirchenlied* (1875); von Procházka, *Robert Franz* (1894); Hermann von der Pfordten, *Robert Franz* (1923).

FRANZEN, FRANS MICHAEL (1772–1847), Finnish-Swedish poet, was born on Feb. 9, 1772 at Uleåborg, and studied

at Åbo where he became professor in 1798 On the annexation of Finland to Russia in 1809, he went to Sweden and in 1831 was appointed bishop of Hernosand, where he died on Aug. 14, 1847. His poems, which show a naive, idyllic spirit, were published in 7 vols (Obebro 1867–9) His chief prose works are. *Minnesteckninger*, a collection of Swedish biographies (3 vols , 1848–60) and *Predikningar* (5 vols , 1841–45).

FRANZENSBAD, a spa in the district of Cheb, north-west Bohemia (Czech, *Františkovy Lázně*) Situated about 1,500 ft above sea-level amidst delightful mountain scenery its springs have been known and used since the 16th century, though the modern town has developed around the *Kurhaus,* built in the late 18th century The springs, 18 in number, are rich in carbon dioxide, iron, Glauber's salt, lithium and radium and are used for drinking and bathing cures, in addition there exist large quantities of ferruginous mineral mud in local peat swamps The waters have an average temperature between 50 2° F and 54 5° F and are of healing value in the treatment of women's diseases, nervous disabilities, abdominal troubles and affections of the heart and blood Franzensbad was a favourite after-cure resort for patients from Carlsbad and Marienbad but is rapidly developing importance as a principal centre of treatment and as a holiday resort for the population of nearby industrial areas Pop (1923), 3,141

FRANZ JOSEF LAND, an arctic archipelago lying east of Spitsbergen and north of Novaya Zemlya, extending northward from about 80° to 82° N , and between 43° and 65° E The islands are all very similar in appearance and consist of platforms of fossiliferous clay, shales and sandstone rising to 400–600 ft capped by 500–700 ft of Tertiary basalt Intrusive sills also occur The basalts are related to those of Jan Mayen, Iceland, Greenland and W Scotland The islands are clearly remains of a more extensive land surface that was broken and partially submerged along lines of faults subsequent to the volcanic period Raised beaches indicate recent elevations The islands have caps of ice or névé and valley glaciers or sheer ice faces to the sea. Vegetation is scanty and includes 14 flowering plants and some



mosses and lichens Pack-ice renders access difficult, but occasionally Norwegian trappers have wintered there. The bear and fox are the only land mammals, insects are rare; but the avifauna includes at least 22 species of which probably 15, including the ivory gull, nest there

August Petermann expressed the opinion that Baffin may have sighted the west of Franz Josef Land in 1614, but the first actual discovery is due to Julius Payer, who was associated with Weyprecht in the Austrian polar expedition fitted out by Count Wilczek on the ship "Tegetthof" in 1872 On Aug. 31, 1873, the "Tegetthof" being then beset, high land was seen to the north-west Later in the season, Payer led expeditions to Hochstetter and Wilczek islands, and after a second winter in the ice-bound ship, a difficult journey was made northward through Austria Sound, which was reported to separate two large masses of land, Wilczek Land on the east from Zichy Land on the west, to Cape Fligely, in 82° 5″ N Cape Fligely was the highest latitude attained by Payer, and remained the highest attained in the Old World till 1895 Payer reported that from Cape Fligely land (Rudolf Land) stretched north-east to a cape (Cape Sherard Osborn), and mountain ranges were visible to the north, indicating lands beyond the 83rd parallel, to which the names King Oscar Land and Petermann Land were given In 1879 De Bruyne sighted high land in the Franz Josef Land region, but otherwise it remained untouched until B Leigh Smith, in the yacht "Eira," explored the whole southern coast from 42° to 54° E in 1881 and 1882, discovering many islands and sounds, and ascertaining that the coast of Alexandra Land, in the extreme west, trended to north-west and north

In 1894 Alfred Harmsworth (afterwards Lord Northcliffe) fitted out an expedition in the "Windward," under F G Jackson, with the object of establishing a permanent base in Franz Josef Land, from which a journey should be made to the Pole Jackson's base was at "Elmwood," near Cape Flora, at the western extremity of Northbrook Island After a preliminary reconnaissance to the north, the summer of 1895 was spent in extending discovery to the west. In 1896 the Jackson-Harmsworth expedition worked northwards and reached Cape Richthofen, whence an expanse of open water was seen to the north, which received the name of Queen Victoria sea To the west of the British channel appeared glacier-covered land, and an island which was probably Payer's King Oscar Land lay to the northward To north a water-sky appeared in the supposed position of Petermann Land Thus Zichy Land itself was resolved into a group of islands, and the outlying land sighted by Payer was found to be islands also Meanwhile Nansen, on his southward journey, had approached Franz Josef Land from the north-east, finding only sea at the north end of Wilczek Land Nansen wintered near Cape Norway, Jackson Island, only a few miles from the spot reached by Jackson in 1895 He had finally proved that a deep oceanic basin lies to the north. On June 17, 1896, the dramatic meeting of Jackson and Nansen took place, and in the same year the "Windward" revisited "Elmwood" and brought Nansen home, the work of the Jackson-Harmsworth expedition being continued for another year As the non-existence of land to the north had been proved, the attempt to penetrate northwards was abandoned, and the last season was devoted to a survey and scientific examination of the archipelago, especially to the west, by Jackson, A B Armitage, R. Koettlitz, H Fisher, W S Bruce and D W Wilton

Further light was thrown on the relations of Franz Josef Land and Spitsbergen during 1897 by the discoveries of Captain Robertson of Dundee In August 1898 an expedition under Walter Wellman, an American, landed at Cape Tegetthof The eastern limits of the archipelago were explored by E Baldwin and many new islands added to the map Wellman reached 82° N. In June 1899, the duke of Abruzzi in the "Stella Polare," succeeded in forcing his ship through the British channel to Rudolf Land, and wintered in Teplitz bay, in 81° 33′ N lat In March 1900, a sledge party of 13, under Captain Cagni, started northwards. They found no trace of Petermann Land, but with great difficulty crossed the ice to 86° 33′ N lat *(See* ARCTIC REGIONS.) Baldwin did some work again in 1901–2 and A Fiala, in 1904, lost his ship in Teplitz bay The Russian, G L Sedoff, used Hooker Island in 1913 as a base for a sledge journey to the Pole, but died near Rudolf Land.

See *Geographical Journal,* vol. xi , Feb. 1898; F. G. Jackson, *A Thousand Days in the Arctic* (1899) (with appendices on geology and botany) , Duke of Abruzzi, *On the Polar Star* (1903) *The Ziegler Polar Expedition 1903–5, Scientific Res* , ed A Fiala (Wash 1907).

FRANZOS, KARL EMIL (1848–1904), German novelist, was born of Jewish parentage on Oct 25, 1848, in Russian Podolia, and spent his early years at Czortków in Galicia. He studied law at Vienna and Graz, and, becoming a journalist, travelled

extensively in the Near East, visiting Asia Minor and Egypt. In 1877 he returned to Vienna, where from 1884 to 1886 he edited the *Neue illustrierte Zeitung*. In 1887 he removed to Berlin and founded the fortnightly review *Deutsche Dichtung*. Franzos died on Jan 28, 1904 His earliest collections of stories and sketches, *Aus Halb-Asien, Land und Leute des östlichen Europas* (1876) and *Die Juden von Barnow* (1877) depict graphically the life and manners of the races of south-eastern Europe Among other of his works may be mentioned the short stories, *Junge Liebe* (1878), *Stille Geschichten* (1880), and the novels *Moschko von Parma* (1880), *Ein Kampf ums Recht* (1882), *Der Präsident* (1884), *Judith Trachtenberg* (1890), *Der Wahrheitsucher* (1894)

FRASCATI, a town and episcopal see of Italy, province of Rome, 15 m. S E of Rome by rail, and also reached by electric tramway via Grottaferrata Pop (1921) 11,100 The town is situated 1,056 ft above the sea-level, on the northern slopes of the outer crater ring of the Alban Hills, and commands a very fine view of the Campagna and of Rome. The cathedral contains a memorial tablet to Charles Edward, the Young Pretender, whose body for some while rested here; his brother, Henry, Cardinal York, was long bishop of Frascati. The villas of the Roman nobility, with their beautiful gardens and fountains, are the chief attractions of Frascati. The earliest in date is the Villa Falconieri, planned by Cardinal Rufini before 1550; the most important of the rest are the Villa Torlonia (formerly Conti), Lancelotti (formerly Piccolomini), Rufinella (now belonging to Prince Lancelloti), Aldobrandini, Borghese and Mondragone (now a Jesuit school) Frascati seems to have arisen on the site of a very large villa (probably that of Passienus Crispus, the second husband of Agrippina the younger, who compassed his death for the sake of his property, which thus passed into the possession of her son Nero and remained imperial) about the 9th century The mediaeval stronghold of the counts of Tusculum (*q v*), which occupied the site of the ancient city, was dismantled by the Romans in 1191, and the inhabitants put to the sword or mutilated Many of the fugitives naturally took refuge in Frascati For the greater part of the middle ages Frascati belonged to the papacy.

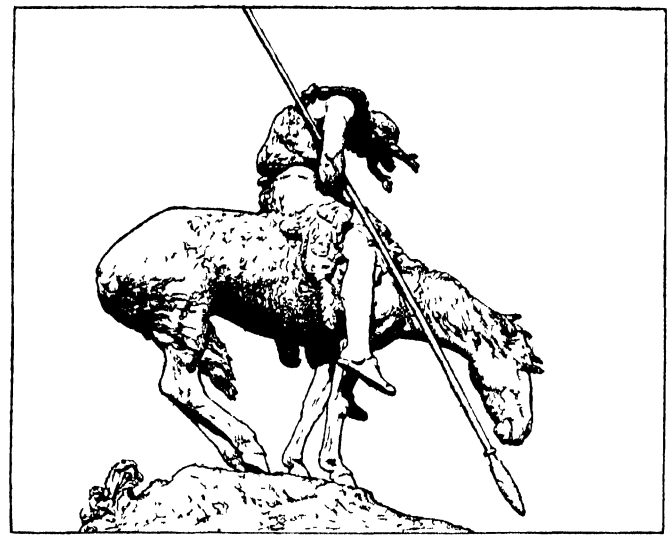
See T. Ashby in *Papers of the British School at Rome*, v. (1910), 301 *sqq*; F Tomassetti, *Campagna Romana*, iv. (1926), 346 *sqq*

(T. A.)

FRASER, CLAUD LOVAT (1890–1921), British artist and designer, was born in London on May 15, 1890, and was educated at Charterhouse He began to follow his father's profession as a solicitor in 1908, but abandoned this three years later for art After working with Walter Sickert for a time, he exhibited in 1913, being responsible in the same year for the decoration of the *Flying Fame* chapbooks and broadsheets He served in France with the Durham Light Infantry during 1915–16, but was gassed and invalided home His gift for spirited design and lively colour, based to a great extent on 18th century conventions, developed rapidly, and he not only illustrated successfully many books, but exercised a rejuvenating influence on English stage designs by his production of *The Beggar's Opera* (1920), *As You Like It* (1920) and *If* (1921) A career of great promise was cut short by his death, June 18, 1921 *See* John Drinkwater and Albert Rutherston, *Claud Lovat Fraser* (1923)

FRASER, JAMES BAILLIE (1783–1856), Scottish traveller and author, was born at Reelick in Inverness He went to India early in life, and in 1815 made a tour of exploration in the Himalayas He was appointed to look after the exiled Persian princes, Reza Kuli Mirza and Nejeff Kuli Mirza, while they were in England, and returned with them as far as Constantinople Sent to Persia on a diplomatic mission he travelled through Asia Minor to Teheran on horseback. In 1823 he married a daughter of Lord Woodhouselee. He died at Reelick in Jan 1856 Some of the astronomical observations taken on his journeys were of great service to the cartography of Asia. He wrote accounts of his travels and stories of Eastern life, his most important works being published between 1820 and 1842.

FRASER, JAMES EARLE (1876–), American sculptor, was born at Winona, Minn., on Nov. 4, 1876. In the public schools of Minneapolis he early revealed his talent by carving figures from sticks of chalk given him to do his sums. His father, an engineer, then at work on the construction of the Northern Pacific railroad, had the boy with him in the Dakotas, where his friendship with the Indians, the sight of buffalo bones whitening on the prairies where herds had once trod, gave him the inspiration for much of his future Indian subjects—his "End of the Trail,"



"THE END OF THE TRAIL," A BRONZE GROUP BY JAMES E FRASER

"Prayer" and the design for the United States "buffalo" five-cent piece At 18 he entered the Art institute in Chicago, and six months later the École des Beaux Arts in Paris His work exhibited in the Salon of 1897–98 won the prize offered for the best work of an American artist and so impressed Saint Gaudens that he invited the youth to become one of his assistants Fraser worked with Saint Gaudens until 1902, when he returned to America and established his own studio In 1906 he became an instructor in the Art Students' league Among his best known works are the bust of Theodore Roosevelt in the Senate chamber, that of Alexander Hamilton in the Treasury building at Washington; and the statue "Journey Through Life" in the Rock Creek cemetery, the monument to Bishop Potter in the cathedral of St John the Divine, the portrait relief of Morris K Jessup in the Museum of Natural History, New York city, the equestrian group "The End of the Trail," exhibited at the Panama-Pacific International Exposition in San Francisco in 1915 and later placed in Waupun, Wis; the "Canadian Officer," in Winnipeg and "Victory," in the Bank of Montreal

See Helen Christine Bennett, "James Earle Fraser, Sculptor," *Arts and Decoration*, vol. i., p. 375–376 (1911), and Effie Seachrest, "James Earle Fraser," *Am. Mag of Art*, vol. viii, p 276–278 (Washington, 1917).

FRASER, the chief river of British Columbia, Canada, rising in two branches among the Rocky Mountains near 52° 45′ N, 118° 30′ W Length 740 m It flows north-west for about 160 m, rounds the head of the Cariboo Mountains, flows directly south for over 400 m to Hope, turns again abruptly and flows west for 80 m, falling into the Gulf of Georgia at New Westminster. The chief tributaries after the two branches join are the Stuart, the Quesnel one hundred miles farther down, the Chilcotin, and about 180 m from the sea the Thompson Several of these drain mountain lakes and have deep and impassable canyons Below Hope the Lillooet flows in from the north The Fraser is a typical mountain stream, rapid and impetuous through all its length, and like most of its tributaries is in many parts not navigable even by canoes. On its southern course between Lytton and Yale, while bursting its way through the Coast Range, it flows through majestic canyons, which, like those of the Thompson, were the scene of many tragedies during the days of the gold-rush to the Cariboo district. At Yale, about 100 m from its mouth, it becomes navigable, though its course is still very rapid. Government works have recently been undertaken at

the mouth. In the Cariboo district, comprised within the great bend of the river, near Tête Jaune Cache, are many valuable gold deposits. With its tributaries the Fraser drains the whole province from 54° to 49° N, except the extreme south-eastern corner, which is within the basin of the Columbia and its tributary the Kootenay.

FRASERBURGH, burgh of barony, parish and seaport, north coast of Aberdeenshire, Scotland Pop (1921), 10,514 It is situated 47½ m by rail N of Aberdeen, from which there is a branch line, of which it is the terminus, of the L N E R. It takes its name from Sir Alexander Fraser, who obtained for it in 1613 a charter as a burgh of royalty, and also in 1592 a charter for the founding of a university, this project, however, was not carried out. The old castle of the Frasers on Kinnaird head now contains a lighthouse, and close by is the Wine tower, with a cave below The town cross is a fine structure The port is one of the leading stations of the herring fishery in Scotland and the head of a fishery district During the herring season (June to September) the population is very largely increased The harbour, originally a refuge for ships of war, is one of the best on the east coast, and has been improved by widening the piers, the extension of the breakwaters, and recently by the addition of a new harbour, making the total area about 30 acres It is easy of access, and affords anchorage for vessels of every size The chief import is timber, the chief export fish

FRASERVILLE (formerly Rivière du Loup en Bas), a town and watering-place in Temiscouata county, Quebec, Canada, 107 m (by water) N E of Quebec, on the St Lawrence river, and at the mouth of the Rivière du Loup, on the Canadian National railways Pop (1921) 7,703

FRATER, FRATER HOUSE or **FRATERY,** a term in architecture for the hall where the members of a monastery or friary met for meals or refreshment The word is by origin synonymous with "refectory" The older forms, such as *freitur* and *fraytor,* show the word to be an adaptation of the O Fr *fraitour,* a shortened form of *refraitour,* from the Med Lat *refectorium* The word has been confused with *frater,* a brother or friar, and hence sometimes confined in meaning to the dining-hall of a friary, while "refectory" is used of a monastery.

FRATERNAL ORGANIZATIONS: *see* FRIENDLY SOCIETIES

FRATERNITIES, COLLEGE, a variety of student organizations peculiar to the colleges and universities of the United States and Canada, usually named from letters of the Greek alphabet, hence frequently called "Greek letter societies" They are nominally secret, each with its individual badge, coat of arms, flag, colours, flower, motto, grip and passwords and having other common characteristics They have a central governing body, each fraternity having branches, of which only one is established in any college, called "chapters," which are also usually designated by Greek letters, although they sometimes bear the name of the institutions where they are located. As a rule each chapter admits its new members from the lowest or freshman college class. Members cease to be active when they leave college In a relatively small number of institutions admission of freshmen is forbidden by college rule In some of the large universities there are chapters of 60 or more fraternities. All of the fraternities aim to be select and to choose their members carefully from the mass of incoming students, the "rushing," as the process of selection is called, being well organized and supervised by the older members

The fraternities play a prominent part in American college life and have a marked influence upon their members. These join in the impressionable years of their youth; they retain for their organizations a peculiar loyalty and affection, and contribute freely toward their advancement. At commencements and on other home-coming occasions former active members of the chapters return to the chapter-houses and help to foster the pride and loyalty of the undergraduates. The chapter-houses usually are owned by corporations made up of alumni, who provide committees of their own number to manage the property and to supervise and regulate scholarship, financial affairs, conduct of the undergraduate members and the relationship of the chapter to the college administration and to college affairs This brings the undergraduates into contact with men of mature age and often of national fame, who treat their membership as a serious privilege. Young men living together in the intimate relationship of daily contact in the same house, having much the same background, tastes and aspirations, naturally form among themselves enduring friendships and develop an *esprit de corps* leading to great pride in the achievements of members of the house in competition with members of similar organizations on the campus in scholarship, athletic contests or in other student activities.

Phi Beta Kappa.—The first of these fraternities was *Phi Beta Kappa,* founded at the College of William and Mary, Williamsburg, Va, on Dec 5, 1776. It was a social club of five students John Heath, Richard Booker, Thomas Smith, Armistead Smith and John Jones It had all the features which characterize the modern fraternity, a ritual with secret obligations, a motto, a grip and a badge in the form of a square silver medal displaying on one side the Greek letters of its name and on the other side the monogram *SP* for *Societas Philosophica* In 1781 the College of William and Mary was closed, its buildings being occupied for military purposes in turn by British, French and American troops The society would have ceased to exist had it not been for a grant made in 1779 to Elisha Parmele, one of its members, to establish "meetings" or chapters at Yale and Harvard This was done, at Yale in 1780 and at Harvard in 1781 By these two chapters were started at Dartmouth in 1787, at Union in 1817 and at Bowdoin in 1826. But in 1826 the society changed its character, becoming non-secret and purely honorary, admitting to its membership a certain proportion of the scholars of highest standing, usually in the classical courses and members of the graduating class In 1926 this society, with over a hundred chapters and a total membership approximating 60,000, celebrated its sesquicentennial by presenting to the College of William and Mary an administration building containing memorial features and by raising an endowment fund of more than a quarter of a million dollars Its golden key badge is a coveted award of American college life

History and Growth.—In 1825, at Union college, Schenectady, N.Y, *Kappa Alpha* was organized, copying many of the features of its predecessor In the same college, in 1827, two other societies, *Sigma Phi* and *Delta Phi* were founded In 1831 *Sigma Phi* established a branch in Hamilton college, and the next year *Alpha Delta Phi* was founded there In 1833 *Psi Upsilon* was organized as the fourth fraternity at Union That same year *Alpha Delta Phi* carried the idea into the West by establishing a chapter at Miami university in Ohio, and, in 1839, *Beta Theta Pi,* the first western fraternity, resulted. And so the system spread until in 1928 there were upwards of 70 such undergraduate societies among men students in American colleges Two of these had more than a hundred chapters each. The ten largest, each of which in 1928 had over 70 chapters, are *Kappa Sigma, Sigma Alpha Epsilon, Phi Delta Theta, Sigma Nu, Alpha Tau Omega, Sigma Chi, Beta Theta Pi, Delta Tau Delta, Lambda Chi Alpha* and *Pi Kappa Alpha.* In 1927 66 of the fraternities had 2,430 active chapters all told, with a total membership of 554,937 They owned 1,576 chapter houses valued at $52,980,155, these houses for the most part being college homes affording room and board to members In addition to these real estate holdings many of the fraternities had substantial endowment funds Beside these chaptered fraternities for men there were in 1927 over 400 local societies acting as independent units. Some of the older of these are permanent in character, owning chapter houses and competing successfully with the fraternity chapters for members and for college honours, but the majority of them are temporary, designed to maintain an organization until the local society becomes a chapter of one of the national fraternities.

The fraternities are well organized The usual plan includes a legislative body composed of delegates from the different chapters, and a small executive or administrative board elected by the delegates. A number of the fraternities maintain central offices with a permanent staff giving its entire time to administration.

Few of the fraternities have any judiciary. The financial methods are sound The conventions of delegates, either annual or biennial, held in various parts of the country attract large numbers of members Most of the fraternities have an inspection system by which these chapters are visited periodically and are kept up to a certain level of excellence The fraternities publish magazines, usually from four to eight times during the college year. The earliest of these was the *Beta Theta Pi*, established in 1872 and published continuously since. The older and more prosperous have published histories and most of them have song books, sheet music, handbooks and other local and ephemeral publications Many of them have substantial revolving loan funds for aiding their members and trophies of permanent value which are used as awards for distinct achievement

The alumni of the fraternities are organized into clubs or associations of somewhat loose constitution having headquarters in centres of population Some of them own and maintain fine clubhouses They exert much influence upon their fraternities on occasion, and through their meetings for luncheon or dinner they keep up the interest of the members Often they render much aid to the college chapters through recommendations of likely candidates for membership

Satellite societies in large numbers, both for men and women students, most of them bearing Greek-letter names, attend the fraternity system These include the professional fraternities, as in medicine, law, dentistry, pharmacy, education and agriculture They maintain chapter-houses, hold conventions, publish magazines, have alumni associations, and in most respects function along the lines of the undergraduate societies There are many honorary societies where membership is granted for distinction of varied sort in separate school, department, or class There are the nationally distributed honour societies, membership in which is highly prized through life, such as *Phi Beta Kappa* in general scholarship, *Sigma Xi* in science, *Tau Beta Pi* in engineering, *Phi Kappa Phi* in general ability, the *Order of the Coif* in law and *Alpha Omega Alpha* in medicine

There are a few colleges and universities which never have permitted fraternities to exist, this ban ordinarily resulting from fundamental religious or denominational opposition to secret societies Curiously enough, too, while the fraternity system is practically uniform throughout the United States, at Harvard, Yale and Princeton it differs in many respects from its character elsewhere At Harvard there are chapters of a few fraternities but their influence is small compared with that of local societies of long standing At Yale the fraternities have chapters of the ordinary type in the engineering department (Sheffield Scientific school), but in the college or classical department the fraternity chapters are called "junior societies," because they limit their membership to the three upper classes and allow the juniors each year practical control of chapter affairs. Senior societies, of which the oldest is Skull and Bones, which are inter-fraternity societies admitting freely members of all the fraternities, are more influential at Yale than the fraternities themselves. Princeton has only local social clubs, without Greek names, and unaffiliated with organizations in other colleges

Inter-fraternity Relations.—In earlier years the sharp rivalry among fraternity chapters fostered clannishness and led to much bitterness of feeling, but in 1909 representatives of the organizations met in New York and formed the *Interfraternity Conference,* which has held annual meetings since and has had wide influence It has secured acquaintanceship and cemented friendships among leaders of the co-operating societies, improved relationships among the fraternities, and secured common action in needed advances. It has stimulated the expansion of existing fraternities and the formation of new ones, so as to offer fraternity benefits to a larger number of students. Its influence has extended among the graduate members who have organized interfraternity clubs in the cities, binding together in fellowship college men who have the common tie of Greek-letter society membership An inter-fraternity quarterly, *Banta's Greek Exchange,* in 1928 in its 16th volume, has been a valuable medium for the exchange of ideas and information among workers in a common field A select library of fraternity literature, based upon the extensive collection of the late William Raimond Baird, is maintained by the New York Public library. This interfraternity movement has practically wiped out opposition to the fraternities, the sincerity of purpose of the leaders having made strong appeal to college administrators, as the common interest of college and fraternity has been emphasized in friendly conference and co-operation (For women's societies *see* SORORITIES.)

(F. W SH.)

BIBLIOGRAPHY —The standard authority on the fraternities is Baird, *Manual of American College Fraternities* (11th ed, 1927) *See* also Dean Thomas Arkle Clark, *The Fraternity and the College* (1916) and *The Fraternity and the Undergraduate* (1917).

FRATICELLI, the name given during the 13th, 14th and 15th centuries to a number of religious groups in Italy, differing widely from each other, but all derived more or less directly from the Franciscan movement The word is a plural diminutive of Ital *frate,* brother As early as 1238 Gregory IX, in his bull *Quoniam abundavit iniquitas,* condemned and denounced as forgers (*tanquam falsarios*) all who begged or preached in a habit resembling that of the mendicant orders, and this condemnation was repeated by him or his successors The term Fraticelli was used contemptuously to denote, not any particular sect, but the members of orders formed on the fringe of the church

The name Fraticelli may more justly be applied to an extreme and fanatical offshoot of Franciscanism, which we hear of definitely in 1322 as established in Sicily, and known as Fraticelli This group of exalted and isolated ascetics soon began to regard itself as the sole legitimate order of the Minorites and then as the sole Catholic Church After being excommunicated as "schismatics and rebels, founders of a superstitious sect, and propagators of false and pestiferous doctrines," they proceeded to elect a general and then a pope called Celestine For nearly a century they were able to carry on an active propaganda throughout Italy, until pope Martin V, in 1426, appointed two of the strict and orthodox section of the Franciscans known as Observants, with orders to make a special crusade against the heresy of the Fraticelli From 1426 to 1449 the Fraticelli were unremittingly pursued, imprisoned and burned The sect gradually died out after losing the protection of the common people, whose sympathy was now transferred to the austere Observants and their miracle-worker Capistrano From 1466 to 1471 there were sporadic burnings of Fraticelli, and in 1471 Tommaso di Scarlino was sent to Piombino and the littoral of Tuscany to track out some Fraticelli, who had been discovered in those parts After that date the name disappears from history

See F. Ehrle, "Die Spiritualen, ihr Verhältnis zum Franziskanerorden und zu den Fraticellen" and "Zur Vorgeschichte des Concils von Vienne," in *Archiv fur Literatur- und Kirchengeschichte des Mittelalters,* vols. I, II, III; Wetzer and Welte, *Kirchenlexikon,* s.v "Fraticellen", H C Lea, *History of the Inquisition of the Middle Ages,* III. 129–180 (London, 1888)

FRAUD. To succeed in an action claiming damages for fraud the person aggrieved must first prove a representation of fact, made either by words, by writing or by conduct, which is in fact untrue Mere concealment is not actionable unless it amounts not only to *suppressio veri,* but to *suggestio falsi* An expression of opinion or of intention is not enough, unless it can be shown that the opinion was not really held, or that the intention was not really entertained, in which case the state of a man's mind is a matter of fact Next, it must be proved that the representation was made without any honest belief in its truth, that is, either with actual knowledge of its falsity, or with a reckless disregard whether it is true or false It was finally established, after much controversy, in the case of *Derry* v *Peek* in 1889, that a merely negligent misstatement is not actionable Further, the person aggrieved must prove that the representation was made with the intention that he should act on it, though not necessarily made directly to him, and that he did in fact act in reliance on it Lastly the complainant must prove that, as the direct consequence, he has suffered actual damage capable of pecuniary measurement (*See* CONTRACT; COMPANY)

For fraud, in its wider sense of dishonest dealing, *see* FRAUDS.

FRAUDS. Frauds practised for material gain were common in remote antiquity and they have remained with us ever since. Wherever men have found themselves gifted with ingenuity a persuasive tongue and histrionic talent without a moral sense to restrain them, they have dishonestly turned their gifts to their own profit Their exploits have come down to us from the very dawn of history According to Herodotus, the mason who built the stone treasury of Rameses III contrived a secret entrance through which he passed nightly to steal a portion of the royal treasure. The Old Testament describes how Jacob defrauded his brother Esau of his birthright and how the Hebrews in bondage defrauded their Egyptian taskmasters of their jewels Specimens of loaded dice have been found in Herculaneum and it is probable that in every crowded community of the ancient and medieval world there were individuals who practised fraud as a profession In modern times frauds are not confined to persons born with glib tongues and no moral sense They have been practised more often by men of natural probity who took the first step in the hope of retrieving themselves from financial ruin

Frauds for personal gain must be distinguished from those perpetrated solely for mischief The catalogue of literary forgeries is already long The person who fabricated a grammar of the Formosan language in Dr Johnson's time was a laborious practical joker, as were the joint authors of *Wanderings in New Guinea*, by "Capt Lawson R N ," a book which was accepted as authentic by all British learned societies except the Linnaean, because the wardroom officers of H M S *Basilisk* who produced their book in advance of that which they had discovered to be projected by their unpopular Admiral, knew less about insects than they did about the fauna in fur and feathers A later forger of travel books who signed himself de Rougemont, had been a footman in the family of an Australian Governor It is supposed that he was also the author of more than one imaginative book on the exploration of South America for which he took the name of Paul Fountain, but since he made some money by these literary forgeries, he might more properly have been referred to in the paragraphs dealing with frauds for profit The person who fabricated the doggerel lines that appeared in the *Times* during the World War, over the name of Rudyard Kipling, may have had the mixed motive of injuring the reputation of both the poet and the newspaper

The motives of Wenzel Hanka, who fabricated poems in the old Tchech language was purely patriotic Other nations had old national poetry and Hanka did not wish his nation to take an inferior place So good was the literary form of his productions that they were admired and quoted for nearly forty years Goethe himself was inspired by them for some of his poems The manuscript produced by Hanka appeared to date from the twelfth century but when it was submitted to chemists they found in the colouring of the illuminated initials, Prussian blue, which was not discovered until a later date After Hanka's death, his library was searched and the instruments used in the fraud together with a draft of the poems in his own handwriting were found concealed The motives of the youth, Thomas Chatterton, who committed suicide in 1770 at the age of 18, was rather to obtain a hearing than to embellish the literature of his native country He, too, was no mean poet, though he was less skilled in the arts of the forger than Hanka He had chosen for his mouthpiece a fictitious monk of the 15th century whom he called Thomas Rowley

It was scarcely possible that the modern interest in archaeology should escape the attention of impostors Quite a factory of ancient documents alleged to have been found in tombs and in the sand of the Fayum are submitted to foreign tourists year by year For the most part they are not unskilfully forged upon sheepskin and papyrus, though they would not deceive any qualified expert some are clumsily executed, as for example, the goatskins in which the eye holes have been mistaken by the forger for missing portions of the skin and he has elided a word or two to allow for them; or where he has used an ink or a kind of pen that had not been invented at the period to which the manuscript is ascribed Hand in hand with these documentary forgeries go the scarabs and the figurines and the objects alleged to have been recovered from Pompeii and Herculaneum Dupes are always to be found to carry such antiquities back to their private museums and to defend their authenticity against every assailant

Even Egyptian mummies have been fabricated with success A Dresden doctor having purchased the corpse of a young woman, embalmed it and disposed of it as the mummy of the Queen Nitocris for a considerable sum Unfortunately his process was defective and when the mummy, which was supposed to have resisted the ravages of time for three millenniums, began to decompose, the fraud was discovered Dr M W Shapira (1830–1884) aimed higher when he offered to the British Museum fifteen sheepskin strips cut from the ends of synagogue rolls 300 years old, treated with chemicals, as an earlier version of the history contained in the Book of Deuteronomy, belonging to the 9th century B C He was a Polish Jew, who kept an antiquity shop in Jerusalem On the discovery of the Moabite stone in 1872, he had sold to the Prussian government forged Moabite pottery, which was exposed by Clermont-Ganneau, who had deciphered the Moabite stone This scholar was sent to London to examine the sheepskins and he declared them to be a forgery, probably by four or five people Shapira committed suicide in Rotterdam in March 1884

Savants of reputation seem to have a vein of credulous simplicity which makes them the natural prey of the forger Chasles, a mathematician of European reputation, was induced by a clumsy forger named Vrain-Lucas to purchase letters of which Cicero, Socrates, St Jerome and Lazarus, after his resurrection, were said to be the authors, and these distinguished persons wrote their letters in modern French and on contemporary notepaper Such clumsy mistakes are not uncommon A will purporting to be signed in 1862 was written on paper bearing the 1870 watermark envelopes addressed by celebrities in the 18th century have been offered for sale, though envelopes were unknown before 1842 Red ink appears in documents dated in the 17th century though red ink was unknown before 1780

Fraudulent Claims.—Fraudulent claims to titles and estates have been common in modern times In the early 17th century a Frenchwoman appeared in Limoges claiming to be Queen Henrietta Maria, the daughter of Louis XIII , who at the moment was in London as consort of Charles I Nevertheless, she carried off her part with such distinction that she was widely accepted as a royal personage A commission was sent down from Paris to examine her and she signed her interrogatory as "Henriette de Bourbon " Nevertheless she was condemned to be whipped by the hangman and to be imprisoned till further orders No less than seven pretenders have claimed to be Louis XVII of France, though the death of the Dauphin in the Temple on June 8th, 1795, was testified to by responsible witnesses More romantic was the claim of the young impostor who assumed the title of hereditary prince of Medina in 1748 He had been landed under mysterious circumstances by a French merchant ship on the island of Martinique Assuming the title of count de Tarnand, he signed a letter as if by inadvertence, in the name of D'Este and the rumour at once spread that he was Hercules D'Este, hereditary prince of Medina He defied the governor of the island and took up residence in a Jesuit convent where he gave audiences, received petitions and transacted public business He had borrowed money freely and finding that his popularity was waning, he set sail for Europe under a royal salute and flying an admiral's flag He was arrested at Madrid and sentenced to the galleys at Ceuta, whence he escaped Having been refused permission to land at Gibraltar, he set sail and was never again heard of He was a good linguist and well educated, but his identity has never been determined.

False claims to titles and estates in England have been not uncommon In 1824, Richard Cook laid forcible claim to the barony of Stafford by taking possession of Stafford castle for a few hours and collecting the rents of the estate He made a "state entry" into Stafford in a hired carriage emblazoned with the Stafford arms and four horses These were unyoked by a mob of

his admirers, who drew him in triumph to his hotel. The next false claimant was Thomas Provis who laid claim to the baronetcy and estates of Sir Hugh Smyth of Ashton hall, Gloucestershire. On the trial of the action in 1853, his proof broke down, for it was shown that at the time when he alleged that he had had an interview with Lady Bath, he was actually serving a sentence in gaol for horsestealing He was sentenced to penal servitude for 21 years

As an instance of the gullibility of people when titles are claimed, the case of Robert Taylor, who represented himself to be the son and heir of Lord Kennedy, ought to be quoted This youth had been married more than once before he was 21, he was uneducated and common-looking, having been, in fact, apprenticed to a chimney-sweep in Durham Nevertheless many people were found to believe in him and a huge crowd attended his trial He was sentenced to 2½ years' imprisonment His chief concern when sentenced was to know whether any of his wives could pursue him on his release

The impudent claim of Arthur Orton, a Wapping butcher, to the title and estates of Sir Roger Tichborne in May 1871, aroused greater public interest than any trial of this nature before or since Sir Roger Tichborne had been born in 1829 and educated at Stonyhurst He was an officer in the carabineers for 3½ years He had become secretly engaged to his cousin and this being discovered by her father there was a stormy scene and he sailed for South America in 1852 He was then presumptive heir to the baronetcy His uncle died while he was in Valparaiso On April 20, 1854, he sailed for Australia in the *Palma* A few days later wreckage from that vessel was picked up and none of the crew was ever heard of again. Roger Tichborne's will was proved and legal proof was given of his death Meanwhile, his mother, unwilling to believe in his death, had advertised a reward for his discovery. Thirteen years after the loss of the *Palma* one of her advertisements came to the notice of a solicitor in Wagga-wagga, Victoria, who wrote to Lady Tichborne that her son was living in the town under the name of Castro Funds having been provided for his journey, this man made a devious journey to Paris during which he went to Wapping to inquire about the Orton family and to Tichborne where he was shown over the house as an ordinary visitor Roger Tichborne had been a slight, narrow-chested man the claimant weighed nearly twenty stone Nevertheless Lady Tichborne made an affidavit that she recognized her son and she allowed him £1,000 a year until the trial She died before the claim came before the court The trial took up the greater part of two years Among the claimant's witnesses were old servants, friends of the family and troopers in the carabineers England was divided between pro- and anti-claimants But as the trial wore on and the claimant himself was cross-examined and admitted that as far as he could remember Caesar and Virgil wrote in Greek and that *laus Deo semper* meant "laws of God forever," and went on to say that he had seduced the lady to whom Roger Tichborne had been engaged—the lady being since married and being actually in court at the time—there was a wave of public sentiment against him He lost his case and was subsequently sentenced to fourteen years' penal servitude for perjury.

There was a mingling of the practical joke and the fraud for profit in the exploit of the ex-convict, William Voigt, who in 1896 assumed the uniform of a captain in the First Prussian Guards and, having collected a force of eleven genuine soldiers, entered the town hall at Koepenick, confiscated the funds of the municipal treasury and sent the burgomaster and the treasurer under military arrest to Berlin He was sentenced to four years' imprisonment.

Company Frauds.—The list of company frauds is a very long one The South Sea Company, founded in 1710, was at first unwisely and afterwards dishonestly managed. The "South Sea bubble," as it was called, burst in 1720 ruining thousands of families In the following year the directors' estates, to the value of over two million sterling, were seized and sold. By fraudulent artifice the shares had been run up from £100 to £1,000 Knight, the cashier, absconded with £100,000. Twenty-three years later he compounded the fraud for £10,000 and returned to England. A parliamentary enquiry was held in Nov. 1720 and as a result, Aislabie, chancellor of the exchequer and several members of parliament were expelled the House. The crash had followed the collapse of Law's bubble in France John Law of Edinburgh, had been made controller general of the French finances upon the strength of a scheme for an East Indian and Mississippi Company by which the national debt of France was to be paid off. In 1716 he opened a bank in his own name The shares rose to 20-fold their original value and in 1719 they were worth 80 times the amount of all the current specie in France In 1720 the whole fabric of false credit collapsed, spreading ruin throughout the country Nine years later Law died in poverty at Venice

Company and banking frauds were commoner during the first half of the 19th century than they are now They were due generally to the misplaced confidence of directors in their servants. Walter Watts, an assistant clerk in the Globe Assurance Office, on a salary of £200 a year, succeeded in robbing his employers undetected for years and in leading a double life quite unknown to them He owned houses in London and Brighton, entertained largely; gave balls and suppers, and even controlled two of the London theatres without a whisper of his real identity reaching the ears of his employers in the city. His defalcations amounted to £70,000 He ended his life in a convict prison

Hard upon his heels followed Robson, chief clerk in the Crystal Palace Company, on a salary of £150 a year He too entertained largely in the West End He wrote plays good enough to be given in London theatres and he dressed fashionably and maintained a smart carriage His directors were aware of this, but they accepted his story that he had been lucky on the Stock Exchange His income was really derived by creating fictitious shares in the company's stock All went well with him until the head of his department asked him one day to produce certain scrip which he had made away with He said that he had taken the certificate home His chief insisted upon accompanying him to his house and while he waited, Robson escaped by the back door to Sweden where he was arrested for extradition. His defalcations proved to be £27,000 and he was transported for 20 years

Robson's conviction caused a profound sensation in the commercial world and the great undertakings began to look into their affairs The Great Northern Railway Company became uneasy when it discovered that larger dividends had been paid than the capital warranted Their books were well-kept and in a published report they stated that "they had every confidence in their registrar, Mr Redpath" Yet this trusted servant had issued no less than £200,000 of fictitious stock He invented new shareholders, endowed them with forged stock for which the dividend passed to him Redpath is interesting as a psychological study. he was an open-handed philanthropist who would forge a share certificate and sign a cheque for a charity within the hour. He was a collector and a patron of the arts, given to lavish hospitality, but his greatest luxury lay in giving to the poor His downfall was dramatic. On the platform of a railway station he was passing the chairman of the company who was in conversation with a certain peer and he raised his hat. The peer stopped him and shook hands. "What do you know of our clerk?" enquired the chairman "Only that he is a charming fellow who gives the best dinners in London" Struck with uncomfortable surprise, the chairman ordered an investigation and Redpath fled to Paris, but he returned voluntarily, stood his trial and was sentenced to transportation for life.

The failure of the Liberator Society brought to light defalcations by Jabez Balfour, Hobbs and Wright of two million sterling The Liberator Building Society had been bankrupt for some 15 years, but the fact was concealed from the shareholders. When Balfour joined it he was a member of the House of Commons with a considerable estate in Oxfordshire. The arrest of Wright and Hobbs, his partners in the fraud, warned him what was coming. He resigned his seat, gave his sister a power of attorney, and fled with all the ready money in notes and gold that he could lay his hands upon. His chosen asylum was the Argentine where he purchased a brewery and felt comparatively safe, since the Argentine Government had refused to grant his extradition. The case was fought from court to court for twelve months, but at last the

supreme court adjudicated against him Even then there were desperate attempts to rescue him. His trial dragged on for months in England, but he was eventually sentenced to 14 years' penal servitude

The London and Globe Company frauds of the early 'nineties were the work of Whitaker Wright, an Englishman who had spent many years as a mining engineer in Philadelphia. He returned to England in 1889 and began at once to float companies. His method was always the same—to rob the companies in which he was concerned and to conceal the facts under a cloud of complicated details The directors of the London and Globe Company were puppets in his hands and believed everything that he told them. The crash came in 1903, when Wright was charged with issuing a fraudulent balance sheet and on Jan. 27, 1904, he was sentenced to 7 years' penal servitude. While the judge was passing sentence he swallowed cyanide of potassium and died before he could be removed from the courthouse.

Banking Frauds.—Like company frauds, banking frauds were commoner in the 19th century than they are now Roland Stephenson of Remington, Stephenson and Co 's Bank succeeded in embezzling half a million of money and in ruining hundreds of his clients Stephenson entertained on a lavish scale and outwardly appeared to be the most cautious and responsible of bankers. Secretly he was a gambler. He sat in the House of Commons and was treasurer of St Bartholomew's hospital where he occupied a room on the night before his disappearance The bank was still open and at 11 A M. the president of the hospital was able to withdraw £5,000, but the door closed two hours later and the bank suspended payment. Stephenson had absconded with his chief clerk, carrying £70,000 in cash They had crossed to Ireland where they took ship in a brig bound for the West Indies Neither they nor the brig were ever heard of again.

The reasons that impelled John Sadleir to take to crime are unknown He was frugal, not given to hospitality or to excesses and no one knew how the money that he stole from his customers was spent He began life as a solicitor in Tipperary and was connected with a long-established private bank that bore the name of his family As a member of Parliament he rose to be junior lord of the Treasury and to be associated with various financial undertakings in the City. As chairman of the London and County Bank he developed its business and made no attempt to rob it, but when his family bank suspended payment it was found that his defalcations exceeded £400,000. He had issued false stock in the Swedish railway of which he was chairman to the value of £150,000 and had forged thousands of false acceptances put into circulation through his creatures The first hint of suspicion came when he resigned office His credit was shaken and the drafts of his bank were dishonoured When ruin seemed irretrievable his body was found lying on Hampstead Heath poisoned with prussic acid. He left behind him letters expressing contrition

The failures of private banks such as Strahan and Paul, the Royal British, and the Eastern Banking Corporation were all due more or less to the same cause—the partners using their customers' deposits for private speculation In the case of the City of Glasgow Bank, which failed in 1878, the directors had issued false balance sheets and declared dividends when the bank was insolvent. When arrested it was found that several of the directors had enormously overdrawn their private accounts They were sentenced to very moderate terms of imprisonment The Union Bank of London was robbed by its cashier, Bullinger, over a period of more than 15 years of the enormous sum of £263,000 and the directors had not discovered it. Bullinger's method was to produce a forged passbook instead of the real Bank of England passbook for inspection. He was a steady unobstrusive man with no vice except a passion for gambling through outside brokers He made no defence and was sentenced to 14 years' penal servitude.

Turf Frauds.—Conspicuous among the turf frauds was the case of Henry Benson, a man who might have prospered by honest courses if he had been born with any moral sense His father was a prosperous merchant of good repute and he had an excellent education. He spoke and wrote several languages with ease; he was a good musician and his manners were excellent. Having already served a sentence for an impudent fraud in London, he advertised for employment as a linguist and was engaged by a certain William Kurr, who was concerned in dubious turf business With Benson's ingenuity and education, a gigantic criminal organization was built up Kurr was under police suspicion and Benson set to work to suborn the police He bought over three chief inspectors at Scotland Yard, all of whom were concerned in watching Benson's new activities in France By means of a specially fabricated copy of a sporting paper, he induced French investors to trust him with their money The French Government pressed for the arrest of the swindlers and the police warned Benson of his danger It was too late· he, Kurr and his police confederates were arrested and sentenced. On release in 1887, Benson and Kurr crossed to America where they prospered as bogus company promoters Subsequently Benson was found exploiting mines in Brussels, but after a term in a Belgian prison, he transferred himself to Geneva as an American banker So well did he play his part that he won the heart of the daughter of a retired Indian officer whom he induced to part with all his capital in return for worthless scrip He was arrested on the point of embarking for the United States, and it was then discovered that all the wedding presents of jewellery were sham. On his release from prison he turned up in Mexico personating Madame Patti's agent and netted £5,000 in advance bookings. Arrested in New York and lodged in the Tombs prison to answer for this offence he committed suicide. He was then still under forty.

Frauds by Individuals.—Two inter-related cases of fraud in the 18th century have been frequently referred to The twin brothers Perreau—Robert, a physician in good practice, and Daniel, a city merchant—had obtained £7,000 from Drummond's Bank on a forged acceptance They maintained that it had been given to them by Mrs. Rudd who kept house for them and that they believed it to be genuine. They were convicted on her evidence as a witness for the crown. Public sympathy was strongly in their favour Nevertheless both were convicted and hanged though they protested their innocence even on the scaffold The accounts of the trial that are preserved suggest that Robert Perreau was innocent.

The Rev Dr Dodd, a canon of Brecon and chaplain to George III , obtained funds from moneylenders by forging his former patron, Lord Chesterfield's, signature Nothing might have been heard of the transaction had the document not been shown to Lord Chesterfield who denied its authenticity and allowed the forger to be arrested. In his extremity Dr Dodd refunded the money Nevertheless he was convicted with a strong recommendation to mercy. Dodd was a fashionable clergyman of the day and a noted preacher and courtier. All London joined in a petition to the King Dr. Johnson himself became his champion, but with King George III. they cried to deaf ears. "If Dodd is pardoned, it will be said that the Perreaus were murdered," said his majesty, being unable to appreciate the difference between the two cases. The poor chaplain was hanged at Newgate pouring forth paeans of praise upon the king

The Victory Bond Scheme for which Horatio Bottomley was sentenced to a term of penal servitude was an ingenious method of exploiting patriotic enthusiasm and the gambling instinct at the same time The Victory Bonds were issued by the Government at £5: Bottomley invited subscribers at £1 or more, on the understanding that the interest should be drawn for as a lottery and the capital investment should remain intact So strong was the bait that some 30,000 people trusted him with their money at the rate of £10,000 a day.

The poor suffer no less from fraud than the rich investor. The confidence trick in its various forms is still practised in the London streets and public houses. So various and intricate are the devices of the modern cheat that new schemes come to the notice of the police nearly every day. Struggling farmers and even labourers still fall victims to the wiles of the "Spanish prisoner" writing from Valencia, though the fraud has been so often exposed in the press; but the lure of hidden treasure—of obtaining something for nothing—will always find a victim. The mock auction in which confederates are seen bidding furiously

for worthless goods, still flourishes in London The fortune-teller is never long without a client, the quack doctor or the vendor of patent remedies without a patient. Even habitual inebriates are made to contribute their quota, for among the advertised remedies for intemperance is a compound of 98% of sugar and 2% of common salt, sold at a fantastic price The menace of Bolshevism has produced bands of Russian impostors who peddle forged documents to foreign embassies As long as dupes continue to abound, the vultures are never far away

(B T)

THE UNITED STATES

Dubious investments are apparently marketed in America more expeditiously than anywhere else on the globe It is said that a Frenchman hoards his savings, an Englishman buys a home or consols, but the small American investor's guiding principle seems to be a mixture of gambling, a desire to get something for nothing, and to become rich without work This principle, according to Andrew Mellon, secretary of the U S Treasury, has caused a loss of $1,700,000,000 annually in the United States, in financial ventures alone Americans depend upon "headlines" for information, and believe statements because they are in print A business in itself is that of marketing "sucker lists," of various nationalities Brokers sell them at 1 cent a name, and so sure are persons once "fleeced" to be good prospects again that swindlers pay over 5 cents a word for lists of veteran victims Names and addresses of corporation stockholders are also sold by "sucker" list dealers

The department of business research of New York university made a survey in 1927 of a selected list of professional and business men in 15 States during three years, and found that the average investment in unsound securities was over $1,190 per person, the average loss $1,100 In the three years surveyed 418 persons lost $435 000 Generally, they were lured by dividends of 8% or over, and the purchase of unlisted common stocks of oil, automobile and mining companies The following are the factors said to have induced such purchase (numbers refer to persons) Hope of extraordinary gain, 218, salesman's persuasion, 112, confidence in the company, 83, own judgment, 55, "tips" on the stock market, 37, stock bonus, 27, appeal to social position, 23, offer of trade, 16, hope of recovering past losses, 14 Total persons reporting, 401, total mentioning two or more factors, 154

The swindler's business has increased since the World War, owing to the high wages paid to industrial workers, general prosperity and the sale of corporate securities to small investors begun in the patriotic Liberty Loan drives and continued by many corporations selling stock to employees on instalments Persons who before had placed their savings in banks thus learned new methods The swindler offered to take Liberty Bonds in payment for his stocks, bonds and real estate Most fraudulent schemes and methods are ancient; but their presentation changes daily As classified when detected some are listed below.—

Blind Pool or Participating Syndicate.—Promoters of this scheme tell their victims that they deal only in high-class securities, and can "work the market" because the pool managers are "among the great financial wizards of Wall street" (New York's financial district) They promise 24 to 120% yearly dividends on money put in the "pool" to be invested as the managers think best These "syndicates" probably never buy or sell stock Operated by an honest banking firm as a form of investment trust, syndicates may help the investor, but an unscrupulous "outfit" can make them extremely dangerous.

The Faked "Rights" Game.—In this a promoter forms a corporation with a name similar to that of a well-known firm, and having secured a list of the latter's stock-holders, usually through a dishonest employee, tries to sell his prospective victim one "rights" certificate in the new firm for every share that he holds in the reputable company.

"Front Money" Parasites flourished during 1920–29 in various cities Posing as service companies, brokers or investment dealers, they get advance fees from poor or inexperienced companies needing new capital or from optimists trying to develop new propositions. For fake services, *i e*, analysis of the company's business, preparing stock certificates, or filing and publishing incorporation papers to comply with the Martin Law, a New York State law to protect investors, they charge fees of $100 to $1,000 with extras

"Declaration of Trust" or "Common Law Trusts," a legal instrument under which have worked many pseudo oil promoters in the South-west It can be honest, but shareholders in fake companies usually get only "certificates" entitling them to an interest in the "trust's" earnings The value and trusteeship of shares under such a "trust" should be examined carefully

"Housing Trusts" have been operated throughout the United States, a number of States declaring them lotteries violating State laws Promoters offer contracts, the buyer agrees to pay $7 50 a month for 10 years, when his contract "matures" he is to get $1,000 from a "trust fund" As a lure, he is allowed to borrow an amount equal to the face of his certificate at 3 or 4% interest When all costs which the holder must pay are totalled the interest rate is usually about 7% The first three or four monthly payments, and perhaps a part of subsequent payments, do not reach the "trust fund" Expenses and salaries have used them up Actual loans at 3 or 4% can be had on demand but the contract holders supply the funds for all loans And the first several monthly payments are forfeited and lost if the holder wishes to withdraw.

"Interim Certificates."—Some promoters try to keep up prices for stocks in new companies by selling interest-bearing "interim certificates," which grant limited rights and are not exchangeable for shares until after a stated period They cannot usually be bought and sold in the open market They may be legitimate, but sales are sometimes manipulated in such a way as to create false market prices

Oil Royalties Companies may be genuine or not, according to the personnel of the management Oil royalties are paid by producing companies to owners for drilling their lands The rate is usually $\frac{1}{8}$ interest in any oil produced, the company pays all expense Since banks in oil territories lend on certain royalties, assigning and recording them as though they were deeds, "royalty companies" have been formed, paying land-owners cash for royalties and holding them for shareholders The next step in the development of these companies was the issuance of various securities against the pooled royalty holdings The investor should remember that the rights of these companies are constantly shrinking in value, a fact rarely obvious until too late In any case, before investing, the purchaser should know (1) The company's holdings and locations, and the amounts paid for them, (2) the producing and non-producing areas, (3) the estimated life of wells, and the authority for the estimates, (4) the identity and reputation of the drilling companies; (5) the method of selecting and valuing properties, (6) trust agreement for control of funds and shareholders' rights

The "Trick Merger" Company.—Shareholders in defunct or inactive oil-drilling companies are offered for their shares stock in consolidation companies with "wonderful chances to realize the success just missed by the first company" In exchanging shares, shareholders often pay 25%, more or less, of the original prices to the consolidation Rarely are such rejuvenated enterprises any better than the companies they amalgamate

The "Reloading Game."—Unsuccessful companies sometimes contract with fiscal concerns who make a business of selling additional issues of worthless stock They "reload" old stock-holders who have realized nothing on their original investment Issues are agreed upon and the fiscal concerns contract to sell the issues at prices which will net the companies a specified sum per share sold. A letter is sent over the president's signature; stock selling starts; the fiscal concern boosts prices Sometimes no par value common stock sells at $50 The original company gets $5, $45 going to the stock-selling "outfit."

The "Fake Race" Swindle.—Through the U S. post office a "bunco" or swindling game, played by confidence men on those in good circumstances, has been stopped in several places; but it

may appear in others at any time One man, it is said, parted with $60,000 in order to collect a fake bet of $160,000 which he believed he had won on a horse race. The plan operates somewhat in this fashion The swindler meets the victim en route to some fashionable resort and suggests a hotel where there is a confederate acting as clerk During motor rides and meetings more confederates are introduced as employees of "big men" following the races with sure tips After much persuasion they reluctantly pass the tips on to their friends During a trip to an "exchange" elaborately equipped with employees and complete racing paraphernalia the victim is impressed He raises the cash and accompanies his "tipster" to a local bank where there is an official who asks no questions about deposits of large drafts and immediate cash withdrawals When they return to the exchange, a confederate bets "by mistake" with the victim's money while it is in the hands of a manager for verification and count, along with the money alleged to have been won by the victim but not yet paid to him The fake race is "finished just before the error is noted" The confederates fight with each other for the victim's benefit There follow disorder, riot, cry of police, advice to the dupe to leave town, and assurances that his "friends" will cover the loss and meet him in another city At a Florida resort recently over $1,000,000 was lost in schemes like this, which the mails are used to further. Since the post office began its campaign against such procedure 28 "fake race" confidence men have been arrested and rather than go to trial some of them have forfeited a good many thousands of dollars in bail bonds

The Confidence Man.—In New York, in 1927, the most notorious confidence man was "Lord Beaverbrook" He, like most of his ilk, posed as an admirer of wealthy divorcées and widows, using $78,000 worth of jewellery which one woman gave him to ensure for her as a present to another woman whom he was said to have bigamously married in order to gain control of her wealth Often a confidence man pretends to a feminine "client" that there is a chance to invest in "a sure thing" and that he will go "fifty-fifty" with her in "a plunge" To prove his good faith, he gives her fraudulent securities for safe keeping, and vanishes with her cash Newspapers carry many stories of confidence men who promise marriage, and pretend to borrow the savings of their victims for the purpose of furnishing new homes As some of the latter keep their cash until after the ceremony, this sort of swindler may be liable for bigamy when there is no other tangible charge against him

The Nationality Game.—Most of the various schemes which have been and will be described in this article are worked on foreigners or aliens Swindlers find it very helpful to speak the language of their victim and to advertise in the many foreign newspapers published in the United States A Czechoslovak who has just arrived is delighted at the interest and friendship of a fellow countryman and listens readily to talk of how to get rich "like other Americans" Germans are easily persuaded to invest in a machine invented by a German In Jan 1928 New York newspapers ran a typical story of a swindler haled to court with over 50 foreigners, mostly poor Italians, who had paid him from $100 to $5,000 He had posed as head of a foreign exchange firm, and had sold "consolidated Italian" bonds The specific charge came from an Italian who had given up $1,421 on a promise of getting "$50,000 worth of bonds" when he had paid a balance of $341 The Italian came to pay and to get the bonds, but the office was closed, the money and manager gone The only asset was office furniture

Tactics.—The first move in any scheme is to establish confidence Sometimes this is done by attacking legitimate business, getting the small investor's cash through his prejudice against "big interests"; or by working the Wall street bogey, or by pretending to be in with the "big fellows" there The swindler fakes endorsements of reputable business leaders; fakes letter-heads, using, except for one inconspicuous word to save him from jail, a reputable firm's name. He advertises in what is called a "tipster" or "dope sheet," a journal supposedly printed in the interest of finance but really no more than an advertising medium, apparently disinterested, for fraudulent securities He supplements these by fake market-letters and advisory investment service It is estimated that one swindler disposed of at least $15,000,000 in stock with a make-believe market to aid him His stock, like that of many of his kind, was listed on an irresponsible exchange The "hurry up" appeal on the telephone accomplishes much for the swindler, who, if he operates widely, equips an office, hires those who can ape the vernacular of financial experts, gives each a desk and a selected telephone list The promoter keeps well out of the picture, usually in a near by office under a different firm name

REAL ESTATE FRAUDS

The "Peak Game" is played by fraudulent real estate agents. First, the victim is sold a lot, then, called to another real estate office, the victim hears that a buyer will pay several times the price of the first lot if, with it, the former will turn over the two adjacent lots The victim hurries to buy the two adjoining lots, returns to the second company, and finds that the customer is gone

Tax-title Sales.—Sometimes land sold to "suckers" is a tax title only The buyer receives what seems to be a deed, in reality mere paper The land has unpaid taxes, and is bought for their amount, usually small compared to what the "sucker" paid The title may prove worthless or the original owner pay his taxes and legally regain his land

The "Gyp" Company sometimes buys real estate on contract and never completes its payments, but sells the land in small lots, 20% down, the rest monthly The buyer goes to the office to make his last payment and receive his deed, only to find the company gone The title remains with the original owner who was not paid in full

The Free Lot Scheme.—In this some one hears that he has won a free lot, and arrangements are made for him to see it. When he visits it he is told that to build he must buy the adjoining lot or lots If he does so, he pays more for the extra two than the three are worth Or he is shown a very undesirable lot as the "free" one, but is sold desirable property at a high price on which the "value" of the "free" lot is credited Or, again, he is asked to pay from $5 to $10 transfer costs, making the price of the "free" lot more than its worth

The Development Scheme was widely exploited in parts of Florida during the "land boom," ending in 1927. The "development company" sent out cards asking the recipients to respond to the sender Those replying were told that as a stockholder in a certain company, a defunct one, they might exchange their stock and $2,000 in cash, as payment for a "valuable" lot The scheme flourished until it was discovered that the "valuable" lot was practically worthless

The Fraudulent Contract.—This was also exploited in Florida The name of an honest and well-known real estate firm was printed in fake contracts giving the buyer such a "square deal" that sales with cash deposits were rapid Before a victim discovered the fraud, the swindlers decamped

MIXED FINANCE-AND-MERCHANDISE FRAUDS

"Directory" or "Year Book" Frauds thrive on the modern business complexity and the need for specialized directory service One "transportation association" may inveigle persons in the transport business into paying $50 for listing in a directory of railroad, steamship and warehouse service which is never published The business public pays an annual toll of possibly a million dollars to fake directory schemes

Business Men's Protective League, one of various so-called city "leagues" or "associations" which promise police or political protection for advertisements usually never printed A "judge," possibly once a small town magistrate, is president. He, or some one in his name, telephones, paving the way for a salesman to collect advertisements for a business men's manual, the price to cover jury duty exemption, immunity from traffic and parking penalties, omission of factory inspectors' visits, etc From $10 to $300 a year is charged; the graft totals hundreds of thousands annually

The Salesman's Bond is a deposit which a salesman who has just been employed is told that he must furnish, without a receipt, for goods in his keeping An inventory is soon taken and he is charged with "lost" goods covered by his bond He has no redress

Photograph Frauds are popular, seemingly even with the public. A telephone call comes from a local "press" bureau to a man or woman who is temporarily prominent, or anxious for newspaper publicity The bureau requests an immediate sitting at Blank's studio, in order to obtain for their files a photograph, "entirely without charge" A few days later the proofs are delivered, with prices ranging from $10 to $200 The victim, if he does not buy, loses no money, although he may have spent considerable time to no purpose

"Ambulance Chasers," a term in general use in America to signify lawyers who accept or solicit doubtful cases and prey upon victims of accidents, and who offer a person injured, whether slightly or seriously, their services, for a large part of any damages secured They are in league with any dishonest persons who may be possible witnesses, and the step from valid to fraudulent claims is short and easy In 1926, in New York city a "gang" consisting of lawyers, stenographers, taxi drivers, doctors and professional "victims," who involved themselves in accidents for a consideration, were exposed in extended court hearings The New York courts, 1927–28, were full of fake claims which delayed valid cases The insurance companies had to raise premiums and postpone authentic claim payments

MERCHANDISING FRAUDS

Contracts Signed But Not Read.—Fraudulent furniture dealers will often advertise certain articles, sell them to customers, give duplicates of signed contracts for instalment purchases and deliver entirely different articles Irate victims are suavely asked to read the signed contracts, which describe not the articles seen, but those delivered The same scheme obtains in selling other goods

The "Give Away" Graft.—A mail-order concern circularizes with a "discount cheque," which is neither a cheque nor a discount The cheque, plus the price, is a liberal amount for the article With books the "give away" plan varies little in method "Representative" persons receive a notice that each will get a set of books free because the company wants one citizen in each community whose opinion counts to accept a free set, in order to act as a local reference The petition, which is "confidential," says that there is only a "shipping memo" to sign In a few days a carbon of the "memo" returns and the citizen finds that he is pledged to make a monthly payment for "supplementary material," usually amounting to $75 or $100, regularly charged for the set.

Coupon Companies and Endless Chains formerly sold silk hose and underwear by mail The victim paid $1 for a coupon as part payment on hosiery "worth $10," and he agreed to remit to the company the coupon and $3 This arrangement entitled him to a receipt and three coupons and the title of "receipt holder" The title gave him the privilege of selling the three coupons at $1 each, keeping the money The first "receipt holder" paid $1 If, and when, each of three subsequent buyers sent $3 to the company the first "receipt holder" got his hosiery without further payment This scheme was stopped by the post office

Suit Clubs, a "graft" usually worked in office buildings A pretty girl sells suit club memberships at $2 a week In the weekly drawing, a lucky number wins a $50 suit Those who never draw a lucky number are told that they will get a suit upon paying $50 Police investigations in one city showed that $30,000 paid into one club group yielded but five suits Those who had paid $50 and went to get their suits found only cheap materials and a make-believe tailor's shop

Merchandise Insurance Frauds.—Dishonest importers find profit while keeping within the law. Import duties do not have to be paid until goods are removed from warehouses, if sufficiently large bonds are put up with surety companies and the goods are stored in bonded warehouses In 1926–27 a wily merchant imported an assortment of costly European goods which he stored in a bonded warehouse. Then he secretly removed it, burned the warehouse, and having his goods concealed and duty free, collected the amount of the insurance.

OTHER FRAUDS

Fraudulent Bankruptcies.—The Federal bankruptcy law says that if liabilities are so much greater than assets that a debtor cannot begin to pay his debts, he may "go into bankruptcy" Trustees are then appointed, to whom the petitioner must turn over all assets. The trustees divide available assets among creditors, and the bankrupt is released He is no longer in debt Creditors can make no further demands upon him, regardless of how much money he may make thereafter. Fake statements made in order to acquire merchandise on credit or to conceal tangible merchandise violate the criminal law Thus a dishonest dealer in silks, furs or diamonds can get stock on credit from wholesalers, conceal or sell it to a "fence" (one handling stolen goods), announce himself bankrupt, and pay wholesalers only a percentage of the value of the merchandise illegally disposed of

Mail Frauds.—Most major swindles listed under finance and real estate are managed more or less by mail Other forms are conducted by mail entirely, but in scheme and method they, too, come under the heads already listed Selling "gold mine" and "oil" stock, and Utopian real estate, is often exclusively managed through the mails, or by telephone. The post office issues fraud orders against swindlers who try to keep within the "technical truth" in advertisements When they advertise in a woman's magazine, "10 yd of silk for shirtwaists at 10 cents" and send 10 yd of silk thread, they are trading on the fact that "silk" generally means cloth, not thread.

"Home Work" Swindles, frequently advertisements, with every mark of honest business, describing work women can "do at home in spare time" The initial payment is perhaps not over 10 cents But if the plan includes the purchase of materials for making embroidery or lace, or any other needle-work, she who endeavours to eke out an income in this way finds that she must invest many times and that her work never satisfies the company

Patent Medicines.—The mails are indispensable in the sale of fake patent medicines Petty grafters advertise profusely in cheap fiction magazines, farm journals and country papers, "finding their most fertile field in the delusion that because it is in print it must be so" Quack advertisements deliberately suggest that the reader suffers from a variety of diseases which a particular lotion or pill will cure

The Loan Shark business in America is old, but it is still very active. The modern American Shylock is suave, has a corps of legal counsel, auditors, expert advisers and high pressure salesmen to help him get cash for his "working capital" It is claimed that 100,000 workers in 1,000 railroad centres pay from 240 to 1,000% to unscrupulous lenders who buy wages at heavy discounts Over 350 offices exist, each handling from 400 to 1,000 accounts Employees frequently need cash when wages are paid bi-weekly or monthly Even when wages are paid weekly, loan sharks keep up salary-buying pretences as long as there is the possibility of a salary to sell Rural and industrial areas are full of small, secret offices for carrying on this usurious business The Uniform Small Loan law, now in effect, wholly or partly, in 21 of the States has, to a certain extent, mitigated this evil It authorizes any person to obtain a State licence, to make loans to $300 at not more than 3½% a month, computed on unpaid balances The law strictly regulates the conduct of the lender's business; it prohibits, and provides suitable punishment for loans by unlicensed lenders or loans exceeding the legal rate

BIBLIOGRAPHY.—*See* articles by J. K Barnes in *World's Work* (Jan. and Feb 1923); H J. Kenner, "The Blue Sky Promoter," in *Credit Monthly* (Nov 1924), Frederick, *The Book of Business Standards* (1925), E H H. Simmons, "Security Frauds," *Independent* (Dec 25, 1925); Ripley, *Main Street and Wall Street* (Boston, 1927); and Rukeyser, *The Common Sense of Money and Investment* (1926); Keyes Winter, "Parasites of Finance," in *North American Review* (Nov. 1927); and "Fools and Their Money" in *Harper's* (Aug. 1927); H J Kenner, "The Fight on Stock Swindlers," reprint No. 1962 of the *Annals* of the American Academy of Political and Social Science.

(J. C. A.)

FRAUENBURG, a town of Germany, in the republic of Prussia, on the Frische Haff, at the mouth of the Bande, 41 m S W from Königsberg by rail Pop (1925) 2,285 The cathedral (founded 1329) is known as Dom-Frauenburg, and is the seat of the Roman Catholic bishop of Ermeland Within is a monument to the astronomer Copernicus Frauenburg was founded in 1287 and received the rights of a town in 1310

FRAUENFELD, the capital of the Swiss canton of Thurgau, 27 m by rail N E of Zurich, on the Murg stream a little above its junction with the Thur It is a prosperous town, at the convergence of several routes, and has iron manufactures In 1920 its population (including the neighbouring villages) was 8,711, mainly German-speaking, while there were 6,304 Protestants to 2,342 Roman Catholics The old upper town centres round the castle, of which the tower dates from the 10th century, though the rest is later Both stood on land belonging to the abbot of Reichenau, who, with the count of Kyburg, founded the town, first mentioned in 1255 The abbot retained all manorial rights till 1803, while the political powers of the Kyburgers (who were the "protectors" of Reichenau) passed to the Habsburgs in 1273, and were seized by the Swiss in 1460 with the rest of the Thurgau. In 1712 the town succeeded Baden in Aargau as the meeting-place of the Federal Diet, and continued to be the capital of the Confederation till its transformation in 1798 In 1799 it was successively occupied by the Austrians and the French The old Capuchin convent (1591–1848) is now a vicarage

FRAUENLOB, the name by which HEINRICH VON MEISSEN, a German poet of the 13th century, is generally known He seems to have acquired the sobriquet because in a famous *Liederstreit* with his rival Regenbogen he defended the use of the word *Frau* (i e, *frouwe* = lady) instead of *Weib* (*wîp* = woman) Frauenlob was born about 1250 of a humble burgher family, but he gradually acquired a reputation as a singer at the various courts of the German princes In 1278 we find him with Rudolph I in the Marchfeld, in 1286 he was at Prague at the knighting of Wenceslaus (Wenzel) II, and in 1311 he was present at a knightly festival celebrated by Waldemar of Brandenburg before Rostock After this he settled in Mainz, and there according to the popular account, founded the first school of Meistersingers (*q v*) He died on Nov 29, 1318

Frauenlob's poems make a great display of learning, he delights in far-fetched metaphors, and his versification abounds in tricks of form and rhyme They were edited by L Ettmuller in 1843, a selection will be found in K Bartsch, *Deutsche Liederdichter des 12 bis 14 Jahrhunderts* (3rd ed, 1893) An English translation of Frauenlob's *Cantica canticorum*, by A E Kroeger, with notes, appeared in 1877 at St Louis, U S A *See* A Boerkel, *Frauenlob* (2nd ed., 1881), Pfannmuller, *Frauenlobs Marienleich* (1913).

FRAUNCE, ABRAHAM (*c* 1558–1633), English poet, a native of Shropshire, was born between 1558 and 1560 He was educated at Shrewsbury and St John's College, Cambridge, where his Latin comedy of *Victoria*, dedicated to Sidney, was probably written He was called to the bar at Gray's Inn in 1588, and then apparently practised in the court of the Welsh marches After the death of Sir Philip Sidney, Fraunce was protected by Sidney's sister Mary, countess of Pembroke His last work was published in 1592, and we know nothing more until his death in 1633

His works are: *The Lamentations of Amintas for the death of Phyllis* (1587), a version in English hexameters of Thomas Watson's, Latin *Amyntas; The Lawiers Logike, exemplifying the praecepts of Logike by the practise of the common Lawe* (1588); *Arcadian Rhetorike* (1588); *Abrahami Fransi Insignium, Armorum . explicatio* (1588); *The Countess of Pembroke's Yvychurch* (1591/2), containing a translation of Tasso's *Aminta*, a reprint of his earlier version of Watson, "The Lamentation of Corydon for the love of Alexis" (Virgil, eclogue ii), a short translation from Heliodorus, and, in the third part (1592) "Aminta's Dale," a collection of "conceited" tales supposed to be related by the nymphs of Ivychurch; *The Countess of Pembroke's Emanuell* (1591); *The Third Part of the Countess of Pembroke's Ivychurch, entituled Aminta's Dale* (1592) His *Arcadian Rhetorike* owes much to earlier critical treatises, but has a special interest from its references to Spenser, and Fraunce quotes from the *Faerie Queene* a year before the publication of the first books. In "Colin Clout's come home again," Spenser speaks of Fraunce as Corydon, on account of his translations of Virgil's second eclogue His poems are written in classical metres, and he was regarded by his contemporaries as the best exponent of Gabriel Harvey's theory Even Thomas Nashe had a good word for "sweete Master Fraunce"

The Countess of Pembroke's Emanuell, hexameters on the nativity and passion of Christ, with versions of some psalms, were reprinted by Dr A B Grosart in the third volume of his *Miscellanies of the Fuller Worthies Library* (1872) Joseph Hunter in his *Chorus Vatum* stated that five of Fraunce's songs were included in Sidney's *Astrophel and Stella*, but it is probable that these should be attributed not to Fraunce, but to Thomas Campion. *See* a life prefixed to the transcription of a ms Latin comedy by Fraunce, *Victoria*, by Professor G. C Moore Smith, published in Bang's *Materialien zur Kunde des alteren englischen Dramas*, vol xiv, 1906

FRAUNHOFER, JOSEPH VON (1787–1826), German optician and physicist, was born at Straubing in Bavaria on March 6, 1787, the son of a glazier who died in 1798 He gained experience in working optical glass and obtained work at the Utzschneider optical institute at Benedictbeuern, near Munich, of which he in 1818 became sole manager; the institute was in 1819 removed to Munich. Fraunhofer acquired great skill in the manufacture of achromatic lenses and various optical instruments While measuring the refractive index of glass of various kinds he noticed and made use of the D lines in the sodium spectrum Continuing this work he observed the dark lines in the solar spectrum His researches were published in the *Denkschriften der Munchener Akademie* for 1814–15 These dark lines had been noted earlier by W H Wollaston (*Phil. Trans*, 1802), but were for the first time carefully observed by Fraunhofer, and have on that account been designated "Fraunhofer's lines" He mapped 576 of these lines, the principle of which he denoted by the letters of the alphabet from A to G, and by ascertaining their refractive indices he determined that their relative positions are constant, whether in spectra produced by the direct rays of the sun, or by the reflected light of the moon and planets The spectra of the stars he obtained by using, outside the object-glass of his telescope, a large prism through which the light passed to be brought to a focus in front of the eye-piece

In 1823 he was appointed conservator of the physical cabinet at Munich, where he died on June 7, 1826.

See J von Utzschneider, *Kurzer Umriss der Lebensgeschichte des Herrn Dr. J. von Fraunhofer* (Munich, 1826), G. Merz, *Das Leben und Wirken Fraunhofers* (Landshut, 1865)

FRAUSTADT (Polish, *Wszowa*), a town of Germany, in the Prussian province of Grenzmark, 50 m S S W of Posen by rail Pop. (1925) 7,458. Cigars and bricks are manufactured and trade is in corn and cattle Fraustadt was founded by Silesians in 1348, and afterwards belonged to the principality of Glogau

FRAYSSINOUS, DENIS ANTOINE LUC, COMTE DE (1765–1841), French prelate and statesman, was born of humble parentage at Curières on May 9, 1765 He owes his reputation mainly to the lectures on dogmatic theology delivered in the church of Saint Sulpice, Paris, from 1803 to 1809 As court preacher and almoner to Louis XVIII, he later exercised great public activity and influence. In connection with the controversy raised by the signing of the reactionary concordat of 1817, he published in 1818 his *Vrais Principes de l'église Gallicane sur la puissance ecclésiastique* The consecration of Frayssinous as bishop of Hermopolis "in partibus," his election to the French Academy, and his appointment to the grand-mastership of the university, followed in rapid succession In 1824, he became minister of public instruction and of ecclesiastical affairs under the administration of Villèle; and about the same time he was created a peer of France with the title of count. In 1828 he, along with his colleagues in the Villèle ministry, was compelled to resign office, and the subsequent revolution of July 1830 led to his retirement to Rome He died at St Géniez on Dec 12, 1841. His lectures were published in 1825 as *Défense du Christianisme* (15th ed 1843, Eng trans 1836)

See Bertrand, *Bibl Sulpicienne* (t. II. 135 *sq*, III 253) for bibliography, and G. A Henrion (*Vie de M Frayssinous*, 1844).

FRAZER, SIR JAMES GEORGE (1854–), British anthropologist, was born at Glasgow on Jan 1, 1854 Educated at Helensburgh, Glasgow university and Trinity college, Cambridge, he was elected a fellow of the latter college in 1879 and called to the bar in the same year He was knighted in 1914, received the O M in 1925 and the order of commander of the Legion of Honour in 1926 His fame as an author was established by the publication in 1890 of *The Golden Bough* (re-issued in 12 volumes under seven titles between 1907 and 1915, in 1922 appeared an abridged edition under the original title) This work is a comprehensive study of ancient cults and folk lore and covers a vast field of anthropological research In 1926 he issued vol I of *The Worship of Nature*, dealing with the worship of the sky and of the earth Among his many other publications are *Totemism* (1887), *Adonis, Attis, Osiris, Studies in the History of Oriental Religion* (1906, 2nd ed 1907, 3rd ed 1914), *Totemism and Exogamy* (1910) In his honour the Frazer Memorial lectureship has been founded by which in rotation an annual lecture on some anthropological topic, in the field in which Sir James's special activities are most prominent, is delivered at the universities with which he has been associated.

FRÉCHETTE, LOUIS HONORÉ (1839–1908), French-Canadian poet, was born at Levis, Quebec, on Nov 16, 1839, and died on June 1, 1908 He was called to the Canadian bar in 1864 He started the *Journal de Levis*, and his revolutionary doctrines compelled him to leave Canada for the United States After some years spent in journalism at Chicago he was in 1874 elected Liberal member for Levis in the Canadian parliament He lost the seat in 1878 He edited *La Patrie* and other French papers in the Dominion, and in 1889 was appointed clerk of the Quebec legislative council He was long a warm advocate of the political union of Canada and the United States, but in later life became less ardent, and in 1897 accepted the honour of C M G from Queen Victoria His works include *Mes Loisirs* (1863), *La Voix d'un exilé* (1867), a satire against the Canadian Government; *Pêle-mêle* (1877), *Les Fleurs boréales*, and *Les Oiseaux de neige* (1880), crowned by the French academy, *La Légende d'un peuple* (1887); two historical dramas, *Papineau* (1880) and *Felix Poutré* (1880), *La Noel au Canada* (1900), and several prose works and translations

See H D'Arles, *Louis Fréchette* (Toronto, 1924), *Makers of Canadian Literature*

FREDEGOND (*Fredigundis*) (d 597), Frankish queen Originally a serving-woman, she inspired the Frankish king, Chilperic I, with a violent passion At her instigation he repudiated his first wife Audovera, and strangled his second, Galswintha, Queen Brunhilda's sister A few days after this murder Chilperic married Fredegond (567) This woman exercised a most pernicious influence over him She forced him into war against Austrasia, in the course of which she procured the assassination of the victorious king Sigebert (575), she carried on a malignant struggle against Chilperic's sons by his first wife, Theodebert, Merwich and Clovis, who all died tragic deaths, and she persistently endeavoured to secure the throne for her own children Her first son Thierry, however, to whom Bishop Ragnemod of Paris stood godfather, died soon after birth, and Fredegond tortured a number of women whom she accused of having bewitched the child Her second son also died in infancy Finally, she gave birth to a child who afterwards became king as Clotaire II Shortly after the birth of this third son, Chilperic himself perished in mysterious circumstances (584) Fredegond has been accused of complicity in his murder, but with little show of probability, since in her husband she lost her principal supporter.

Henceforth Fredegond did all in her power to gain the kingdom for her child Taking refuge at the church of Notre Dame at Paris, she appealed to King Guntram of Burgundy, who took Clotaire under his protection and defended him against his other nephew, Childebert II, king of Austrasia From that time until her death Fredegond governed the western kingdom She endeavoured to prevent the alliance between King Guntram and Childebert, which was cemented by the pact of Andelot, and made several attempts to assassinate Childebert by sending against him hired bravoes armed with poisoned *scramasaxes* (heavy single-edged knives). After the death of Childebert in 595 she resolved to augment the kingdom of Neustria at the expense of Austrasia, and to this end seized some cities near Paris and defeated Theodebert at the battle of Laffaux, near Soissons Her triumph, however, was short-lived, as she died quietly in her bed in 597 soon after her victory

See V N Augustin Thierry, *Récits des temps mérovingiens* (Brussels, 1840), Ulysse Chevalier, *Bio-bibliographie* (2nd ed), *s v* "Frédégonde" (C Pr)

FREDERICIA (FRIEDERICIA), a seaport of Denmark, near the south-east corner of Jutland, on the west shore of the Little Belt opposite the island of Funen Pop (1925) 18,454 It has good railway communication, and a steam ferry connects with Middelfart, a seaside resort on Funen There are a considerable shipping trade and railway works, and industries comprise the manufacture of tobacco, salt and chicory, and of cotton goods A small fort was erected on the site of Fredericia by Christian IV of Denmark, and his successor, Frederick III, determined about 1650 to make it a powerful fortress The town first bore the name of Frederiksodde, and only received its present designation in 1664 In 1657 it was taken by the Swedes and in 1659, after the fortress had been dismantled, it was occupied by Frederick William of Brandenburg It was refortified in 1709–10 Monuments in the town and vicinity commemorate the fighting of 1849 with the Prussians The fortress was strengthened again in 1864 and stood a short siege before the Austro-Prussian occupation

FREDERICK, "king or lord of peace" (Ger *Friedrich* Ital *Federigo*, Fr *Frédéric* and *Fédéric*) A Christian name borne by many European sovereigns and princes

FREDERICK I. (*c* 1123–1190), Holy Roman emperor, called "Barbarossa" or "Redbeard" by the Italians, was the son of Frederick II of Hohenstaufen duke of Swabia, and Judith, daughter of the Welf Henry IX, duke of Bavaria When his father died in 1147 Frederick became duke of Swabia, and immediately afterwards accompanied his uncle, the German king Conrad III, on his disastrous crusade, during which he won the complete confidence of the king In 1152 the dying king advised the princes to choose Frederick as his successor to the exclusion of his own young son Frederick was chosen German king at Frankfurt on March 5, 1152, and crowned at Aix-la-Chapelle on the 9th, owing his election partly to his personal qualities, and partly to the fact that he united in himself the blood of the rival families of Welf and Waiblingen

The new king saw clearly that the restoration of order in Germany was a necessary preliminary to the enforcement of the imperial rights in Italy Issuing a general order for peace, he was prodigal in his concessions to the nobles Abroad Frederick decided a quarrel for the Danish throne in favour of Svend, or Peter as he is sometimes called, who did homage for his kingdom, and negotiations were begun with the East Roman emperor, Manuel Comnenus About this time he obtained a divorce from his wife Adela, on the ground of consanguinity, and made a vain effort to obtain a bride from the court of Constantinople On his accession Frederick had communicated the news of his election to Pope Eugenius III, but neglected to ask for the papal confirmation But a treaty was concluded between king and pope at Constance in March 1153, by which Frederick promised in return for his coronation to make no peace with Roger I king of Sicily, or with the rebellious Romans, without the consent of Eugenius, and generally to help and defend the papacy

The journey to Italy made by the king in 1154 was the precursor of five other expeditions which engaged his main energies for 30 years, during which the subjugation of the peninsula was the central and abiding aim of his policy He was crowned emperor at Rome on June 18, 1155 He left Italy in the autumn of 1155 to prepare for a new and more formidable campaign Disorder was again rampant in Germany, especially in Bavaria, but general peace was restored by Frederick's vigorous measures Bavaria was transferred from Henry II Jasomirgott, margrave of

Austria, to Henry the Lion, duke of Saxony; and the former was pacified by the erection of his margraviate into a duchy, while Frederick's step-brother Conrad was invested with the Palatinate of the Rhine On June 9, 1156 the king was married at Wurzburg to Beatrix, daughter and heiress of the dead count of Upper Burgundy, Renaud III, when Upper Burgundy or Franche Comté, as it is sometimes called, was added to his possessions An expedition into Poland reduced Duke Boleslaus IV to submission, after which Frederick received the homage of the Burgundian nobles at Besançon in Oct 1157

In June 1158 Frederick set out upon his second Italian expedition, during which imperial officers called *podestas* in the cities of northern Italy, captured revolted Milan, and the long struggle began with pope Alexander III, who excommunicated the emperor on March 2, 1160 During this visit Frederick summoned the doctors of Bologna to Roncaglia in November 1158, and as a result of their inquiries into the rights belonging to the kingdom of Italy he obtained a large amount of wealth Returning to Germany towards the close of 1162, Frederick prevented a conflict between Henry the Lion, duke of Saxony, and a number of neighbouring princes, and severely punished the citizens of Mainz for their rebellion against archbishop Arnold In 1163 his plans for the conquest of Sicily were checked by a powerful league against him provoked by the exactions of the *podestas* and the enforcement of the rights declared by the doctors of Bologna Frederick had supported an anti-pope Victor IV against Alexander, and on Victor's death in 1163 a new anti-pope called Paschal III was chosen to succeed him At a diet at Wurzburg in May 1165 he took an oath, followed by many of the clergy and nobles, to remain true to Paschal and his successors A temporary alliance with Henry II, king of England, the magnificent celebration of the canonization of Charlemagne at Aix-la-Chapelle, and the restoration of peace in the Rhineland, occupied Frederick's attention until Oct 1166, when he made his fourth journey to Italy Having captured Ancona, he marched to Rome, stormed the Leonine city, and procured the enthronement of Paschal, and the coronation of his wife Beatrix, but the sudden outbreak of a pestilence destroyed the German army and drove the emperor to Germany During the next six years the imperial authority was asserted over Bohemia, Poland and Hungary Friendly relations were entered into with the emperor Manuel, and a better understanding was sought with Henry II, king of England, and Louis VII, king of France

In 1174, Frederick made his fifth expedition to Italy The campaign was a complete failure The refusal of Henry the Lion to bring help into Italy was followed by the defeat of the emperor at Legnano on May 29, 1176, when he was wounded and believed to be dead He concluded with Alexander the treaty of Venice (Aug 1177), and at the same time a truce with the Lombard league was arranged for six years Frederick, loosed from the papal ban, recognized Alexander, and in July 1177 knelt before him and kissed his feet The possession of the vast estates left by Matilda, marchioness of Tuscany, and claimed by both pope and emperor, was to be decided by arbitration and in Oct 1178 the emperor was again in Germany Henry the Lion was deprived of his duchy, and sent into exile, a treaty was made with the Lombard league at Constance in June 1183, and Frederick's son Henry was betrothed in 1184 to Constance, daughter of Roger I, king of Sicily, and heiress of the reigning king, William II This betrothal, which threatened to unite Sicily with the Empire, made it difficult for Frederick, when during his last Italian expedition in 1184 he met Pope Lucius III at Verona, to establish friendly relations with the papacy The question of Matilda's estates was left undecided, and Lucius had refused to crown Henry or to recognize the German clergy who had been ordained during the schism. Frederick then formed an alliance with Milan, where the emperor, who had been crowned king of Burgundy, or Arles, at Arles on July 30, 1178, had this ceremony repeated (Jan 27, 1186); while his son Henry was crowned king of Italy and married to Constance, who was crowned queen of Germany

The quarrel with the papacy was continued with the new pope Urban III., and open warfare was begun. But Frederick was recalled to Germany by the news of a revolt raised by Philip of Heinsberg, archbishop of Cologne, and instigated by the pope Hostilities were checked by the death of Urban and the election of a new pope as Gregory VIII In 1188 Philip submitted, and immediately afterwards Frederick joined the Third Crusade He left Regensburg in May 1189 at the head of a splendid army, and having overcome the hostility of the Eastern Roman emperor Isaac Angelus, marched into Asia Minor. On June 10, 1190, Frederick was either bathing or crossing the river Calycadnus (Geuksu), near Seleucia (Selefke) in Cilicia, when he was drowned The place of his burial is unknown, and the legend which says he still sits in a cavern in the Kyffhauser mountain in Thuringia waiting until the need of his country shall call him, is now thought to refer, at least in its earlier form, to his grandson, the emperor Frederick II He left by his wife, Beatrix, five sons, of whom the eldest afterwards became emperor as Henry VI

Frederick encouraged the growth of towns, easily suppressed the few risings against his authority, and took strong and successful measures to establish order in Germany His power rested upon his earnest and commanding personality, and also upon the support which he received from the German church, the possession of a valuable private domain, and the care with which he exacted feudal dues from his dependents Even in Italy, though his general course of action was warped by wrong prepossessions, he in many instances showed exceptional practical sagacity in dealing with immediate difficulties and emergencies From the beginning, however, he treated the Italians, as indeed was only natural, less as rebellious subjects than as conquered aliens

In appearance Frederick was a man of well-proportioned, medium stature, with flowing yellow hair and a reddish beard He delighted in hunting and the reading of history, was zealous in his attention to public business, and his private life was unimpeachable Carlyle called him "a terror to evil-doers and a praise to well-doers in this world, probably beyond what was ever seen since"

The principal contemporary authority for the earlier part of the reign of Frederick is the *Gesta Friderici imperatoris*, mainly the work of Otto, bishop of Freising This is continued from 1156 to 1160 by Rahewin, a canon of Freising, and from 1160 to 1170 by an anonymous author The various annals and chronicles of the period are to be found in the *Monumenta Germaniae historica Scriptores* (Hanover and Berlin, 1826–92), many valuable documents are found in the *Monumenta Germaniae selecta*, vol iv, edited by M Doeberl (Munich, 1889–90)

See also, J Jastrow, *Deutsche Geschichte im Zeitalter der Hohenstaufen* (1893), W von Giesebrecht, *Geschichte der deutschen Kaiserzeit*, vol iv (Brunswick, 1877), H von Bunau, *Leben und Thaten Friedrichs I.* (Leipzig, 1872), H Prutz, *Kaiser Friedrich I* (Dantzig, 1871–74), C Peters, "Die Wahl Kaiser Friedrichs I" in the *Forschungen zur deutschen Geschichte*, vol xx (Gottingen, 1862–86), W Gundlach, *Barbarossalieder* (Innsbruck, 1899) For a complete bibliography *see* Dahlmann-Waitz, *Quellenkunde der deutschen Geschichte* (Gottingen, 1894), and U Chevalier, *Répertoire des sources historiques du moyen âge*, vol ii (1904) *See* further W Stubbs, *Germany in the Early Middle Ages* (1908), and *Germany in the Later Middle Ages* (1908)

FREDERICK II. (1194–1250), Holy Roman emperor, king of Sicily and Jerusalem, was son of the emperor Henry VI and Constance of Naples, daughter of Roger I, king of Sicily, and therefore grandson of the emperor Frederick I Born at Jesi near Ancona on Dec 26, 1194, and chosen German king at Frankfort in 1196, he was baptized Frederick Roger, and after his father's death crowned king of Sicily at Palermo on May 17, 1198 His mother, who assumed the government, died in November 1198, leaving Pope Innocent III as regent of Sicily and guardian of her son In 1208 he was declared of age, and in 1209 he married Constance, daughter of Alphonso II king of Aragon, and widow of Emerich or Imre, king of Hungary In September 1211, a number of influential German princes met at Nuremberg, declared Otto IV deposed, and invited Frederick to come and occupy the vacant throne He accepted the invitation; and having recognized the papal supremacy over Sicily, and procured the coronation of his son Henry as its king, he reached Germany in the autumn of 1212 Frederick was welcomed in Swabia, and the renown of the Hohenstaufen name and a liberal distribution of promises made his

progress easy. He was chosen German king a second time at Frankfort on Dec. 5, 1212, and crowned Dec. 9, at Mainz Anxious to retain the pope's support, Frederick promulgated a bull at Eger on July 12, 1213, by which he renounced all lands claimed by the pope since the death of the emperor Henry VI. in 1197, gave up the right of spoils and all interference in episcopal elections, and acknowledged the right of appeal to Rome He again affirmed the papal supremacy over Sicily, and promised to root out heresy in Germany He had allied himself with Philip Augustus of France against Otto, and the victory of his French allies at Bouvines on July 27, 1214 greatly strengthened his position He was crowned the German king at Aix-la-Chapelle on July 25, 1215 In May 1218 the death of Otto left him undisputed ruler of Germany His son Henry was brought to Germany and chosen by the princes German king at Frankfort in April 1220, though Frederick assured the new pope, Honorius III , that this step, which would involve the future union of Sicily with Germany, had been taken without his consent In August 1220 Frederick set out for Italy, and was crowned emperor at Rome on Nov 22, 1220; after which he repeated the undertaking he had entered into at Aix-la-Chapelle in 1215 to go on crusade, and made lavish promises to the Church The clergy were freed from taxation and from lay jurisdiction, the ban of the Empire was to follow the ban of the Church, and heretics were to be severely punished

But Frederick was occupied until 1225 in restoring order in Sicily The island was seething with disorder, but by stern and sometimes cruel measures the emperor suppressed anarchy Meanwhile the crusade was postponed again and again; until under a threat of excommunication, after the fall of Damietta in 1221, Frederick definitely undertook to set out in August 1227 On Nov 9, 1225, he married his second wife Iolande (Yolande or Isabella), daughter of John, count of Brienne, titular king of Jerusalem She died in 1227 Frederick then himself assumed the title of king of Jerusalem He then summoned a diet at Cremona, but the cities, watchful and suspicious, renewed the Lombard league and took up a hostile attitude Frederick's reply was to annul the treaty of Constance and place the cities under the imperial ban; but he was forced by lack of military strength to accept the mediation of Pope Honorius and the maintenance of the *status quo*

After these events, which occurred early in 1227, preparations for the crusade were pressed on, and the emperor sailed from Brindisi on Sept 8 A pestilence, however, which attacked his forces compelled him to land in Italy three days later, and on the 29th of the same month he was excommunicated by the new pope, Gregory IX The greater part of the succeeding year was spent by pope and emperor in a violent quarrel Alarmed at the increase in his opponent's power, Gregory denounced him in a public letter, to which Frederick replied in a clever document addressed to the princes of Europe The reading of this manifesto, drawing attention to the absolute power claimed by the popes, was received in Rome with such evidences of approval that Gregory was compelled to fly to Viterbo Frederick again set sail for Palestine, where he met with considerable success, the result of diplomatic rather than of military skill By a treaty made in February 1229 he secured possession of Jerusalem, Bethlehem, Nazareth and the surrounding neighbourhood Entering Jerusalem, he crowned himself king of that city on March 18, 1229. These successes had been won in spite of the hostility of Gregory, which deprived Frederick of the assistance of many members of the military orders and of the clergy of Palestine But although the emperor's possessions on the Italian mainland had been attacked in his absence by the papal troops and their allies, Gregory's efforts had failed to arouse serious opposition in Germany and Sicily; so that when Frederick returned unexpectedly to Italy in June 1229 he had no difficulty in driving back his enemies, and compelling the pope to sue for peace By the treaty of San Germano (July 1230), the emperor, loosed from the ban, promised to respect the papal territory, and to allow freedom of election and other privileges to the Sicilian clergy Frederick then pacified Sicily. In 1231 a series of laws were published at Melfi which destroyed the ascendancy of the feudal nobles. Royal officials were appointed for administrative purposes, large estates were recovered for the crown, and fortresses were destroyed, while the church was placed under the royal jurisdiction and all gifts to it were prohibited. At the same time certain privileges of self-government were granted to the towns, representatives from which were summoned to sit in the diet. In short, by means of a centralized system of government, the king established an almost absolute monarchical power.

In Germany, an entirely different policy was pursued. The concessions granted by Frederick in 1220, together with the Privilege of Worms, dated May 1, 1231, made the German princes virtually independent All jurisdiction over their lands was vested in them, no new mints or toll-centres were to be erected on their domains, and the imperial authority was restricted to a small and dwindling area A fierce attack was made on the rights of the cities. Compelled to restore all their lands, their jurisdiction was bounded by their city-walls, they were forbidden to receive the dependents of the princes, all trade gilds were declared abolished, and all official appointments made without the consent of the archbishop or bishop were annulled A further attack on the Lombard cities at the diet of Ravenna in 1231 was answered by a renewal of their league, and was soon connected with unrest in Germany About 1231 a breach took place between Frederick and his elder son Henry, who appears to have opposed the Privilege of Worms and to have favoured the towns against the princes After refusing to travel to Italy, Henry changed his mind and submitted to his father at Aquileia in 1232; and a temporary peace was made with the Lombard cities in June 1233. But on his return to Germany Henry again raised the standard of revolt, and made a league with the Lombards in December 1234 Frederick, meanwhile, having helped Pope Gregory against the rebellious Romans and having secured the friendship of France and England, appeared in Germany early in 1235 and put down this rising without difficulty Henry was imprisoned, but his associates were treated leniently In August 1235 a splendid diet was held at Mainz, during which the marriage of the emperor with Isabella (1214–1241), daughter of John, king of England, was celebrated A general peace (*Landfrieden*), which became the basis of all such peaces in the future, was sworn to, a new office, that of imperial justiciar, was created, and a permanent judicial record was first instituted Otto of Brunswick, grandson of Henry the Lion, duke of Saxony, was made duke of Brunswick-Luneburg, and war was declared against the Lombards

Frederick was now at the height of his power His second son, Conrad, was invested with the duchy of Swabia, and the claim of Wenceslaus, king of Bohemia, to some lands which had belonged to the German king Philip was bought off. The attitude of Frederick II (the Quarrelsome), duke of Austria, had been considered by the emperor so suspicious that during a visit paid by Frederick to Italy a war against him was begun. Compelled to return by the ill-fortune which attended this campaign, the emperor took command of his troops, seized Austria, Styria and Carinthia, and declared these territories to be immediately dependent on the Empire In January 1237 he secured the election of his son Conrad as German king at Vienna, and in September went to Italy to prosecute the war which had broken out with the Lombards in the preceding year Pope Gregory attempted to mediate, but the cities refused to accept the insulting terms offered by Frederick The emperor gained a great victory over their forces at Cortenuova (Nov. 27, 1237); but his failure to take Brescia in October 1238, together with the changed attitude of Gregory, turned the fortune of war. The pope had become alarmed by the project of marriage between the heiress of Sardinia, Adelasia, and Frederick's natural son Enzio, who afterwards assumed the title of king of Sardinia. But as his warnings had been disregarded, he made an alliance with the Lombards, and excommunicated (Mar. 20, 1239), the emperor A violent war of words ensued. Frederick, accused of heresy, blasphemy and other crimes, called upon all kings and princes to unite against the pope, who on his side used his emissaries, a crowd of wandering friars, to preach rebellion in Germany. It was, however, impossible to find an anti-king. In Italy, Spoleto and Ancona were declared part of the imperial dominions, and Rome itself was threatened. A number of ecclesiastics proceeding to a council called by Gregory were captured by Enzio at the sea-

fight of Meloria, and the emperor was about to undertake the siege of Rome when the pope died (August 1241) Germany was at this time menaced by the Mongols; but Frederick contented himself with issuing directions for a campaign against them, until in 1242 he was able to pay a short visit to Germany, where he gained some support from the towns by grants of extensive privileges

Gregory's immediate successor, Pope Celestine IX, died soon after his election, and after a delay of eighteen months, during which Frederick marched against Rome on two occasions and devastated the lands of his opponents, one of his partisans, Sinibaldo Fiesco, was chosen pope, and took the name of Innocent IV Negotiations for peace were begun, but the relations of the Lombard cities to the Empire could not be adjusted, and when the emperor began again to ravage the papal territories Innocent fled to Lyons. Hither he summoned a general council, which met in June 1245, but although Frederick sent his justiciar, Thaddeus of Suessa, to represent him, and expressed his willingness to treat, sentence of excommunication and deposition was pronounced against him Accused by Innocent of violating treaties, breaking oaths, persecuting the church and abetting heresy, Frederick replied by an open letter rebutting these charges, and denouncing the clergy and threatening the confiscation of their wealth In vain the mediation of the saintly king of France, Louis IX, was invoked Innocent declared Frederick deposed, and ordered the Germans to elect a new king War soon became general in Germany and Italy Henry Raspe, landgrave of Thuringia, was chosen German king in opposition to Frederick in May 1246, but neither he nor his successor, William II, count of Holland, could drive the Hohenstaufen from Germany. In Italy, during the emperor's absence, his cause had been upheld by Enzio and by the ferocious Eccelino da Romano In 1246 a formidable conspiracy of the discontented Apulian barons against the emperor was crushed with ruthless cruelty Suddenly news reached Frederick that Parma, a stronghold of the imperial authority in the north, had been surprised, while the garrison was off its guard, by the Guelphs. He therefore concentrated his forces on the city, building over against it a wooden town which, in anticipation of the success that astrologers had predicted, he named Vittoria The siege was protracted, and finally, in February 1248, during the absence of the emperor on a hunting expedition, was brought to an end by a sudden sortie of the men of Parma, who stormed the imperial camp The emperor's forces were destroyed or scattered, the treasury, with the imperial insignia, together with Frederick's harem and some of the most trusted of his ministers, fell into the hands of the victors Thaddeus of Suessa was hacked to pieces by the mob; the imperial crown was placed in mockery on the head of a hunch-backed beggar, who was carried back in triumph into the city

Frederick's old confidence had left him, he had grown moody and suspicious, and his temper gave a ready handle to his enemies Pier della Vigna, accused of treasonable designs, was disgraced, and the once all-powerful favourite and minister, blinded now and in rags, was dragged in the emperor's train, as a warning to traitors, till in despair he dashed out his brains Then, in May 1248, the tidings of Enzio's capture by the Bolognese broke the emperor's spirit He retired to southern Italy, and after a short illness died at Fiorentino on Dec 13, 1250, after having been loosed from the ban by the archbishop of Palermo He was buried in the cathedral of that city, where his splendid tomb may still be seen. By his will he appointed his son Conrad to succeed him in Germany and Sicily, and Henry, his son by Isabella of England, to be king of Jerusalem or Arles, neither of which kingdoms, however, he obtained Frederick left several illegitimate children: Enzio has already been referred to; Frederick, who was made the imperial vicar in Tuscany; and Manfred, his son by the beloved Bianca Lancia or Lanzia, who was legitimatized just before his father's death, and was appointed by his will prince of Tarento and regent of Sicily.

The character of Frederick is one of extraordinary interest and versatility, and contemporary opinion is expressed in the words *stupor mundi et immutator mirabilis*. Licentious and luxurious in his manners, cultured and catholic in his tastes, he united in his person the most diverse qualities. His Sicilian court was a centre of intellectual activity. Michael Scot, the translator of some treatises of Aristotle and of the commentaries of Averroes, Leonard of Pisa, who introduced Arabic numerals and algebra to the West, and other scholars, Jewish and Mohammedan as well as Christian, were welcome at his court Frederick himself had a knowledge of six languages, was acquainted with mathematics, philosophy and natural history, and took an interest in medicine and architecture In 1224 he founded the university of Naples, and he was a liberal patron of the medical school at Salerno He formed a menagerie of strange animals, and wrote a treatise on falconry (*De arte venandi cum avibus*) which is remarkable for its accurate observation of the habits of birds[1] It was at his court, too, that—as Dante points out—Italian poetry had its birth Pier della Vigna there wrote the first sonnet, and Italian lyrics by Frederick himself are preserved to us His wives were kept secluded in oriental fashion; a harem was maintained at Lucera, and eunuchs were a prominent feature of his household His religious ideas have been the subject of much controversy Frederick's rule in Germany and Italy was a failure, but this fact may be accounted for by the conditions of the time and the inevitable conflict with the papacy In Germany the enactments of 1220 and 1231 contributed to the disintegration of the Empire and the fall of the Hohenstaufen, while conflicting interests made the government of Italy a problem of exceptional difficulty In Sicily Frederick was more successful He quelled disorder, and under his rule the island was prosperous and contented His ideas of government were those of an absolute monarch, and he probably wished to surround himself with some of the pomp which had encircled the older emperors of Rome. His chief claim to fame, perhaps, is as a lawgiver The code of laws which he gave to Sicily in 1231 bears the impress of his personality, and has been described as "the fullest and most adequate body of legislation promulgated by any western ruler since Charlemagne" Without being a great soldier, Frederick was not unskilful in warfare, but was better acquainted with the arts of diplomacy In person he is said to have been "red, bald and short-sighted," but with good features and a pleasing countenance It was believed in Germany for about a century after his death that Frederick was still alive, and many impostors attempted to personate him A legend, afterwards transferred to Frederick Barbarossa, told how he sat in a cavern in the Kyffhäusser before a stone table through which his beard had grown, waiting for the time for him to awake and restore to the Empire the golden age of peace

The contemporary documents relating to the reign of Frederick II are very numerous Many of the more important ones are given in the *Historia diplomatica Friderici II*, edited by M Huillard-Bréholles (Paris, 1852–61), *Acta imperii selecta Urkunden deutscher Konige und Kaiser*, edited by J. F. Bohmer and J Ficker (Innsbruck, 1870); *Acta imperii inedita seculi XIII. Urkunden und Briefe zur Geschichte des Kaiserreichs und des Konigreichs Sicilien*, edited by E Winkelmann (Innsbruck, 1880); *Epistolae saeculi XIII. selecta e regestis pontificum Romanorum*, edited by C Rodenberg, tome I (Berlin, 1883); P Pressutti, *Regesta Honorii papae III.* (Rome, 1888); L Auvray, *Les Registres de Grégoire IX.* (Paris, 1890)

The best modern authorities are M Huillard-Bréholles, *Vie et corr. de Pierre de la Vigne* (1865); F von Raumer, *Geschichte der Hohenstaufen* (vols III & IV., 5th ed, 1878), C. Kohler, *Das Verhältnis Kaiser Friedrichs II zu den Papsten seiner Zeit* (Breslau, 1888), W. von Giesebrecht, *Gesch. der deut Kaiserzeit*, vol V (Leipzig, 1888), G. Blondel, *Etude sur la politique de l'empereur Frédéric II en Allemagne* (1892); K Hampe, *Kaiser Friedrich II* (Munich, 1899); A Folz, *Kaiser Friedrich II und Papst Innocenz IV ihr Kampf 1244–45* (1905); W. Cohn, *Das Zeitalter der Hohenstaufen in Sizilien* (1925).

FREDERICK III. (1415–1493), Holy Roman emperor—as Frederick IV., German king; as Frederick V, archduke of Austria,—son of Ernest of Habsburg, duke of Styria and Carinthia, was born at Innsbruck on Sept 21, 1415. After his father's death in 1424 he lived at the court of his uncle and guardian, Frederick IV, count of Tirol In 1435, together with his brother, Albert the Prodigal, he undertook the government of Styria and Carinthia, but there were constant feuds between the brothers, which lasted until Albert's death in 1463. In 1439 the deaths of the German king Albert II. and of Frederick of Tirol left Frederick

[1] First printed at Augsburg in 1596; German edition by Schöpffer (Berlin, 1896).

the senior member of the Habsburg family, and guardian of Sigismund, count of Tirol In the following year he also became guardian of Ladislaus, the posthumous son of Albert II, and heir to Bohemia, Hungary and Austria On Feb 2, 1440 Frederick was chosen German king at Frankfort, but, owing to his absence from Germany, the coronation at Aix-la-Chapelle was delayed until June 17, 1442

Disregarding the neutral attitude of the German electors towards the papal schism, and acting under the influence of Aeneas Sylvius Piccolomini, afterwards Pope Pius II, Frederick in 1445 made a secret treaty with Pope Eugenius IV This developed into the Concordat of Vienna, signed in 1448 with the succeeding pope, Nicholas V, by which the king, in return for a sum of money and a promise of the imperial crown, pledged the obedience of the German people to Rome, and so checked for a time the rising tide of liberty in the German church Taking up the quarrel between the Habsburgs and the Swiss cantons, Frederick invited the Armagnacs to attack his enemies, but after meeting with a stubborn resistance at St Jacob on Aug 26, these allies proved faithless, and the king soon lost every vestige of authority in Switzerland In 1451 Frederick, disregarding the revolts in Austria and Hungary, travelled to Rome where, on March 16, 1452, his marriage with Leonora of Portugal was celebrated, and three days later he was crowned emperor by pope Nicholas He was the last emperor crowned in Rome On his return he found Germany seething with indignation His capitulation to the pope was not forgotten, his refusal to attend the diets, and his apathy in the face of Turkish aggressions, constituted a serious danger, and plans for his deposition failed only because the electors could not unite upon a rival king

In 1457 Ladislaus, king of Hungary and Bohemia, and archduke of Austria, died, Frederick failed to secure either kingdom, but obtained lower Austria, from which however, he was soon driven by his brother Albert, who occupied Vienna On Albert's death in 1463 the emperor united upper and lower Austria under his rule, but these possessions were constantly ravaged by George Poděbrad, king of Bohemia, and by Matthias Corvinus, king of Hungary A visit to Rome in 1468 to discuss measures against the Turks with Pope Paul II had no result, and in 1470 Frederick began negotiations for a marriage between his son Maximilian and Mary, daughter and heiress of Charles the Bold, duke of Burgundy. The emperor met the duke at Treves in 1473, when Frederick, unwilling to bestow the title of king upon Charles, left the city secretly, but brought about the marriage after the duke's death in 1477 Again attacked by Matthias, the emperor was driven from Vienna (1490), and soon handed over the government of his lands to Maximilian, whose election as king of the Romans he vainly opposed in 1486. Frederick then retired to Linz, where he passed his time in the study of botany, alchemy and astronomy, until his death on Aug 19, 1493

Frederick was a listless and incapable ruler, lacking alike the qualities of the soldier and of the diplomatist, but possessing a certain cleverness in evading difficulties With a fine presence, he had many excellent personal qualities, is spoken of as mild and just, and had a real love of learning He contributed to the aggrandisement of his family by the marriage of Maximilian with Mary of Burgundy, and delighted to inscribe his books and other articles of value with the letters A E I O U (*Austriae es imperare orbi universo;* or in German, *Alles Erdreich ist Oesterreich unterthan*) His tomb, in red and white marble, is in the cathedral of St Stephen at Vienna

See Aeneas Sylvius Piccolomini, *De rebus et gestis Friderici III* (trans Th Ilgen, Leipzig, 1889), J Chmel, *Geschichte Kaiser Friedrichs IV und seines Sohnes Maximilians I* (Hamburg, 1840), A Bachmann, *Deutsche Reichsgeschichte im Zeitalter Friedrichs III und Maximilians I* (Leipzig, 2 vols, 1884–94); A. Huber, *Geschichte Osterreichs* (Gotha, 1885–92)

FREDERICK II. (1534–1588), king of Denmark and Norway, son of Christian III, was born at Hadersleben on July 1, 1534 His mother, Dorothea of Saxe-Lauenburg, was the elder sister of Catherine, the first wife of Gustavus Vasa and the mother of Eric XIV. The two little cousins, born the same year, were destined to be lifelong rivals At the age of two Frederick was proclaimed successor to the throne at the *Rigsdag* of Copenhagen (Oct. 30, 1536), and homage was done to him at Oslo for Norway in 1548 He married his cousin, Sophia of Mecklenburg, on July 20, 1572

The reign of Frederick II falls into two well-defined periods, one of war, 1559–70; and the other of peace, 1570–88 The period of war began with the Ditmarsh expedition, when the independent peasant-republic of the Ditmarshers of West Holstein, which had stoutly maintained its independence for centuries against the counts of Holstein and the Danish kings, was subdued by a Dano-Holstein army of 20,000 men in 1559, Frederick and his uncles John and Adolphus, dukes of Holstein, dividing the land between them Frederick was also victorious in the Scandinavian Seven Years' War There were many causes of quarrel between Denmark and Sweden, but the detention at Copenhagen in 1563 of an embassy on its way to Germany, to negotiate a match between Eric XIV of Sweden and Christina of Hesse, which King Frederick for political reasons was determined to prevent, precipitated hostilities The war was very unpopular in Denmark, and the closing of the Sound against foreign shipping, in order to starve out Sweden, had exasperated the maritime powers and all the Baltic states On New Year's Day, 1570, Frederick threatened to abdicate, but the peace of Stettin (Dec 13, 1570) reconciled all parties, and though Frederick had now to relinquish his ambitious dream of re-establishing the Union of Kalmar, he had at least succeeded in maintaining the supremacy of Denmark in the north

After the peace Frederick aspired to the dominion of all the seas which washed the Scandinavian coasts, and before he died he suppressed the pirates who for so long had haunted the Baltic and the German Ocean He also erected the fortress of Kronborg, to guard the Sound Frederick gave free scope to ministers whose superiority in their various departments he frankly recognized, rarely interfering personally unless absolutely called upon to do so His influence, always great, was increased by his genial and unaffected manners as a host He was one of the few kings of the house of Oldenburg who had no illicit *liaison* He died at Antvorskov on April 4, 1588 No other Danish king was ever so beloved by his people

See *Lund (Troels), Danmarks og Norges Historie i Slutningen af det XVI Aarh* (Copenhagen, 1879), *Danmarks Riges Historie* (Copenhagen, 1897–1905), vol 3, R N Bain, *Scandinavia,* cap 4 (Cambridge, 1905)

FREDERICK III. (1286?–1330), surnamed "the Fair," German king and duke of Austria, was the second son of the German king, Albert I In 1298, when his father was chosen king, Frederick was invested with some of the family lands (*see* HABSBURG), and in 1306, when his elder brother Rudolph became king of Bohemia, he succeeded to the duchy of Austria In 1307 Rudolph died, and Frederick failed to obtain the Bohemian throne Neither did he obtain the German crown on his father's death in 1308, and the relations between the new king, Henry VII, and the Habsburgs were far from friendly Frederick asked to be confirmed in the possession of Austria, and be invested with Moravia, a demand which Henry refused, and the duke eventually agreed to renounce Moravia in return for a payment of 50,000 marks Frederick then became involved in a quarrel with his cousin Louis IV, duke of Upper Bavaria (afterwards the emperor Louis IV), over the guardianship of Henry II, duke of Lower Bavaria He was defeated by Louis at the battle of Gammelsdorf (Nov 9, 1313), and compelled to renounce his claim.

Meanwhile the emperor Henry VII had died in Italy, and a stubborn contest ensued for the vacant throne After a long delay Frederick was chosen German king at Frankfort by a minority of the electors on Oct 19, 1314, while a majority elected Louis of Bavaria Six days later Frederick was crowned at Bonn by the archbishop of Cologne, and war broke out between the rivals Frederick drew his chief strength from southern and eastern Germany, and was supported by the full power of the Habsburgs The struggle continued for seven years. At Mühldorf (Sept 28, 1322) Frederick was finally defeated and sent as a prisoner to Trausnitz, where he remained for three years Then

by the treaty of Trausnitz (March 13, 1325) Frederick acknowledged the kingship of Louis in return for freedom, and promised to return to captivity unless he could induce his brother Leopold to make a similar acknowledgment As Leopold refused, Frederick, although released from his oath by Pope John XXII, returned to Bavaria It was agreed that Frederick should govern Germany while Louis went to Italy for the imperial crown But this arrangement did not prove generally acceptable, and the death of Leopold in 1326 deprived Frederick of a powerful supporter. He returned to Austria, and died at Gutenstein on Jan 13, 1330 He was buried at Mauerbach, whence his remains were removed in 1783 to the cathedral of St Stephen at Vienna He married Elizabeth, daughter of James I, king of Aragon, and left two daughters His voluntary return into captivity is used by Schiller in his poem *Deutsche Treue*, and by J. L. Uhland in the drama *Ludwig der Bayer*

See E M Furst von Lichnowsky, *Geschichte des Hauses Habsburg* (Vienna, 1836–44), H Schrohe, *Der Kampf der Gegenkonige Ludwig und Friedrich* (1902), Vancsa, *Geschichte Nieder- und Oberosterreichs* (vol 2, 1926)

FREDERICK III. (1609–1670), king of Denmark and Norway, son of Christian IV and Anne Catherine of Brandenburg, was born on March 18, 1609 at Hadersleben While still a lad he became successively bishop of Bremen, bishop of Verden and coadjutor of Halberstadt, while at the age of 18 he was the chief commandant of the fortress of Stade In 1643 he married Sophia Amelia of Brunswick-Luneburg During the disastrous Swedish War of 1643–45 Frederick was appointed *generalissimo* of the duchies by his father, he quarrelled with the Earl-Marshal Anders Bille, who commanded the Danish forces, and the Danish nobility began to regard him with extreme distrust The death of his elder brother Christian in June 1647 opened to him the prospect of the succession, but the question was still unsettled when Christian IV died on Feb 28, 1648 On July 6 Frederick III was acknowledged king, after he had signed a *Haandfaestning* or charter, by which the already diminished royal prerogative was still further curtailed

Frederick lacked the brilliant qualities of his impulsive, jovial father, but he possessed compensating virtues of moderation, sobriety and self-control He rightly regarded the accession of Charles X of Sweden (June 6, 1654) as a source of danger to Denmark Charles's invasion of Poland (July 1654) came as a distinct relief to the Danes, who had feared an attack on themselves, but even the Polish War was full of latent peril to Denmark Frederick resolved on a rupture with Sweden at the first convenient opportunity The *Rigsdag* of 1657 granted subsidies for mobilization and other military expenses, on April 23 Frederick received the assent of the majority of the *Rigsraad* to an attack on Sweden's German provinces, in the beginning of May the still pending negotiations with Sweden were broken off, and on June 1 Frederick signed the manifesto justifying a war which was never formally declared The Swedish king traversed all the plans of his enemies by his passage of the frozen Belts, in January and February 1658 (*see* CHARLES X of Sweden) Frederick III at once sued for peace, and, persuaded by the English and French ministers, Charles finally agreed to be content with mutilating instead of annihilating the Danish monarchy (treaties of Taastrup, Feb 18, and of Roskilde, Feb 26, 1658). The conclusion of peace was followed by a remarkable episode Charles X was the Danish king's guest for three days (March 3–5) at the castle of Fredriksborg, and friendship seemed to be established. But on July 17, without any reasonable cause, without a declaration of war, in defiance of all international equity, Charles again attacked Denmark

The main Swedish army landed at Korsor in Zealand None had anticipated the sudden and brutal attack, and the Danish capital was inadequately fortified and garrisoned. The Danes had only three days' warning of the approaching danger; and the vast and dilapidated line of defence had at first but 2,000 regular defenders. But Government and people displayed exemplary energy, under the constant supervision of the king, the queen and burgomaster Hans Nansen Charles X began a regular siege, which he abandoned when, on Oct 29, an auxiliary Dutch fleet, after reinforcing and reprovisioning the garrison, defeated, in conjunction with the Danish fleet, the Swedish navy of 44 liners in the Sound The traditional loyalty of the Danish middle classes was transformed into a boundless enthusiasm for the king personally, and for a brief period Frederick found himself the most popular man in his kingdom He used his popularity to convert an elective into an absolute monarchy by the Revolution of 1660 (*see* DENMARK: *History*). Frederick III died on Feb 6, 1670 at the castle of Copenhagen

See R N Bain, "Scandinavia," in *Cambridge Modern History* (1905), Knud Fabricius, *Kongeloven* (1920).

FREDERICK VIII. (1843–1912), king of Denmark, eldest son of Christian IX, was born at Copenhagen on June 3, 1843 As crown prince of Denmark he took part in the war of 1864 against Austria and Prussia, in which the duchies of Schleswig-Holstein and Lauenburg were lost He then assisted his father in the duties of government, becoming king on Christian's death in Jan 1906 In 1869 Frederick married Louise (1851–1926), daughter of Charles XV of Sweden, by whom he had four sons and four daughters In 1907, during a visit to Iceland, Frederick appointed a mixed commission to draft a measure of home rule, but it was thrown out at the next election, when the island claimed full state independence, though "personal union" with Denmark was retained (*see* ICELAND) During his reign he gained the confidence of his people by his energetic interest in politics, his genial manner, and his simple mode of living. He died at Hamburg on May 14, 1912

He was succeeded by his eldest son Christian X. (*q v*) and his second son, Charles (b 1872), who married his cousin Maud, daughter of Edward VII of Great Britain, became king of Norway as Haakon VII (*q v*) in 1905

FREDERICK I. (1657–1713), first king of Prussia, and (as Frederick III) elector of Brandenburg, was the second son of the great elector, Frederick William, by his first marriage with Louise Henriette of Orange Born at Konigsberg on July 11, 1657, he was educated and greatly influenced by Eberhard Danckelmann, and became heir to the throne of Brandenburg through the death of his elder brother, Charles Emil, in 1674 He appears to have taken some part in public business before his father's death, and the court at Berlin was disturbed by quarrels between the young prince and his stepmother, Dorothea of Holstein-Glucksburg In 1686 Dorothea persuaded her husband to bequeath outlying portions of his lands to her four sons, and Frederick, fearing he would be poisoned, left Brandenburg determined to prevent any diminution of his inheritance By promising to restore Schwiebus to Silesia after his accession he won the support of the emperor Leopold I, but eventually he gained his end in a peaceable fashion After he became elector of Brandenburg in May 1688, his half-brothers renounced their rights under their father's will in return for a sum of money, and the new elector thus secured the whole of Frederick William's territories He fulfilled his bargain with Leopold and gave up Schwiebus in 1695. At home and abroad Frederick continued the policy of the great elector He helped William of Orange to make his descent on England, added various places, including Bonn, Quedlinburg, the principality of Neuchâtel, to his lands; and placed his large and efficient army at the disposal of the emperor and his allies (*see* BRANDENBURG) He was present in person at the siege of Bonn in 1689, but was not often in command of his troops. The elector sought to model his court upon that of Louis XIV, and directed his main energies towards obtaining for himself the title of king He gave Leopold, in return for a promise of military aid, the imperial sanction to Frederick's request in November 1700, and the elector, hurrying at once to Konigsberg, crowned himself king of Prussia on Jan. 18, 1701. During the War of the Spanish Succession the troops of Brandenburg-Prussia rendered great assistance to the allies at Blenheim and elsewhere. Frederick, who was deformed through an injury to his spine, died Feb. 25, 1713. He founded the university of Halle, and the Academy of Sciences at Berlin; welcomed and protected Protestant refugees from France and elsewhere; and lavished money on the erection of public

buildings The king was married three times. His second wife, Sophie Charlotte (1668–1705), sister of the English king George I, was the friend of Leibnitz and one of the most cultured princesses of the age, she bore him his only son, his successor, King Frederick William I

See W. Hahn, *Friedrich I., Konig in Preussen* (Berlin, 1876); J G. Droysen, *Geschichte der preussischen Politik*, Band IV (Leipzig, 1872); E Heyck, *Friedrich I und die Begrundung des preussischen Konigtums* (Bielefeld, 1901), *Aus dem Briefwechsel Konig Friedrichs I von Preussen und seiner Familie*, ed Berner (Berlin, 1901); H. von Hymmen, *Der erste preussische Konig* (1904)

FREDERICK II., known as "the Great" (1712–1786), king of Prussia, was born on Jan 24, 1712 Two elder brothers having died in infancy, he became heir of his father, Frederick William I, who brought him up with extreme rigour, in the hope that he would become a hardy soldier, and "acquire thrift and frugality" The result was just the opposite Encouraged by his mother, and under the influence of his governess Madame de Roucoulle, and of his first tutor Duhan, a French refugee, Frederick acquired a taste for literature and music, secretly learned Latin, which his father had forbidden, scoffed at religion, refused to ride or shoot, preferred the French language, literature and dress, and openly despised German habits and life His discontent was heartily shared by his sister, Wilhelmina, a bright and intelligent young princess for whom Frederick had a warm affection

Early Years.—Frederick William, seeing his son absorbed in frivolous and effeminate amusements, conceived for him an intense dislike, which had its share in causing him to break off the negotiations for a double marriage between the prince of Wales and Wilhelmina, and the princess Amelia, daughter of George II, and Frederick; for Frederick had been so indiscreet as to carry on a separate correspondence with the English court and to vow that he would marry Amelia or no one Frederick William's hatred of his son, openly avowed, displayed itself in violent outbursts and public insults, and so harsh was his treatment that Frederick frequently thought of running away and taking refuge at the English court He at last resolved to do so during a journey which he made with the king to south Germany in 1730 He was helped by his two friends, Lieutenant Katte and Lieutenant Keith; but the secret was found out

Frederick was arrested, deprived of his rank as crown prince, tried by court-martial, and imprisoned in the fortress of Custrin Keith escaped, but Katte was captured and sentenced by court martial to imprisonment for life This sentence the king changed to one of death and, to enforce the example, had Katte beheaded in Frederick's presence (Nov 5, 1730). The object-lesson had some effect The prison chaplain reported that Frederick's heart was changed, while the Emperor himself interceded for him His father released him from solitary confinement and sent him to work in the auditing office of the departments of war and agriculture at Custrin, pending the earning of a full pardon "The whole town shall be his prison," wrote the king; "I will give him employment, from morning to night, in the departments of war, and agriculture, and of the Government He shall work at financial matters, receive accounts, read minutes and make extracts. . . . But if he kicks or rears again, he shall forfeit the succession to the crown, and even, according to circumstances, life itself"

Frederick's submissive conduct under these conditions earned him gradual alleviations On Nov. 30, 1731, he was allowed again to appear in uniform, and in 1732 was made colonel in command of the regiment at Neuruppin On June 12, 1733, he married the princess Elizabeth Christina, daughter of the duke of Brunswick-Bevern, a niece of the Empress and cousin of Maria Theresa He was given the estate of Rheinsberg, near Neuruppin, and there he lived until he succeeded to the throne These years were perhaps the happiest of his life, although the marriage, concluded by his father's orders, was unhappy He seldom visited his wife, who was childless, treating her harshly and even brutally. His conscientious performance of his duties, however, at last earned his father's esteem At the same time, he was able to indulge his personal tastes.

He carried on a lively correspondence with Voltaire and other French men of letters, and was a diligent student of philosophy, history and poetry. Two of his best-known works were written at this time—*Considérations sur l'état présent du corps politique de l'Europe* and his *Anti-Macchiavel.* In the former he calls attention to the growing strength of Austria and France, and insists on the necessity of some third power, by which he clearly means Prussia, to counterbalance their excessive influence. The second treatise, which was issued by Voltaire in The Hague in 1740, contains a generous exposition of some of the favourite ideas of the 18th-century philosophers respecting the duties of sovereigns, which may be summed up in the famous sentence: "the prince is not the absolute master, but only the first servant of his people" It was during this period that he became a freemason, and finally repudiated Christianity.

The Throne and Austria.—On May 31, 1740, he became king. He maintained all the forms of government established by his father, but ruled in a far more enlightened spirit; he tolerated every form of religious opinion, abolished torture, except for whole-sale murder, conspiracy, lèse-majesté and high treason, was most careful to secure an exact and impartial administration of justice, and, while keeping the reins of government strictly in his own hands, allowed every one with a genuine grievance free access to his presence The Potsdam regiment of giants was disbanded, but the real interests of the army were carefully studied, for Frederick realized that the two pillars of the Prussian state were sound finances and a strong army On Oct 20, 1740, the emperor Charles VI died Frederick at once began to make extensive military preparations, with a view to asserting the ancient claims put forward by his house, but always denied by Austria, to the three Silesian duchies Frederick undoubtedly believed in the justice of his claims, and the lawfulness of repudiating, for Silesia, his father's guarantee of the Pragmatic Sanction He confessed, however, himself, that his scheme was prompted by "the desire of glory, even curiosity," and "a means of acquiring reputation and of increasing the power of the State."

Frederick sent an ambassador to Vienna, offering, in the event of his rights in Silesia being conceded, to aid Maria Theresa against her enemies The queen, who regarded the proposal as that of a mere robber, haughtily declined; whereupon Frederick immediately invaded Silesia with an army of 30,000 men His first victory was gained at Mollwitz on April 10, 1741 Under the impression, in consequence of a furious charge of Austrian cavalry, that the battle was lost, he rode rapidly away at an early stage of the struggle—a mistake which gave rise for a time to the groundless idea that he lacked personal courage. A second Prussian victory was gained at Chotusitz, near Časlau, on May 17, 1742; and Maria Theresa was forced to conclude the Peace of Breslau (June 11, 1742), ceding Breslau to Prussia, Upper and Lower Silesia as far as the Oppa, together with the county of Glatz Frederick made good use of the next two years, fortifying his new territory, and repairing the evils inflicted upon it by the war By the death of the prince of East Friesland, without heirs, he also gained possession of that country (1744). In the same year, in view of Austria's increasing strength and determination to recover Silesia, Frederick formed the union of Frankfurt with Bavaria, the Elector Palatine and Hesse-Cassel, concluded a secret treaty with France (June 4, 1744) and suddenly invaded Bohemia, taking Prague He was forced to retreat, but in 1745 won a series of victories, and the Peace of Dresden (Dec. 25, 1745) assured to Frederick a second time the possession of Silesia (*See* AUSTRIAN SUCCESSION, WAR OF THE)

Internal Administration.—Frederick was now, at the age of 33, the most conspicuous sovereign of his time. He was a thoroughly absolute ruler, his so-called ministers being mere clerks whose business was to give effect to his will To use his own famous phrase, however, he regarded himself as but "the first servant of the State"; and during the next 11 years he proved that the words expressed his inmost conviction and feeling. All kinds of questions were submitted to him, important and unimportant, even questions of trivial detail A keen judge of character, he filled the public offices with faithful, capable, energetic men, who were kept up to a high standard of duty by the consciousness that their work might at any time come under his

strict supervision. The Academy of Sciences, which had fallen into contempt during his father's reign, he restored, infusing into it vigorous life; and he did more to promote elementary education than any of his predecessors. He did much, too, for the economic development of Prussia, especially for agriculture; he established colonies, peopling them with immigrants, extended the canal system, drained and diked the great marshes of the Oderbruch, turning them into rich pasturage, encouraged the planting of fruit trees and of root crops, and, though in accordance with his ideas of discipline he maintained serfdom, he did much to lighten the burdens of the peasants All kinds of manufacture, too, particularly that of silk, owed much to his encouragement. To the army he gave unremitting attention, reviewing it at regular intervals, and sternly punishing negligence on the part of the officers. Its numbers were raised to 160,000 men, while fortresses and magazines were always kept in a state of readiness for war The influence of the king's example was felt far beyond the limits of his immediate circle The nation was proud of his genius, and displayed something of his energy in all departments of life Lessing, who as a youth of 20 came to Berlin in 1749, composed enthusiastic odes in his honour, and Gleim, the Halberstadt poet, wrote of him as of a kind of demi-god These may be taken as fair illustrations of the popular feeling long before the Seven Years' War

Tastes and Character.—He despised the German language although it is remarkable that at a later period, in a French essay on German literature, he predicted for it a great future He habitually wrote and spoke French, and had a strong ambition to rank as a distinguished French author Nobody can now read his verses, but his prose writings have a certain calm simplicity and dignity, without, however, giving evidence of the splendid mental qualities which he revealed in practical life To this period belong his *Mémoires pour servir à l'histoire de Brandebourg* and his poem *L'Art de la guerre*. The latter, judged as literature, is intolerably dull; but the former is valuable, throwing as it does considerable light on his personal sympathies as well as on the motives of important epochs in his career. He continued to correspond with French writers, and induced a number of them to settle in Berlin, Maupertuis being president of the Academy In 1752 Voltaire, who had repeatedly visited him came at Frederick's urgent entreaty, and received a truly royal welcome. The famous Hirsch trial, and Voltaire's vanity and caprice, greatly lowered him in the esteem of the king, who, on his side, irritated his guest by often requiring him to correct bad verses, and by making him the object of rude banter The publication of *Doctor Akakia*, which brought down upon the president of the Academy a storm of ridicule, finally alienated Frederick, while Voltaire's wrongs culminated in the famous arrest at Frankfurt, the most disagreeable elements of which were due to the misunderstanding of an order by a subordinate official

The king lived as much as possible in a retired mansion, to which he gave the name of Sans-Souci—not the palace so called, which was built after the Seven Years' War, and was never a favourite residence He rose regularly in summer at five, in winter at six, devoting himself to public business till about eleven During part of this time, after coffee, he would aid his reflections by playing on the flute, of which he was passionately fond, being a really skilful performer At eleven came parade, and an hour afterwards, punctually, dinner, which continued till two, or later, if conversation happened to be particularly attractive After dinner he glanced through and signed cabinet orders written in accordance with his morning instructions, often adding marginal notes and postscripts, many of which were in a caustic tone These disposed of, he amused himself for a couple of hours with literary work; between six and seven he would converse with his friends or listen to his reader (a post held for some time by La Mettrie); at seven there was a concert; and at half-past eight he sat down to supper, which might go on till midnight He liked good eating and drinking, although even here the cost was sharply looked after, the expenses of his kitchen mounting to no higher figure than £1,800 a year. At supper he was always surrounded by a number of his most intimate friends, mainly Frenchmen; and he insisted on the conversation being perfectly free. His wit, however, was often cruel, and any one who responded with too much spirit was soon made to feel that the licence of talk was to be complete only on one side At Frederick's court ladies were seldom seen, a circumstance that gave occasion to much scandal The queen he visited only on rare occasions, though he provided her with a generous income, half of which she gave away in charity Although without charm, she was a woman of many noble qualities, and, like her husband, she wrote French books, some of which attracted a certain attention in their day She survived him by 11 years, dying in 1797.

War and Reconstruction.—From 1756 to 1763 Frederick's energies were wholly taken up in the Seven Years' War (*q v*) in which virtually the whole Continent was in arms against him Although Prussia was fearfully exhausted by this struggle, and at times seemed on the verge of ruin, Frederick's tenacity and military genius carried him through, and the peace of Hubertushof (Feb 15, 1763) restored the territorial *status quo ante bellum* Morally, however, the Seven Years' War was a great victory for Prussia She was now universally recognized as one of the great powers of the Continent, and definitely took her place in Germany as the rival of Austria From this time it was inevitable that there should be a final struggle between the two nations for predominance, and that the smaller German states should group themselves around one or the other.

Frederick's first care after the war was, as far as possible, to enable the country to recover from its terrific losses, a task which he undertook with genius and energy. Pomerania and Neumark were freed from taxation for two years, Silesia for six months Many nobles whose lands had been wasted received corn for seed, his war horses were within a few months to be found on farms all over Prussia; and money was freely spent in the re-erection of houses which had been destroyed The coinage, which had been debased, was gradually restored to its proper value, and trade received a favourable impulse by the foundation of the Bank of Berlin All these matters were carefully looked into by Frederick himself, who, while acting as generously as his circumstances would allow, insisted on the maximum of efficiency and economy

Unfortunately, he adopted the French ideas of excise, and the French methods of imposing and collecting taxes—a system known as the Regie This system secured a large revenue, but led to much petty tyranny, all the more intolerable because it was carried out by French officials. It was continued to the end of Frederick's reign, and nothing did so much to injure his otherwise immense popularity He was quite aware of the discontent the system excited, and the good-nature with which he tolerated the criticisms directed against it and him is illustrated by a well-known and well-authenticated incident Riding along the Jager Strasse one day, he saw a crowd of people "See what it is," he said to the groom who was attending him "They have something posted up about your Majesty," said the groom, returning Frederick, riding forward, saw a caricature of himself "King in very melancholy guise," says Preuss (as translated by Carlyle), "seated on a stool, a coffee-mill between his knees, diligently grinding with the one hand, and with the other picking up any bean that might have fallen. 'Hang it lower,' said the king, beckoning his groom with a wave of the finger; 'lower, that they may not have to hurt their necks about it' No sooner were the words spoken, which spread instantly, than there rose from the whole crowd one universal huzzah of joy. They tore the caricature into a thousand pieces, and rolled after the king with loud '*Lebe Hoch*, our Frederick for ever,' as he rode slowly away"

Frederick took particular interest in the proper administration of justice He disliked the formalities of the law, and in one instance, "the miller Arnold case," where he thought injustice had been done to a poor man, he dismissed the judges, condemned them to a year's fortress arrest, and compelled them to make good out of their own pockets the loss sustained by their supposed victim—really a violation of justice, but one springing from a generous motive He once defined himself as "l'avocat du pauvre," and few things gave him more pleasure than the famous answer of the miller whose windmill stood on ground

which was wanted for the king's garden. The miller sturdily refused to sell it "Not at any price?" said the king's agent; "could not the king take it from you for nothing, if he chose?" "Have we not the Kammergericht at Berlin?" was the answer, which became a popular saying in Germany

The Prussian Code.—Soon after he came to the throne Frederick began to make preparations for a new code In 1747 appeared the *Codex Fridericianus*, by which the Prussian judicial body was established But a greater monument of Frederick's interest in legal reform was the *Allgemeines preussisches Landrecht*, completed by the grand chancellor Count Johann H C von Carmer (1721–1801) on the basis of the *Project des Corporis Juris Fridericiani*, completed in 1749–51 by the eminent jurist Samuel von Cocceji (1679–1755) The *Landrecht*, a work of vast labour and erudition, combines the two systems of German and Roman law supplemented by the law of nature, it was the first German code, but only came into force in 1794, after Frederick's death

Looking ahead after the Seven Years' War, Frederick saw no means of securing himself so effectually as by cultivating the goodwill of Russia In 1764 he accordingly concluded a treaty of alliance with the empress Catherine for eight years Six years afterwards, unfortunately for his fame, he joined in the first partition of Poland, by which he received Polish Prussia, without Danzig and Thorn, and Great Poland as far as the river Netze Prussia was then for the first time made continuous with Brandenburg and Pomerania

Relations With Austria.—Joseph II greatly admired Frederick, and visited him at Neisse, in Silesia, in 1769, a visit which Frederick returned, in Moravia, in the following year The young emperor was frank and cordial, Frederick was more cautious, for he detected under the respectful manner of Joseph a keen ambition that might one day become dangerous to Prussia Nothing came of these suspicions till the death of Maximilian Joseph, elector of Bavaria, without children, in 1777, led ultimately to the War of the Bavarian Succession (the Potato War) in which Frederick invaded Bohemia (July 1778) No general engagement was fought, and after many delays the Treaty of Teschen was signed on May 13, 1779 Austria received the circle of Burgau, and consented that the king of Prussia should take the Franconian principalities

Frederick never abandoned his jealousy of Austria, whose ambition he regarded as the chief danger against which Europe had to guard He seems to have had no suspicion that evil days were coming in France It was Austria which had given trouble in his time, and if her pride were curbed, he fancied that Prussia at least would be safe Hence one of the last important acts of his life was to form, in 1785, a league of princes (the "Furstenbund") for the defence of the imperial constitution, believed to be imperilled by Joseph's restless activity The league came to an end after Frederick's death, but it is of considerable historical interest, as the first open attempt of Prussia to take the lead in Germany

Last Years.—Frederick's chief trust was always in his treasury and his army By continual economy he left in the former the immense sum of 70 million thalers; the latter, at the time of his death, numbered 200,000 men, disciplined with all the strictness to which he had throughout life accustomed his troops. He died at Sans-Souci on Aug 17, 1786; his death being hastened by exposure to a storm of rain, stoically borne, during a military review He passed away on the eve of tremendous events, which for a time obscured his fame; but now that he can be impartially estimated, he is seen to have been in many respects one of the greatest figures in modern history

He was rather below the middle size, in youth inclined to stoutness, lean in old age, but of vigorous and active habits An expression of keen intelligence lighted up his features, and his large, sparkling grey eyes darted penetrating glances at every one who approached him. He was uncleanly in his personal habits In his later years an old blue uniform with red facings was his usual dress, and on his breast was generally some Spanish snuff, of which he consumed large quantities He shared many of the chief intellectual tendencies of his age, including its scepticism. Of Christianity he always spoke in the mocking tone of the "enlightened" philosophers, regarding it as the invention of priests; but after the Seven Years' War, the trials of which steadied his character, he sought to strengthen the church for the sake of its elevating moral influence

In his judgments of mankind he often talked as a misanthrope When a school inspector named Sulzer expressed to him the opinion that "the inborn inclination of men is rather to good than to evil," he replied "Ah, my dear Sulzer, you don't know this damned race" ("Ach, mein lieber Sulzer, er kennt nicht diese verdammte Rasse") This fearful saying unquestionably expressed a frequent mood of Frederick's, and he sometimes acted with great harshness, and seemed to take a malicious pleasure in tormenting his acquaintances Yet he was capable of genuine attachments He was beautifully loyal to his mother and his sister Wilhelmina; his letters to the duchess of Gotha are full of a certain tender reverence, the two Keiths found him a devoted friend In his lonely old age, his best-loved companions were his greyhounds, who slept in his bed; he erected monuments to them, and gave orders that he was to be buried near them As a king, however, he laboured genuinely for humanity

Taking the reign of Frederick II as a whole, it must be said that he looked upon his power rather as a trust than as a source of personal advantage, and the trust was faithfully discharged according to the best lights of his day He has often been condemned for doing nothing to encourage German literature, and it is true that he was supremely indifferent to it Before he died a tide of intellectual life was rising all about him, yet he failed to recognize it, declined to give Lessing even the small post of royal librarian, and thought *Gotz von Berlichingen* a vulgar imitation of vulgar English models But when his taste was formed, German literature did not exist, the choice was between Racine and Voltaire on the one hand and Gottsched and Gellert on the other He survived into the era of Kant, Goethe and Schiller, but he was not of it, and it would have been unreasonable to expect that he should in old age pass beyond the limits of his own epoch It was better, indeed, that he let German literature alone, thus letting it become a thoroughly independent product Indirectly he powerfully promoted it by deepening the national life from which it sprang At a time when there was no real bond of cohesion between the different States, he stirred among them a common enthusiasm, and in making Prussia great he laid the foundation of a genuinely united empire

BIBLIOGRAPHY.—The main sources for the biography of Frederick the Great are his own works, which, in the words of Leopold von Ranke, "deal with the politics and wars of the period with the greatest possible objectivity, *i e*, truthfulness, and form an imperishable monument of his life and opinions" A magnificent edition of Frederick's complete works was issued (1846–57), at the instance of Frederick William IV, under the supervision of the historian Johann D E Preuss (1785–1868) It is in 30 volumes, of which six contain verse, seven are historical, two philosophical, and three military, 12 being made up of correspondence So long as the various State archives remained largely inaccessible historians relied upon this as their chief authority. Among works belonging to this period may be mentioned Thomas Carlyle, *History of Frederick II of Prussia* (6 vols., 1858–65), J G Droysen, *Friedrich der Grosse* (2 vols, Leipzig, 1874–76, forming part V. of his *Geschichte der preussischen Politik*), Ranke, *Friedrich II, Konig von Preussen* (*Werke*, vols ii and iii) A great stimulus to the study of Frederick's history has since been given by the publication of collections of documents preserved in various archives Of these the most important is the great official edition of Frederick's political correspondence (35 vols, Berlin, 1879–1911). Of later works, based on modern research, may be mentioned L. Paul-Dubois, *Frédéric le Grand, d'après sa correspondance politique* (1903), W F Reddaway, *Frederick the Great and the Rise of Prussia* (1904); E. Zeller, *Friedrich der Grosse als Philosoph* (1886); H. Pigge, *Die Staatstheorie Friedrichs des Grossen* (Munster, 1904), T. von Bernhardi, *Friedrich der Grosse als Feldherr* (2 vols., 1881), Ernest Lavisse, *La Jeunesse du Grand Frédéric* (1891, 3rd ed, 1899; Eng transl., 1891), R Brode, *Friedrich der Grosse und der Konflikt mit seinem Vater* (Leipzig, 1904), W. von Bremen, *Friedrich der Grosse* (Bd. ii of *Erzieher des preussischen Heeres*, 1905); *Dreissig Jahre am Hofe Friedrichs des Grossen. Aus den Tagebuchern des Reichsgrafen Ahasuerus Heinrich von Lehndorff, Kammerherrn der Konigin Elisabett Christine von Preussen* (Gotha, 1907) The great work on the wars of Frederick is that issued by the Prussian General Staff: *Die Kriege Friedrichs des Grossen* (15 vols in three parts,

1890–1913). *See* also G Künstel, *Politisches Testament Friedrichs des Grossen von 1752* (1911), G Koser, *Geschichte Friedrichs des Grossen* (4 vols, 1912–14), H Temperley, *Frederick the Great and Kaiser Joseph* (1915); and N Young, *The Life of Frederick the Great* (1919, with bibliog) For a full list of other works *see* Dahlmann-Waitz, *Quellenkunde* (Leipzig, 1912). (J. Sr ; X)

FREDERICK III. (1831–1888), king of Prussia and German emperor, was born at Potsdam on Oct 18, 1831, being the eldest son of prince William of Prussia, afterwards first German emperor, and the princess Augusta He was carefully educated, and in 1849–50 studied at the university of Bonn The next years were spent in military duties and in travels, in which he was accompanied by Moltke In 1851 he visited England on the occasion of the Great Exhibition He married Victoria, princess royal of Great Britain, in London on Jan 25, 1858 On the death of his uncle in 1861 and the accession of his father, Prince Frederick William, as he was then called, became crown prince of Prussia. His education, the influence of his mother, and perhaps still more that of his wife's father, the Prince Consort, had made him a strong Liberal, and he disliked the course of events in Prussia after the appointment of Bismarck as minister In June 1863, he publicly dissociated himself from the press ordinances which had just been published He ceased to attend meetings of the council of state, and was much away from Berlin The opposition of the crown prince to the ministers was increased by Bismarck's refusal to support the claims of his friend the prince of Augustenburg to Schleswig-Holstein During the war with Denmark Frederick had his first military experience, being attached to the staff of Marshal von Wrangel, he performed valuable service in arranging the difficulties caused by the disputes between the field marshal and the other officers, and was eventually given a control over him. After the war he continued to support the prince of Augustenburg, and was strongly opposed to the war with Austria During the campaign of 1866 he received the command of an army consisting of four army corps, he was assisted by General von Blumenthal, as chief of the staff, but took a very active part in directing the difficult operations by which his army fought its way through the mountains from Silesia to Bohemia, fighting four engagements in three days, and showed that he possessed genuine military capacity. In the decisive battle of Koniggratz the arrival of his army on the field of battle, after a march of nearly 20m, secured the victory During the negotiations which ended the war he persuaded the king to accept Bismarck's policy as regards peace with Austria He was anxious to see the king of Prussia unite the whole of Germany, with the title of emperor, and was impatient of the caution with which Bismarck proceeded

He played a conspicuous part in the year 1870–71, being appointed to command the armies of the Southern States, General Blumenthal again being his chief of the staff, his troops won the victory of Worth, took an important part in the battle of Sedan, and later in the siege of Paris During the years that followed, little opportunity for political activity was open to him He and the crown princess took a great interest in art and industry, especially in the royal museums, and the excavations conducted at Olympia and Pergamum were chiefly due to him In 1878, when the emperor was incapacitated by the shot of an assassin, the prince acted for some months as regent His palace was the centre of all that was best in the literary and learned society of the capital For many reasons the accession of the prince was looked forward to with great hope by a large part of the nation Unfortunately he was attacked by cancer in the throat; he spent the winter of 1887–88 at San Remo; in January 1888 the operation of tracheotomy had to be performed On the death of his father, (March 9), he at once journeyed to Berlin; but he came to the throne only to die. While the Liberals hoped the emperor would use his power for some signal declaration of policy, the adherents of Bismarck made bitter attacks on the empress The emperor's most important act was a severe reprimand addressed to von Puttkamer, the reactionary minister of the interior, which caused his resignation; in the distribution of honours he chose many who belonged to classes and parties hitherto excluded from court favour. Queen Victoria visited Berlin to see her dying son-in-law He died at Potsdam on June 15, 1888, after a reign of 99 days. After the emperor's death Professor Geffcken, a personal friend, published in the *Deutsche Rundschau* extracts from the diary of the crown prince containing passages which illustrated his differences with Bismarck during the war of 1870. The object was to injure Bismarck's reputation, and a very unseemly dispute ensued. The treatment of the crown prince's illness also gave rise to an acrimonious controversy, for which *see* MACKENZIE, SIR MORELL.

The empress VICTORIA, who, after the death of her husband, was known as the empress Frederick, died on Aug 5, 1901 at the castle of Friedrichskron, Cronberg, near Homburg, where she spent her last years Of the emperor's children two, Prince Sigismund (1864–1866) and Prince Waldemar (1869–1879), died in childhood He left two sons, William, his successor as emperor, and Henry, who adopted a naval career Of his daughters, the princess Charlotte was married to Bernard, hereditary prince of Meiningen; the princess Victoria to Prince Adolph of Schaumburg-Lippe, the princess Sophie to the duke of Sparta, crown prince of Greece; and the princess Margaretha to Prince Friedrich Karl of Hesse.

BIBLIOGRAPHY—M. von Poschinger, *Kaiser Friedrich* (3 vols., 1898–1900, English version by Sidney Whitman, *Life of the Emperor Frederick*, 1901) *See* also Bismarck, *Reflections and Reminiscences;* Rennell Rodd, *Frederick, Crown Prince and Emperor* (1888), Gustav Freytag, *Der Kronprinz und die deutsche Kaiserkrone* (1889, English trans, 1890), Otto Richter, *Kaiser Friedrich III* (2nd ed, 1903). For his illness, *see* the official publication, *Die Krankheit Kaiser Friedrichs III* (1888), and Morell Mackenzie, *The Fatal Illness of Frederick the Noble* (1888) Most of the copies of the *Deutsche Rundschau* containing the extracts from the crown prince's diary were confiscated, but there is an English edition, published in 1889

FREDERICK III. (1272–1337), king of Sicily, third son of King Peter of Aragon and Sicily, and of Constance, daughter of Manfred Peter died in 1285, leaving Aragon to his eldest son Alphonso, and Sicily to his second son James When Alphonso died in 1291 James became king of Aragon, and left his brother Frederick as regent of Sicily The war between the Angevins and the Aragonese for the possession of Sicily was still in progress, and although the Aragonese were successful in Italy James's position in Spain became very insecure owing to internal troubles and French attacks Peace negotiations were begun with Charles II. of Anjou, but were interrupted by the successive deaths of two popes, at last under the auspices of Boniface VIII James concluded a shameful treaty, by which, in exchange for being left undisturbed in Aragon and promised possession of Sardinia and Corsica, he gave up Sicily to the Church, for whom it was to be held by the Angevins (1295) The Sicilians refused to be made over once more to the hated French whom they had expelled in 1282, and found a national leader in the regent Frederick In vain the pope tried to bribe him with promises and dignities; he was determined to stand by his subjects, and was crowned king by the nobles at Palermo in 1296 Although the second Frederick of Sicily, he called himself third, being the third son of King Peter He reformed the administration and extended the powers of the Sicilian parliament, which was composed of the barons, the prelates and the representatives of the towns

War with the Angevins.—His refusal to comply with the pope's injunctions led to a renewal of the war Frederick landed in Calabria, where he seized several towns, encouraged revolt in Naples, negotiated with the Ghibellines of Tuscany and Lombardy, and assisted the house of Colonna against Pope Boniface In the meanwhile James married his sister Yolanda to Robert, the third son of Charles II Unfortunately for Frederick, a part of the Aragonese nobles of Sicily favoured King James, and both John of Procida and Ruggiero di Lauria went over to the Angevins, and the latter completely defeated the Sicilian fleet off Cape Orlando Charles's sons Robert and Philip landed in Sicily, but after capturing Catania were defeated by Frederick, Philip being taken prisoner (1299) For two years more the fighting continued with varying success, until Charles of Valois, who had been sent by Boniface to invade Sicily, was forced to sue for peace, his army being decimated by the plague, and in Aug 1302 the treaty of Caltabellotta was signed, by which Frederick was recognized king of Trinacria (the name Sicily was not to be used) for his lifetime, and was to marry Eleonora, the daughter of Charles II ; at his death the kingdom was to revert to the Angevins (this

clause was inserted chiefly to save Charles's face), and his children would receive compensation elsewhere Boniface tried to induce King Charles to break the treaty, but the latter was only too anxious for peace, and finally in May 1303 the pope ratified it, Frederick agreeing to pay him a tribute

Later Struggles.—For a few years Sicily enjoyed peace, and the kingdom was reorganized But on the descent of the emperor Henry VII , Frederick entered into an alliance with him, and in violation of the pact of Caltabellotta made war on the Angevins again (1313), and captured Reggio He set sail for Tuscany to cooperate with the emperor, but on the latter's death (1314) he returned to Sicily Robert, who had succeeded Charles II. in 1309, made several raids into the island A truce was concluded in 1317, but as the Sicilians helped the north Italian Ghibellines in the attack on Genoa, and Frederick seized some Church revenues for military purposes, the pope (John XXII) excommunicated him and placed the island under an interdict (1321) which lasted until 1335 An Angevin fleet and army, under Robert's son Charles, was defeated at Palermo by Giovanni da Chiaramonte in 1325, and in 1326 and 1327 there were further Angevin raids on the island, until the descent into Italy of the emperor Louis the Bavarian distracted their attention The election of Pope Benedict XII (1334), who was friendly to Frederick, promised a respite, but after fruitless negotiations the war broke out once more, and Chiaramonte went over to Robert, owing to a private feud In 1337 Frederick died at Paternione, and in spite of the peace of Caltabellotta his son Peter succeeded During Frederick's reign the Aragonese dynasty became thoroughly national and helped to weld the Sicilians into a united people

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(L. V)

FREDERICK I. (1372?–1440), elector of Brandenburg, founder of the greatness of the House of Hohenzollern, was born at Nuremberg, a son of Frederick V , burgrave of Nuremberg, and first came into prominence by saving the life of Sigismund, king of Hungary, at the battle of Nicopolis in 1396 In 1397 he became burgrave of Nuremberg, and after his father's death in 1398 he shared Ansbach, Bayreuth, and the smaller possessions of the family, with his only brother John, but became sole ruler after his brother's death in 1420 Loyal at first to King Wenceslaus, the king's neglect of Germany drove Frederick to take part in his deposition in 1400, and in the election of Rupert III , count palatine of the Rhine, whom he accompanied to Italy in the following year In 1401 he married Elizabeth, or Elsa, daughter of Frederick, duke of Bavaria-Landshut (d 1393), and in 1409 took service again with King Sigismund, whom he assisted in his struggle with the Hungarian rebels The double election to the German throne in 1410 first brought Frederick into relation with Brandenburg Sigismund, anxious to obtain another vote in the electoral college, appointed Frederick to exercise the Brandenburg vote on his behalf, and it was largely through his efforts that Sigismund was chosen German king Frederick then restored a certain degree of order in Brandenburg, and was formally invested with the electorate and margraviate by Sigismund at Constance on April 18, 1417 (*see* BRANDENBURG) He took part in the war against the Hussites, but became estranged from Sigismund when in 1423 the king invested Frederick of Wettin, margrave of Meissen, with the vacant electoral duchy of Saxe-Wittenberg In 1427 he was one of the band of electors who sought to impose reforms upon Sigismund An unsuccessful candidate for the German throne in 1438, Frederick was chosen king of Bohemia in 1440, but declined the honour. He took part in the election of Frederick III as German king in 1440, and died at Kadolzburg on Sept 21, of the same year In 1902 a statue was erected to his memory at Friesack Another one is in the "Siegesallee," Berlin

See E Brandenburg, *Konig Sigmund und Kurfürst Friedrich I von Brandenburg* (1891).

FREDERICK I. (1425–1476), elector palatine of the Rhine, surnamed "the Victorious," and called by his enemies "wicked Fritz," second son of the elector palatine Louis III , was born on Aug. 1, 1425 He inherited a part of the Palatinate on his father's death in 1439, but surrendered this inheritance to his elder brother, the elector Louis IV On his brother's death in 1449 he became guardian of the young elector Philip, and in 1451 he persuaded the nobles to recognize him as elector, on condition that Philip should be his successor The elector was leader among the princes who formed plans to secure a more efficient government for Germany, and even discussed the deposition of Frederick III. In alliance with Louis IX., duke of Bavaria-Landshut, Frederick gained several victories during the ensuing struggle between the princes, and in 1462 won a decisive battle at Seckenheim over Ulrich V , count of Wurttemberg In 1472 the elector married Clara Tott, or Dett, the daughter of an Augsburg citizen, and by her he had two sons, Frederick, who died during his father's lifetime, and Louis (d 1524), ancestor of the counts of Lowenstein He died at Heidelberg on Dec 12, 1476, and was succeeded, according to the compact, by his nephew Philip Frederick was a wise and intelligent ruler who added to the area of the Palatinate and furthered its internal prosperity

See N Feeser, *Friedrich der Siegreiche, Kurfurst von der Pfalz* (Neuberg, 1880)

FREDERICK II. (1482–1556), surnamed "the Wise," elector palatine of the Rhine, fourth son of the elector Philip was born Dec 9, 1482 He fought under the emperor Maximilian I. in 1508, worked to secure the election of Charles, afterwards the emperor Charles V , as the successor of Maximilian in 1519, fought in two campaigns against the Turks, and being disappointed in his hope of obtaining the hand of one of the emperor's sisters, married in 1535 Dorothea (d 1580), daughter of Christian II , who had been driven from the Danish throne Frederick became elector palatine by the death of his brother, Louis V , in March 1544 In the religious troubles of Germany, he took up at first the rôle of a mediator, but in 1545 he joined the league of Schmalkalden, and in 1546 broke definitely with the older faith He gave a little assistance to the league in its war with Charles, but soon submitted to the emperor, accepted the *Interim* issued from Augsburg in May 1548, and afterwards acted in harmony with Charles. The elector died on Feb 26, 1556, and as he left no children was succeeded by his nephew, Otto Henry (1502–1559) He was a great benefactor to the university of Heidelberg

Frederick's life, *Annales de vita et rebus gestis Friderici II electoris palatini* (Frankfort 1624 Germ trans by E von Bulow, 1849), was written by his secretary Hubert Thomas Leodius *See* also Rott, *Friedrich II von der Pfalz und die Reformation* (Heidelberg, 1904).

FREDERICK III. (1515–1576), called "the Pious," elector palatine of the Rhine, eldest son of John II , count palatine of Simmern, was born at Simmern on Feb 14, 1515 In 1537 he married Maria (d 1567), daughter of Casimir, prince of Bayreuth, and in 1546, mainly as a result of this union, adopted the reformed doctrines In 1557 he became count palatine of Simmern by his father's death, succeeding his kinsman, Otto Henry (1502–1559), as elector palatine two years later Although inclined to the views of Calvin rather than to those of Luther, and as the breach between the followers of the two reformers became wider, he definitely adopted Calvinism. This form of faith was established in the Palatinate; in its interests the "Heidelberg Catechism" was drawn up in 1563; and Catholics and Lutherans were persecuted alike, while the churches were denuded of all their ornaments The Lutheran princes wished to root out Calvinism in the Palatinate, but were not willing to exclude the elector from the benefits of the religious peace of Augsburg, which were confined to the adherents of the confession of Augsburg, and the matter came before the diet in 1566 Boldly defending his position, Frederick refused to give way an inch, and as the Lutherans were unwilling to proceed to extremities the emperor Maximilian II could only warn him to mend his ways. The elector aided the Huguenots in France and the insurgents in the Netherlands with men and money; one of his sons, John Casimir (1543–1592), took a prominent part in the French wars

of religion, while another, Christopher, was killed in 1574 fighting for the Dutch at Mooker Heath Frederick sought in vain to prevent the election of a member of the Habsburg family as Roman king, to secure the abrogation of the "ecclesiastical reservation" clause in the peace of Augsburg, or to obtain for Protestants in the territories of the spiritual princes He died at Heidelberg on Oct 26, 1576.

See A. Kluckhohn, *Friedrich der Fromme* (Nordlingen, 1877–79); and *Briefe Friedrichs des Frommen,* edited by Kluckhohn (Brunswick, 1868–72)

FREDERICK IV. (1574–1610), elector palatine of the Rhine, only surviving son of the elector Louis VI., was born at Amberg on March 5, 1574 His uncle and guardian, John Casimir, brought him up as a Lutheran In January 1592, on the death of John Casimir, Frederick undertook the government of the Palatinate, and continued the policy of his uncle, hostility to the Catholic Church and the Habsburgs, and co-operation with foreign Protestants He was often in communication with Henry of Navarre, afterwards Henry IV. of France, and like him was unremitting in his efforts to conclude a league among the German Protestants, while he sought to weaken the Habsburgs by refusing aid for the Turkish War After many delays and disappointments the Union of Evangelical Estates was actually formed in May 1608, under the leadership of the elector Frederick married in 1593 Louise, daughter of William the Silent, prince of Orange He died on Sept 19, 1610

FREDERICK V. (1596–1632), elector palatine of the Rhine and king of Bohemia, son of the elector Frederick IV by his wife, Louisa Juliana, daughter of William the Silent, prince of Orange, was born at Amberg on Aug 26, 1596 He became elector on his father's death in Sept 1610, and was under the guardianship of his kinsman, John II, count palatine of Zweibrucken (d 1635), until he was declared of age in July 1614 Frederick had married Elizabeth, daughter of the English king James I, in Feb 1613, and was the recognized head of the Evangelical Union founded by his father to protect the interests of the Protestants In 1619 he stepped into a larger arena. In Aug 1619, a few months after the death of the emperor Matthias, the estates of Bohemia declared his successor, Ferdinand, afterwards the emperor Ferdinand II, deposed, and chose Frederick as their king The elector was crowned king of Bohemia at Prague on Nov 4, 1619 On Nov. 8, four days after his coronation, his forces were easily routed by the imperial army under Tilly at the White Hill, near Prague, and his short reign in Bohemia ended abruptly The Palatinate was overrun by the Spaniards and Bavarians, and, after a futile attempt to dislodge them, Frederick, called in derision the "winter king," sought refuge in the Netherlands His electorate was given in 1623 to Maximilian I. of Bavaria

The remainder of Frederick's life was spent in obscurity. He died at Mainz on Nov 29, 1632

In addition to the numerous works which treat of the outbreak of the Thirty Years' War *see* A Gindely, *Friedrich V. von der Pfalz* (Prague, 1884), J. Krebs, *Die Politik der evangelischen Union im Jahre 1618* (Breslau, 1890–1901).

FREDERICK I. (1370–1428), surnamed "the Warlike," elector and duke of Saxony, was the eldest son of Frederick "the Stern," count of Osterland, and Catherine, daughter and heiress of Henry VIII., count of Coburg. He was born at Altenburg on April 11, 1370, and was a member of the family of Wettin In the division of their father's lands in 1382 Frederick and his brothers shared Meissen and Thuringia with their uncles Balthasar and William. Frederick's brother George died in 1402, and his uncle William in 1407 A further dispute then arose, but in 1410 a treaty was made at Naumburg, when Frederick and his brother William added the northern part of Meissen to their lands; and in 1425 the death of William left Frederick sole ruler. In the German town war of 1388 he assisted Frederick V of Hohenzollern, burgrave of Nuremberg, and in 1391 did the same for the Teutonic Order against Ladislaus V., king of Poland and prince of Lithuania. He supported Rupert III, elector palatine of the Rhine, in his struggle with King Wenceslaus for the German throne, probably because Wenceslaus refused to fulfil a promise to give him his sister Anna in marriage He took a leading part in the war against the Hussites, receiving from the German King Sigismund, as a return for his services, various places in Bohemia and elsewhere in pledge, together with the vacant electoral duchy of Saxe-Wittenberg He was formally invested at Budapest on Aug. 1, 1425 The elector was endeavouring to rouse the German princes to aid him in prosecuting the war against the Hussites when the Saxon army was almost annihilated at Aussig (1426) Frederick died at Altenburg on Jan 4, 1428 In 1402 he married Catherine of Brunswick, by whom he left four sons and two daughters He and his brother William founded the university of Leipzig for German students who had just left the university of Prague Frederick's importance as an historical figure arises from his having obtained the electorate of Saxe-Wittenberg for the house of Wettin, and transformed the margraviate of Meissen into the territory which afterwards became the kingdom of Saxony The ex-king of Saxony, the sovereigns of England and of the Belgians are his direct descendants

See C W Bottiger and Th Flathe, *Geschichte des Kurstaates und Konigreichs Sachsen* (Gotha, 1867–73), and J G Horn, *Lebens- und Heldengeschichte Friedrichs des Streitbaren* (Leipzig, 1733).

FREDERICK II. (1411–1464), called "the Mild," elector and duke of Saxony, eldest son of the elector Frederick I, was born at Leipzig on Aug 22, 1411 He succeeded his father as elector in 1428, but shared the family lands with his three brothers, and was at once engaged in defending Saxony against the attacks of the Hussites He obtained the burgraviate of Meissen in 1439, and some part of Lower Lusatia after a struggle with Brandenburg about the same time In 1438 it was decided that Frederick, and not his rival, Bernard IV, duke of Saxe-Lauenburg, was entitled to exercise the Saxon electoral vote at the elections for the German throne On the death of their cousin Frederick, margrave of Thuringia, the brothers Frederick and William divided Frederick's territory, but this arrangement was not satisfactory, and war broke out between them in 1446. After a struggle known as the *Bruderkrieg* peace was made in Jan 1451, when William received Thuringia, and Frederick Altenburg and other districts He died at Leipzig on Sept 7, 1464 By his wife, Margaret (d. 1486), daughter of Ernest, duke of Styria, he left two sons and four daughters In July 1455 occurred the celebrated *Prinzenraub,* the attempt of a knight named Kunz von Kaufungen (d 1455) to abduct Frederick's two sons, Ernest and Albert. Having carried them off from Altenburg, Kunz was making his way to Bohemia when the plot was accidentally discovered and the princes restored

See W. Schafer, *Der Montag vor Kiliani* (1855); J. Gersdorf, *Einige Aktenstucke zur Geschichte des sachsischen Prinzenraubes* (1855), and T Carlyle, *Critical and Miscellaneous Essays,* vol iv. (1899).

FREDERICK III. (1463–1525), called "the Wise," elector of Saxony, eldest son of Ernest, elector of Saxony, and Elizabeth, daughter of Albert, duke of Bavaria-Munich (d 1508), was born at Torgau on Jan 17, 1463 and succeeded his father as elector in 1486 Retaining the government of Saxony in his own hands, he shared the other possessions of his family with his brother John, called "the Stedfast" (1468–1532) Frederick was among the princes who pressed the need of reform upon the German king Maximilian I. in 1495, and in 1500 he became president of the newly-formed council of regency (*Reichsregiment*). He took a genuine interest in learning, was a friend of Georg Spalatin, and in 1502 founded the university of Wittenberg, where he appointed Luther and Melanchthon to professorships In 1520 he refused to put into execution the papal bull ordering Luther's writings to be burned and the reformer to be put under restraint or sent to Rome; and in 1521, after Luther had been placed under the imperial ban by the diet at Worms, the elector had him conveyed to his castle at the Wartburg, and protected him In 1519, Frederick, who alone among the electors refused to be bribed by the rival candidates for the imperial throne, declined to be a candidate himself, and assisted to secure the election of Charles V. He died unmarried at Langau, near Annaberg, on May 5, 1525.

See M. M Tutzschmann, *Friedrich der Weise, Kurfurst von Sachsen* (Grimma, 1848), G Spalatin, *Das Leben und die Zeitgeschichte Friedrichs des Weisen,* edited by C G Neudecker and L. Preller (Jena, 1851); T. Kolde, *Friedrich der Weise und die Anfange der Reformation*

(Erlangen, 1881), Kalkoff, *Die Kaiserwahl Friedrichs IV und Karls V* (1925).

FREDERICK, a city of Maryland, U S A, 45m W by N of Baltimore, on a tributary of the Monocacy river, the county seat of Frederick county It is on Federal highways 15, 40, 240 and 340, and is served by the Baltimore and Ohio, the Western Maryland, and the Pennsylvania railways, and by inter-urban motor-coach and trolley lines The population was 11,066 in 1920 (88% native white) and 14,860 in 1928, according to a local census The "clustered spires" of Frederick, to borrow Whittier's description, rising from "meadows rich with corn," are "green-walled by the hills of Maryland" The modern city is an important trading, farming and manufacturing centre, with a factory output in 1927 valued at $9,500,000, and bank clearings amounting to $25,106,794 There are large flour mills, brush and silo factories, creameries, corn-canning factories and various other industrial plants On the outskirts of the city is Hood college for women (Reformed Church), organized in 1903 on the foundation of a seminary chartered in 1839 The State school for the deaf was established here in 1867 On its grounds is a stone barrack built in 1777, which was used as quarters for prisoners from Saratoga, Trenton and Yorktown during the Revolution, and as a Union hospital during the Civil War The town clock, in the tower of Trinity chapel, has been in constant service since 1796 Frederick was the birthplace of Francis Scott Key, author of "The Star-Spangled Banner," and of Admiral Winfield Scott Schley "Rose Hill," home of the first governor of Maryland, Thomas Johnson (b 1732), is one of the many beautiful colonial estates near the city, and within its limits is the summer home of Chief Justice Taney, with the slave quarters still standing Frederick was settled by Germans in 1733, and was laid out in 1745 It is uncertain whether it was named after the last Lord Baltimore, the then Prince of Wales, or Frederick the Great of Prussia The city was incorporated in 1817 Here in 1755 Gen Braddock prepared for his expedition against Ft Duquesne, and in the county court-house on Nov 23, 1765, the 12 county judges took official action (the first jurists of the country to do so) repudiating the British Stamp Act During the Civil War the city was occupied at different times by Unionists and Confederates The battle of Monocacy was fought 3m south The flag-waving by Barbara Fritchie, which through Whittier's ballad has become a cherished national legend, took place, if at all, during "Stonewall" Jackson's march to Harper's Ferry, in 1862 The site of Mrs Fritchie's home was eaten away by the changing channel of the creek, and the materials of the house were made into canes and other souvenirs A replica has been constructed for a museum in which the flag itself and other relics are preserved

FREDERICK AUGUSTUS I. (1750–1827), king of Saxony, son of the elector Frederick Christian, was born at Dresden on Dec 23, 1750 He succeeded his father under the guardianship of Prince Xavier in 1763, and was declared of age in 1768 In 1769 he married Maria Amelia, daughter of Duke Frederick of Zweibrucken, by whom he had one daughter, Princess Augusta He was methodical and conscientious, and a good example to all his officials, whence his surname "the Just" He sided with Frederick the Great in the short Bavarian succession war of 1778 against Austria. At the peace of Teschen, which concluded the war, he received 6 million florins In 1785 he joined the league of German princes (*Deutscher Furstenbund*) formed by Prussia, but without prejudice to his neutrality Thus he remained neutral during the quarrel between Austria and Prussia in 1790 In the following year he declined the crown of Poland He refused to join the league against France (Feb 7, 1792), but when war was declared his duty to the empire necessitated his taking part in it Even after the peace of Basel (April 5, 1795) he continued the war But when the French army during the following year, advanced into the heart of Germany, he was compelled by General Jourdan to retreat (Aug 13, 1796) In 1806 he joined Prussia against France After the disastrous battle of Jena he concluded peace with Napoleon at Posen (Dec 11, 1806), and, assuming the title of king, he joined the Confederation of the Rhine But he did not alter the constitution and administration of his new kingdom After the peace of Tilsit (July 9, 1807) he was created by Napoleon grand-duke of Warsaw, but his sovereignty of Poland was little more than nominal In 1809 Frederick Augustus fought with Napoleon against Austria On several occasions (1807, 1812, 1813) Napoleon was entertained at Dresden, and when, on his return from his disastrous Russian campaign, he passed through Saxony by Dresden (Dec 16, 1812), Frederick Augustus remained true to his friend and ally In April 1813 he made overtures to Austria, but he soon afterwards returned to the side of the French He returned to Dresden on May 10 and was present at the terrible battle of Aug 26 and 27, in which Napoleon's army and his own were defeated He fell into the hands of the Allies after their entry into Leipzig, and, although he regained his freedom after the congress of Vienna, he was compelled to give up the northern part—three-fifths—of his kingdom to Prussia (May 21, 1814) He entered Dresden on July 7, and was enthusiastically welcomed by his people The remainder of his life was spent in repairing the damages caused by the Napoleonic wars, in developing the agricultural, commercial and industrial resources of his kingdom, reforming the administration of justice, establishing hospitals and other charitable institutions, encouraging art and science and promoting education He had a special interest in botany, and originated the beautiful park at Pillnitz He died on May 5, 1827

Bibliography—The earlier lives, by C E Weisse (1811), A L Herrmann (1827), Politz (1830), are mere panegyrics On the other side *see* Flathe in *Allgemeine deutsche Biographie*, and Bottiger-Flathe, *History of Saxony* (2nd ed, 1867 ff), vols II and III, A Bonnetons, *Un Allié de Napoléon, Frédéric Auguste, premier roi de Saxe* (1902), Fritz, Friedrich, *Politik Sachsens 1801–1803* (1898), P Ruhlmann, *Öffentliche Meinung 1806–1813* (1902) There are many pamphlets bearing on the Saxon question and on Frederick Augustus during the years 1814 and 1815

FREDERICK AUGUSTUS II. (1797–1854), king of Saxony, eldest son of Prince Maximilian and of Caroline Maria Theresa of Parma, was born on May 18, 1797, at Dresden He was twice married—in 1819 (October 7) to the duchess Caroline, fourth daughter of the emperor Francis I of Austria (d May 22, 1832), and in 1833 (April 4) to Maria, daughter of Maximilian I of Bavaria There were no children of either marriage In 1830 a rising in Dresden led to his being named joint regent of the kingdom along with King Antony, and on June 6, 1836, he succeeded his uncle Frederick Augustus was at first in favour of the programme of German unity put forward at Frankfort in 1848, but he refused to acknowledge the democratic constitution of the German parliament This attitude led to the insurrection at Dresden in May 1849, which was suppressed by the help of Prussian troops Count Beust, leader of the Austrian and feudal party in Saxony, became his principal minister and guided his policy He died in consequence of a carriage accident near Brennbuhel, between Imst and Wenns in Tirol (August 9, 1854) Frederick Augustus was a keen botanist, and wrote *Flora Marienbadensis, oder Pflanzen und Gebirgsarten, gesammelt und beschrieben* (Prague, 1837)

See Bottiger-Flathe, *History of Saxony*, vol. III, R Freiherr von Friesen, *Erinnerungen* (Dresden, 1881), F F Graf von Beust, *Aus drei-viertel Jahrhunderten* (1887), Flathe, in *Allg deutsche Biogr*

FREDERICK CHARLES (FRIEDRICH KARL NIKOLAUS), Prince (1828–1885), Prussian general field marshal, son of Prince Charles of Prussia and grandson of King Frederick William III, was born in Berlin on March 20, 1828 He entered the army on his tenth birthday as second lieutenant in the 14th Foot Guards He studied at Bonn where he lived for two years, being accompanied throughout by Major von Roon, afterwards the famous war minister. He served in the Schleswig-Holstein War on the staff of Marshal von Wrangel In 1849 he took part in the campaign against the Baden insurgents, and was wounded at the action of Wiesenthal while leading a desperate charge against entrenched infantry In 1852 he became colonel, and in 1854 major-general and commander of a cavalry brigade. In this capacity he was brought closely in touch with General von Reyher, the chief of the general staff, and with Moltke. He married, in the same year, Princess Marie Anne of Anhalt

In 1858 he visited France, where he minutely investigated the state of the French army, but was recalled when Prussia mobilized

her forces during the Franco-Austrian war The prince was made a divisional commander in the II. army corps with a liberty of action which had previously been denied to him About this time (1860) he gave a lecture to the officers of his command on the French army and its methods, the substance of which (*Eine militarische Denkschrift von P F K*, Frankfort on Main, 1860) was circulated more widely than the author intended, and in the French translation gave rise to much indignation in France In 1861 Frederick Charles became general of cavalry He was then commander of the III (Brandenburg) army corps This post he held from 1860 to 1870, except during the campaigns of 1864 and 1866, and in it he displayed his real qualities as a troop leader Ten years of his continuous and thorough training brought the III corps to a pitch of real efficiency which the Guard corps alone, in virtue of its special recruiting powers, slightly surpassed Prince Frederick Charles' work was to be tested when von Alvensleben and the III corps engaged the whole French army on Aug 16, 1870 In 1864 the Prussian contingent under Frederick Charles formed a corps of the allied army, operating against the Danes, and half of it was drawn from the III corps After the storming of the Duppel lines the prince succeeded Wrangel in the supreme command, with Moltke as his chief of staff These two great soldiers then planned and brilliantly carried out the capture of the island of Alsen, after which the war ended

In 1866 came the Seven Weeks' War with Austria Prince Frederick Charles was appointed to command the I Army, which he led through the mountains into Bohemia, driving before him the Austrians and Saxons to the upper Elbe, where on July 3, took place the decisive battle of Koniggrätz or Sadowa This was brought on by the initiative of the leader of the I Army, which had to bear the brunt of the fighting until the advance of the II Army turned the Austrian flank After the peace he returned to the III army corps, which he finally left, in July 1870, when appointed to command the II German Army in the war with France In the early days of the advance the prince's ruthless energy led to much friction between the I and II Armies (*see* FRANCO-GERMAN WAR), while his strategical mistakes seriously embarrassed the great headquarters staff The advance of the II Army beyond the Saar to the Moselle and from that river to the Meuse displayed more energy than careful strategy, though the "red prince" (as he was called from the colour of his favourite hussar uniform) was in thorough sympathy with the king's headquarters on the one hand and the feelings of the troops on the other Then came the discovery that the French were not in front, but to the right rear of the II Army (August 16) Alvensleben with the III corps held the French to their ground at Vionville while the prince hurried together his scattered forces He himself directed with superb tactical skill the last efforts of the Germans at Vionville, and the victory of St Privat on the 18th was due to his leadership (*see* METZ), which shone all the more by contrast with the failures of the I Army at Gravelotte The prince was left in command of the forces which blockaded Bazaine in Metz, and received the surrender of that place and of the last remaining field army of the enemy He was promoted at once to the rank of general field marshal, and shortly afterwards the II. Army was despatched to aid in crushing the newly organized army of the French republic on the Loire. Here again he retrieved strategical errors by energy and tactical skill, and his work was in the end crowned by the victory of Le Mans on Jan 12, 1871

He now became inspector-general of the 3rd "army inspection," and a little later inspector of cavalry, and in the latter post he brought the Germany cavalry to a high degree of perfection in manoeuvre and general training. His sternness of character kept him aloof from the court and from his own family, and he spent his leisure months chiefly on his various country estates. In 1872 and in 1882 he travelled in the Mediterranean and the Near East. He died on June 15, 1885, at Klein-Glienicke near Berlin, and was buried at the adjacent church of Nikolskoe. His third daughter, Princess Louise Margareta, was married, in March 1879, to the duke of Connaught. His *Denkwürdigkeiten* were edited by W. Foerster in 1910

See Muller-Bohn, *Der Eiserne Prinz* (1902).

FREDERICK HENRY (1583–1647), prince of Orange, the youngest child of William the Silent, was born at Delft about six months before his father's assassination on Jan 29, 1584 His mother, Louise de Coligny, daughter of the Huguenot leader, Admiral de Coligny, was the fourth wife of William the Silent The boy was trained to arms by his elder brother, Maurice of Nassau, one of the first generals of his age. On the death of Maurice in 1625, Frederick Henry succeeded him in his paternal dignities and estates, and also in the stadtholderates of the five provinces of Holland, Zeeland, Utrecht, Overysel and Gelderland, and in the important posts of captain and admiral-general of the Union Frederick Henry proved himself scarcely inferior to his brother as a general, and a far more capable statesman and politician For 22 years he remained at the head of affairs in the United Provinces, and the "period of Frederick Henry," as it is usually styled by Dutch writers, is generally accounted the golden age of the republic The chief military exploits of Frederick Henry were the sieges and captures of Hertogenbosch in 1629, of Maastricht in 1632, of Breda in 1637, of Sas van Ghent in 1644, and of Hulst in 1645 The alliance with France against Spain had been the pivot of Frederick Henry's foreign policy, but in his last years he sacrificed the French alliance to conclude at Munster a separate peace with Spain, by which the United Provinces obtained the advantages for which they had for 80 years been contending Frederick Henry died on March 14, 1647, and was buried at Delft The actual signing of the peace was delayed by his death until 1648 Frederick Henry was married in 1625 to Amalia von Solms, and left one son, William II of Orange and four daughters. *See* also NETHERLANDS *History*

Frederick Henry left an account of his campaign in his *Mémoires de Frédéric Henri* (Amsterdam, 1743) See *Cambridge Mod Hist.* vol. iv chap 24, and the bibliography on p 931

FREDERICK LOUIS (1707–1751), prince of Wales, eldest son of George II, was born at Hanover on Jan 20, 1707. After his grandfather, George I, became king of Great Britain and Ireland in 1714, Frederick was known as duke of Gloucester (though never actually created) and made a knight of the Garter He had been betrothed to Wilhelmina Sophia Dorothea (1709–1758), daughter of Frederick William I, king of Prussia, and sister of Frederick the Great, but the match was prevented by the ill will between the parents On the accession of George II. in 1727 Frederick came to England and in 1729 was created prince of Wales, but the relations between father and son were unfriendly, and the king refused to make him an adequate allowance In 1735 Frederick wrote, or inspired the writing of, the *Histoire du prince Titi*, a book containing offensive caricatures of both king and queen, "he made his court" says Lecky, "the special centre of opposition to the government, and he exerted all his influence for the ruin of Walpole" After a marriage between the prince and Lady Diana Spencer, afterwards the wife of John, 4th duke of Bedford, had been frustrated by Walpole, Frederick married in April 1736 Augusta (1719–1772), daughter of Frederick II, duke of Saxe-Gotha George proposed to allow the prince £50,000 a year; but this sum was regarded as insufficient by the latter, whose appeal to parliament was unsuccessful After the birth of his first child, Augusta, in 1737, Frederick was ordered by the king to quit St. James's Palace, and foreign ambassadors were requested to refrain from visiting him In 1745 George II refused to allow his son to command the British army against the Jacobites On March 20, 1751, the prince died in London, and was buried in Westminster Abbey He left five sons and two daughters. The sons were George (afterwards King George III.), Edward Augustus, duke of York and Albany (1739–1767), William Henry, duke of Gloucester and Edinburgh (1743–1805), Henry Frederick, duke of Cumberland (1745–1790), and Frederick William (1750–1765); the daughters were Augusta (1737–1813), wife of Charles William Ferdinand, duke of Brunswick, and Caroline Matilda (1751–1775), wife of Christian VII, king of Denmark.

See Lord Hervey of Ickworth, *Memoirs of the Reign of George II*, edited by J W. Croker (London, 1884); Horace Walpole, *Memoirs of the Reign of George II.* (London, 1847), and Sir N W Wraxall, *Memoirs*, edited by H. B. Wheatley, vol i. (London, 1884).

FREDERICK WILLIAM I. (1688–1740), king of Prussia, son of Frederick I by his second marriage, was born on Aug. 15, 1688. He was early imbued with a passion for military life, and this was deepened by acquaintance with the duke of Marlborough (1709), Prince Eugene, whom he visited during the siege of Tournai, and Prince Leopold of Anhalt (the "Old Dessauer"). In nearly every respect he was the opposite of his father, having frugal, simple tastes, a passionate temper and a determined will His life was simple and puritanical, being founded on the teaching of the Bible He was, however, fond of hunting and somewhat given to drinking He intensely disliked the French, and highly disapproved of the imitation of their manners by his father and his court. When he came to the throne (Feb. 25, 1713) his first act was to dismiss from the palace every unnecessary official and to regulate the royal household on principles of the strictest parsimony. The greater part of the beautiful furniture was sold His importance for Prussia is twofold in internal politics he laid down principles which continued to be followed long after his death; he was one of the greatest administrators who have ever worn the Prussian crown His foreign policy was less successful, though under his rule the kingdom acquired some extension of territory.

Thus at the peace of Utrecht (April 11, 1713), after the War of the Spanish Succession, he acquired the greater part of the duchy of Gelderland. By the treaty of Schwedt, concluded with Russia, he was assured of an important influence in the solution of the Baltic question, and Swedish Pomerania, as far as the Peene, was occupied by Prussia But Charles XII on his return turned against the king, though without success, for the Pomeranian campaign of 1715 ended in favour of Prussia (fall of Stralsund, Dec 22) This enabled Frederick William I to maintain a more independent attitude towards the tsar; he refused, for example, to provide him with troops for a campaign (in Schonen) against the Swedes When on May 28, 1718, in view of the disturbances in Mecklenburg, he signed at Havelberg the alliance with Russia, he confined himself to a defensive attitude, and, on the other hand, on Aug 14, 1719, he also entered into relations with his former enemies, England and Hanover. By the treaty of Stockholm (Feb 1, 1720), Frederick William succeeded in obtaining the consent of Sweden to the cession of that part of Pomerania which he had occupied (Usedom, Wollin, Stettin, Hither Pomerania, east of the Peene) in return for a payment of 2,000,000 thalers.

In order to secure the succession to the Lower Rhine duchies of Julich and Berg, Frederick William finally agreed to the treaty of Wusterhausen (Oct 12, 1726, ratified at Berlin, Dec 23, 1728), in which he recognised the Pragmatic Sanction In the War of the Polish Succession against France (1734–35), Frederick William remained faithful to the emperor's cause, and sent an auxiliary force of 10,000 men The peace of Vienna, which terminated the war, led to a reconciliation between France and Austria, and so to a further estrangement between Frederick William and the emperor In 1738 the western Powers, together with the emperor, insisted in identical notes on the recognition of the emperor's right to decide the question of the succession in the Lower Rhine duchies A breach with the emperor was now inevitable, and this explains why in a last treaty (April 5, 1739) Frederick William obtained from France a guarantee of a part, at least, of Berg (excluding Dusseldorf).

But Frederick William's failures in foreign policy were more than compensated for by his splendid services in the internal administration of Prussia. He saw the necessity of rigid economy not only in his private life but in the whole administration of the state During his reign Prussia obtained for the first time a centralized and uniform financial administration. It was the king himself who composed and wrote in the year 1722 the famous instruction for the general directory (*Generaldirektorium*) of war, finance and domains When he died the income of the state was about seven million thalers (£1,050,000). The consequence was that he paid off the debts incurred by his father, and left to his successor a well filled treasury. In the administration of the domains he made three innovations: (1) the private estates of the king were turned into domains of the crown (Aug 13, 1713), (2) the freeing of the serfs on the royal domains (March 22, 1719), (3) the conversion of the hereditary lease into a short-term lease on the basis of productiveness His industrial policy was inspired by the mercantile spirit On this account he forbade the importation of foreign manufactures and the export of raw materials from home, a policy which had a very good effect on the growth of Prussian industries

The work of internal colonization he carried on with especial zeal Most notable of all was his *rétablissement* of East Prussia, to which he devoted six million thalers (*c.* £900,000) His policy in respect of the towns was motived largely by fiscal considerations, but at the same time he tried also to improve their municipal administration; for example, in the matter of buildings, of the letting of domain lands and of the collection of the excise in towns Frederick William had many opponents among the nobles because he pressed on the abolition of the old feudal rights, introduced in East Prussia and Lithuania a general land tax (the *General hufenschoss*), and finally in 1739 attacked in a special edict the *Legen, i e*, the expropriation of the peasant proprietors

He did nothing for the higher learning, and even banished the philosopher Christian Wolff at 48 hours' notice "on pain of the halter," for teaching, as he believed, fatalist doctrines Afterwards he modified his judgment in favour of Wolff, and even, in 1739, recommended the study of his works. He established many village schools, which he often visited in person, and after the year 1717 (Oct. 23) all Prussian parents were obliged to send their children to school (*Schulzwang*). Under him the people flourished, and although it stood in awe of his vehement spirit it respected him for his firmness, his honesty of purpose and his love of justice. He was devoted also to his army, the number of which he raised from 38,000 to 83,500, so that under him Prussia became the third military power in the world, coming next after Russia and France There was not a more thoroughly drilled or better appointed force. The Potsdam guard, made up of giants collected from all parts of Europe, sometimes kidnapped, was a sort of toy with which he amused himself The reviewing of his troops was his chief pleasure. But he was also fond of meeting his friends in the evening in what he called his Tobacco-College, where amid clouds of tobacco smoke he not only discussed affairs of state but heard the newest "guard-room jokes" He died on May 31, 1740, leaving behind him his widow, Sophia Dorothea of Hanover, whom he had married on Nov. 26, 1706 His son was Frederick the Great (*see* FREDERICK II, king of Prussia), who opposed him This opposition became so strong in 1730 that the crown prince fled from the court, and was later arrested and brought before a court martial A reconciliation was brought about, at first gradually. In later years the relations between father and son came to be of the best.

See the references *s.v* Prussia; also *Hohenzollernjahrbuch*, viii. (1905), for particulars of Frederick William's education and death; letters to Prince Leopold of Anhalt-Dessau in the *Acta Borussica* (1905) There is a picturesque account of him in Thomas Carlyle's *Frederick the Great.*

FREDERICK WILLIAM II. (1744–1797), king of Prussia, son of Augustus William, second son of King Frederick William I and of Louise Amalie of Brunswick, sister-in-law of Frederick the Great, was born at Berlin on Sept 25, 1744, and became heir to the throne on his father's death in 1757 Although the prince had a numerous family, he was completely under the influence of his mistress, Wilhelmine Enke, afterwards created Countess Lichtenau, a woman of strong intellect and much ambition He was a handsome man, and devoted to the arts—Beethoven and Mozart enjoyed his patronage and his private orchestra had a European reputation Frederick the Great, who had employed him in various services—notably in an abortive confidential mission to the court of Russia in 1780—openly expressed his misgivings as to the character of the prince and his surroundings.

The misgivings were justified by the event. Frederick William's accession to the throne on the death of the great Frederick (Aug 17, 1786) was, indeed, followed by a series of measures for lightening the burdens of the people, reforming the oppressive French system of tax-collecting, and encouraging trade by the diminution of customs dues and the making of roads and canals The educated

classes were pleased by his removal of Frederick's ban on the German language by the admission of German writers to the Prussian Academy, and by the active encouragement given to schools and universities But these reforms were vitiated in their source In 1781 Frederick William, then prince of Prussia, had joined the Rosicrucians, and had fallen under the influence of the fanatical Johann Christof Wollner (1732–1800), and by him the royal policy was inspired On Aug 26, 1786 Wollner was appointed privy councillor for finance (*Geheimer Oberfinanzrath*) Though not in name, in fact he was prime minister, and the fiscal and economic reforms of the new reign were the application of his theories Bischoffswerder, another Rosicrucian, was also called into the king's counsels, by 1789 he was already an adjutant-general. In 1788 Wollner became privy councillor of state and of justice and head of the spiritual department for Lutheran and Catholic affairs War was at once declared on what—to use a later term—we may call the "modernists." On July 9 was issued the edict forbidding ministers to teach anything not contained in the letter of their official books, proclaiming the necessity of protecting the Christian religion against the "enlighteners" (*Aufklarer*), and placing educational establishments under the supervision of the orthodox clergy On Dec 18, a new censorship law was issued, to secure the orthodoxy of all published books, and finally, in 1791, a sort of Protestant Inquisition was established at Berlin (*Immediat-Examinations-commission*) to watch over all ecclesiastical and scholastic appointments The effects of this policy of blind obscurantism outweighed any good that resulted from economic and financial reform, and even this reform was but spasmodic and partial Far more fateful for Prussia was the king's attitude towards the army and foreign policy Frederick William, who had no taste for military matters, put his authority as "War-Lord" into commission under a supreme college of war (*Oberkriegs-Collegium*) under the duke of Brunswick and General von Mollendorf It was the beginning of the process that ended in 1806 at Jena

The Dutch campaign of 1787, entered on for purely family reasons, was indeed successful, but Prussia received not even the cost of her intervention An attempt to intervene in the war of Russia and Austria against Turkey failed of its object; Prussia did not succeed in obtaining any concessions of territory from the alarms of the Allies, and the dismissal of Hertzberg in 1791 marked the final abandonment of the anti-Austrian tradition of Frederick the Great For, meanwhile, the French Revolution had entered upon alarming phases, and in Aug 1791 Frederick William, at the meeting at Pillnitz, arranged with the emperor Leopold to join in supporting the cause of Louis XVI A formal alliance was signed on Feb 7, 1792, and Frederick William took part personally in the campaigns of 1792 and 1793 A subsidy treaty with the sea powers (April 19, 1794) filled his coffers, but the insurrection in Poland that followed the partition of 1793, and the threat of the isolated intervention of Russia, hurried him into the separate treaty of Basle with the French Republic (April 5, 1795), which was regarded by the great monarchies as a betrayal, and left Prussia morally isolated in Europe on the eve of the revolutionary era Prussia had paid a heavy price for the vast territories acquired at the expense of Poland in 1793 and 1795, and when, on Nov 16, 1797, Frederick William died, he left the state in bankruptcy and confusion, the army decayed and the monarchy discredited

Frederick William II was twice married (1) in 1765 to Elizabeth of Brunswick (d 1841), by whom he had a daughter, Frederika, afterwards duchess of York, and from whom he was divorced in 1769, (2) in 1769 to Frederika Louisa of Hesse-Darmstadt, by whom he had four sons, Frederick William III., Louis (d. 1796), Henry and William, and two daughters, Wilhelmina, wife of William of Orange, afterwards William I, king of the Netherlands, and Augusta, wife of William II, elector of Hesse. Besides his relations with his *maîtresse en titre*, the countess Lichtenau, the king—who was a frank polygamist—contracted two "marriages of the left hand" with Fräulein von Voss and the countess Dönhoff.

See article by von Hartmann in *Allgem. deutsche Biog.* (Leipzig, 1878); Stadelmann, *Preussens Konige in ihrer Tatigkeit fur die Landeskultur*, vol. iii. "Friedrich Wilhelm II" (Leipzig, 1885); Paulig, *Friedrich Wilhelm II., sein Privatleben u seine Regierung* (Frankfurt-an-der-Oder, 1896).

FREDERICK WILLIAM III. (1770–1840), king of Prussia, eldest son of King Frederick William II, was born at Potsdam on Aug 3, 1770 His father, then prince of Prussia, was out of favour with Frederick the Great and entirely under the influence of his mistress, and the boy led a solitary and repressed life As a soldier he received the usual training of a Prussian prince, obtained his lieutenancy in 1784, became a colonel commanding in 1790, and took part in the campaigns of 1792–94 In 1793 he married Louise, daughter of Prince Charles of Mecklenburg-Strelitz, whom he met at Frankfort He succeeded to the throne on Nov 16, 1797, and at once began to remedy the worst abuses of his father's reign But he had neither the strength nor the ability to meet the difficult foreign situation The consequences of his infirmity of purpose are written large on the history of Prussia from the treaty of Lunéville in 1801 to the downfall that followed the campaign of Jena in 1806 By the treaty of Tilsit (July 9, 1807) Frederick William had to surrender half his dominions, and what remained to him was exhausted by French exactions and liable at any moment to be crushed out of existence by Napoleon Only the indomitable courage of Queen Louise helped the weak king not to despair of the state She seconded the reforming efforts of Stein and the work of Scharnhorst and Gneisenau in reorganizing the army, by which the resurrection of Prussia became a possibility When Stein was dismissed at the instance of Napoleon, Hardenberg succeeded him as chancellor (June 1810). In the following month Queen Louise died, and the king was left alone to deal with circumstances of ever-increasing difficulty. He was forced to join Napoleon in the war against Russia, and even when the disastrous campaign of 1812 had for the time broken the French power, it was not his own resolution, but the loyal disloyalty of General York in concluding with Russia the convention of Tauroggen that forced him into line with the patriotic fervour of his people

Once committed to the Russian alliance, however, he became the faithful henchman of the emperor Alexander He was one of the original co-signatories of the Holy Alliance, though he signed it with reluctance, and in the counsels of the Grand Alliance he allowed himself to be practically subordinated to Alexander and later to Metternich At the various congresses, from Aix-la-Chapelle (1818) to Verona (1822), he showed himself in sympathy with the repressive policy formulated in the Troppau Protocol The promise of a constitution, which in the excitement of the War of Liberation he had made to his people, remained unfulfilled But though reluctant to play the part of a constitutional king, Frederick William laboured assiduously at the enormous task of administrative reconstruction involved in welding the heterogeneous elements of the new Prussian kingdom into a united whole. He was sincerely religious, but his well-meant efforts to unite the Lutheran and Reformed Churches, revealed the limits of his paternal power, not till 1834, after a régime of coercion and confiscation, was outward union secured on the basis of common worship but separate symbols, the opponents of the measure being forbidden to form communities of their own With the Roman Catholic Church, too, the king came into conflict on the vexed question of "mixed marriages," a conflict in which the Vatican gained an easy victory (*see* BUNSEN, CHRISTIAN CHARLES JOSIAS).

The revolutions of 1830 strengthened Frederick William in his reactionary tendencies, the question of the constitution was indefinitely shelved, and in 1831 Prussian troops concentrated on the frontier helped the task of the Russians in reducing the military rising in Poland Yet, in spite of all, Frederick William was beloved by his subjects, who valued him for the simplicity of his manners, the goodness of his heart and the memories of the dark days after 1806 He died on June 7, 1840 In 1824 he had contracted a morganatic marriage with the countess Auguste von Harrach, whom he created Princess von Liegnitz He wrote *Luther in Bezug auf die Kirchenagenda von 1822 und 1823* (Berlin, 1827), *Reminiszenzen aus der Kampagne 1792 in Frankreich*, and *Journal meiner Brigade in der Kampagne am Rhein 1793*

The correspondence (*Briefwechsel*) of King Frederick William III and Queen Louise with the emperor Alexander I has been published (Leipzig, 1900) and also that between the king and queen (*ib* 1903), both edited by P Bailleu *See* W Hahn, *Friedrich Wilhelm III. und Luise* (3rd ed, Leipzig, 1877); M W Duncker, *Aus der Zeit Friedrichs des Grossen und Friedrich Wilhelms III.* (Leipzig, 1876); *Briefe und Aktenstucke zur Geschichte Preussens unter Friedrich Wilhelm III* (ed Ruhl, 3 vols, 1899–1902).

FREDERICK WILLIAM IV. (1795–1861), king of Prussia, eldest son of Frederick William III, was born on Oct 15, 1795 From his first tutor, Johann Delbruck, he imbibed a love of culture and art, but after a time Delbruck was dismissed, his place being taken by the pastor and historian Friedrich Ancillon, while a military governor was also appointed By Ancillon he was grounded in religion, in history and political science, and his tutor impressed upon him his own hatred of the Revolution and its principles This hatred was confirmed by the sufferings of his country and family in the terrible years after 1806, and his first experience of active soldiering was in the campaigns that ended in the occupation of Paris by the Allies in 1814 On his return to Berlin he studied art under the sculptor Christian Daniel Rauch and the painter and architect Karl Friedrich Schinkel (1781–1841), proving himself in the end a good draughtsman, a born architect and an excellent landscape gardener At the same time he was being tutored in law by Savigny and in finance by a series of distinguished masters In 1823 he married the princess Elizabeth of Bavaria, who adopted the Lutheran creed The union, though childless, was very happy A long tour in Italy in 1828 was the beginning of his intimacy with Bunsen and did much to develop his knowledge of art and love of antiquity

On his accession to the throne in 1840 Frederick William reversed the unfortunate ecclesiastical policy of his father, allowing a wide liberty of dissent, and releasing the imprisoned archbishop of Cologne, he modified the press censorship, he promised the deputations of the provincial diets to create a central constitution, which he admitted to be required by the royal promises But the idea of the sovereignty of the people was to him utterly abhorrent, and even any delegation of sovereign power on his own part would have seemed a betrayal of a God-given trust "I will never," he declared, "allow to come between Almighty God and this country a plotted parchment, to rule us with paragraphs, and to replace the ancient, sacred bond of loyalty" His vision of the ideal state was that of a patriarchal monarchy, surrounded and advised by the traditional estates of the realm—nobles, peasants, burghers—and cemented by the bonds of evangelical religion In Prussia, with its traditional loyalty and its old-world caste divisions, he believed that such a conception could be realized, and he stood half-way between those who would have rejected the proposal for a central diet altogether as a dangerous "thin end of the wedge," and those who would have approximated it more to the modern conception of a parliament With a charter, or a representative system based on population, he would have nothing to do The united diet which was opened on Feb 3, 1847, was no more than a congregation of the diets instituted by Frederick William III in the eight provinces of Prussia Unrepresentative though it was—for the industrial working-classes had no share in it—it at once gave voice to the demand for a constitutional system

The revolutionary outbreaks of 1848 rudely awakened Frederick William from his mediaeval dreamings, he even allowed himself to be carried away for a while by the popular tide The loyalty of the Prussian army remained inviolate, but the king was too tender-hearted to use military force against his "beloved Berliners," and when the victory of the populace was thus assured his impressionable temper yielded to the general enthusiasm He paraded the streets of Berlin wrapped in a scarf of the German black and gold, symbol of his intention to be the leader of the united Germany; and he even wrote to the indignant tsar in praise of "the glorious German revolution" But the united Germany which he was prepared to champion was not the democratic state of the Frankfort national parliament, but the old Holy Roman Empire, the heritage of the house of Habsburg Finally, when Austria had been excluded from the new empire, he replied to the parliamentary deputation that came to offer him the imperial crown that he might have accepted it had it been freely offered to him by the German princes, but that he would never stoop "to pick up a crown out of the gutter"

In fact the German empire would have lost immeasurably had it been the cause rather than the result of the inevitable struggle with Austria However that may be, Frederick William's refusal gave the deathblow to the parliament and to all hope of the immediate creation of a united Germany. For Frederick William the position of leader of Germany now meant the employment of the military force of Prussia to crush the scattered elements of revolution that survived the collapse of the national movement His establishment of the northern confederacy was a reversion to the traditional policy of Prussia in opposition to Austria, which, after the emperor Nicholas had crushed the insurrection in Hungary, was once more free to assert her claims to dominance in Germany But Prussia was not ripe for a struggle with Austria, and the result was the humiliating convention of Olmutz (Nov 29, 1850), by which Prussia agreed to surrender her separatist plans and to restore the old constitution of the confederation Yet Frederick William had so far profited by the lessons of 1848 that he consented to establish (1850) a national parliament, though with a restricted franchise and limited powers

In religious matters Frederick William sought a *rapprochement* between the Lutheran and Anglican churches, the first-fruits of which was the establishment of the Jerusalem bishopric under the joint patronage of Great Britain and Prussia, but the only result of his efforts was to precipitate the secession of J H Newman and his followers to the Church of Rome In the summer of 1857 he had a stroke of paralysis, and a second in October From this time, with the exception of brief intervals, his mind was completely clouded, and the duties of government were undertaken by his brother William (afterwards emperor), who on Oct 7, 1858, was formally recognized as regent Frederick William died on Jan 2, 1861

Selections from the correspondence (*Briefwechsel*) of Frederick William IV and Bunsen were edited by Ranke (Leipzig, 1873), his proclamations, speeches, etc, from March 6, 1848 to May 31, 1851, have been published (Berlin, 1851), also his correspondence with Bettina von Arnim, *Bettina von Arnim und Friedrich Wilhelm IV, ungedruckte Briefe und Aktenstucke*, ed L Geiger (Frankfort-on-Main, 1902) *See* L von Ranke, *Friedrich Wilhelm IV, Konig von Preussen* (works 51, 52 also in *Allgem. deutsche Biog* vol vii), especially for the king's education and the inner history of the debates leading up to the united diet of 1847, H von Petersdorff, *Konig Friedrich Wilhelm IV* (Stuttgart, 1900), H von Poschinger (ed), *Unter Friedrich Wilhelm IV Denkwurdigkeiten des Ministers Otto Frhr von Manteuffel, 1848–1858* (3 vols, 1902), and *Preussens auswartige Politik, 1850–1858* (3 vols, *ib*, 1902), documents selected from those left by Manteuffel, F Rachfahl, *Deutschland, Konig Friedrich Wilhelm IV und die Berliner Marzrevolution* (Halle, 1901), *Die deutsche Politik Konig Friedrich Wilhelm IV, im Winter 1848–49* (Munich, 1919)

FREDERICK WILLIAM (1620–1688), elector of Brandenburg, usually called the "Great Elector," was born in Berlin on Feb 16, 1620, son of the elector George William, and Elizabeth Charlotte, daughter of Frederick IV, elector palatine of the Rhine He studied at the university of Leyden and learned something of war and statecraft under Frederick Henry, prince of Orange, whose daughter, Louise Henriette he married in 1646 He became ruler of Brandenburg and Prussia by his father's death in Dec. 1640, and set to work at once to repair the damage wrought during the Thirty Years' War, still in progress He secured his investiture as duke of Prussia from Wladislaus, king of Poland, in Oct 1641, but was not equally successful in crushing the independent tendencies of the estates of Cleves In Brandenburg, he showed his supreme skill as a diplomatist and administrator His disorderly troops were replaced by an efficient and disciplined force; his patience and perseverence freed his dominions from the Swedish soldiers; and the restoration of law and order was followed by a revival of trade and an increase of material prosperity. After a tedious struggle he centralized the administration, controlled and increased the revenue, and no department of public life escaped his sedulous care (*see* BRANDENBURG). The area of his dominions was increased at the peace of Westphalia in 1648, and this treaty and the treaty of Oliva in 1660 added to his

prestige By a clever but unscrupulous use of the position of his dominions between Sweden and Poland he procured his recognition as independent duke of Prussia from both powers and eventually crushed the stubborn opposition offered to his authority by the estates of the duchy (*see* PRUSSIA) In 1666 his title to Cleves, Julich and Ravensburg was definitely recognized He failed to annex the western part of the duchy of Pomerania, which he had conquered from the Swedes, owing to the insistence of Louis XIV at the treaty of St Germain-en-Laye in 1679, and he could not obtain the Silesian duchies of Liegnitz, Brieg and Wohlau from the emperor Leopold I when they fell vacant in 1675

Frederick William played an important part in European politics Although found once or twice on the side of France, he was generally loyal to the interests of the empire and the Habsburgs Himself a Protestant, he supported Protestant interests abroad on political rather than on religious grounds, and sought to strengthen Brandenburg by allaying the hostility between Lutherans and Calvinists His success in founding and organizing the army of Brandenburg-Prussia was amply demonstrated by the great victory which he gained over the Swedes at Fehrbellin in June 1675, and by the eagerness with which foreign powers sought his support He was also the founder of the Prussian navy The elector assisted trade in every possible way He made the canal which still bears his name between the Oder and the Spree, established a trading company, and founded colonies on the west coast of Africa He encouraged Flemings to settle in Brandenburg, and both before and after the revocation of the edict of Nantes in 1685 welcomed large numbers of Huguenots, who added greatly to the welfare of the country Education was not neglected, and if in this direction some of his plans were abortive, it was from lack of means and opportunity rather than effort and inclination The services of the great elector to Brandenburg and Prussia can only be properly appreciated by comparing the condition of his country in 1640 and in 1688 Poverty had given place to comparative wealth, and anarchy to a system of government which afterwards made Prussia the most centralized state in Europe In fighting local privileges his conduct was doubtless despotic He regarded absolute rule as the best guarantee for the internal and external welfare of the state

The great elector died at Potsdam on May 9, 1688, and was succeeded by his eldest surviving son, Frederick He deserves the eulogy passed upon him by Frederick the Great, *Messieurs; celuici a fait de grandes choses* By his second marriage, with Dorothea (d 1689), widow of Christian Louis, duke of Brunswick-Luneburg, he had four sons and three daughters His concluding years were troubled by differences between his wife and her step-son, Frederick, and influenced by Dorothea he bequeathed portions of Brandenburg to her four sons, a bequest which was annulled under his successor

See J G Droysen, *Geschichte der preussischen Politik* (Berlin, 1855–86); M Philippson, *Der grosse Kurfurst* (Berlin, 1897–1903), E Heyck, *Der grosse Kurfurst* (Bielefeld, 1902), Spahn, *Der grosse Kurfurst* (Mainz, 1902), H Prutz, *Aus des grossen Kurfursten letzten Jahren* (Berlin, 1897) Also *Urkunden und Aktenstucke zur Geschichte des Kurfursten Friedrich Wilhelm von Brandenburg* (Berlin, 1864–1902); T Carlyle, *History of Frederick the Great*, vol. i (London, 1858), and A Waddington, *Le Grand Électeur et Louis XIV* (Paris, 1905)

FRÉDÉRICK-LEMAÎTRE, ANTOINE LOUIS PROSPER (1800–1876), French actor, was born at Havre on July 28, 1800, and died in Paris on Jan 26, 1876 On July 12, 1823, he appeared as Robert Macaire in *L'Auberge des Adrêts*, playing the part seriously, and failed; the next night he turned it into a burlesque rôle, and all Paris came to see it Frédérick-Lemaître created many important parts; the greatest of all was perhaps Ruy Blas in Hugo's drama of that name

FREDERICKSBURG, a city of Virginia, U S A , 60m N of Richmond, at the head of navigation on the Rappahannock river; in Spottsylvania county, but politically independent of it. It is on Federal highways 1 and 17, and is served by the Richmond, Fredericksburg and Potomac and the Virginia Central railways, and by steamers to Baltimore The population was 5,882 in 1920 (20% negroes). It is a beautiful old city, with many historic associations, which has modern industries, schools and improvements, is the seat of a State teachers college, and has had since 1914 a city-manager form of government Its manufactures include metal egg-crates which go to all parts of the country, and it is a large railroad-tie market Captain John Smith landed here in 1608 and had negotiations with Indian villages in the vicinity, and in 1671 a settlement (called Leaseland) of 40 colonists was established The city was incorporated in 1727 and was named after the then prince of Wales It was one of the homes of the Washington family, where George lived (at "Ferry Farm") from 1739 until his marriage in 1759, and where his mother died in 1789 Her home, and that of his sister after her marriage to Colonel Fielding Lewis ("Kenmore," built in 1752), still stands. Other places of historic interest are the old Masonic lodge, in which Washington in 1752 was initiated and Lafayette later received an honorary degree, the Rising Sun tavern, a favourite stopping place in pre-Revolutionary days, St George's Episcopal church, where many prominent citizens were buried; James Monroe's law office, now a museum in his memory, the sentry-box from which a watch was kept in three wars for enemy ships on the Rappahannock, Gunnery Springs, where in 1775 the General Assembly of Virginia established a manufactory of small arms; and the old slave block During the Civil War Fredericksburg was in the theatre of some of the most desperate fighting The national cemetery here contains 15,295 graves (12,795 marked "unknown"), and the Confederate cemetery 5,000 (3,500 "unknown") These battlegrounds were in 1927 made a national memorial park.

Military Operations.—The battle of Fredericksburg, an important conflict in the American Civil War, was fought on Dec 13, 1862, between the Union forces (Army of the Potomac) under Major-General A E Burnside and the Confederates (Army of Northern Virginia) under Gen. *R E Lee* When *Lee* withdrew across the Potomac after his "political" move into Maryland, the Union Government was anxious for a counter-offensive, also with a political motive—that of influencing the autumn elections by a military success But McClellan s belated advance was ineffective and being also politically opposed to Emancipation, he was superseded (Nov 7) by Burnside in the command of the Army of the Potomac Burnside then manoeuvred eastwards from the neighbourhood of Warrenton with a view to beginning an offensive move from Fredericksburg and, as a preliminary, to seizing a foothold beyond the Rappahannock at or near that place His first Grand Division under Sumner arrived at Falmouth, opposite Fredericksburg, on Nov 17 Sumner wished to send a detachment across at once and seize the town but was stopped by Burnside, who feared that it might be left isolated by a rise of the river. The pontoon train, demanded from Washington, did not arrive until Nov. 25 and even then Burnside was slow to decide upon a plan in face of the gathering strength of the Confederate Army *Lee* had at first intended to await Burnside on the North Anna, 36m further south, where there was scope for a counter-stroke, but yielded to *President Davis's* preference for defending the line of the Rappahannock *Longstreet's* corps concentrated at Fredericksburg while *Jackson's* watched the crossings below the town as far as Port Royal (18m) Its presence frustrated Burnside's initial idea of attempting a crossing at Skinker's Neck 12m below Fredericksburg, and at last Burnside decided to cross the river and to attack frontally the Confederate position on the heights beyond the town The respective forces were Union 122,000, Confederate 79,000. Maj -Gen E V Sumner, commanding the Federal right wing (II and IX Corps), was to cross at Fredericksburg, Maj -gen W B Franklin with the left (I and VI. Corps) some miles below, while the centre (III. and V. Corps) under Maj -gen Joseph Hooker was to connect the two attacks and to reinforce either at need The Union artillery took position along the heights of the north bank to cover the crossing, and no opposition was encountered opposite Franklin's command, which formed up on the other side during the 11th and 12th Opposite Sumner, however, the Confederate riflemen, hidden in the gardens and houses of Fredericksburg, caused much trouble and considerable losses to the Union pioneers, and a body of volunteers from the infantry had to be rowed across under fire before the enemy's

skirmishers could be dislodged Sumner's two corps crossed on the 12th The battle took place next morning. Burnside had crossed the river without settling his plan On the afternoon of the 12th he held a conference at which Franklin proposed a strong blow against the Confederate right, but Burnside settled nothing During the night he at last issued orders, of a different nature, for a tentative blow on each flank with weak force, apparently hoping that these would force the Confederates to evacuate the centre of the ridge. Whatever chance of success there was in such an attack on the well-posted enemy was thrown away through misunderstandings; nothing but misunderstandings could be expected from the vague and bewildering orders issued by the general in command The actual battle can be described in a few words *Jackson*, whose two outlying divisions only came into position on the morning of the 13th, held the right of *Lee's* line from Hamilton's crossing, *Longstreet* the left, the whole covering a 6m front, partially entrenched Franklin, tied by his instructions, attacked with one division only, which a little later he supported by two more (I Corps) out of eight or nine available His left flank was harassed by the Confederate horse artillery under the young and brilliant *Capt John Pelham*, and after breaking the first line of *Stonewall Jackson's* corps the assailants were in the end driven back with heavy losses On the other flank, where part of *Longstreet's* corps held the low ridge opposite Fredericksburg called Marye's Heights, Burnside ordered in the II Corps about noon, and thenceforward division after division, on a front of little more than 800yds, was sent forward to assault with the bayonet They had half a mile to traverse, the last part bare, before they could reach the enemy The "Stone Wall" along the foot of Marye's and a higher tier of fire up the slope was thickly lined with the riflemen of *Longstreet's* corps, and above them the Confederate guns fired heavily on the assailants, whose artillery, on the height beyond the river, was too far off to assist them Not a man of the Federals reached the wall, though the bravest were killed a few paces from it, and Sumner's and a number of Hooker's brigades were broken one after the other as often as they tried to assault At night the wrecks of the right wing were withdrawn Burnside proposed next day to lead the IX Corps, which he had formerly commanded, in one mass to the assault of the Stone Wall, but his subordinates dissuaded him, and on the night of the 15th the Army of the Potomac withdrew to its camps about Falmouth The losses of the Federals were 12,650 men, those of the Confederates 4,200, little more than a third of which fell on *Longstreet's* corps

See F W Palfrey, *Antietam and Fredericksburg* (New York, 1881); G W. Redway, *Fredericksburg* (London, 1906); G F R Henderson, *Fredericksburg* (London, 1889) and W B Wood and J E Edmonds, *The Civil War in the United States* (1905); J E Gough, *Fredericksburg and Chancellorsville* (1913), and V M Fleming, *Battles of Fredericksburg and Chancellorsville* (1921)

FREDERICTON, a city of New Brunswick, Canada, capital of the province, situated on the St John river, 84 m. from its mouth, and on the Canadian Pacific railway The city was founded in 1785 by Sir Guy Carleton, and made the capital of the province, in spite of the jealousy of St John, on account of its superior strategical position It contains the parliament buildings and Government house Fredericton is the chief commercial centre in the interior of the province, and has also a large trade in lumber Its industries include canneries, tanneries and wooden ware factories The river is navigable for large steamers up to the city, and above it by vessels of lighter draught Pop. (1921) 8,114

FREDONIA, village of Chautauqua county, New York, U S A, 45m S W of Buffalo and 3m from Lake Erie at Dunkirk. It is on Federal highway 20, and is served by the New York Central railroad The population in 1925 was 6,293 It is in the grape-growing and nursery region of western New York, and ships annually over 6,000,000 grape roots, 2,500,000 berry bushes, and large quantities of seeds Grape-juice and other grape products and canned fruits and vegetables are the principal manufactured products It is the seat of a State normal school (est 1867) and of a branch of the State agricultural experiment station. Fredonia was settled in 1804, and until 1817 was called Canandaway It was incorporated in 1829 A gas well (the first in the United States) was drilled here in 1821, and supplied enough gas to light the streets It was piped to the tavern for use on the occasion of Lafayette's visit in 1825 The first grange of the order of the Patrons of Husbandry was established in Fredonia in 1867; and the Woman's Christian Temperance Union movement began with the organization here of a local union in 1873

FREDRIKSHALD (FREDERIKSHALD, FRIEDRICHSHALL), a seaport of Norway, in Smaalenene *amt* (county), 85 m by rail S by E of Oslo Pop (1920), 11,149 It is situated on both banks of the Tistedal river at its outflow to the Ide fjord The town is surrounded by high ground on which is the famous fortress Fredriksten, protected on three sides by precipices, founded by Frederick III (1661), and mainly showing, in its present form, the works of Frederick V (1766) and Christian VII (1808) Monuments commemorate the siege of the town in 1718 Fredrikshald is close to the Swedish frontier, and had previously (1660) withstood invasion Its name was changed from Halden to the present form in 1665 in honour of Frederick III The town was almost totally destroyed by fire in 1759 and 1826 The castle surrendered to the Swedes in 1814, and its capture was followed by the conquest of the kingdom and its union with Sweden Fredrikshald exports timber and marble is quarried for ornamental work. There are railway communications with all parts of Sweden and coastal services

FREDRIKSTAD (FREDERIKSTAD), a seaport and manufacturing town of Norway in Smaalenene *amt* (county), 58 m S by E of Oslo by rail Pop (1927) 14,247 It lies at the mouth and on the eastern shore of the Oslo fjord, occupying both banks of the river Glommen, which, descending from the richly-wooded district of Österdal, floats down vast quantities of timber The new town on the right bank is therefore a centre of the timber export trade Brick making and granite quarrying are important as well as the timber trade The harbour is kept open in winter by an ice-breaker In the vicinity is the island Hanko, a Norwegian seaside resort. The old town on the left bank was founded by Frederick II in 1567 It was for a long time strongly fortified, and in 1716 Charles XII of Sweden failed to capture it

FREE BAPTISTS, formerly called (but no longer officially) FREEWILL BAPTISTS, an American denomination holding anti-paedobaptist and anti-Calvinistic doctrines, and practically identical in creed with the General Baptists of Great Britain Many of the early Baptist churches in Rhode Island and throughout the South were believers in "general redemption" (hence called "general" Baptists), and there was a largely attended conference of this Arminian branch of the church at Newport in 1729 But the denomination known as "Free-willers" had its rise in 1779–1780, when anti-Calvinists in Loudon, Barrington and Canterbury, New Hampshire, seceded and were organized by Benjamin Randall (1749–1808), a native of New Hampshire Randall was an itinerant missionary, who had been preaching for two years before his ordination in 1780, in the same year he was censured for "heterodox" teaching The work of the church suffered a relapse after his death, but from 1820 to 1830 the abbreviation of the denominational name to "Free Baptists" suggests their liberal policy—indeed open communion is the main if not the only hindrance to union with the "regular" Baptist Church

See I. D. Stewart, *History of the Free Will Baptists* (Dover, N H., 1862) for 1780–1830, and his edition of the *Minutes of the General Conference of the Free Will Baptist Connection* (Boston, 1887); James B. Taylor, *The Centennial Record of the Free Will Baptists* (Dover, 1881); John Buzzell, *Memoir of Elder Benjamin Randall* (Parsonfield, Maine, 1827), and P Richardson, "Randall and the Free Will Baptists," in *The Christian Review*, vol. xxiii. (Baltimore, 1858); J. T Christian, *A History of the Baptists* (Nashville, Tenn., 1922); W T Whitley, *A History of British Baptists* (1923); G. Yuille, *History of the Baptists in Scotland* (Glasgow, 1926).

FREEBENCH, in English law, the interest which a widow had in the copyhold lands of her husband, corresponding to dower in the case of freeholds It depended upon the custom of the manor, but as a general rule the widow took a third for her life of the lands of which her husband died seised, but it might be an estate greater or less than a third. Freebench disappeared with the abolition of copyhold tenures by the Law of Property Act

1922 and the Administration of Estates Act 1925

FREEBOARD literally means the amount of the vertical side of a vessel which is above water—(free meaning clear, and board being the side of the vessel, *e g*, starboard or steering side)

The freeboard is measured vertically at the middle of the length, generally from the line of the uppermost continuous deck to the centre of a circular disk, 12in in diameter, which is marked on the side of the ship, and which is called the freeboard mark, or sometimes, the Plimsoll mark, as defined in the Merchant Shipping act, inspired by Samuel Plimsoll

The centre of the disk gives the limit of loading for the summer season Certain further marks, away from the disk, give the appropriate limits for other seasons, such as winter, winter in the North Atlantic, and the Indian summer Nearly all nations now require sea-going vessels to have a freeboard mark, which is determined in accordance with the conditions described in the article entitled SHIPPING *Registration, Classification and State Regulation*

FREE CHURCH FEDERATION. *See* FEDERAL COUNCIL OF EVANGELICAL FREE CHURCHES, REUNION (CHURCH)

FREE CHURCH OF ENGLAND, a Protestant episcopal church "essentially one with the established church of England, but free to go into any parish, to use a revised edition of the Book of Common Prayer, to associate the laity with the clergy in the government and work of the church, and to hold communion with Christians of other denominations" It was founded in 1844 in opposition to the Tractarian movement, and embodies the distinctively evangelical elements of the Reformation, especially in its opposition to ritualism

See G H Jones, article "Reformed Episcopal Church and Free Church of England," in Hastings' *Encyclopaedia of Religion and Ethics* vol x with references there given.

FREE CHURCH OF SCOTLAND. In one sense the Free Church of Scotland dated its existence from the Disruption of 1843, in another it claimed to be the rightful representative of the National Church of Scotland (*see* SCOTLAND, CHURCH OF) as it was reformed in 1560 In the ecclesiastical history of Scotland the Free Churchman saw three great reforming periods In each of these the inherent scriptural right of the church to exercise a spiritual jurisdiction in which she is responsible to Christ alone, was asserted and practically maintained The first reformation extended from 1560, when the church freely held her first General Assembly, and of her own authority acted on the First Book of Discipline, to 1592, when her Presbyterian order was finally and fully ratified by the parliament The second period began in 1638, when, after 20 years of suspended animation, the Assembly once more shook off Episcopacy, and terminated in 1649, when the parliament of Scotland confirmed the church in her liberties in a larger and ampler sense than before The Westminster standards were ratified, lay-patronage was abolished, and the coronation oath itself framed in accordance with the principles of Presbyterian church government The Revolution Settlement of 1690 was not so entirely favourable to the freedom of the church as the legislation of 1649 had been Presbyterianism was re-established, and the old rights of patrons were again discontinued, but the large powers which had been conferred on congregations by the act of 1649 were not wholly restored Nevertheless, the great principle of a distinct ecclesiastical jurisdiction, embodied in the Confession of Faith, was accepted without reservation, and a Presbyterian polity effectively confirmed both then and at the ratification of the treaty of Union This settlement, however, did not long subsist unimpaired In 1712 the act of Queen Anne, restoring patronage to its ancient footing, was passed in spite of the earnest remonstrances of the Scottish people. For many years afterwards (until 1784) the Assembly continued to instruct each succeeding commission to make application to the king and the parliament for redress of the grievance But meanwhile a new phase of Scottish ecclesiastical politics commonly known as Moderatism had been inaugurated, during the prevalence of which the church became even more indifferent than the lay patrons themselves to the rights of her congregations with regard to the "calling" of ministers.

The "Veto" Act.—The result was a protracted struggle which entered on its final stage with the passing in 1834 of the "Veto" Act, by which it was declared to be a fundamental law of the church that no pastor should be intruded on a congregation contrary to the will of the people, and by which it was provided that the simple dissent of a majority of heads of families in a parish should be enough to warrant a presbytery in rejecting a presentee. The question of the legality of this measure soon came to be tried in the civil courts; and it was ultimately answered in a sense unfavourable to the church by the decision (1838) of the court of session that a presbytery had no right to reject a presentee simply because the parishioners protested against his settlement, but was bound to disregard the veto (*see* CHALMERS, THOMAS) This decision elicited from the Assembly of that year a new declaration of the doctrine of the spiritual independence of the church The "exclusive jurisdiction of the civil courts in regard to the civil rights and emoluments secured by law to the church and the ministers thereof" was acknowledged without qualification. At the same time it was insisted that "in all matters touching the doctrine, discipline and government of the church her judicatories possess an exclusive jurisdiction founded on the Word of God" And it was resolved to assert, and at all hazards defend, this spiritual jurisdiction, and firmly to enforce obedience to the same upon the office-bearers and members of the church The decision of the court of session having been confirmed by the House of Lords early in 1839, it was decided in the Assembly of that year that the church should reaffirm the principle of "non-intrusion" as an integral part of the constitution of the Reformed Church of Scotland, and that a committee should be appointed to confer with the government with a view to the prevention, if possible, of any further collision between the civil and ecclesiastical authorities Yet the conference with the government had no practical result, and grave complications were arising over other cases where congregations objected to ministers "intruded" by patrons In the circumstances it was resolved by the Assembly of 1842 to transmit to the queen, by the hands of the lord high commissioner, a "claim, declaration and protest," complaining of the encroachments of the court of session, and also an address praying for the abolition of patronage The home secretary's answer (received in January 1843) gave no hope of redress

Difficulties of the Church.—A final appeal to parliament by petition was made in March 1843, when, by a majority of 135, the House of Commons declined to attempt any redress of the grievances of the Scottish Church At the first session of the following General Assembly (May 18, 1843) the reply of the non-intrusion party was made in a protest, signed by upwards of 200 commissioners, to the effect that since, in their opinion, the recent decisions of the civil courts, and the still more recent sanction of these decisions by the legislature, had made it impossible at that time to hold a free Assembly of the church as by law established they therefore "protest that it shall be lawful for us, and such other commissioners as may concur with us, to withdraw to a separate place of meeting, for the purpose of taking steps for ourselves and all who adhere to us—maintaining with us the Confession of Faith and standards of the Church of Scotland as heretofore understood—for separating in an orderly way from the Establishment, and thereupon adopting such measures as may be competent to us, in humble dependence on God's grace and the aid of His Holy Spirit, for the advancement of His glory, the extension of the gospel of our Lord and Saviour, and the administration of the affairs of Christ's house according to His holy word." The reading of this document was followed by the withdrawal of the entire non-intrusion party to another place of meeting, where the first Assembly of the Free Church was constituted, with Dr Thomas Chalmers as moderator. This Assembly sat from the 18th to the 30th of May, and transacted a large amount of important business On Tuesday the 23rd, 396 ministers and professors publicly adhibited their names to the Act of Separation and deed of demission by which they renounced all claim to the benefices they had held in connection with the Establishment, declaring them to be vacant, and consenting to their being dealt with as such By this impressive proceeding

the signatories voluntarily surrendered an annual income amounting to fully £100,000

The first care of the voluntarily disestablished church was to provide incomes for her clergy and places of worship for her people. Dr Chalmers had already prepared a carefully matured scheme, according to which "each congregation should do its part in sustaining the whole, and the whole should sustain each congregation", and at the first Assembly it was announced that upwards of £17,000 had already been contributed Each successive year showed a steady increase in the gross amount of the fund To provide for the erection of the buildings which, it was foreseen, would be necessary, a general building fund, in which all should share alike, was also organized, and local building funds were as far as possible established in each parish, with the result that at the first Assembly a sum of £104,776 was reported as already available At the end of four years considerably more than 700 churches had been provided During the winter session 1843–1844 the divinity students who had joined the Free Church continued their studies under Dr Chalmers and Dr David Welsh (1793–1845), and at the Assembly of 1844 arrangements were made for the erection of suitable collegiate buildings The New College, Edinburgh, was built in 1847 at a cost of £46,506, and divinity halls were subsequently set up also in Glasgow and Aberdeen

The "Non-Intrusion" Party.—During the conflict preceding disruption the "non-intrusion" party strenuously denied that in any one respect it was departing from acknowledged principles of the National Church It continued to do so after the disruption In 1846, however, it was found to have become necessary, "in consequence of the late change in the outward condition of the church," to amend the "questions and formula" to be used at the licensing of probationers and the ordination of office-bearers These were amended accordingly, and at the same time it was declared that, "while the church firmly maintains the same scriptural principles as to the duties of nations and their rulers in reference to true religion and the Church of Christ for which she has hitherto contended, she disclaims intolerant or persecuting principles, and does not regard her Confession of Faith, or any portion thereof when fairly interpreted, as favouring intolerance or persecution, or consider that her office-bearers by subscribing it profess any principles inconsistent with liberty of conscience and the right of private judgment " The main difference between the "formula" of the Free Church and that of the Established Church (as at the year 1900) was that the former referred to the Confession of Faith simply as "approven by General Assemblies of this Church," while the latter described it as "approven by the General Assemblies of this National Church, and ratified by law in the year 1690, and frequently confirmed by divers Acts of Parliament since that time", and the Free Church inserted an additional clause,—"I also approve of the general principles respecting the jurisdiction of the church, and her subjection to Christ as her only Head, which are contained in the Claim of Right and in the Protest referred to in the questions already put to me", and also added the words which are here distinguished by italics,—"And I promise that through the grace of God I shall firmly and constantly adhere to the same, and to the utmost of my power shall in my station assert, maintain and defend the said doctrine, worship, discipline and government of this church by kirk-sessions, presbyteries, provincial synods and general assemblies, *together with the liberty and exclusive jurisdiction thereof;* and that I shall, in my practice, conform myself to the said worship and submit to the said discipline [and] government, *and exclusive jurisdiction,* and not endeavour directly or indirectly the prejudice or subversion of the same "

In 1863 a motion was made and unanimously carried in the Free Church Assembly for the appointment of a committee to confer with a corresponding committee of the United Presbyterian Synod, and with the representatives of such other disestablished churches as might be willing to meet and deliberate with a view to an incorporating union. Formal negotiations between the representatives of these two churches were begun shortly afterwards, which resulted in a report laid before the following Assembly. From this document it appeared that the committees of the two churches were not at one on the question as to the relation of the civil magistrate to the church. While on the part of the Free Church it was maintained that he "may lawfully acknowledge, as being in accordance with the Word of God, the creed and jurisdiction of the church," and that "it is his duty, when necessary and expedient, to employ the national resources in aid of the church, provided always that in doing so, while reserving to himself full control over the temporalities which are his own gift, he abstain from all authoritative interference in the internal government of the church," it was declared by the committee of the United Presbyterian Church that, "inasmuch as the civil magistrate has no authority in spiritual things, and as the employment of force in such matters is opposed to the spirit and precepts of Christianity, it is not within his province to legislate as to what is true in religion, to prescribe a creed or form of worship to his subjects, or to endow the church from national resources " Thus in a very short time it had been made perfectly evident that a union between the two bodies, if accomplished at all, could only be brought about on the understanding that the question as to the lawfulness of state endowments should be an open one The Free Church Assembly, by increasing majorities, manifested a readiness for union, even although unanimity had not been attained on that theoretical point But there was a minority which did not sympathize in this readiness, and after ten years of fruitless effort it was in 1873 found to be expedient that the idea of union with the United Presbyterians should for the time be abandoned Other negotiations, however, which had been entered upon with the Reformed Presbyterian Church at a somewhat later date proved more successful, and a majority of the ministers of that church with their congregations were united with the Free Church in 1876

Scholarship.—The mind of the Free Church was by no means absorbed only in questions of ecclesiastical polity The Colleges of the Church have been the home of the most active interest in theological and historical questions There was a stormy period, however, when extreme conservatism appeared to gain a victory In 1870 W. Robertson Smith (*see* SMITH, WILLIAM ROBERTSON) was ordained to the office of professor of oriental languages and Old Testament exegesis in the Free Church College, Aberdeen Here from the first he advocated views which though now widely accepted, were then regarded with apprehension In 1876 a committee of the Free Church reported so adversely on his writings that Smith demanded a formal trial The indictment failed, but a vote of want of confidence was passed, and in 1881 he was removed from his chair This event, however, was no adequate expression of the real mind of the Church During the last quarter of the 19th century the Free Church continued to be the most active, theologically, of the Scottish Churches The College chairs were almost uniformly filled by theologians and historians of progressive views, inspired more or less by Professor A B Davidson of New College, Edinburgh Dr A B Bruce, author of *The Training of the Twelve,* etc , was appointed to the chair of apologetics and New Testament exegesis in the Glasgow College in 1875; Henry Drummond (author of *Natural Law in the Spiritual World,* etc) was made lecturer in natural science in the same college in 1877 and became professor in 1884; and Dr George Adam Smith (author of *The Twelve Prophets,* etc) was called to the Hebrew chair in 1892 Attempts were made between 1890 and 1895 to bring all these professors except Davidson (similar attacks were also made on Dr Marcus Dods, afterwards principal of the New College, Edinburgh) to the bar of the Assembly for unsound teaching or writing; but in every case these were abortive, the Assembly never taking any step beyond warning the accused that their primary duty was to teach and defend the church's faith as embodied in the confession In 1892 the Free Church, following the example of the United Presbyterian Church and the Church of Scotland (1889), passed a Declaratory Act relaxing the stringency of subscription to the confession, with the result that a small number of ministers and congregations, mostly in the Highlands, severed their connection with the church and formed the Free Presbyterian Church of Scotland, on strictly orthodox lines Meanwhile other changes were taking place. The

standard of parochial and congregational activity was raised, a new method of operation devised The use of instrumental music was sanctioned and special attention given to the promotion of the ends of edification, order and reverence in public worship And the establishment principle was from then onwards almost entirely abandoned.

19th and 20th Centuries.—During the last four or five years of the 19th century the Free and United Presbyterian churches, which after the failure of their union negotiations in 1873 had been connected together by a Mutual Eligibility Act enabling a congregation of one church to call a minister from the other, devoted their energy to the arrangement of an incorporating union The Synod of the United Presbyterian Church resolved in 1896 to "take steps towards union," and in the following year the Free Assembly responded by appointing a committee to confer with a committee of the other church The joint committee discovered a "remarkable and happy agreement" between the doctrinal standards, rules and methods of the two bodies, and with very little concessions on either side a common constitution and common "questions and formula" for the admission of ministers and office-bearers were arranged A minority, always growing smaller, of the Free Church Assembly, protested against the proposed union, and threatened if it were carried through to test its legality in the courts, nevertheless the union was carried through The supreme courts of the churches met for the last time in their respective places of meeting on the 30th of October 1900, and on the following day the joint meeting took place at which the union was completed, and the United Free Church of Scotland (*q v*) entered on its career The protesting and dissenting minority at once claimed to be the Free Church They met outside the Free Assembly Hall on the 31st of October, and, failing to gain admission to it, withdrew to another hall, where they elected Mr Colin Bannatyne their moderator and held the remaining sittings of the Assembly It was reported that between 16,000 and 17,000 names had been received of persons adhering to the anti-unionist principle At the Assembly of 1901 it was stated that the Free Church had twenty-five ministers and at least sixty-three congregations The character of the church is indicated by the fact that its office-bearers were the faithful survivors of the decreasing minority of the Old Free Church, which had protested against the disestablishment resolutions, against the relaxation of subscription, against toleration of the teaching of the Glasgow professors, and against the use in worship of organs or of human hymns Her congregations were mostly in the Gaelic-speaking districts of Scotland She was confronted with a very arduous undertaking, her congregations grew in number, but were far from each other and there were not nearly enough ministers The church met with no sympathy or assistance at the hands of the United Free Church, and her work was conducted at first under considerable hardships, nor was her position one to appeal to the general popular sentiment of Scotland But the little church continued her course with indomitable courage and without any compromise of principle The Declaratory Act of 1892 was repealed after a consultation of presbyteries, and the old principles as to worship were declared The desire of the Church of Scotland to obtain relaxation of her formula was declared to make union with her impossible

The decision of the House of Lords in 1904 did not bring the trials of the Free Church to an end In the absence of any arrangement with the United Free Church, she could only gain possession of the property declared to belong to her by an application in each particular case to the Court of Session, and a series of law-suits began which were trying to all parties In the year 1905 the Free Church Assembly met in the historic Free Church Assembly Hall, but it did not meet there again The urgent task confronting the church was that of supplying ordinances to her congregations. The latter numbered 200 in 1907, and the church had as yet only 74 ordained ministers, so that many of the manses allocated to her by the commissioners were not yet occupied, and catechists and elders were called to conduct services where possible The problem has been faced with energy and enthusiasm, but it is still serious.

See SCOTLAND, CHURCH OF, and UNITED FREE CHURCH OF SCOTLAND.

FREEDEN, WILHELM IHNO ADOLPH VON (1822–1894), German scientist, was born at Norden, Hanover, on May 12, 1822 He studied at Bonn and Gottingen and later held the posts of teacher of mathematics, physics and modern languages at the "Gymnasium" at Jever (1845–56) and headmaster of the Navigation school at Elsfleth near Bremen (1856–67). In 1867 he resigned his post at Elsfleth and went to Hamburg, where he established and became the first director of the Norddeutsche Seewarte (later Deutsche Seewarte) He afterwards took an active part in founding the North German Lloyd company He also organized the first system of storm warnings for the German coast Between 1871 and 1876 he served in the *Reichstag* as a member for Hamburg He died at Bonn on Jan 11, 1894

He wrote *Nautische Hulfstafeln* (with T Koster, 1862), *Handbuch der Nautik* (1864), *Barometerbuch zur Gebrauche der Seeleute* (1885), and a memoir on the use of the method of least squares

FREEDMEN'S BUREAU (officially the BUREAU OF FREEDMEN, REFUGEES AND ABANDONED LANDS), a bureau created in the United States war department by an act of Congress (March 3, 1865), to last one year, but continued until 1872 by later acts Its establishment was due partly to the fear entertained by the North that the Southerners if left to deal with the blacks would attempt to re-establish some form of slavery, partly to the necessity for extending relief to needy negroes and whites in the lately conquered South, and partly to the need of creating some commission or bureau to take charge of lands confiscated in the South At the head of the bureau was a commissioner, General O O Howard, and under him in each Southern state was an assistant commissioner with a corps of local superintendents, agents and inspectors The officials had the broadest possible authority in all matters that concerned the blacks The work of the bureau may be classified as follows (1) distributing rations and medical supplies among the blacks, (2) establishing schools for them and aiding benevolent societies to establish schools and churches, (3) regulating labour and contracts; (4) taking charge of confiscated lands, and (5) administering justice in cases in which blacks were concerned For several years the ex-slaves were under the almost absolute control of the bureau Whether this control had a good or bad effect is still disputed Much necessary relief work was done, but demoralization was also caused by it In educating the blacks the bureau made some progress, but the instruction imparted by the missionary teachers resulted in giving the ex-slaves notions of liberty and racial equality that led to much trouble, finally resulting in the hostility of the whites to negro education When negro suffrage was imposed by Congress upon the Southern States, the bureau aided the Union League (*q v*) in organizing the blacks into a political party opposed to the whites A large majority of the bureau officials secured office through their control of the blacks The failure of the bureau system, its discontinuance, in the midst of reconstruction, without harm to the blacks, and the intense hostility of the Southern whites to the institution, caused by the irritating conduct of bureau officials, are indications that the institution was not well conceived nor wisely administered

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FREEHOLD, a borough of New Jersey, U S A, near the centre of the State, county seat of Monmouth county It is served by the Central of New Jersey and the Pennsylvania railways The population was 4,768 in 1920, and was estimated locally at 6,000 in 1928 It is the trade centre of a large and productive agricultural area, and has pea and bean canneries, an iron foundry, and large factories making rugs and carpets The town was founded in 1715. It was long known as Monmouth Court-House, but later took the name of Freehold (from the township) and was incorporated as a town in 1869 In 1919 it was incorporated as a borough An important engagement of the Revolution (the Battle

of Monmouth) was fought near the court-house on June 28, 1778 It was in this battle that Molly Pitcher took the place of her husband, John C. Hays, an artillerist, when he was injured, and served his gun, preventing its capture by the British

FREEHOLD, in the English law of real property, an estate in land, not being less than an estate for life (*see* ESTATE) The term *customary freeholds* was applied to a kind of copyhold tenure in the north of England, viz , tenure by copy of court-roll, but at the will of the lord These were abolished by the Law of Property Acts 1922 and 1925

FREE LANCE, a name applied to writers, both of editorial material and advertisements, who work on a fee basis and are not a part of any organization There are free lance newspaper writers, free lance writers for technical and trade magazines, as well as free lance writers who prepare booklets and other advertisements

FREELAND, a borough of Luzerne county, Pa , U S A , 30m S of Wilkes-Barre, on Broad mountain, at an altitude of nearly 2,000ft It is served by the Lehigh Valley and electric railways The population was 6,666 in 1920, and was estimated locally at 8,500 in 1928 The mining of anthracite is the dominant occupation There are large foundries and machine shops, and factories making silk, bobbins, overalls, shirts, cigars and hames Freeland was settled about 1842, and was incorporated in 1876 It is the seat of the Mining and Mechanical institute of the anthracite region (chartered 1894), founded and endowed by Eckley B Coxe, the first coal operator in this region, and modelled after the German *Steigerschulen*

FREEMAN, EDWARD AUGUSTUS (1823–1892), English historian, was born at Harborne, Staffordshire, and educated privately until he went to Trinity college, Oxford, where he became a fellow in 1845 In 1847 he married a daughter of a former tutor, the Rev R Gutch His life was one of strenuous literary work He wrote many books, and countless articles for newspapers and reviews, especially for the *Saturday Review,* which was the vehicle for his prolonged attack on Froude In politics he was a follower of Gladstone, but foreign politics interested him more than domestic, especially the struggle for independence of the small countries of eastern Europe In 1854 he became Regius Professor of Modern History at Oxford, and he died at Alicante, in Spain, on March 16, 1892

His reputation as an historian rests chiefly on his *History of the Norman Conquest* (15 vols , 1867–76), which is exhaustive in treatment and remarkably accurate Its ruling idea, however—that of the permanence of the Anglo-Saxon elements in spite of the Conquest, and their continued importance as the basis of constitutional development—is less generally accepted now He advanced the study of history in England in two main ways, by insisting on the unity of history, as against its artificial division into periodic or national sections, and by teaching the importance of original authorities The central truth of European history, he thought, its bond of unity, was the permanence of Rome, and he wrote his *History of Sicily* (1891–94) to illustrate this

See W R W Stephens, *Life and Letters of E A. Freeman* (1895)

FREEMAN, MARY ELEANOR WILKINS, (1862–), American writer, was born in Randolph (Mass), Jan 7, 1862, of Puritan ancestry Her early education, chiefly from reading and observation, was supplemented by a course at Mount Holyoke seminary, South Hadley (Mass) She subsequently lived in Brattleboro (Vt), until her marriage in 1902 to Dr Charles M Freeman of Metuchen (N J) She contributed poems and stories to magazines and published several books for children, including *Young Lucretia and Other Stories* (1892) and *Once upon a Time and Other Child Verses* (1897) *A Humble Romance and Other Stories* (1887) and *A New England Nun and Other Stories* (1891) gave her a prominent place among American short-story writers Her novels, however, are poorly constructed and, though successful in the portrayal of character, lack the compression, suggestiveness, and intensity of her short stories Through her tales she has given literary permanence to fast disappearing characteristics of New England life

Among her novels the best, perhaps, are *Jane Field* (1892) and *Pembroke* (1894). Besides her characteristic depictions of rural New England she has published *The Wind in the Rose-Bush* (1903), a collection of eerie ghost tales; *Giles Corey, Yeoman* (1893), a prose tragedy founded on incidents from New England history, the problem novel, *The Portion of Labor* (1901); *Jerome, A Poor Young Man* (1897), a purpose novel; *The Long Arm* (1895), a detective story which won a prize of $2,000, and many others Good criticism is afforded by F. L Pattee's "On the Terminal Moraine of New England Puritanism," in his *Side-Lights on American Literature* (1922)

FREEMAN, the term specifically applied to one who possesses the freedom of a city, borough or company. Before the passing of the Municipal Corporations Act 1835, each English borough admitted freemen according to its own peculiar custom and by-laws The rights and privileges of a freeman, though varying in different boroughs, generally included the right to vote at a parliamentary election of the borough, and exemption from all tolls and dues The act of 1835 respected existing usages, and every person who was then an admitted freeman remained one, retaining all his former rights and privileges The admission of freemen is now regulated by the Municipal Corporations Act 1882, whereby the term "freeman" includes any person of the class whose rights and interests are reserved by the act of 1835 under the name either of freemen or of burgesses No person can be admitted a freeman by gift or by purchase, that is, only birth, servitude or marriage are qualifications By the Honorary Freedom of Boroughs Act 1885, however, the council of every borough may admit persons of distinction to be honorary freemen

A person may become a freeman or freewoman of one of the London livery companies by (1) apprenticeship or servitude; (2) patrimony, (3) redemption, (4) gift.

See W. C Hazlitt, *The Livery Companies of the City of London* (1892).

FREEMARTIN, the name used by farmers and breeders to denote the hermaphrodite (*q v*) of domestic cattle Freemartins always occur as twin with normal males For an explanation of this, *see* SEX

FREEMASONRY. According to an old "Charge" delivered to initiates, Freemasonry is declared to be an "ancient and honourable institution. ancient no doubt it is, as having subsisted from time immemorial, and honourable it must be acknowledged to be, as by a natural tendency it conduces to make those so who are obedient to its precepts . . . to so high an eminence has its credit been advanced that in every age monarchs themselves have been promoters of the art, have not thought it derogatory from their dignity to exchange the sceptre for the trowel, have patronized our mysteries and joined in our assemblies "

The precise origin of the society has yet to be ascertained, and is not likely to be, as the early records are lost; there is, however, ample evidence remaining to justify the claim for its antiquity and its honourable character Much has been written as to its eventful past, based upon actual records, but still more which has served only to amuse or repel enquirers, and led not a few to believe that the fraternity has no trustworthy history An unfavourable opinion of the historians of the craft generally may fairly have been held during the 18th and early in the 19th centuries, but happily since the middle of the latter century quite a different principle has animated those brethren who have sought to make the facts of masonic history known to the brotherhood, as well as worth the study of students in general

It is only necessary to refer to the old works on Freemasonry, and to compare them with the accepted histories of the present time to be assured that such strictures as above are more than justified The premier work on the subject was published in London in 1723, the Rev. James Anderson being the author of the historical portion introductory to the first "Book of Constitutions" of the original Grand Lodge of England. Dr. Anderson gravely states that "Grand Master Moses often marshalled the Israelites into a regular and general lodge while in the wilderness . . . King Solomon was Grand Master of the lodge at Jerusalem . . . Nebuchadrezzar became the Grand Master Mason," etc., devoting many more pages to similar absurdities, but dismisses the impor-

tant modern innovation (1716–17) of a grand lodge with a few lines noteworthy for their brief and indefinite character

In 1738, a second edition was issued dedicated to the prince of Wales ("a master mason and master of a lodge"), and was the work of the same brother (as respects the historical part), the additions being mainly on the same lines as the former volume, only, if possible, still more ridiculous and extravagant; *e g*, Cyrus constituted Jerubbabel "provincial grand master in Judah", Charles Martel was "the Right Worshipful Grand Master of France, and Edward I, being deeply engaged in wars, left the craft to the care of several successive grand masters" (duly enumerated). Such loose statements may now pass unheeded, but unfortunately they do not exhaust the objections to Dr Anderson's method of writing history The excerpt concerning St Alban (apparently made from Coles's *Ancient Constitutions* [1728–29]) has the unwarranted additional title of grand master conferred on that saint, and the extract concerning King Aethelstan and Prince Edwin from the "old ms charges" (given in the first edition) contains still more unauthorized modern terms, with the year added of 926, thus misleading most seriously those who accepted the volume as trustworthy, because written by the accredited historian of the grand lodge, junior grand warden in 1723 These examples hardly increase our confidence in the author's accuracy when Dr. Anderson comes to treat of the origin of the premier grand lodge; but he is our only informant as to that important event, and if his version of the occurrence is declined, we are absolutely without any information

Early History.—In considering the early history of Freemasonry, from a purely matter-of-fact standpoint, it will be well to settle as a necessary preliminary what the term did and does now include or mean, and how far back the enquiry should be conducted as well as on what lines If the view of the subject herein taken be correct, it will be useless to load the investigation by devoting considerable space to a consideration of the laws and customs of still older societies which may have been utilized and imitated by the fraternity, but which in no sense can be accepted as the actual forbears of the present society of Free and Accepted Masons They were predecessors, or possibly prototypes, but not near relatives or progenitors of the Freemasons.

The mother grand lodge of the world is that of England, which was inaugurated in the metropolis on St John Baptist's day, 1717, by four or more old lodges, three of which still flourish There were other lodges also in London and the country at the time, but whether they were invited to the meeting is not now known Probably not, as existing records of the period preserve a sphinx-like silence thereon Likewise there were many scores of lodges at work in Scotland, and undoubtedly in Ireland the craft was widely patronized. Whatever the ceremonies may have been which were then known as Freemasonry in Great Britain and Ireland, they were practically alike, and the venerable *Old Charges* or ms constitutions, dating back several centuries, were rightly held by them as the title-deeds of their masonic inheritance It was not long before most of the lodges of the pre-grand-lodge era joined and accepted "constitution" by warrant of the grand master Not only so, but Ireland quickly followed the lead, so early as 1725 there being a grand lodge for that country which must have been formed even still earlier, and probably by lodges started before any were authorized in the English counties In Scotland the change was not made until 1736, many lodges even then holding aloof from such an organization Indeed, out of some hundreds of lodges known to have been active then, only 33 responded and agreed to fall into line, though several joined later; some, however, kept separate down to the end of the 19th century, while others never united Many of these lodges have records of the 17th century though not then newly formed, one in particular, the oldest (the lodge of Edinburgh, No. 1), possesses minutes so far back as the year 1599

All the regular lodges throughout the world, and likewise all the grand lodges, directly or indirectly, have sprung from one or other of the three governing bodies named, Ireland and Scotland following the example set by their masonic mother of England in having grand lodges of their own. It is not proved how the latter two became acquainted with Freemasonry as a secret society, guided more or less by the operative *Constitutions* or *Charges* common to the three bodies not met with elsewhere, but the credit of a grand lodge being established to control the lodges belongs to England There is no other Freemasonry, as the term is now understood, than that which has been so derived In other words, the lodges and grand lodges in both hemispheres trace their origin and authority back to England for working what are known as the Three Degrees, controlled by regular grand lodges That being so, a history of modern Freemasonry, the direct offspring of the British parents aforesaid, should first of all establish the descent of three grand lodges from the Freemasonry of earlier days, such continuity, of five centuries or more, being a *sine qua non* of antiquity and regularity

It will be found that from the early part of the 18th century back to the 16th century existing records testify to the assemblies of lodges, mainly operative, but partly speculative, in Great Britain, whose guiding stars and common heritage were the *Old Charges* and that when their actual minutes and transactions cease to be traced by reason of their loss, these same ms *Constitutions* furnish testimony of the still older working of such combinations of freemasons, or masons, without the assistance, countenance or authority of any other masonic body, consequently such documents still preserved, of the 14th and later centuries (numbering about 70, mostly in form of rolls), with the existing lodge minutes referred to of the 16th century, down to the establishment of the premier grand lodge in 1717, prove the continuity of the society Indeed so universally has this claim been admitted, that in popular usage the term *Free*-mason is only now applied to those who belong to this particular fraternity, that of *mason* being applicable to one who follows that trade, or honourable calling, as a builder. There is no evidence that during this long period any other organization of any kind, religious, philosophical, mystical or otherwise, materially or even slightly influenced the customs of the fraternity, though they may have done so, but so far as is known the lodges were of much the same character throughout, and consisted really of operatives (who enjoyed practically a monopoly for some time of the trade as masons or freemasons), and in part of "speculatives," *i e*, noblemen, gentlemen and men of other trades, who were admitted as honorary members

The rules and regulations of the masons were embodied in what are known as the *Old Charges*, the senior known copy being the *Regius ms* (British Museum Bibl Reg 17 A, i), which, however, is not so exclusively devoted to masonry as the later copies. David Casley, in his catalogue of the mss. in the King's Library (1734), unfortunately styled the little gem *A Poem of Moral Duties;* and owing to this misdescription its true character was not recognized until the year 1839, and then by a non-mason (Halliwell-Phillipps), who had it reproduced in 1840 and brought out an improved edition in 1844 Its date has been approximately fixed at 1390 by Casley and other authorities The curious legend of the craft, therein made known, deals first of all with the number of unemployed in early days and the necessity of finding work "that they myght gete here lyvynge thereby." Euclid was consulted, and recommended the "onest craft of good masonry" and the genesis of the society is found "yn Egypte lande" By a rapid transition, but "mony erys afterwarde," we are told that the "Craft com ynto England yn tyme of good kynge Adelstonus (Aethelstan) day," who called an assembly of the masons, when 15 articles, and as many more points were agreed to for the government of the craft, each being duly described Each brother was instructed that—

> "He must love wel God, and holy Churche algate
> And hys mayster also, that he ys wythe"
>
> "The thrydde poynt must be severle
> With the prentes knowe hyt wele
> Hys mayster counsel he kepe and close,
> And hys felows by hys goode purpose,
> The prevetyse of the chamber telle he no mon,
> Ny yn the logge whatsever they done,
> Whatsever thou heryst, or syste hem do,
> Telle hyt no mon, whersever thou go"

The rules, generally, besides referring to trade regulations, are as

a whole suggestive of the Ten Commandments in an extended form, winding up with the legend of the *Ars quatuor coronatorum,* as an incentive to a faithful discharge of the numerous obligations A second part introduces a more lengthy account of the origin of masonry, in which Noah's flood and the Tower of Babylon are mentioned as well as the great skill of Euclid, who—

"Through hye grace of Crist yn Heven,
He commensed yn the syens seven"

The "seven sciences" are duly named and explained The compiler apparently was a priest, line 629 reading "And, when ye gospel *me rede schal"* thus also accounting for the many religious injunctions in the ms The last hundred lines are evidently based upon *Urbanitatis* (Cott ms Caligula A II, fol 88) and *Instructions for a Parish Priest* (Cott ms Claudius A II, fol 27), instructions such as lads and even men would need who were ignorant of the customs of polite society, correct deportment at church and in the presence of their social superiors The recital of the legend of the *Quatuor Coronati* has been held by Herr Findel in his *History of Freemasonry (Allgemeine Geschichte der Freimaurerei,* 1862, English editions, 1866–69) to prove that British Freemasonry was derived from Germany, but without any justification, the legend being met with in England centuries prior to the date of the *Regius ms*, and long prior to its incorporation in masonic legends on the Continent

The next ms, in order, is known as the "Cooke" (Ad mss 23, 198, British Museum), because Matthew Cooke published a fair reproduction of the document in 1861, and it is deemed by competent paleographers to date from the first part of the 15th century. There are two versions of the Old Charges in this little book, purchased for the British Museum in 1850 The compiler was probably a mason and familiar with several copies of these mss *Constitutions,* two of which he utilizes and comments upon, he quotes from a ms copy of the Policronicon the manner in which a written account of the sciences was preserved in the two historic stones at the time of the Flood, and generally makes known the traditions of the society as well as the laws which were to govern the members

Its introduction into England through Egypt is noted (where the Children of Israel "lernyd ye craft of Masonry"), also the "lande of behest" (Jerusalem) and the Temple of Solomon (who "confirmed ye chargys yt David his Fadir" had made) Then masonry in France is interestingly described, and St Alban and "Aethelstane with his yongest sone" (the Edwin of the later mss) became the chosen mediums subsequently, as with the other *Charges,* portions of the Old Testament are often cited in order to convey a correct idea to the neophyte, who is to hear the document read, as to these sciences which are declared to be free in themselves (*fre in hem selfe*) Of all crafts followed by man in this world "Masonry hathe the moste notabilite," as confirmed by "Elders that were bi for us of masons [who] had these chargys wryten," and "as is write and taught in ye boke of our charges"

For long no representative of this particular version had been traced, but in 1890 one was discovered of 1687 (since known as the *William Watson ms*) Of some seventy copies of these old scrolls which have been unearthed, by far the greater proportion have been made public since 1860 They have all much in common, though often curious differences are to be detected, are of English origin, no matter where used, and when complete, as they mostly are, whether of the 16th or subsequent centuries, are noteworthy for an invocation or prayer which begins the recital —

"The mighte of the ffather of heaven
And the wysedome of the glorious Sonne
through the grace and the goodness of the holly
ghoste yt been three p'sons and one God
be with us at or beginning and give us grace
so to gou'ne us here in or lyving that wee maye
come to his blisse that nevr shall have ending.—
Amen"
(*Grand Lodge ms* No. 1, AD. 1583)

They are chiefly of the 17th century and nearly all located in England, particulars may be found in Hughan's *Old Charges of the British Freemasons* (1872, 1895 and supplement 1906) The chief scrolls with some others have been reproduced in facsimile in six volumes of the *Quatuor Coronatorum Antigrapha;* and the collection in Yorkshire has been published separately either in the *West Yorkshire Reprints* or the *Ancient York Masonic Rolls* Several have been transcribed and issued in other works

These scrolls give considerable information as to the traditions and customs of the craft, together with the regulations for its government, and were required to be read to apprentices long after the peculiar rules ceased to be acted upon, each lodge apparently having one or more copies kept for the purpose The old Lodge of Aberdeen ordered in 1670 that the Charge was to be "read at ye entering of everie entered prenteise", another at Alnwick in 1701 provided—

"Noe Mason shall take any apprentice [but he must]
Enter him and give him his Charge, within one whole year after",

and still another at Swallwell (now No 48 Gateshead) demanded that "the Apprentices shall have their Charge given at the time of Registering, or within 30 days after"; the minutes inserting such entries accordingly even so late as 1754, nearly 20 years after the lodge had cast in its lot with the Grand Lodge of England

Their Christian character is further emphasized by the "First Charge that you shall be true men to God and the holy Church", the *York ms No 6* beseeches the brethren "at every meeting and assembly they pray heartily for all Christians", the *Melrose ms No 2* (1674) mentions "Merchants and all other Christian men," and the *Aberdeen ms* (1670) terms the invocation "A Prayer before the Meeting" Until the grand lodge era, Freemasonry was thus wholly Christian The *York ms No 4,* of 1693 contains a singular error in the admonitory lines —

"The [n] one of the elders takeing the Booke and that hee or *shee* that is to be made mason shall lay their hands thereon and the charge shall be given"

This particular reading was cited by Hughan in 1871, but was considered doubtful, Findel, however, confirmed it, on his visit to York under the guidance of the celebrated masonic student the late Rev A F A Woodford The mistake was due possibly to the transcriber, who had an older roll before him, confusing "they," sometimes written "the" with "she," or reading that portion which is often in Latin as *ille vel illa,* instead of *ille vel illi*

In some of the *Codices,* about the middle of the 17th century and later, new articles are inserted, such as would be suitable for an organization similar to the Masons' company of London, which had one, at least, of the *Old Charges* in its possession according to inventories of 1665 and 1676, and likewise in 1722, termed *The Book of the Constitutions of the Accepted Masons* Save its mention ("Book wrote on parchment") by Sir Francis Palgrave in the *Edinburgh Review* (April 1839) as being in existence "not long since," this valuable document has been lost sight of for many years

That there were signs and other secrets preserved and used by the brethren throughout this mainly operative period may be gathered from discreet references in these old mss The *Institutions in parchment* (Nov 22, 1696) of the Dumfries Kilwinning Lodge (No 53, Scotland) contain a copy of the oath taken "when any man should be made" —

"These Charges which we now reherse to you and all others ye secrets and misterys belonging to free masons you shall faithfully and truly keep, together with ye Counsell of ye assembly or lodge, or any other lodge, or brother or fellow"

"Then after ye oath taken and the book kissed," *i e*, the Bible, the "precepts" are read, the first being —

"You shall be true men to God and his holy Church, and that you do not countenance or maintaine any eror, faction, schism or heresy, in ye church to ye best of your understanding" (*History of No. 53,* by James Smith)

The *Grand Lodge ms No 2* provides that "You shall keepe secret ye obscure and intricate pts. of ye science, not disclosinge them to any but such as study and use ye same."

The *Harleian ms No 2054* (Brit. Mus.) is still more explicit, termed *The free Masons Orders and Constitutions,* and is in the

handwriting of Randle Holme (author of the *Academie of Armory*, 1688), who was a member of a lodge in Cheshire Following the ms *Constitutions*, in the same handwriting, about 1650, is a scrap of paper with the obligation —

"There is sevrall words and signes of a free Mason to be revailed to yu wch as yu will answr before God at the Great and terrible day of judgmt yu keep secret and not to revaile the same to any in the heares of any p'son, but to the Mrs and fellows of the Society of Free Masons, so helpe me God, etc" (W. H Rylands, *Mas Mag*, 1882)

The lodge is often met with, either as the *tabulatum domicialem* (1200, at St Alban's Abbey) or actually so named in the *Fabric Rolls* of York Minster (1370), *ye loge* being situated close to the fane in course of erection, it was used as a place in which the stones were prepared in private for the structure as well as occupied at meal-time, etc Each mason was required to "swere upon ye boke yt he sall trewly ande bysyli at his power hold and kepe holy all ye poyntes of yis forsayde ordinance" (*Ordinacio Cementanorum*)

As to the term *free*-mason, from the 14th century it is held by some authorities that it described simply those men who worked "freestone," but there is abundant evidence to prove that, whatever may have been intended at first, *free*-mason soon had a much wider signification, the prefix *free* being also employed by carpenters (1666), sewers (15th century, tailors at Exeter) and others, presumably to indicate that they were free to follow their trades in certain localities On this point Gould well observes "The class of persons from whom the Freemasons of Warrington (1646), Staffordshire (1686), Chester, York, London and their congeners in the 17th century derived the descriptive title, which became the inheritance of the grand lodge of England, were *free men*, and masons of gilds or companies" (*History*, vol ii p 160) Dr Brentano may also be cited. "Wherever the craft gilds were legally acknowledged, we find foremost, that the right to exercise their craft, and sell their manufactures, depended upon the freedom of their city" (*Development of Gilds*, etc, p 65) In like manner, the privilege of working as a mason was not conferred before candidates had been "made free" The regular freemasons would not work with men, even if they had a knowledge of their trade "if *un*free," but styled them "Cowans," a course justified by the king's "Maister of Work," William Schaw, whose *Statutis and Ordinancies* (Dec 28, 1598) required that "Na maister or fellow of craft ressaue any *cowanis* to wirk in his societie or companye, nor send nane of his servants to wirk wt cowanis, under the pane of twentie pounds" Gradually, however, the rule was relaxed, in time such monopoly practically ceased, and the word "cowan" is only known in connection with speculative Freemasonry. Sir Walter Scott, as a member of Lodge St David (No. 36) was familiar with the word and used it in *Rob Roy* In 1707 a cowan was described in the minutes of Mother Lodge Kilwinning, as a mason "without the word," thus one who was not a *free* mason (*History of the Lodge of Edinburgh No. 1*, by D Murray Lyon, 1900)

In the *New English Dictionary* (Oxford, vol. iv., 1897) under "Freemason" it is noted that three views have been propounded. —(1) "The suggestion that *free-mason* stands for free-stone-mason would appear unworthy of attention, but for the curious fact that the earliest known instances of any similar appellation are *mestre mason de franche peer* (Act 25 Edw. III, 1350), and *sculptores lapidum liberorum*, alleged to occur in a document of 1217; the coincidence, however, seems to be merely accidental (2) The view most generally held is that freemasons were those who were free of the masons' guild Against this explanation many forcible objections have been brought by Mr. G W. Speth, who suggests (3) that the itinerant masons were called free because they claimed exemption from the control of the local guilds of the towns in which they temporarily settled. (4) Perhaps the best hypothesis is that the term refers to the mediaeval practice of emancipating skilled artisans, in order that they might be able to travel and render their services wherever any great building was in process of construction." Still it cannot be denied that members of lodges in the 16th and following centuries exercised the privilege of making *free* masons and denied the freedom of working to cowans (also called *un*-freemen) who had not been so made free; "the Masownys of the luge" being the only ones recognized as *free*masons As to the prefix being derived from the word *frere* (brother), a sufficient answer is the fact that frequent reference is made to "Brother *free*masons," so that no ground for that supposition exists (*cf* articles by Mr Gould in the *Freemason* for Sept 1898 on "Free and Freemasonry").

There are numerous indications of masonic activity in the British lodges of the 17th century, especially in Scotland; the existing records of the southern part of the United Kingdom, though few, are of importance, some only having been made known in recent years These concern the Masons' Company of London, whose valuable minutes and other documents are ably described and commented upon by Edward Conger, Jr, in his *Hole Crafte and Fellowship of Masons* (1894), the author then being the master of that ancient company. It was incorporated in 1677 by Charles II, who graciously met the wishes of the members, but the information "that is to be found in the Corporation Records at Guildhall proves very clearly that in 1376 the Masons' Company existed and was represented in the court of common council" The title then favoured was "Masons," the entry of the term "Freemasons" being crossed out. Herbert erroneously overlooked the correction, and stated in his *History of the Twelve Great Livery Companies* (vol 1) that the Freemasons returned two, and the Masons four members, but subsequently amalgamated, whereas the revised entry was for the "Masons" only The company obtained a grant of arms in 1472 (12th year Edw IV) one of the first of the kind, being thus described: "A feld of Sablys A Chevron silver grailed thre Castellis of the same garnysshed wt dores and wyndows of the feld in the Cheveron or Cumpas of Black of Blak"; it is the authority (if any) for all later armorial bearings having a chevron and castles, assumed by other masonic organizations This precious document was only discovered in 1871, having been missing for a long time, thus doubtless accounting for the erroneous representations met with, the artist not having the correct blazon to follow The oldest masonic motto known is "God is our Guide" on Kerwin's tomb in St Helen's church, Bishopgate, of 1594; that of "In the Lord is all our trust" not being traced until the next century Supporters consisting of two Doric columns are mentioned in 1688 by Randle Holme, but the grand lodge of England in the following century used beavers, as operative builders Its first motto was "In the beginning was the Word" (in Greek), exchanged a few years onward for "Relief and Truth," the rival grand lodge (Atholl Masons) selecting "Holiness to the Lord" (in Hebrew) and the final selection at the "Union of December 1813" being *Audi Vide Tace*.

Conder's discovery of a lodge of "Accepted Masons" being held under the wing of the company was a great surprise, dating as the records do from 1620 to 1621 (the earliest of the kind yet traced in England) when seven were made masons, all of whom were free of the company *before*, three being of the livery; the entry commencing "Att the making masons" The meetings were entitled the "Acception," and the members of the lodge were called *Accepted* masons, being so *accepted* and initiated, the terms never otherwise being met with in the records An additional fee had to be paid by a member of the company to join the "Acception," and any not belonging thereto was mulct in twice the sum; though even then such "acceptance" did not qualify for membership of the superior body the fees for the "Acception" being £1 and £2 respectively. In 1638–1639, when Nicholas Stone entered the lodge (he was master of the company 1632–33) the banquet cost a considerable sum, showing that the number of brethren present must have been large

Elias Ashmole (who according to his diary was "made a Free Mason of Warrington with Colonel Henry Mainwaring," seven brethren being named as in attendance at the lodge, Oct. 16, 1646) states that he "received a summons to appear at a lodge to be held next day at the Masons' Hall, London." Accordingly on March 11, 1682, he attended and saw six gentlemen "admitted into the Fellowship of Free Masons," of whom three only belonged

to the company; the master, however, Mr. Thomas Wise, the two wardens and six others being present on the occasion as members in their *dual* capacity Ashmole adds: "We all dyned at the Halfe Moone Tavern in Cheapside at a noble dinner prepaired at the charge of the new-accepted Masons"

It is almost certain that there was not an operative mason present at the lodge held in 1646, and at the one which met in 1682 there was a strong representation of the speculative branch. Before the year 1654 the company was known as that of the Freemasons for some time, but after then the old title of Masons was reverted to, the terms "Acception" and "Accepted" belonging to the speculative lodge, which, however, in all probability either became independent or ceased to work soon after 1682 It is very interesting to note that subsequently (but never before) the lodge designation is met with of "Free and Accepted Masons," and is thus a combination of operative and speculative usage

Conder is of opinion that in the records "there is no evidence of any particular ceremony attending the position of master mason, possibly it consisted of administering a different oath from the one taken by the apprentices on being entered" There is much to favour this supposition and it may provide the key to the vexed question of the plurality of degrees prior to the grand lodge era The fellow-crafts were recruited from those apprentices who had served their time and had their essay (or sufficient trial of their skill) duly passed, they and the masters, by the *Schaw Statutes* of 1598, being only admitted in the presence of "sex Maisteris and *twa enterit prenteissis*" As a rule a master mason meant one who was master of his trade, *i e*, duly qualified, but it sometimes described employers as distinct from journeymen Freemasons, being also a compliment conferred on honorary members during the 17th century in particular

In Dr Plot's *History of Staffordshire* (1686) is a remarkable account of the "Society of Freemasons," which, being by an unfriendly critic, is all the more valuable He states that the custom had spread "more or less all over the nation"; persons of the most eminent quality did not disdain to enter the fellowship, they had "a large *parchment volum* containing the History and Rules of the Craft of Masonry", St Amphibal, St Alban, King Athelstan and Edwin are mentioned, and these "charges and manners" were "after perusal approved by King Hen 6 and his council, both as to Masters and Fellows of this right Worshipfull craft" He further remarks of its history that there is nothing he ever "met with more false or incoherent"

The author of the *Academie of Armory,* previously noted, knew better what he was writing about in that work of 1688 in which he declares "I cannot but Honor the Fellowship of the Masons because of its Antiquity, and the more *as being a member of that Society called Free Masons*" In the same year, "A Tripos or Speech delivered at a commencement in the University of Dublin held there July 11, 1688, by John Jones, then A B, afterwards D D," contained "notable evidence concerning Freemasonry in Dublin." The Tripos was included in Sir Walter Scott's edition of Dean Swift's works (1814), but as Dr Chetwode Crawley points out, though noticed by the Rev Dr George Oliver (the voluminous masonic author), he failed to realize its historical importance The satirical and amusing speech was partly translated from the Latin by Dr Crawley for his scholarly introduction to the *Masonic Reprints,* etc, by Henry Sadler. "The point seems to be that Ridley (reputed to have been an informer against priests under the barbarous penal laws) was, or ought to have been, hanged, that his carcase, anatomized and stuffed, stood in the library, and that *frath scoundrellus* discovered on his remains the Freemasons' Mark" These are references to the craft in Ireland illustrative of the influence of the society at that time, of which records are lacking

It is primarily to Scotland, however, that we have to look for such numerous particulars of the activity of the fraternity from 1599 to the establishment of its grand lodge in 1736, for an excellent account of which we are indebted to Lyon, the Scottish masonic historian. As early as 1600 (June 8) the attendance of John Boswell, Esq., the laird of Auchinleck, is entered in the minutes of the lodge of Edinburgh; he attested the record and added his mark, as did the other members; so it was not his first appearance Many noblemen and other gentlemen joined this ancient *atelier*, notably Lord Alexander, Sir Anthony Alexander and Sir Alexander Strachan in 1634, the king's master of work (Herrie Alexander) in 1638, General Alexander Hamilton in 1640, Dr. Hamilton in 1647, and many other prominent and distinguished men later, "James Neilsone, Master Sklaitter to His Majestie," who was "entered and past in the lodge of Linlithgow, being elected a joining member," March 2, 1654 Quarter-Master General Robert Moray (or Murray) was initiated by members of the lodge of Edinburgh at Newcastle on May 20, 1641, while the Scottish army was in occupation

The minute-books of a number of Scottish lodges, which are still on the register go back to the 17th century, and abundantly confirm the frequent admission of speculatives as members, and officers, especially those of the venerable "Mother Lodge Kilwinning" of which the earl of Cassillis was the deacon in 1672, who was succeeded by Sir Alexander Cunningham, and the earl of Eglinton, who like the first of the trio was but an apprentice There were three head lodges according to the Scottish Code of 1599, Edinburgh being "the first and principall," Kilwinning "the secund," and Stirling "the third ludge"

The Aberdeen Lodge (No 1 *bis*) has records preserved from 1670, in which year what is known as the *Mark Book* begins, containing the oldest existing roll of members, numbering 49, all of whom have their marks registered, save two, though only ten were operatives The names of the earls of Finlater, Erroll and Dunfermline, Lord Forbes, several ministers and professional men are on the list, which was written by a glazier, all of whom had been enlightened as to "the benefit of the measson word," and inserted in order as they "were made fellow craft" The Charter (*Old Charges*) had to be read at the "entering of everie prenteise" and the officers included a master and two wardens

The lodge at Melrose (No 1 *bis*) with records back to 1674 did not join the Grand Lodge until 1891, and was the last of those working (possibly centuries before that body was formed) to accept the modern system of government Of the many noteworthy lodges mention should be made of that of "Canongate Kilwinning No 2," Edinburgh, the first of the numerous pendicles of "Mother Lodge Kilwinning No 0," Ayrshire, started in 1677, and of the Journeyman No 8, formed in 1707, which was a secession from the Lodge of Edinburgh, the fellow crafts or journeymen not being satisfied with their treatment by the freemen masters of the Incorporation of Masons, etc This action led to a trial before the Lords of Council and Session, when finally a "Decreet Arbitral" was subscribed to by both parties, and the junior organization was permitted "to give the mason word as it is called" in a separate lodge The presbytery of Kelso in 1652 sustained the action of the Rev James Ainslie in becoming a Freemason, declaring that "there is neither sinne nor scandale in that word," *i e*, the "Mason Word," which is often alluded to but never revealed in the old records already referred to. One Scottish family may be cited in illustration of the continuous working of Freemasonry, whose membership is enshrined in the records of the ancient Lodge of "Scoon and Perth No 3" and others A venerable document, lovingly cared for by No 3, bears date 1658, and recites how John Mylne came to Perth from the "North Countrie," and was the king's master mason and W M. of the Lodge, his successor being his son, who entered "King James the sixt as ffremam measone and fellow craft"; his third son John was a member of Lodge No 1 and master mason to Charles I., 1631–36, and his eldest son was a deacon of No 1 eleven times during 30 years To him was apprenticed his nephew, who was warden in 1663–64 and deacon several times William Mylne was a warden in 1695, Thomas (eldest son) was master in 1735, and took part in the formation of the Grand Lodge of Scotland Others of the family continued to join the Lodge No. 1., until Robert, the last of the Mylnes as Freemasons, was initiated in 1754, died in 1811, and "was buried in St. Paul's cathedral, having been surveyor to that edifice for fifty years," and the last of the masonic Mylnes for five generations The "St John's Lodge," Glasgow (No. 3 *bis*), has some

valuable old record and a "Charter Chest," with the words carved thereon, "God save the King and Masons Craft 1684" *Loyalty and Charity* are the watchwords of the society.

The craft gilds (Corps d État) of France, and their progeny the *Compagnonage* have been fully described by Gould, and the *Steinmetzen* of Germany would require too detailed notice if we were to particularize its rules, customs and general character from about the 12th century onward Much as there was in common between the Stonemasons of Germany and the Freemasons of Great Britain and Ireland, it must be conceded that the two societies never united and were all through this long period wholly separate and independent, a knowledge of Freemasonry and authority to hold lodges in Germany being derived from the Grand Lodge of England during the first half of the 18th century The theory of the derivation of the Freemasons from the *Steinmetzen* was first propounded in 1779, by the Abbé Grandidier, and has been maintained by more modern writers, but such a theory is now generally discredited

Whether the *Steinmetzen* had secret signs of recognition or not, is not quite clear, but that the Freemasons had, for centuries, cannot be doubted, though precisely what they were may be open to question, and also what portions of the existing ceremonies are reminiscent of the craft anterior to the revival of 1717 Messrs Speth and Gould favour the notion that there were two distinct and separate degrees prior to the third decade of the 18th century (*Ars* Q C , 1898 and 1903), while other authorities have either supported the *one degree* theory, or consider there is not sufficient evidence to warrant a decision Recent discoveries, however, tend in favour of the first view noted, such as the *Trinity college ms*, Dublin ("Free Masonry, Feb 1711"), and the invaluable *Chetwode Crawley ms* (Grand Lodge Library, Dublin), the second being read in connection with the Haughfoot Lodge Records, beginning 1702 (*Hist. of Freemasonry*, by W F. Vernon, 1893)

Two of the most remarkable lodges at work during the period of transition (1717–23), out of the many then existing in England, assembled at Alnwick and at York The origin of the first noted is not known, but there are minutes of the meetings from 1703, the rules are of 1701, signed by quite a number of members, and a transcript of the *Old Charges* begins the volume In 1708–1709 a minute provided for a masonic procession, at which the brethren were to walk "with their aprons on and Common Square" The lodge consisted mainly of operative "free brothers," and continued for many years, a code of by-laws being published in 1763, but it never united with the grand lodge, giving up the struggle for existence a few years further on.

The other lodge, the most noteworthy of all the English predecessors of the grand lodge of England, was long held at York, the Mecca of English Freemasons Its origin is unknown, but there are traces of its existence at an early date, and possibly it was a survival of the Minster lodge of the 14th century. Assuming that the *York ms No 4 of 1693* was the property of the lodge in that year (which roll was presented by George Walker of Wetherby in 1777), the entry which concludes that scroll is most suggestive, as it gives "The names of the Lodge" (members) and the "Lodge Ward(en)" Its influence most probably may be also noted at Scarborough, where "A private Lodge" was held on July 10, 1705, at which the president "William Thompson, Esq , and severall others brethren ffree Masons" were present, and six gentlemen (named) "were then admitted into the said ffraternity" These particulars are endorsed on the *Scarborough ms.* of the Old Charges, now owned by the Grand Lodge of Canada at Toronto "A narrow folio manuscript Book beginning 7th March 1705–1706" which was quoted from in 1778, has long been missing, which is much to be regretted, as possibly it gave particulars of the lodge which assembled at Bradford, Yorkshire, "when 18 Gentlemen of the first families in that neighbourhood were made Masons" There is, however, another roll of records from 1712 to 1730 happily preserved of this "Ancient Honble. Society and Fraternity of Free Masons," sometimes styled "Company" or "Society of Free and Accepted Masons"

Not to be behind the London *fratres*, the York brethren formed a grand lodge on Dec. 27, 1725 (the "Grand Lodge of all England" was its modest title), and was flourishing for years, receiving into their company many county men of great influence Some twenty years later there was a brief period of somnolence, but in 1761 a revival took place, with Francis Drake, the historian, as grand master, ten lodges being chartered in Yorkshire, Cheshire and Lancashire, 1762–90, and a Grand Lodge of England, south of the Trent, in 1779, at London, which warranted two lodges Before the century ended all these collapsed or joined the Grand Lodge of England, so there was not a single representative of "York Masonry" left on the advent of the next century

The premier grand lodge of England soon began to constitute new lodges in the metropolis, and to reconstitute old ones that applied for recognition, one of the earliest of 1720–21 being still on the roll as No 6, thus having kept company ever since with the three "time immemorial lodges," Nos 2, 4 and 12. Applications for constitution kept coming in, the provinces being represented from 1723 to 1724, before which time it is likely that the Grand Lodge of Ireland had been started, about which the most valuable *Caementaria Hibernica* by Dr Chetwode Crawley may be consulted with absolute confidence The celebrated "Lady Freemason," the Hon Mrs Aldworth (*née* Miss St Leger, daughter of Lord Doneraile), was initiated in Ireland, but at a much earlier date than popularly supposed, certainly not later than 1713, when the venturesome lady was twenty All early accounts of the occurrence must be received with caution, as there are no contemporary records of the event

Provincial grand lodges were formed to ease the authorities at headquarters, and, as the society spread, also for the Continent, and gradually throughout the civilized globe Owing to the custom prevailing before the 18th century, a few brethren were competent to form lodges on their own initiative anywhere, and hence the registers of the British grand lodges are not always indicative of the first appearance of the craft abroad In North America lodges were held before what is known as the first "regular" lodge was formed at Boston (Mass), in 1733, and probably in Canada likewise The same remark applies to Denmark, France, Germany, Holland, Italy, Portugal, Russia, Spain, Sweden and other countries Of the many scores of military lodges, the first warrant was granted by Ireland in 1732 To no other body of Freemasons has the craft been so indebted for its prosperity in early days as to their military brethren There were rivals to the grand lodge of England during the 18th century, one of considerable magnitude being known as the Ancients or Atholl Masons, formed in 1751, but in Dec 1813 a junction was effected, and from that time the prosperity of the united grand lodge of England, with few exceptions, has been extraordinary

Nothing but a volume to itself could possibly describe the main features of the English craft from 1717, when Anthony Sayer was elected the first grand master of a brilliant galaxy of rulers The first nobleman to undertake that office was the duke of Montagu in 1721, the natural philosopher, J T Desaguliers being his immediate predecessor who has been credited (and also the Rev. James Anderson) with the honour of starting the premier grand lodge; but like the fable of Sir Christopher Wren having been grand master, evidence is entirely lacking. Irish and Scottish peers share with those of England the distinction of presiding over the grand lodge, and from 1782 to 1813, their royal highnesses the duke of Cumberland, the prince of Wales, or the duke of Sussex occupied the masonic throne. From 1753 to 1813 the rival grand lodge had been busy, but ultimately a desire for a *united* body prevailed, and under the "ancient" grand master, the duke of Kent, it was decided to amalgamate with the original ruling organization, the duke of Sussex becoming the grand master of the united grand lodge On the decease of the prince in 1843 the earl of Zetland succeeded, followed by the marquess of Ripon in 1874, on whose resignation the prince of Wales became the grand master Soon after succeeding to the throne King Edward VII ceased to govern the English craft, and was succeeded by the duke of Connaught. From 1737 to 1907 some 16 English princes of the royal blood joined the brotherhood

Distribution and Organization.—The advantage of the

cosmopolitan basis of the fraternity generally (though some grand lodges still preserve the original Christian foundation) has been conspicuously manifested and appreciated in India and other countries where the votaries of numerous religious systems congregate, but the unalterable basis of a belief in the Great Architect of the Universe remains, for without such a recognition there can be no Freemasonry The vast increase of late years, both of lodges and members, however, calls for renewed vigilance and extra care in selecting candidates, that numbers may not be a source of weakness instead of strength

In its internal organization, the working of Freemasonry involves an elaborate system of symbolic ritual, as carried out at meetings of the various lodges, uniformity as to essentials being the rule The members are classified in numerous degrees of which the first three are "Entered Apprentice," "Fellow Craft" and "Master Mason," each class of which after initiation can only be attained after passing a prescribed ordeal or examination, as a test of proficiency, corresponding to the "essays" of the operative period The lodges have their own by-laws for guidance, subject to the *Book of Constitutions* of their grand lodge, and the regulations of the provincial or district grand lodge if located in counties or held abroad

On the continent of Europe Freemasonry has often developed on different lines from that of the "Mother Grand Lodge" and Anglo-Saxon grand lodges generally, and through its political and anti-religious tendencies has come into contact or conflict with the State authorities or the Roman Catholic Church The "Grand Orient of France" (but not the Supreme Council 33°, and its grand lodge) is an example of this, having eliminated the paragraph referring to a belief in the "Great Architect of the Universe" from its *Statuts et réglements généraux* This action has led to the withdrawal of all "regular" grand lodges from association with that body

The Grand Lodge of England constituted its first lodge in Paris in the year 1732, but one was formed still earlier on the Continent at Gibraltar 1728–29 Others were also opened in Germany 1733, Portugal 1735, Holland 1735, Switzerland 1740, Denmark 1745, Italy 1763, Belgium 1765, Russia 1771, and Sweden 1773 In most of these countries grand lodges were subsequently created and continue to this date, save in those countries, such as Italy, where no masonic lodges are permitted There is a union of grand lodges of Germany, and an annual diet is held for the transaction of business affecting the several masonic organizations in that country, which works well Lodges were constituted in India from 1730 (Calcutta), 1752 (Madras) and 1758 (Bombay), in Jamaica 1742, Antigua 1738, and St Christopher 1739; soon after which period the grand lodges of England, Ireland and Scotland had representatives at work throughout the civilized world

There are many additional degrees which may be taken or not (being quite optional), and dependent on a favourable ballot, the difficulty, however, of obtaining admission increases as progress is made, the numbers accepted decreasing rapidly with each advancement The chief of these are arranged in separate classes and are governed either by the "Grand Chapter of the Royal Arch," the "Mark Grand Lodge," the "Great Priory of Knights Templars" or the "Ancient and Accepted Rite," these being mutually complementary and intimately connected as respects England, and more or less so in Ireland, Scotland, North America and wherever worked on a similar basis; the countries of the continent of Europe have also their own *Hautes Grades*

(W J H)

Progress of Freemasonry Since 1910.—The number of Freemasons probably doubled between 1910 and 1928 and in Aug 1928 stood at about 4,400,000 In addition there are at least 1,000,000 "unrecognized" masons, the most important group being the "Negro" masons of the United States of America Of the "regular" masons, all save 300,000 belong to the various grand lodges of the U S A and of the British empire, which indicates that Freemasonry is essentially an Anglo-Saxon institution Freemasonry in the Dominion of Canada is believed to date from 1740. The grand lodges are all of comparatively recent organization, the oldest and largest being in Ontario There are some seven grand lodges in Australasia; South Australia coming first as a "sovereign body," followed closely by New South Wales and Victoria (of 1884–89 constitution)

In the U S A and Holland, the most noticeable change has been a tendency to take a more active part in the social betterment of the nation This tendency is less marked in the British grand lodges, owing to their anxiety to avoid any appearance of interfering *as Masons* in politics

Among British masons one of the most noticeable changes has been the rise of a new school of masonic research, which aims at tracing the history of Freemasonry anterior to 1717 Faced by the paucity of documentary evidence, due to the nature of the obligations taken by mediaeval masons, this school has adopted the principles used in the study of anthropology It has discovered that figures carved or painted by mediaeval masons are often depicted making certain signs still known to Freemasons, and that in the scenes represented these clearly convey the same inner meaning as to-day

Examples of such secret messages have been found in mediaeval and Comacine work and also in that done by members of the Roman Collegia There also exists documentary evidence connecting these three groups of builders A similar use of signs in ancient Egypt, in the Hung Society of China and among savage races when initiating a boy into manhood, has also been demonstrated On the basis of these facts the theory is being developed that speculative Freemasonry is descended via the Comacines, the Roman Collegia, and the Mysteries from primitive rites once universal in the dawn of history, survivals of which are to be found to this day in Central Africa and Australia Concurrent with this work has been the careful study of the modern rituals, and the comparison of certain peculiar features in them with similar incidents in the ancient mysteries and in savage rites The facts so far disclosed suggest that in modern Freemasonry we may have an intellectualised survival of the cult of the Dying God and of the Fertility rites Although this school has produced much interesting data, its conclusions are not yet universally accepted by the older or "documentary" school, the members of which consider that coincidence may explain the similarities to which their attention has been directed If, however, the views of the Anthropological school are ultimately accepted, the result will be that the origin of Freemasonry will be pushed back thousands of years

Quite as important has been the rise of a distinctly spiritual school of thought, which endeavours to interpret the meaning of the ceremonies, and considers that in the rituals of the various degrees we have an allegory of the quest of the soul after mystic union with the Supreme Being While often differing in detail, since they approach the subject from different angles, all the exponents of this school agree in the main principles, although in historical research they are often sharply divided, some belonging to the documentary school and others to the anthropological Perhaps, however, the most important fact is the ever increasing interest among the rank and file in a subject which, even a few years ago, would have been treated with complete indifference.

Masonic Relations.—Since 1910 events have proved that the breach between Latin and Anglo-Saxon masonry was based on a fundamental divergence of opinion as to the basic principles on which the order rests, and this breach tends to grow wider year by year. The disastrous results of interfering in politics has been shown by the fact that the Italian and Hungarian Governments have declared Freemasonry to be a danger to the State and have suppressed it within their jurisdictions. In France opposition to the political activities of the Grand Orient culminated in 1914 in the formation of a new body "Grande Loge Nationale Indépendante et Regulière pour la France" which avoids politics and insists on belief in God This body, which has increased rapidly in numbers, is recognized by the Grand Lodge of England At the same time, one by one, most of the American grand lodges which were still in fraternal relations with the Grand Orient have felt compelled to sever relations.

(J. S. M W.)

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UNITED STATES

Freemasonry was planted in the American colonies by English masons during the first three decades of the 18th century. The oldest existing written record is a minute book of a lodge in Philadelphia containing entries dated in 1730 and presupposing a yet earlier date. Benjamin Franklin became a member of this lodge. It is believed that it may have been a "time immemorial" lodge, that is, one formed by a group of masons without a written charter. The earliest lodge known to have been constituted on written authority of the Mother Grand Lodge of England was the First Lodge of Boston, organized in 1733, by Henry Price, deputized by Viscount Montague, Grand Master, to be "Provincial Grand Master of New England and Dominions and Territories thereunto belonging."

During the colonial period a majority of the lodges worked under English Constitutions, with here and there a few receiving their charters from the Grand Lodges of Scotland and Ireland. Their governing bodies were provincial grand lodges, the provincial grand masters being authorized or appointed by the grand masters of the Grand Lodges of England, of which there were two (the first was organized in London, 1717) from 1751 to the end of the colonial period. At the culmination of the Revolutionary War these grand bodies set themselves up as independent grand lodges, their sovereignty becoming everywhere recognized within a few years. Each of these grand lodges confined itself within a jurisdiction coincident with the political boundaries of its corresponding State, a custom followed by all grand lodges subsequently organized in the United States. This was the origin of the now famous American doctrine of exclusive territorial jurisdiction, the point of which is that a grand lodge is sole and sovereign within its own acknowledged territory, any violation of this exclusive jurisdiction being considered grounds for the discontinuance of fraternal recognition. Accordingly there are 49 independent grand lodges in the United States, including that of the District of Columbia. Statistics at the beginning of 1928 showed these to have 16,605 constituent lodges on their rolls, with a total membership of 3,248,518 master masons in good standing, approximately three-fourths of the total number of master masons in the world, estimated at 4,400,000.

The presence of the Holy Bible on the altar, belief in God, the forbidding of political activity or discussion, and non-sectarianism in religion are among the fundamentals adhered to by all grand lodges in the nation. It is because of their insistence on these as a *sine qua non* of regular masonry that American grand lodges are unable to extend fraternal recognition to a few grand bodies abroad which do not consider them as necessary landmarks.

The lodges and grand lodges here referred to stand in a line of direct descent from the operative masons of mediaeval England and Europe; their members look upon the ancient manuscripts, old charges and traditions left behind by those operative masons as the fountainhead of doctrine and practice, however much the present system may have become modified during some six or seven centuries of development. The masonry exemplified by them is variously described as Symbolic Masonry, as Ancient Craft Masonry, as Emblematic Masonry and as Blue Lodge Masonry. The technically learned in craft lore have frowned upon the use of the last named appellation as being little more than a nickname, but it has become deeply rooted in popular use nevertheless. This masonry is conferred in the form of the three degrees of Entered Apprentice, Fellow of the Craft, and Master Mason. It is a fixed principle in the American craft that grand lodges, and grand lodges only, have sovereign jurisdiction over the three degrees. Since membership in any of the concordant bodies of the Capitular, Cryptic, Chivalric and Scottish rites requires that a man be and remain in good standing in a regular lodge, it will be seen that grand lodges are the foundation of the masonic system in the United States.

Royal Arch Masonry, otherwise known as the Capitular rite, has flourished in the United States since the middle of the 18th century. Its chapters are organized under the authority of grand chapters, one to a State, all of these, with the exception of Pennsylvania, Virginia and Texas, are linked together in a general grand chapter for the United States of America, which meets triennially.

The councils of Royal and Select Masters, comprising the Cryptic rite, are organized under grand councils in the States and are federated under a general grand council, meeting triennially. The Cryptic degrees were introduced into America during the latter half of the 18th century. Columbian Council, No. 1, of New York city, organized in 1810, is the oldest existing Council in the United States.

Knight Templarism or Chivalric rite, was introduced during the same period. Its commanderies confer three orders, Red Cross, Temple and Malta. They are organized under a grand commandery in each State, these grand commanderies are federated under the Grand Encampment of the United States, which holds triennial conclaves.

The Mother Supreme Council of the Scottish rite was organized in Charleston, S.C., in 1801. Until 1813, this was the supreme Scottish rite authority in the United States, when, in the latter year, a Supreme Council for the Northern Jurisdiction was formed, with territory north of the Ohio river and east of the Mississippi river, it became the Supreme Council for the Southern Jurisdiction, comprising all U.S. territory not included in that of the Northern Jurisdiction. The Scottish rite system consists of 30 degrees, beginning with the fourth and culminating in the thirty-third. Each Jurisdiction is governed by a supreme council composed of the "active" members of this degree. The seat of the Northern Jurisdiction is at Boston, Mass., of the Southern, at Washington, D.C. At the head of each of the two supreme councils is a sovereign grand commander.

The Craft lodge, together with the bodies of the Capitular, Cryptic and Chivalric rites, are together often referred to as the "York rite", while this is a misnomer it is in general use and is likely so to continue. The York and Scottish rites together do not, in any strict sense, comprise a "system", nevertheless they work harmoniously together and may be viewed in the large as a single fraternity, the bodies of which alone have the right to describe themselves as masonic. Alongside of these, independent but often basing their membership on membership in good standing in some regular masonic body, usually a Craft lodge, are a number of social organizations, the so-called "Side Orders." Notable among these are the Order of the Eastern Star, with a mixed membership, the Ancient Arabic Order, Nobles of the Mystic Shrine for North America, Mystic Order of Veiled Prophets of the Enchanted Realm, the Ancient Egyptian Order of Sciots, the Tall Cedars of Lebanon, the Order of De Molay for Boys; and a number of others of less importance. In addition to these are some hundreds of masonic clubs, most of them local and social in character, some being directly connected with masonic bodies, others being independently organized. Many of these hold memberships in the National League of Masonic Clubs, the province of which is sufficiently indicated by its title. While most of these organizations require of every candidate that he be a member, or the close relative of a member, of some masonic body, these appendant societies are not to be confused with masonic bodies properly so called. (H. L. Ha.)

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FREEPORT, a city of north-western Illinois, U S A, on the Pecatonica river, the county seat of Stephenson county. It is on Federal highway 20, and is served by the Chicago and North Western, the Chicago, Milwaukee, St Paul and Pacific, and the Illinois Central railways The population in 1920 was 19,669 (88% native white), and was estimated locally at 22,000 in 1928 It is the trade centre of a farming and dairying district, and has many and varied manufactures, with an output in 1925 valued at $15 860,193 The Illinois Central has extensive repair shops and division headquarters here A granite boulder marks the historic spot where the famous debate between Abraham Lincoln and Stephen A Douglas took place (Aug 27, 1858) in which Douglas took the position that the people of a territory could exclude slavery through "unfriendly" legislation, and that therefore "it matters not what way the Supreme Court may hereafter decide on the abstract question" of the introduction of slavery into free territory This "Freeport doctrine" greatly weakened Douglas's candidacy for the presidency in the election of 1860 Freeport was settled in 1835, laid out and named Winneshiek in 1836, renamed and made the county seat in 1837; incorporated as a town in 1850, and as a city in 1855

FREEPORT, a village of Nassau county, New York, U S A, on the south shore of Long Island, 5m E of the city limits of Brooklyn It is served by the Long Island railroad The population in 1925 was 13,903 Oyster and other fisheries and truck-gardening are important industries, and there is some manufacturing, but the village is chiefly a suburban residential community It was incorporated in 1892

FREE PORTS. A term applied to ports, or more usually zones within ports, in which vessels can load or unload, and commercial and even manufacturing businesses can be carried on, without any active control by the fiscal authorities In a free port no import or export duties are levied, the only charges being for services rendered, *i e*, wharf dues, etc, it is only when goods pass from the free port area into the hinterland for consumption that import duty is payable But when goods have been worked up in the free zone, duty is in some cases only payable on the raw material as originally imported and not on the finished product as crossing the customs frontier

During the middle ages certain cities granted foreign merchants various privileges which approached freedom of trade. With the rise of the mercantile system, however, such restrictions were in general laid on foreign imports that some device was found necessary to prevent the entire collapse of foreign commerce With this object certain maritime towns were exempted from the restrictions and were placed outside the customs frontier of the country in which they were situated Thus Leghorn was made a free port in 1547 and became an important centre for the Levantine trade, while other Italian cities were afterwards granted similar privileges In the north the Hanse towns, including Hamburg, Bremen and Lubeck, had from very early times maintained such a system, and they became the trading centres in the north of Europe corresponding to Venice and Genoa in the Mediterranean

With the movement towards national unity in the first half of the 19th century, the existence of these extra-territorial units became increasingly inconvenient Other maritime towns in the country complained of the unfair advantages possessed by the free ports, while the State considered that customs revenue was lost, not only by the duty-free facilities of the port, but by smuggling from the free port into the customs area On the other hand, in some cases the products of the free ports had to pay duties on crossing the customs frontier, thus penalizing manufacturers in the free port as compared with competitors within the customs territory.

Thus the privileges were gradually withdrawn, although in some cases the creation of a free zone, as at Hamburg and Bremen, served an entrepôt trade Recourse was now had to the bonded warehouse system for the ordinary re-export trade, and to systems of "drawback" or "temporary importation" under which duties paid (or covered by bond) were refunded, wholly or in part, on the exportation of goods composed of dutiable imported raw materials.

In Europe the principal free ports are Copenhagen, Danzig and Hamburg

Copenhagen.—The free port of Copenhagen was opened in Nov 1894 and has since been extended till, in 1927, the area of the land territory is 51 8 hectares and the water area 33 4 hectares, while the quays total 4,773 metres. The owning company undertakes the warehousing, storing and transport of goods within the limits of the port, at rates controlled by the Danish Government Merchants can rent sites for offices, warehouses and factories, the only stipulation being that manufacturing can only be carried out in the free port with the sanction of the minister of public works, such sanction, however, is readily obtained, though the available space at the end of 1927 was nearly all occupied Warehouse warrants are issued by the free port company free of stamp duty, thus facilitating the financing of the re-export trade. Owing to the installation of up-to-date machinery and appliances, it is claimed for the free port of Copenhagen that it is the quickest and cheapest port of call in northern Europe and forms the most convenient centre for the Baltic trade, consignments to the smaller ports being transhipped there and goods from those ports concentrated for shipment thence on ocean-going vessels

Danzig.—The free zone at Danzig was established in 1898 to compete with Copenhagen as a centre for the Baltic trade The existence of this free zone was continued by the Treaty of Versailles, which provided for the incorporation of the free city and territory of Danzig (*q v*), apart from this free zone, in the Polish customs union The unloading, loading, warehousing, repacking, sorting, etc, of goods takes place within the free zone without any customs control, and there is no limit to the time the goods may remain stored Manufacturing or any process which changes the form of the goods is, however, prohibited Customs examination is only required if and when goods leave the free zone for the customs territory, and customs offices are situated in the free zone to facilitate the clearance of such goods Before the World War the principal use of the free zone was the storage of excisable goods of German origin prior to export, a drawback being payable on arrival in the zone without waiting till the goods were actually shipped A considerable portion of Polish trade passes through the zone, both inwards and outwards, while there is an important re-export trade The existence of the free zone enables importers to send goods into Poland or to reship them, as market conditions may dictate without any customs formalities

Hamburg.—The free port at Hamburg is a survival of the freedom of trade which existed under the Hanseatic League Hamburg is a sovereign State, and as such entered the German empire when this was formed in 1871, but stipulated that the port should not enter the customs union However, in 1888, in view of the fact that goods manufactured in Hamburg had to pay duty on entering the customs area, while those from other German towns were only charged with the duty, if any, on the raw materials used, the city joined the customs union At the same time, however, the larger portion of the port was fenced off and established as a free port This extra-territorial free port includes land on both banks of the Elbe and the main river itself for a considerable distance and is surrounded by a customs line guarded by customs officials Merchandise can be brought into the free port free of duty and customs examination, and stored, repacked, sorted, etc, at will, and then either reshipped or sent into Germany as the conditions of the market may suggest In Hamburg alone among German free ports is manufacturing permitted, but this is no great advantage except for ship-repairing and certain trades working almost entirely for re-export (as rice-milling and oil-milling), for which the situation of the works in the immediate neighbourhood of the waterway reduces costs. As no one is allowed to live in the free port, the transport of workers involves special arrangement The total area of the free port is 2,500ac. of which 1,576ac. are water

The bulk of the trade of Hamburg passes through the free port, where freedom from customs control makes the handling of goods

much simpler and speedier than under a bonded warehouse system. The issue of warehouse warrants by the free port warehouse company enables trade to be financed if necessary. At the same time the rapidity of handling and the concentration of shipping, both sea and river, makes the free port an exceptionally advantageous centre for the transhipment trade

Other Free Ports.—Other free ports or free zones exist in Germany at Bremen, Bremerhaven, Brake, Cuxhaven, Geestemunde, Emden and Stettin Since the War free harbours have been established in Sweden at Stockholm (1919), Gothenburg (1922) and Malmo (1922), while in Finland a free harbour was in course of construction at Hango in 1927 Trieste was a free port from 1719 to 1891, since when a free zone has existed When Trieste passed to Italy this zone was continued

Fiume was also a free port till 1891, since when a free zone has existed When under the Peace Treaties, Fiume formed a free State, the only duties levied were on spirits, tobacco and similar luxuries, but on the establishment of the Italian sovereignty over the port, the Italian customs tariff was applied from March 1, 1924 The free zone, however, was continued, although a portion of it was allocated to Yugoslavia Since then an extension has been authorized to accommodate the timber trade, the old timber harbour at Porto Barros having passed to Yugoslavia Proposals were afoot in 1928 to provide free zones in other principal Italian ports.

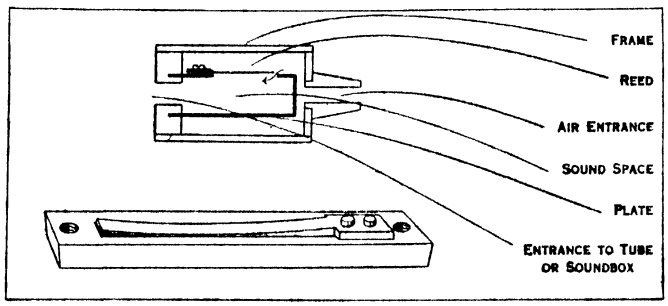
Sulina at the mouth of the Danube is a free port, but consumption duties are levied on articles of "colonial produce," etc , landed at the town for local consumption As the town is inaccessible by land owing to marshes, smuggling into the customs territory is impossible; all vessels proceeding up the Danube to inland ports are treated as coming from abroad

In the British empire, Hong-kong, Singapore and Penang are free ports and are important transhipment centres, while the Portuguese have a free port at Macao, off the Chinese coast

(H Cr)

FREE REED VIBRATOR, in musical instruments, a thin metal tongue fixed at one end and vibrating freely either in surrounding space, as in the accordion and concertina, or enclosed in a pipe or channel, as in certain reed stops of the organ or in the harmonium

We have to deal with air under three different conditions in considering the acoustics of the sound produced by free reeds (1) The stationary column in pipe or channel containing the reed, which is normally at rest, (2) The wind or current of air fed from the bellows with a variable velocity and pressure, which is broken up into periodic air puffs as its entrance into



FROM DUFF, "TEXT BOOK OF PHYSICS"

DIAGRAM ILLUSTRATING ACTION OF THE FREE REED VIBRATOR (ABOVE) SHOWING DIRECTION OF AIR CURRENT WHICH CAUSES VIBRATION OF FREE END OF REED, AND (BELOW) PERSPECTIVE OF ORGAN REED

pipe or channel is alternately checked or allowed by the vibrator; (3) The disturbed condition of No 1 when acted upon by the metal vibrator and by No 2, whereby the air within the pipe is forced into alternate pulses of condensation and rarefaction

The most valuable characteristic of the free reed is its power of producing all the delicate gradations of tone between forte and piano by virtue of a law of acoustics governing the vibration of free reeds, whereby increased pressure of wind produces a proportional increase in the volume of tone The sound produced by the free reed itself is weak and requires to be reinforced by means of an additional stationary column or stratum of air. Free reed instruments are therefore classified according to the nature of the resonant medium provided. (1) Free reeds vibrating in pipes, as in organs, (2) Free reeds vibrating in reed compartments and reinforced by air chambers of various shapes and sizes, as in the harmonium (*q v*), (3) free reeds set in vibration through a valve, but having no reinforcing medium, as in the accordion and concertina

The quality of tone of free reeds is due to the tendency of air set in periodic pulsations to divide into aliquot vibrations or loops, producing the phenomenon known as harmonic overtones or upper partials, which may, in the highly composite tone of free reeds, be discerned as far as the 16th or 20th of the series

For the history of the application of the free reed to keyboard instruments, *see* Harmonium

FREESIA, in botany, a genus of plants belonging to the Iris family (Iridaceae), and containing three species, all natives of S Africa The plants grow from a corm (a solid bulb, as in *Gladiolus*) which sends up a tuft of long narrow leaves and a slightly branched stem bearing a few leaves and loose one-sided spikes of fragrant narrowly funnel-shaped flowers Several varieties are known in cultivation, differing in the colour of the flower, which is white, cream or yellow They form pretty greenhouse plants which are readily increased from seed They are extensively grown for the market in Guernsey, England and America. By potting successively throughout the autumn a supply of flowers is obtained through winter and spring

FREE SOIL PARTY, a political party in the United States, which was organized in 1847–48 to oppose the extension of slavery into the Territories It was a combination of the political abolitionists—many of whom had formerly been identified with the more radical Liberty Party—the anti-slavery Whigs, and the faction of the Democratic Party in the State of New York, called "Barnburners," who favoured the prohibition of slavery, in accordance with the "Wilmot Proviso" (*see* Wilmot, David), in the territory acquired from Mexico The party was prominent in the presidential campaigns of 1848 and 1852 At the national convention held in Buffalo, N Y , on Aug 9–10, 1848, they secured the nomination to the presidency of ex-president Martin Van Buren, who had failed to secure nomination by the Democrats in 1844 because of his opposition to the annexation of Texas, and of Charles Francis Adams, of Massachusetts, for the vice-presidency, taking as their "platform" a declaration that Congress, having "no more power to make a slave than to make a king," was bound to restrict slavery to the slave states, and concluding, "we inscribe on our banner 'Free Soil, Free Speech, Free Labor and Free Man,' and under it we will fight on and fight ever, until a triumphant victory shall reward our exertions " The Liberty Party had previously, in Nov 1847, nominated John P Hale and Leicester King as president and vice-president respectively, but in the spring of 1848 it withdrew its candidates and joined the "free soil" movement Representatives of 18 States, including Delaware, Maryland and Virginia, attended the Buffalo convention. In the ensuing presidential election Van Buren and Adams received a popular vote of 291,263, of which 120,510 were cast in New York They received no electoral votes, all these being divided between the Whig candidate, Zachary Taylor, who was elected, and the Democratic candidate, Lewis Cass The "free soilers," however, succeeded in sending to Congress two senators and 14 representatives, who by their ability exercised an influence out of proportion to their number

Between 1848 and 1852 the "Barnburners" and the "Hunkers," their opponents, became partially reunited, the former returning to the Democratic ranks, and thus greatly weakening the Free Soilers. The party held its national convention at Pittsburgh, Pa (Aug 11, 1852), delegates being present from all the free states, and from Delaware, Maryland, Virginia and Kentucky; and John P Hale, of New Hampshire, and George W. Julian of Indiana, were nominated for the presidency and the vice-presidency respectively, on a platform which declared slavery "a sin against God and a crime against man," denounced the Compromise measures of 1850, the fugitive slave law in particular, and again

opposed the extension of slavery in the Territories. These candidates, however, received no electoral votes and a popular vote of only 156,149, of which but 25,329 were polled in New York By 1856 they abandoned their separate organization and joined the movement which resulted in the formation of the powerful Republican Party (*q v*), of which the Free Soil Party was the legitimate precursor

See Theodore Clarke Smith, "The Liberty and Free Soil Parties in the Northwest," *Harvard Historical Studies*, vol. vi (1897)

FREE-STONE, stone used in architecture for mouldings, tracery and other work required to be worked with the chisel The oolitic stones (*i e*, limestones) are generally so called, although in some countries soft sandstones are used, in some churches an indurated chalk called "clunch" is employed for internal lining and for carving

FREETHINKER denotes any one who considers problems of religion and religious history in a purely rational manner, without regard to the authority of a Church The term is applied more especially to the Deists of the 18th century

See L Stephen, *English Thought in the 18th Century* (2 vols, 1876).

FREETOWN, capital of the British colony and protectorate of Sierra Leone, West Africa, on the south side of the Sierra Leone estuary, about 5 m from the cape of that name, in 8° 29′ N, 13° 10′ W Pop (1921) 44,142 Freetown is picturesquely situated on a plain, closed in behind by a succession of wooded hills, the Sierra Leone, rising to a height of 2,900 feet There are many fine stone-built business premises and public buildings, including an Anglican cathedral, Wilberforce Hall, courts of justice and the governor's residence Several of these institutions are built on the slopes of the hills, and on the highest point, Sugar Loaf mountain, is a sanatorium The botanic gardens form a pleasant and favourite place of resort Freetown possesses an abundant and pure water-supply, drawn from the adjacent hills but the climate is enervating and was notoriously unhealthy It was particularly to Freetown, often spoken of as Sierra Leone, that the designation "White Man's Grave" applied Since the beginning of the 20th century successful efforts have been made to improve the sanitary condition notably by a new system of drainage, and the filling up of marshes wherein the malarial mosquito breeds A light railway 6 m long, opened in 1904, has been built to Hill Station (900 ft high), where, on a healthy site, are the residences of the government officials and of other Europeans The town is governed by a municipality (created in 1893) with a mayor and councillors, the large majority being elective Freetown was the first place in British West Africa granted local self-government

Both commercially and strategically Freetown is a place of importance Its harbour, the best in West Africa, affords ample accommodation for the largest fleets and is a port of call for all steamers serving West Africa Freetown is also the ocean terminus of the Sierre Leone railways Its inhabitants who include a number of Syrians are noted as very keen and successful traders

In consequence of the character of the original settlement (*see* SIERRA LEONE), 75% of the inhabitants are descended from non-indigenous Negro races As many as 150 different tribes are represented in the Sierra Leonis of to-day Their semi-Europeanization is largely the result of missionary endeavour A large proportion of the citizens are highly educated men The most noted citizens are Bishop Crowther and Sir Samuel Lewis, chief justice of Sierra Leone 1882–1894, both full-blooded Africans The Kru-men form a distinct section of the community, living in a separate quarter and preserving their tribal customs

Since 1861–1862 there has been an independent Episcopal Native Church, but the Church Missionary Society, which in 1804 sent out the first missionaries to Sierra Leone, maintains various agencies Furah Bay college, built by the society on the site of General Charles Turner's estate (1½ m E. of Freetown), and opened in 1828 with six pupils, one of whom was Bishop Crowther, was affiliated in 1876 to Durham university. The Wesleyans have a high school, a theological college and other educative agencies The Mohammedans have several state-aided primary schools

FREE TRADE, the term commonly reserved for the policy of trade regulation that makes no discrimination between imported and domestic products It does not exclude the possibility of import duties, but restricts them to the purpose of raising revenue, and supplements them by a countervailing excise duty in cases in which the commodity taxed is produced in the country as well as imported In the past the term was applied with different significations, varying with the circumstances and controversies of the time In the 17th century it was used to describe their policy by the opponents of the monopolistic privileges of trading companies, such as the Merchant Adventurers The free trade bills of 1604 were designed, not to establish freedom of trade in the modern sense, but to throw open the companies, to which was reserved the trade with different regions, and to check the practice of restricting entry, and so making of them monopolistic corporations Later in the century the same description was applied to the claim that individuals should be free to engage in the different branches of foreign trade without being members of any company In the 18th century the term was popularly used as a euphemism for smuggling Its present signification may be dated from the generation following the publication of Adam Smith's *Wealth of Nations* in 1776

The *Wealth of Nations*, by its patient and detailed examination of the actual effects of existing commercial restrictions, destroyed the authority of the theories on which those restrictions had been based, and so closed an epoch, by demonstrating the true nature of international trade and showing the falsity of the traditional view that the commercial prosperity of one country is at the expense of, and incompatible with, that of another, it prepared the way for the freer trade and more liberal regulations of the modern age The advantages of exchange, the necessity of freedom if these advantages were to be secured and the evils of restrictions, particularly upon the corn trade, had been urged for a generation by the French economists or Physiocrats (*q v*), and other writers associated with that school Condillac formulated the new theory of commerce even more succinctly than Adam Smith in the sentence "every nation in its exchanges wants to have the whole of the profit of the trade, they do not see that by the very nature of the exchange there is bound to be some profit on both sides, since each on his side gives less than he receives", while Mercier and Le Trosne anticipated the crucial doctrine that free trade would benefit a country even if other countries did not follow its example No other work, however, had the influence of the *Wealth of Nations*

The Free Trade Movement.—The first important achievement of the free trade movement was Pitt's commercial treaty with France in 1786, which removed many of the prohibitions and duties that had previously obstructed legitimate trade between the two countries Further progress was checked by war The circumstances of the generation that followed the Napoleonic War were, however, in England not unfavourable to the new movement. The growth of population created a demand for imported foodstuffs, and at the same time the new manufactures favoured the freeing of trade as likely to assist them in finding export markets The reform of the old tariff was begun by Huskisson in 1823 In 1837 an anti-corn law association was formed, reconstituted as the National Anti-Corn Law League in 1839, which, under the leadership of Cobden and Bright, organized an active propaganda against the protection of agriculture Sir Robert Peel took further the reform of the tariff in his budgets of 1842 and 1845, and in 1846 carried the repeal of the corn laws Gladstone completed the work of simplifying the customs tariff and eliminating from it any protectionist element in the budgets of 1853 and 1860, the latter giving effect to the British undertakings in the negotiation of a commercial treaty with France by Cobden. A new protectionist movement was launched by Joseph Chamberlain in 1903, which, however, was without legislative effect before the war. During and after the war, a protectionist element was introduced into the British tariff, particularly by the Safeguarding of Industries Acts (1921 and 1925).

In other countries the circumstances were not so favourable as in England; the Free Trade movement was, however, not with-

out effect In Germany the influence of Adam Smith was shown in the reform of the Prussian tariff in 1818. Free trade ideas combined with the nationalist economic propaganda of Friedrich List and the practical exigencies of trade to form the German zollverein in 1833, by which freedom of trade was established between seventeen German states, a number subsequently increased In the middle of the century an active free trade movement developed, particularly in northern Germany, influenced by the writings of Prince Smith, and during the period of Bismarck's co-operation with the Liberal Party, Prussia and Germany moved rapidly in the direction of free trade A network of commercial treaties brought protectionist duties lower and lower, and the tariff law of 1873 approached complete free trade However, before it came into force, a combination of circumstances brought about a reaction A commercial crisis in 1873 was followed by a long period of trade depression; the high protection of the United States provoked a desire to retaliate, with improvement in transport, first Russian and then American competition began to affect agriculture, which had hitherto been sympathetic to free trade, the war of 1870 excited nationalist feeling and put a strain on national finance; finally Bismarck broke with his Liberal allies

The French Treaty, 1860.—In France there was a strong intellectual movement in favour of free trade, which produced in Frederic Bastiat one of the foremost propagandists of that policy The only considerable reform was, however, due to Napoleon III, who used his administrative powers to reduce the tariff, and in 1860 negotiated a commercial treaty with England The influence of this treaty was extensive, since, by making a distinction between the "autonomous" tariff, which was imposed in the absence of special agreement, and the "conventional" tariff, which was granted by special agreement, or in accordance with a general agreement to accord a country "most favoured nation" treatment, it led to the negotiation of a net-work of commercial treaties, covering most of the countries of Europe, and to the establishment of "conventional" tariffs, much lower than the nominal tariffs After 1870, however, influences the same as, or similar to, those which brought about a change in Germany produced a protectionist reaction in France In the United States also, there has always been a strong intellectual movement in favour of free trade, which at times (*e g*, in Secretary of the Treasury Walker's Report of 1845) found official expression Moreover, sentiment in the South was in favour of free trade, and tended to counteract the protectionist claims of the North until the Civil War The high taxation on imports, imposed to meet the expenses of that struggle, was, however, continued when that reason for them no longer held, and the United States was highly protectionist in its policy until the end of the century Outside the United Kingdom and the smaller maritime countries with a large transit trade, commercial policy was increasingly protectionist after the '70s of the last century The gains of the reforming decade that followed Cobden's commercial Treaty with France were not lost, but the growth of international commerce, which the cheapening of transport and the development of manufacturing technique made inevitable, was hampered and qualified by a new growth of restrictions and obstructions There was, as yet, no return to the absolute prohibitions of import that were normal before the free trade reforms; but an interference with the freedom of exchange that in itself was slight might have grave effects in the new circumstances of commerce The improvements in transport not only increased the volume of trade, but reduced the margins of profit on which trade was conducted, a very small addition to costs by a protective duty or other interference might, therefore, have a very large influence As has been indicated, this improvement in transport, by exposing new interests, and particularly European agriculture, to foreign competition, and the growth of nationalist feeling produced a reaction after 1871 It was the counterpart in the field of commercial policy of the growth of armaments in the field of military policy The United Kingdom escaped it, in part because the political influence of agriculturalists was less than in Continental countries, in part because an established system of direct taxation of incomes provided an alternative source of revenue from which expenditure on armaments could be financed. For a time the reaction was obstructed by the commercial treaties negotiated before 1871, these, however, served not so much to check the protectionist tendency as to turn it into other directions If duties could not be raised during the currency of a treaty other methods of protecting the home produce could be devised

Protection is defined by Grunzel as "the totality of those measures by which the national economy seeks to promote its interests in the world economy field," and its end as "the securing of the domestic market to the business of a country by political means" Tariffs are not the only means by which this end can be secured Freight rates in nationalized railway systems were manipulated to favour the domestic and to hamper the foreign producer; not only were they used to provide protection against imports, but also to give a concealed bounty on exports Other bounties became common, particularly on sugar and shipping, originating in drawbacks designed to compensate native producers in their export trade for the increase in their costs imposed by protective duties on their materials The difficulty of varying tariff laws led to other forms of administrative protection, sanitary provisions were used to stop the import of live stock and so protect the native grazier, food inspection was perverted to the same end The practice of confining public contracts to native contractors, and seeking to influence the governments of dependencies to confine their contracts to firms of the mother country, was an effective substitute for a tariff in certain industries Restrictions on immigration, especially the prohibition by the United States of America of the immigration of contract labour, were inspired by the same economic philosophy, and sought to reconcile the manual working class to a protectionist *régime* The Congress of the United States introduced a further complication by providing for special duties on the imports of countries that levied "unfair taxes" on American goods and giving the President power to vary rates of duty, or suspend free entry, by administrative act in certain cases

Free Trade and the War.—International trade before the war in spite of these obstacles continued to grow, moreover, as Grunzel demonstrates statistically (*Economic Protectionism*, p 73–4), it took the form predominantly of exchange between industrialized countries, all of which except England were protectionist in policy, much more than exchange between industrialized and agricultural countries The policy of free trade was maintained by England in spite of the propaganda launched by Joseph Chamberlain in 1903 and the last tariff revision before the war in the United States, the Underwood tariff of 1913, was a revision downwards in the direction of free trade The war, however, and the peace that closed it, confirmed the governments of the world in their protectionist tendencies By exciting nationalist feelings, establishing new national frontiers, and creating new fiscal needs, it encouraged a revival of protection that made it impossible to secure a hearing for the coldly rational arguments for international free trade Even the British Government moved away from the strict free trade position, imposing duties and prohibitions on imports of certain "key industry" products, supposed to be essential in war, providing administrative protection against imports from countries with depreciating currencies, continuing the protection afforded during the special circumstances of the war to a miscellaneous group of industries of which motor manufacturing was the most important, and reciprocating the preference accorded to imports from the United Kingdom by the Dominions In other countries the tendency was to higher and more elaborate tariffs The American tariff of 1922, the Fordney Tariff, is described by Professor H Parker Willis as "both actually and potentially the highest general tariff law ever enacted in the history of protection" Absolute prohibitions and duties at a prohibitive height were common in the policies of the succession states constituted out of the Austro-Hungarian empire Certain incidents of post-war trade assisted the same tendency The instability of the foreign exchanges, due to the vicious currency policies of most European countries, added a new uncertainty to industry, and cancelled the protection afforded by pre-war tariffs which imposed specific, not *ad valorem*, duties The latter difficulty was met in some cases, *e g*, France, by a system of "co-efficients," factors by which the duties in the tariffs were to be multiplied, varying with the depre-

ciation of the local currency, in others, *e g.*, Germany, by requiring the payment of duties in gold or its equivalent The war, by obstructing normal interchange of commodities, had led to the establishment or expansion of industries serving a local or national market, which demanded and usually obtained protection, when the circumstances that made them necessary passed away Most serious of all, in the uncertainty it introduced into industry, was the general shortening of the terms for which protective duties were fixed, and the general extension of the practice of varying and extending tariffs by administrative action Whereas before the World War tariffs were normally enacted by legislation for a term of years, and imposed settled conditions to which industry could accommodate itself, since the war they have been a field of incessant and unpredictable change to which industry has the greatest difficulty in adjusting itself

The persistence of a war-time psychology prevented both governments and peoples from perceiving that the economic distress caused by the war was general and could be alleviated only by joint action Gradually, however, a perception of this truth gained ground The results of the new protection were so serious, in the obstacles it opposed to the economic recovery of Europe, that a new movement for the freeing of trade gathered strength, which found expression in the so-called "Bankers' Manifesto," published on Oct 20, 1926, and culminated in the international economic conference, convened by the League of Nations in Geneva in May 1927 The words that the President, M Theunis, prefaced to the report of that conference, if they are the latest statements of the free trade principle, are also an echo of the earliest and classic statement of Adam Smith

"The exchange of products between persons of the same country or of different countries is normally to the advantage of both parties; the greater the range of exchange of different products between those who by their resources and capacities are best fitted to produce them, the greater is the general economic advantage that international trade is normally and properly not a matter of victory and defeat, of profit of one at the expense of the other, but of mutual benefit, has necessarily been the basis of this international conference"

The Free Trade Doctrine.—The basis of free trade is a belief in the benefits of exchange International trade is regarded as only one branch of exchange, differing in certain incidentals to it, but not in its essential benefits, from exchange within the limits of a single state, the free trade doctrine, therefore, regards the economic progress of different countries not as conflicting, but as mutually beneficial The benefits of exchange are, firstly, cheapness, a country does not import a commodity, unless by so doing it gets it cheaper than it could by producing it for itself; and, secondly, the most economical distribution of productive resources among the different industries and services of the country In Ricardo's words "Under a system of perfectly free commerce, each country naturally devotes its capital and labour to such employments as are most beneficial to each This pursuit of individual advantage is admirably connected with the universal good of the whole By stimulating industry, by rewarding ingenuity, and by using most efficaciously the peculiar powers bestowed by nature, it distributes labour most effectively and most economically, while, by increasing the general mass of productions, it diffuses general benefit, and binds together, by one common tie of interest and intercourse, the universal society of nations throughout the civilized world" (*Principles of Political Economy and Taxation,* ch vii 1817)

It is an important part of the free trade doctrine that the forms under which international trade is carried on obscure the reality If trade could be carried on on terms of barter, its nature as an exchange between producers would be obvious, since it takes the form of sales and purchase for money, this reality is not recognized Moreover, since the currencies of two or more countries are involved, transactions in foreign exchange are necessary Either the importer has first to acquire in exchange for currency of his own country currency of the country from which he wishes to import, or the exporter has to accept payment for his export in a currency which he cannot use to meet his ordinary expenses in his own country, and he has to sell this foreign currency Such exchange transactions do not, however, alter the economic character of trade International trade, like domestic trade, is an exchange of goods and services, which must in the long run balance. Exports create credits in other countries, which are used to pay for imports, imports create debits, which are liquidated by exports A country's credits and debits in relation with the rest of the world, however, are not exhausted by the imports and exports of merchandize that are all that customs administrations record; the balance of indebtedness is affected also by such "invisible exports" as interest on foreign investments, services of shipping and financial agencies, services to tourists, and receipt of remittances from emigrants When everything is taken into account, the debits and credits in any period may still not balance, the difference may be adjusted by a movement of gold, but before this takes place, a temporary difference will be met by short loans or by the transfer of Stock Exchange securities In the long run they must balance the movement of the exchanges and of gold under the gold standard automatically setting forces in motion that will correct any divergence, this statement is, however, subject to one qualification, the effect of the import and export of capital A country's exports, visible and invisible combined, will exceed its imports if it is lending capital to the rest of the world; its imports will exceed its exports if it is borrowing capital

Fundamental Relation of Imports and Exports.—Thus the cost of a country's imports is the cost of the exports with which it buys them, and the gain from foreign trade is the difference between the value to a country of its imports and the value to it of the exports, which it sends to other countries in exchange for those imports Since imports are paid for by exports, to prevent by protection an import is to reduce by the amount of that import the purchases by foreigners in the country, and therefore to reduce exports Therefore the expansion of production in a protected trade that follows the grant of protection, is not a net addition to employment and production, but merely a diversion of resources from other employments in which protection was unnecessary

This statement requires elaboration by reference to two criticisms which have been directed against it The first (urged, *e g*, by R Schuller, *Schutzzoll und Freihandel,* 1905) is a denial of the proposition that, since imports are paid for by exports, any increase in imports will give rise to a corresponding increase in exports, maintaining production in the aggregate unimpaired or increased Competitive imports may, it is argued, compel a native industry to close down, the imports will, it is true, have to be paid for by exports, but payment will be made by a diversion to export of a portion of the country's produce previously consumed at home The result is that imports and exports still balance, but the aggregate of the importing country's production is reduced by the amount of the output of the industry that has been ruined It is urged that the productive resources of a country are not necessarily exploited to the full, at any moment there may be land under-cultivated, seams of minerals not being worked, capital idle, and labour unemployed

In answer to this objection, free trade doctrine draws a distinction between the immediate and temporary effects of a change in fiscal policy, and the ultimate and lasting effects It may be admitted that the sudden admission of a hitherto excluded export might destroy a native industry, if the native industry was, as its collapse implies, unsuited to the country; but the labour and enterprise so displaced do not remain permanently unemployed As the pre-war experience of a country that admitted free imports like the United Kingdom showed, in time the displaced labour finds its way into other occupations, in which it can maintain itself in competition with other countries The argument depends on isolating the immediate effect upon the industry that suffers and ignoring the indirect effects of the change; free trade doctrine treats both the immediate dislocation and the ultimate benefit as on a par with any other economic improvement The effect of a new invention may equally be to displace and render obsolete the specialized labour and capital of an industry; equally, therefore, the threatened industry might claim protection—as in the past

has been done.

It is true that there always are unemployed, or under-employed, land, labour and capital, not only in free trade but in protectionist countries; but that condition is not necessarily connected with fiscal policy. Economic production does not consist in the production of material output, irrespective of its cost and its value, but of the production of those commodities and services only, the value of which, when produced, exceeds the cost of producing them; and unemployment, whether of labour or capital occurs under all fiscal systems, and is attributable to causes that operate independently of fiscal systems. Tariff *changes,* whether in the direction of restricting or enlarging freedom of trade, are likely to cause unemployment, since they cause dislocation of the existing adjustment of production to markets; but they do not figure largely in the modern scientific analysis of unemployment

Harmonious Development and Tariff Policy.—The other criticism to which it is necessary to refer is more fundamental It may be summed up in the statement that, while the monetary advantage may lie in taking things where they can be got cheapest, in the long run the national advantage lies in the harmonious development of all the country's resources The advantages of free trade are represented as advantages only on a short view; the cheapness that is secured at the expense of the sacrifice of national industry may be dear in the long run As List, who first formulated systematically this criticism, said, "The power of producing wealth is infinitely more important than wealth itself" This is supported by a rather different proposition Cheapness, it is argued, depends on large-scale production, this in turn is economical only if the industry runs full, protection by giving the native industry a secure home market enables it to run full, and so secures to the consumer the benefits of large-scale production Since the surplus over home needs on this system are liable to be dumped abroad, protection is also needed against such dumping by other countries

The answer given by free trade doctrine to this objection is partly practical and partly theoretical In practice, it is urged, tariff systems seldom show the influence of a balanced and well-considered scheme for developing a country's resources, rather they represent an indiscriminating and unscientific response to the pressure of the interests that seek protection, a response commonly described as "treating each case upon its merits" The policy that List himself based upon his criticism of free trade was a system of duties that should be moderate in amount, temporary in character, and confined to manufactures; no protectionist country has observed these limits Governments do not, in fact, necessarily take a long view of a country's needs, they are as liable to influence by transient passions, illusions and pecuniary difficulties, as the individuals who compose them; so that the free play of economic intercourse is in practice much better calculated to direct a country's activities into the permanent channels in which its natural and social advantages lie than are the shifting and uncertain policies of democratic governments or bureaucrats

The theoretical objection is that the criticism involves a misunderstanding of the nature of production It is admitted that fiscal policy should take account of the future as well as of the immediate present, that the power of producing wealth should not be sacrificed to a transient cheapness But it is denied either that the policy of free trade makes the mistake of sacrificing the present to the future, or that protection is any more successful in increasing the power of producing wealth Under any fiscal system a country will produce some wealth; under a system of unrestricted trade it will be compelled to concentrate on those branches of production for which it has comparative advantages. A policy of protection may divert a portion of its resources to other channels, and so perhaps widen the range of industrial processes in which the country engages; but this is not to increase its power of making wealth. The argument that it does is vitiated by the same materialist misconception of production that was noticed above; not the ability to perform processes or produce material products, but the ability to produce values in excess of the costs of production, in other words, to satisfy human wants with a minimum of real cost, constitutes economic production. A country is not richer, but poorer for the diversion into a variety of fields, in which it has no special advantages, of resources, which under free trade would be employed in the fields in which it has special advantages A policy of protection will have the advantage over free trade that is assumed for it only if a governmental direction of the development of industry through tariffs can be shown to be successful in discerning a country's comparative advantages and directing industry to them List attempted an elaborate historical argument to prove this, but subsequently investigation has made it necessary to re-write his history.

The modern argument, that the cheapness that comes from large-scale production is available only if an industry has the home market secured to it, attributes to protection the results of monopoly A protective tariff may increase the volume of domestic production in the protected industry, but the increase may just as well take the form of a multiplication of concerns without increase of scale, as of an increase of scale of existing concerns. Only if the home producers combine will they be able to pursue the policy suggested Protection merely gives them an additional incentive and opportunity to combine and exploit the home consumer

Generalizing upon Special Cases.—The effectiveness of the objections to the free trade doctrine just considered is in large measure due to the fact that they generalize special cases, which were recognized by Adam Smith, and have always been recognized since, as exceptions to the rule of free imports. Protection may be necessary to enable an industry, for which a country has the necessary advantages, to establish itself against the competition of the mature industries of foreign countries, in that case, the object of free trade, the direction of the country's resources to those activities for which it is best fitted, will be attained by a departure from the rule of free trade In practice, however, cases are rare, if any exist, in which such infant industries have justified the foresight of the statesmen who nursed them, by relinquishing protection on attaining maturity, and such examples as the industrial development of the Middle West, and more recently of the Southern States of America, in the face of the competition of the mature industries of the Eastern States, or the parallel and equal development before federation of manufacturing industry in free trade, New South Wales and protectionist Victoria, are cited to show that enterprise and capital, even without protection, will not be lacking if natural and social conditions favour the establishment of an industry

The argument that imports cause unemployment and reduce national production is similarly, in the free trade view, a generalization from an exceptional case. If a competitive import succeeds in displacing a native product—whether in a free trade or a protectionist country makes no difference—and owes its success not to any lasting or basic advantage over the native industry, but solely to transient or accidental advantages, or to a policy which it will be impossible for the foreign exporter to persist in, then there is a case on free trade principles for affording temporary protection to the threatened industry Thus it was not inconsistent with free trade doctrine to afford protection during the war to industries which were prevented by war-time requirements from carrying on their normal activities, or, after the war, to industries that were suffering from abnormal competition from countries with depreciating exchanges Again, dumping, being essentially a temporary expedient, falls under the head of the same exception: "If the free trade doctrine be regarded as the positive doctrine that commerce and industry should be kept in their natural channels and not merely that nothing should be done by legislatures to force them out of their natural channels, it would not merely be invalid to cite the doctrine as opposed to restrictions on dumping, but it would be valid to argue that it calls for such restrictions" (J Viner, *Dumping: a Problem of International Trade,* p 147, Chicago, 1923) In noting this exception it is, however, necessary to add, that the attitude of free trade partisans to any particular proposal will usually be influenced by the evidence brought forward to prove that the competition, against which provision is to be made, is really abnormal and transient, by the

assurances afforded that the protection will, in fact, be only temporary, and by the form and content of the measure by which the protection will be given

While the grounds on which the policy of free trade has usually been urged are economic, considerations of a purely political character have played an important part in the movement toward free trade, and the opposition to it has been motived even more decisively by political considerations Between the early advocates and opponents of the policy there was a profound cleavage over the functions of Government in relation to industry, which still influences the controversy Free trade was in its origin a special application of the general principle of *laissez-faire* It was, however, based also on empirical grounds, and is now dissociated from a policy of non-interference in general, deriving much of its support from Socialists, who in general favour the extension of State interference or participation in industry The political ground, on which the policy of free trade is supported by those who are supporters neither of *laissez-faire* nor of Socialism, is the unsuitability of governments, as at present constituted, for the special work of directing the currents of international trade In their internal relations they are unsuitable, because they are liable to interested pressure, whatever constitutional form they take, discrimination between industries (and therefore between localities) is inevitable in the framing or amendment of a protective tariff, since, unlike factory acts and similar legislation designed to safeguard the conditions of labour, a tariff does not press uniformly on all branches of industry, but inevitably favours certain industries at the expense of others They are unsuitable in their external relations, since they are merely local authorities in a world economy, they represent territories the boundaries of which have in most cases no economic *rationale*, while the commerce they propose to regulate and direct is the commerce of the world The encouragement of commercial relations that, cutting across political frontiers and establishing international communities of interest, might counteract nationalist jealousies and repair the breaches which diplomacy has failed to prevent, has underlain the advocacy of free trade, even when the arguments put forward have been mainly economic Towards the end of his argument on the unwisdom of restraints upon trade Adam Smith remarked "To expect, indeed, that freedom of trade should ever be entirely restored in Great Britain is as absurd as to expect that an Oceana or Utopia should ever be established in it Not only the prejudices of the public, but, what is much more unconquerable, the private interests of many individuals irresistibly oppose it" The change that has taken place in the fiscal and other regulation of foreign commerce between his age and the present, not only in Great Britain but in the world as a whole, is a measure of the achievement of the free trade movement, of which he was the father

BIBLIOGRAPHY —In addition to the works to which reference is made in the text, the following may be mentioned —C. F. Bastable, *Commerce of Nations*, new edition by T E Gregory (1923)—an excellent popular account of the subject, F W Taussig *Selected Readings in International Trade and Tariff Problems* (Boston, 1921)—a very convenient collection of important and representative statements upon the chief theoretical problems involved in international trade and the chief positions that have been taken up in fiscal policy, the same author's *Tariff History of the United States* (8th ed, 1923), *Some Aspects of the Tariff Question* (2nd ed, 1916), and *International Trade* (1927), are all important, the last as the most recent and careful restatement of the economic theory underlying fiscal policy, J Grunzel *Economic Protectionism* (1916)—a detailed analysis and description from the protectionist standpoint

For the post-war situation the documents and reports of the International Economic Conference of 1927 should be consulted; *The Economic Consequences of the League* (1927) is a good introduction and guide to them

For the "Free Trade" agitation of the early 17th century, *see* G. Unwin's *Industrial Organization of the 16th and 17th Centuries* (1904), and for the error of attributing the growth of English industry to the far-sighted policy of English Governments, the same author's *Studies in Economic History* (1923) and L. Brentano's *Eine Geschichte der wirtschaftlichen Entwicklung Englands*, 3 vols (Jena, 1927).

(H. CLA)

FREE VERSE. No exact definition of this form of poetry has yet been reached Indeed its very nature makes it difficult to define except by exclusion. Thus it is verse which discards traditional rhyme, metre, and form in favour of cadence. The theory upon which it rests, is that poetry depends upon the substance rather than the form The free-verse writer seeks to isolate the essential, and convey it to the reader stripped and absolute. The result will be differentiated from prose not so much by its quality of song as by reality captured in a lightning-flash

In all European countries since the war free verse has found many adherents In Great Britain and the United States it has achieved such a vogue that it has for the moment almost displaced the traditional But it must not be supposed that it is in fact an innovation in the English tongue The Song of Solomon, for example, is plainly free verse in the modern acceptation of the term, and many passages in Sir Thomas Browne are entitled to the same description This may be accidental, but in the Victorian era Matthew Arnold deliberately, and with great success, wrote general poems that depended wholly on cadence

Among the principal exponents of this form of verse in Great Britain have been the Imagists—F S Flint, Richard Aldington and T S Eliot In the United States we have had Ezra Pound, H D, Conrad Aiken, Carl Sandburg and Archibald Macleish. The movement at the moment is still increasing in strength and popularity But it has yet to prove that, when it succeeds, it succeeds by methods different from those used by Matthew Arnold

(H Wo)

FREE-WILL. The Scope of the Problem.—The problem of free-will, or of the freedom of the will, is complicated for various reasons In the first place, the traditional formulation of the problem, its very name, is misleading To ask whether the will is free seems to assume that there is such a thing as a will, which may or may not be free in its activities This is a relic of the old, and now generally discredited, faculty psychology (*q v*) As Spinoza pointed out, will is a general concept derived from particular processes of volition, just as the concept of colour is derived from particular colours, blue, green, yellow, etc And to think of will as exercising acts of volition is just like thinking of colour as the cause of blue, green, yellow, etc Locke likewise ridiculed the conception, remarking that "we may as properly say that the singing faculty sings, and the dancing faculty dances, as that the will chooses" (*Essay on the Human Understanding*, book 2, chap xxi, § 17) It would be best to avoid this hypostasis of an abstraction, and to speak of the freedom of the self, that is of the concrete personality, rather than of an abstract will But the term, free-will, is too well established to be dislodged Moreover, the expression, freedom of the self or of the person, might suggest the problem of political freedom rather than the philosophical and psychological problems traditionally associated with the term free-will

In the second place, the problem is unduly complicated by the fact that it can be, and has been, approached from very different points of view The psychologist is mainly interested in the right explanation of the experience of freedom of choice, which seems to challenge the usual scientific assumption that all things, including mental experiences, are subject to law and necessity The moral philosopher is primarily interested in the free-will as a postulate of the moral life. For how can there be any significance in the moral "ought" or "ought not" if human life moves to the tune of an inevitable "must"? The jurist is concerned with the problem of free-will in its bearing on personal responsibility For the whole penal system seems meaningless if people are not free agents in their actions, good and evil Lastly, the theologian has an interest in the problem, since it seems to involve either the denial of God's omniscience or of His justice. If man is truly free, then it would appear that God cannot fore-know his actions, if man is not free, then his prosperity or his suffering seem to be governed by caprice rather than by justice.

Such are the chief ways of approaching the problem of free-will. The discussion of the problem is also beset by the peculiar difficulty involved in having to use terms which have rather different meanings in different antithesis, such as there are bound to be when a question is approached from several different points of view. This applies especially to the terms freedom and necessity, round which the whole problem turns. How serious this last

difficulty is, may be indicated briefly by pointing out that whereas most people regard freedom and necessity as opposed terms, Spinoza (one of the greatest thinkers) actually identified them! And he did so for good reasons, as will be shown later

The Scientific Problem.—The aim of science, and therefore of psychology as one of the sciences, is to describe and, as far as possible, to explain the phenomena which it investigates Correct description (involving, of course, correct observation on which it is based) is of the utmost importance, for if the data furnished by observation and description are inaccurate, the explanations are bound to be futile And explanation in modern science takes the form of indicating some kind of order to which the facts observed belong The most usual kind of order sought consists of the laws (that is, uniformities) of the phenomena under investigation In the history of modern science the most important laws first discovered and established were those of mechanics, and their fruitfulness in the domain of astronomy and physics was such that every other science attempted to approximate to the mechanical model. Even psychology, in the hands of the associationist school (*see* ASSOCIATIONISM) has, indeed, attempted to explain mental experiences in terms of sensations and laws of association, as though sensations were analogous to the corpuscles, and the laws of association to the laws of motion, in mechanics Under the circumstances it seemed natural to think of mental life as essentially mechanical in character, with as little freedom as is to be found in a mechanical engine Under the influence of the materialism that was prevalent in the age of classical mechanics, even those who could not reconcile themselves to a materialistic conception of mental experiences such as "secretions of the brain" were sufficiently influenced by the known correlation between neural and psychical processes to suppose that the mental processes were at least in some sense, and indirectly, as mechanically determined as the neural processes were then commonly believed to be

Strictly speaking, however, all this was a violation of the real spirit of science, inasmuch as it did violence to actual observation Except in the very last resort, observations should not be repudiated, or dismissed as deceptive, merely because they cannot as yet be explained in a way analogous to the explanations in vogue in sciences dealing with other phenomena Now, the evidence of observation is clear enough There certainly are cases in which we appear to have the experiences of deliberately or freely choosing one course of action in preference to others Moreover we also have other experiences in which we appear to be coerced in deciding or doing as we then do If all our experiences were really of a quasi-mechanical character, it would be necessary to account for this difference between some of our mental experiences and others As a matter of fact, recent psychology, indeed recent biology, has found it necessary to abandon the mechanistic model, and to assume an element of spontaneity or freedom in all living organisms in order to account for facts of observation. And some have gone so far as to repudiate the possibility of purely mechanistic explanation even in some of the purely physical sciences, such as chemistry This revolt has found expression in the now familiar conceptions of "emergence" (*q v*) and "creative evolution" (*q v*) It seems to be an entirely unwarranted assumption to suppose that the kind of order studied in mechanics is the only kind of order applicable to all phenomena, organic and inorganic, mental and physical And it seems to be equally unwarranted to suppose that mechanical energy is the sole producer of all kinds of events, living and lifeless, mental and physical Granted that the principle of the conservation of energy has its perfectly legitimate and extensive domain, there is no reason for doing violence to *prima facie* facts of observation merely for the sake of applying the principle universally As Bergson has pointed out "no one can tell whether the study of physiological phenomena in general, and of neural phenomena in particular, will not reveal to us, besides the *vis viva* or kinetic energy of which Leibniz spoke and the potential energy which was a later and necessary adjunct, some new kind of energy which may differ from them" (*Time and Free Will*, pp. 151, *seq*) Moreover, the principle of conservation of energy really affects the whole question of the relation between body and mind, and has no more a special bearing on the problem of free-will than on that, say, of the expression of the emotions (*q v*)

Nay, more It may be urged not only that science has no *prima facie* justification for dismissing the possibility of a measure of human freedom, but that science itself really postulates such freedom In a world of thorough-going determinism, in which all things were mechanically or quasi-mechanically pre-determined, in which even men of science were not free to think as they thought fit in the light of the evidence before them, how could science lay any claim to truth, universally valid truth? There could be nothing but individual opinion, the opinion of each individual being as necessary, and probably as far from the truth, as that of any other It may be, of course, that our world is such a world But in such a world there could be no science And to insist upon maintaining such a deterministic view of the world in the name, and on behalf of, science, is simply to stultify oneself. The real question, from the point of view of science in general and psychology in particular, is not whether there is such a thing as human freedom, but rather how much of it there is, and wherein it consists

The Psychology of Free-will.—The older psychology tended to treat the human mind as essentially passive and receptive The mind was thought of as a blank tablet (*tabula rasa*) on which external stimuli made "impressions" which eventually resulted in more or less mechanical responses Recent psychology has entirely abandoned this wax tablet conception of the human mind, and even of the mind of lower animals It has been found necessary to assume from the very outset an element of spontaneous activity or self-assertion on the part of the mind For not all external stimuli make an impression on the mind, there is a process of selection going on all the time The familiar phenomenon of attention is essentially such a process of selection, and in some degree attention is always present throughout waking life The stress now laid on the conational side of mental life is only another aspect of the present tendency in psychology to bring out the factor of spontaneity in the life of mind This is not surprising in view of the fact that biologists have been led to assume such a factor even in the case of micro-organisms The evidence of consciousness itself, as we have remarked above, seems to give direct support to the belief in the existence of such a factor, even if it be granted that the direct evidence of introspection is only available in the higher stages of mental development

It would seem, then, that in the absence of cogent reasons to the contrary, such as have not been made out hitherto, we are justified in maintaining that there are elements of spontaneity or self assertion in human life And if by freedom or free-will we mean, as we usually do mean, these elements of spontaneity and self-expression, then it may be said that a case has been made out for the view that man normally enjoys a measure of freedom or free-will

This admission or contention is, however, a long way from the extreme claims of what is commonly known as *libertarianism*, the opposite extreme to the thorough-going determinism or mechanism dealt with above. According to extreme libertarians, every human being, no matter what his past may have been, no matter what his present character may be, is at every moment of his life absolutely free to choose any one of the alternative courses of conduct that may confront him If this view were true, then there would be no connection between an individual's choice at any moment and the rest of his mental life and being Mental life would have to be conceived as something essentially discontinuous, a mere sequence of discrete experiences Such a view is entirely inconsistent with the evidence, to say nothing about the fact that, if true, it would make a science of psychology, or indeed any science, impossible The accumulation of evidence which has led to the theory of evolution in biology *prima facie* tends all the other way, namely, in the direction of supporting a view of a continuity of influences that extend even beyond the life of the individual And in psychology it has similarly been found increasingly necessary to take into account not only the whole past life and education of the individual but also various inherited char-

acters The libertarian position would reduce life to, it may be a miraculous, but at the same time a lawless and disorderly sequence of events such as would render impossible a science of mental life. For it is the function of science as such, and of psychology as a science, to discover law and order in its investigated facts

If, now, we dismiss the two extremes, namely, absolute determinism and absolute libertarianism, we are left with a view which may commend itself as a compromise, that is to say, the view that man is partly free and partly determined This is the view actually adopted by most thinkers, because all the evidence is in favour of it, as we shall now indicate briefly

In its primary and most usual meaning the term freedom is contrasted with coercion If a man feels hungry and takes food of his own accord, his eating is spontaneous, voluntary or free, if his food is forcibly taken from him so that he goes hungry, then his hunger is involuntary or forced upon him If, on the other hand, he adopts the hunger-strike and is forcibly fed, then the cases are reversed—his hunger is voluntary or free, whereas his feeding is involuntary or forced upon him This is the primary contrast, which it is well to observe if one is to avoid the confusion common in discussions about free-will Human actions have, of course, a great range of complexity into which all sorts of considerations enter Take, for example, the case of a move in a game of chess The chess-player, under normal conditions, is free to make any move he thinks fit In a sense he is more free when he makes the first move in the game than later on when the game has developed and his permissible movements are restricted by the position of the various pieces, and he is never entirely free, because there are rules to be observed which restrict his movements in various ways But he is free to a very large extent, for there is nearly always a choice of movements (good and bad) from which he may select, at least until he is checkmate or stalemate But now suppose we consider differences in the degree of different people's skill in the game It is clear that a good player will often see possible movements which the inferior player, confronted by the same position, does not see When comparing the two players one is tempted to say that the inferior player was forced to make a bad move, or at least an inferior move, because he could not see the better move His ignorance, or insufficient skill, thus comes to be regarded as a hindrance to a better move, indeed, as a coercion to an inferior move, and one is inclined to say that the more skilled player has greater freedom than the less skilled player But to do so is really to confuse the issue, it confuses *better* play with *freer* play In reality the two players are equally free, inasmuch as each plays of his own accord, and in conformity with the same rules The fact that one of them plays better than the other is irrelevant to the question of freedom One might play better and yet not so freely, *e g*, when he simply carries out the instructions of another person In the same kind of way the conduct of one person may be morally or artistically more valuable than that of another, yet both are equally free, so long as they act of their own accord, and each according to his light, under the same circumstances It is a widespread view among moral philosophers that only good conduct is really free

But this view is based on the very confusion between the value and the freedom of conduct to which attention has just been drawn One curious consequence of the view under consideration is that wicked actions are never free This is unwarranted psychologically, and contrary to common sense There are plenty of people who of their own accord behave immorally under circumstances in which others act morally Both are equally free, and the moral difference in their conduct is not relevant to the question of their freedom Freedom consists essentially in self determination, as distinguished from external coercion or restraint, and the value of the resulting conduct, however important it may be in various other respects, does not affect the psychological question of its freedom

Degrees of freedom, of course, there are, and have to be recognized on purely psychological grounds Only God (in Spinoza's sense) is free Human conduct is always influenced to some extent by external factors which are beyond control And the relative weight of these external influences varies from case to case A precise estimate of the proportion of freedom is impossible; but in practical life common sense allows for differences in the degree of freedom in its own rough and ready way

Perhaps the most serious difficulty in this connection is caused by the fact that the relative effect of external circumstances varies with the general condition of the person who has to face them, and no one is always at the height of his powers, or at his best The degree of external coercion may thus vary very considerably although the circumstances are the same, or essentially similar, and although the agent concerned is to all appearances also the same One way of dealing with such cases is to say that even a normal individual is to some extent a multiple personality, consisting of selves of different orders of merit and power There is the habitual self; there is the highest self to which a man rises at his best; and there is the sub-normal self to which he sometimes sinks The same, or essentially similar circumstances will coerce these several selves to a very different extent, and the same individual may in each case be said to have a different degree of freedom, the freedom being greatest for the highest self, and lowest for the sub-normal self There is no great harm in expressing the facts in this way, except that it may tend to encourage the above-mentioned confusion between value and freedom Another way of describing the facts is to say that each of these selves is as free as it can be, but that in judging an individual we rightly take into account his whole personality rather than a fragmentary self, and that we have special regard for what is best in him And to that extent whatever is done by the sub-normal self is not judged as typical of the real personality (the habitual or even the highest self) of the agent It is true, of course, that assuming circumstances to remain constant, an individual's freedom will increase as his powers develop. But this is not to say that his greater freedom will necessarily make him morally better, it may make him more wicked, as appears from the cases of better educated crooks Those who entertain the metaphysical faith in a moral world-order may urge that with still further self-development, and therefore with still greater freedom, there will eventually come greater moral goodness That may be so; but this consideration of it falls outside the psychological consideration of the problem of free-will

The Ethical Problem.—Moral life is usually characterized by devotion to some ideal end (*summum bonum*) such as happiness or perfection, or by a sense of duty (the categorical imperative) In the former case moral conduct is guided by the will to realize, or at least to approximate to, what is believed to be the highest good, in the latter case it is prompted by an imperious sense of duty which dictates what "ought" or "ought not" to be done But if human life were completely determined by external circumstances, there would be nothing but delusion in either of these attitudes Both imply a certain spontaneous power on the part of the moral agent Ideals are mere will-o'-the-wisps for those who cannot pursue them, and "ought" has no significance except for those who "can" The moral life thus postulates, as Kant insisted, the freedom of the will But the freedom which it requires is not the kind of freedom maintained by the extreme libertarians, for the "freedom of indifference" (as it is sometimes called), the absolute freedom to choose any possible course of action, entirely uninfluenced by the past and the character of the agent, would be just as fatal to real morality as its opposite extreme, thorough-going determinism, would be An action carried out under conditions of "freedom of indifference" could not be described as the agent's act in any real sense of the term; it would be essentially accidental and therefore non-moral, in the sense that it would not be a suitable object or occasion of moral judgment. Moral judgment is primarily a judgment passed on the agent of the act under consideration, and how could one justly pass moral judgment on an agent for an act that is not really his, though associated with him as a chance product? To justify a moral judgment the action must be the agent's, in the sense that it was, in part at least, determined by his habits, his character, his self, under certain external circumstances which, of course, must also be taken into account

before passing moral judgment.

Thus partial self-determination is the only kind of free-will that ethics really postulates, and that much, as has already been shown, psychology justifies us in assuming. On the assumption of either thorough-going determinism or extreme libertarianism the only kind of ethics that would be possible would be a merely descriptive, natural-history ethics, as contrasted with a normative, philosophical ethics, which strictly speaking is the only real ethics, to which the other kinds of ethical studies are only subordinate (*See* ETHICS)

The Juridical Problem.—Law and morals are so closely connected that one need not be surprised to find that philosophical lawyers as well as moral philosophers are interested in the problem of free-will The juridical problem turns mainly round the justification of punishment—the penal side or sanction of law In a civilized society unmerited punishment (to a lesser extent also undeserved reward) offends the general sense of justice, in the interests of which law is assumed to exist Yet punishment cannot, it is felt, be merited unless the offender committed the offence freely, of his own accord And so the whole penal system would appear to be based on the assumption that man is free in his actions, and therefore responsible for them

In the case of the philosophy of law, however, as in the case of moral philosophy, what is required is not the "freedom of indifference" urged by extreme libertarianism Such freedom would be as fatal to law as to ethics, and partly for the same reasons, which therefore need not be repeated In the case of law there is the additional objection that, on the extreme libertarian view, punishment could only be regarded as vindictive, for it could not possibly help to improve the future conduct of the offender or deter others, since past experience is assumed not to influence future conduct Again, in law and in ethics the conception of freedom as partial self-determination furnishes an equally satisfactory basis, and for the same reasons, which also need not be repeated But there is a great difference between legal and ethical requirements in relation to the theory of thorough-going determinism It has already been shown above that thorough-going determinism would be fatal to the moral life But it could be made a more or less satisfactory basis of the penal code For the needs of social security may be regarded as justifying the "punishment" of those who endanger it, even if the offenders do not deserve punishment, because they are not really responsible for their "offences." A mad dog may have to be killed, and a person suffering from a communicable disease may have to be isolated and virtually imprisoned, even if neither is responsible for his condition Nevertheless the view of thorough-going determinism, though possible, is not altogether satisfactory And the view of freedom as partial self-determination offers a sound basis both for the deterrent and the corrective theory of punishment, as well as for that humane conception of the partly preventive and partly curative treatment of offenders which advancing civilization increasingly favours.

The Theological Problem.—During the middle ages the problem of human freedom, or freedom of the will, was felt to be urgent on account of its seeming conflict with the omniscience of God, of whom foreknowledge was regarded as an essential attribute. If man is really free to do as he thinks fit, how can God foretell what man will do? The solutions offered have been, and are, various One familiar solution, if it may be called a solution, is to maintain at once both the foreknowledge of God and the freedom of man, in spite of their apparent irreconcilableness Some attempt to make this position plausible by pointing out that, after all, foreknowledge does not really determine the anticipated result No one, *e g*, supposes that a forecast of the weather, when it turns out to be correct, actually determines or helps to determine, the coming weather. In the same way, it is argued, God's foreknowledge of human conduct does not determine it, and consequently is compatible with human freedom But the argument, though very popular, is really fallacious, or at least beside the point The question is not whether the forecast itself determines the coming event, but whether any real foreknowledge (as distinguished from a random guess) is possible except in a more or less deterministic system A legitimate forecast is based upon a knowledge of certain causal relationships and on the observation of the assembling of the conditions which, when completed, will produce the event in question (say, rain, etc). So that strictly speaking Divine omniscience would not appear to be compatible with human freedom, certainly not with that extreme freedom advocated by the libertarians

Another solution of this problem is to abandon the belief in Divine omniscience in order to save human freedom, just as some theologians are ready to forego their belief in Divine omnipotence in order to save His goodness in the face of so much apparent evil in the world.

Generally speaking, one may distinguish two main types of theological thought; one which lays the greatest stress on the *goodness* of God, the other on the *power* (including the omniscience) of God The former type of religious philosophy tends to regard *morality* as *autonomous* It holds that God does what He does, or decrees what He decrees, because it is good; not that it is good merely because he does or decrees it And consequently it attaches such value to the moral life of man (which as we have seen, postulates a measure of free-will) that it is ready to forgo the belief in the omnipotence (including the omniscience) of God On the other hand, the second type of theology is mainly obsessed with the omnipotence of God, and is so jealous on behalf of God (so conceived) that it tends to deny every sort of independence of Him, even such as free-will would appear to suggest, or the autonomy of goodness According to this type what God does or decrees is good just because He does or decrees it, He does not do or decree it because it is good And rather than conceive of man as sufficiently free and independent to pursue an autonomous morality, it prefers a doctrine of thorough-going determinism, or predestination, in spite of its apparent reduction of human life and endeavour to a mere puppet show

The present-day theological tendency is predominantly in favour of an autonomous morality, and consequently of such a measure of human freedom as this postulates And incidentally the conception of free-will as being essentially a measure of self-determination by the agent also helps to mitigate to some extent the difficulty of reconciling human freedom with Divine foreknowledge as based on a knowledge of the character of the agent

Historical Note on the Problem of Free-will.—The problem first appears, in a rather obscure way, in Plato's *Republic* (book 10), where it already has a theological complexion Plato there endeavours to vindicate the ways of God to men, and he does this by attributing to men the responsibility for the choice of their several destinies Plato must have assumed, therefore, the freedom of the will, or rather the freedom of man, for strictly speaking he, like Socrates, believed that the will is determined by our knowledge Still, within the limits of his knowledge, man, according to Plato, is free In *Aristotle* the question is raised in connection with the problem of human responsibility. He laid great stress on the difference between the voluntary actions of men and their involuntary actions, and held men responsible for their voluntary actions The state, according to him, is primarily concerned with the voluntary actions of the citizens, for which alone they can be held responsible Hence Aristotle regarded man as partly free, and insisted on his responsibility for all his voluntary actions, good and bad alike.

The problem of free-will received fuller attention from the Stoics and Epicureans The *Stoics* believed in a world-soul which they regarded as controlling everything, and this belief naturally led to a thorough-going determinism The *Epicureans*, on the other hand, were materialists; but as they did not believe in any kind of cosmic order, and attributed everything to chance, they inclined to the belief in free-will *Chrysippus*, the Stoic, is noteworthy for his endeavour to reconcile determinism with moral responsibility He distinguished between the principal causes of human conduct and its contributory causes By identifying character with the principal cause of conduct he upheld the view that man is responsible for his actions

Christianity, from the beginning, was faced with the problem of reconciling human freedom with Divine government—the old Stoic problem in fact *St. Augustine* was not particularly consistent in his views concerning our problem He professed to see no inconsistency between the belief in Divine foreknowledge and that in human freedom, and tended to restrict human freedom to the solitary case of Adam, whose fall has condemned to necessary evil the rest of mankind, except those who by Divine grace are predestined to good *Thomas Aquinas* and *Duns Scotus* see no difficulty in reconciling the free-will of man with the foreknowledge of God, and the latter emphasizes the will's complete power of self-determination, even when guided by the intellect

Turning to modern philosophy, we find the three principal answers to the problem of free-will given by the three more or less contemporary philosophers, Hobbes, Descartes and Spinoza *Hobbes'* thorough-going determinism was the logical consequence of his materialism Mental experiences, according to him are in the last resort merely motions of brain particles, and all human conduct is determined partly by such brain motions and partly by external material causes *Descartes,* on the other hand, endowed the human will with absolute power of self-determination All evil and all error can be avoided by withholding our consent by a sheer act of will So far is knowledge or belief from determining our will that it is really our will that determines what we shall believe. *Spinoza* is commonly described as a thorough-going determinist, but that is only one of the many injustices done to him by incompetent interpreters In reality he was the first to identify freedom with self-determination, and to attribute to man partial freedom The confusion has arisen from his somewhat peculiar use of the term "necessity", Spinoza distinguished between (external) coercion and (inner) necessity What is coerced, of course, is not free—the two terms are opposed to each other The term "necessary" however, is not used by Spinoza as synonymous with "coerced" or as the contradictory of "free," but as synonymous with "what is in accordance with law and order" (in the scientific sense), as the contradictory of what is merely "accidental" or "a matter of chance" If, as has been maintained above, human freedom is partial self-determination, and human conduct is not a matter of mere chance, but is determined by the whole character and mentality of the agent, then human conduct is at once "free" and "necessary" in Spinoza's sense, and only partly "coerced" *Leibniz,* in consequence of his doctrine of a pre-established harmony among the windowless monads which are controlled by God, was to all intents and purposes a thorough-going determinist *Locke,* like Spinoza, corrected the misconception underlying the expression "freedom of the will," which should really be "freedom of man" and he supported the theory of free-will in that sense *Hume* in so far as he was a consistent opponent of the objective reality of the causal nexus (which he was not) could of course attach no real meaning to determinism in conduct Consistently with his radical scepticism he could neither hold a definite view on one problem nor regard human conduct as merely accidental *Kant* is no doubt the best known philosopher in relation to the problem of free-will He was the first to insist on freedom as a postulate of morality "I ought, therefore I can" His next problem was to reconcile this postulated freedom with the thorough-going determinism which the scientific explanation of all phenomena seemed to demand, as he thought He solved this difficulty in a characteristic way He distinguished between phenomena and noumena, that is, between the world as it appears to us and the world as it is in itself Human experiences as parts of the world of appearances are subject to the thorough-going determinism that characterizes all natural phenomena But man is also part of the world of noumena, and as such he is free to obey the categorical imperative, or highest moral law, which is really only an expression of his noumenal self.

This brief and inadequate historic note only indicates the origin of the leading ideas in the history of the problem of free-will. For an adequate study of the history of the subject it is necessary to study carefully the works of the philosophers named, as well as those of many post-Kantians, who have not even been mentioned here

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FREEZING MACHINE: *see* REFRIGERATORS.

FREGATIDAE: *see* FRIGATE-BIRD.

FREGELLAE, an ancient town of Latium on the Via Latina, 11 m W N W of Aquinum, near the left branch of the Liris It was destroyed by the Samnites a little before 330 B C, and in 328 B C a Latin colony was established there It continued faithful to Rome, by breaking the bridges over the Liris it interposed an obstacle to Hannibal in 212 B C, and it was a native of Fregellae who headed the deputation of the non-revolting colonies in 209 B C It flourished owing to its command of the crossing of the Liris, and to its position in a fertile territory, and here a revolt against Rome broke out in 125 B C It was captured by treachery and destroyed, but in 124 Fabrateria Nova was founded 3 m to the S E on the opposite bank of the Liris, and a post station Fregellanum (mod Ceprano) grew up, Fregellae itself, however, continued to exist as a village even under the empire The site is about ½ m E of Ceprano, but the remains are very scanty

See G Colasanti, *Fregellae, storia e topografia* (1906).

FREIBERG or FREYBERG, a town of Germany in the republic of Saxony, on the Munzbach, near its confluence with the Mulde, 19 m S W of Dresden by rail Pop. (1925) 34,742 It owes its origin to the discovery of silver mines (*c* 1163) The town, with the castle of Freudenstein, was built in 1175, and its name, which first appears in 1221, is derived from the extensive mining franchises granted to it about that time From the end of the 13th century until 1485 Freiberg remained common property The Reformation was introduced in 1536 by Henry the Pious, who resided here The town suffered severely during the Thirty Years' War, and again during the French occupation from 1806 to 1814 A part of its ancient walls still remains, the other portions have been converted into public walks and gardens Freiberg is the seat of the general administration of the mines throughout the republic, and its mining academy (*Bergakademie*), founded in 1765, is famous Among its distinguished scholars were Werner (1750–1817), who was also a professor there, and Alexander von Humboldt Freiberg has manufactures of gold and silver lace, woollen cloths, iron-wares, china, sugar and cigars In the vicinity are its famous silver and lead mines, of which the principal ones became state property in 1886 The castle of Freudenstein or Freistein, rebuilt by the elector Augustus in 1572, has been used as a military magazine The cathedral, rebuilt in late Gothic style after its destruction by fire in 1484 and restored in 1893, was founded in the 12th century Of the original church a German Romanesque doorway, known as the Golden Gate (*Goldene Pforte*), survives Henry the Pious and several of his successors are buried here The town-hall dates from the 15th century

See H Gerlach, *Kleine Chronik von Freiberg* (2nd ed., Freiberg, 1898); H Ermisch, *Das Freiberger Stadtrecht* (Leipzig, 1889), Ermisch and O Posse, *Urkundenbuch der Stadt Freiberg,* in *Codex diplom Sax reg* (3 vols, Leipzig, 1883–91); *Freibergs Berg- und Huttenwesen,* published by the Bergmännischer Verein (Freiberg, 1883); Ledebur, *Über die Bedeutung der Freiberger Bergakademie* (*ib* 1903); Steche, *Bau- und Kunstdenkmäler der Amtshauptmannschaft Freiberg* (Dresden, 1884).

FREIBURG, a town of Germany in Prussian Silesia, on the Polsnitz, 35 m S W. of Breslau, by rail Pop (1925) 9,458. Its industries include watch-making, linen-weaving and glass-making In the neighbourhood are the old and modern castles of the Fürstenstein family, whence the town is sometimes distinguished as Freiburg unter dem Fürstenstein

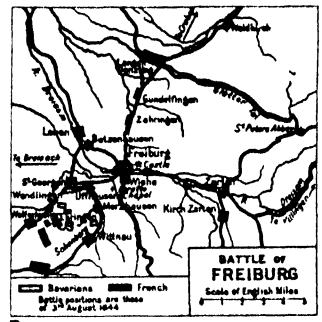
FREIBURG IM BREISGAU, archiepiscopal see and city of Germany in the republic of Baden, situated on the Dreisam at

the foot of the Schlossberg, 40 m. N of Basle by rail. Pop. (1925) 90,475

In 1120 Freiburg became a free town, with privileges similar to those of Cologne; but in 1219 it fell into the hands of a branch of the family of Urach. It purchased its freedom in 1366; but, unable to reimburse its creditors, it was, in 1368, obliged to recognize the supremacy of the house of Hapsburg. In the 17th and 18th centuries it played a considerable part as a fortified town Since 1821 it has been the seat of an archbishop with jurisdiction over the sees of Mainz, Rottenberg and Limburg The waters of the river flow through the streets in open channels; and the old fortifications have been replaced by public walks and vineyards It possesses a famous university, the Ludovica Albertina, founded by Albert VI , archduke of Austria, in 1457 The Freiburg minster is considered one of the finest Gothic churches in Germany It was probably erected between 1122 and 1252, but the choir was not built till 1513. The tower is 386 ft in height In the interior of the church are some beautiful stained glass windows and paintings by Holbein and by Hans Baldung (*c* 1470–1545) The palaces of the grand duke and the archbishop, the old town-hall and the *Kaufhaus* or merchants' hall, a 16th-century building with a handsome façade, are noteworthy On the Schlossberg above the town there are ruins of two castles destroyed by the French in 1744, and about 2 m N E stands the castle of Zahringen Situated on the ancient road which runs by the Hollenpass between the valleys of the Danube and the Rhine, Freiburg early acquired commercial importance, and it is still the principal centre of the trade of the Black Forest It manufactures buttons, tobacco, silk thread, paper, sugar, surgical and musical instruments

See Schreiber, *Geschichte und Beschreibung des Münsters zu Freiburg* (1820 and 1825), *Geschichte der Stadt und Universität Freiburgs* (1857–59), *Der Schlossberg bei Freiburg* (1860), and Albert, *Die Geschichtsschreibung der Stadt Freiburg* (1902).

Battles of Freiburg, Aug 3, 5 and 10, 1644—During the Thirty Years' War the neighbourhood of Freiburg was the scene of a series of engagements between the French under Louis de Bourbon, duc d'Enghien (afterwards called the great Condé), and Henri de la Tour d'Auvergne, vicomte de Turenne, and the Bavarians and Austrians commanded by Franz, Freiherr von Mercy At the close of the campaign of 1643 the French "Army of Weimar," having been defeated and driven into Alsace by the Bavarians, had there been reorganized under the command of Turenne, then a young general of 32 and newly promoted to the marshalate In May 1644 he opened the campaign by recrossing the Rhine and raiding the enemy's posts as far as Überlingen on the lake of Constance and Donaueschingen on the Danube The French then fell back with their booty and prisoners to Breisach, a strong garrison being left in Freiburg The Bavarian commander, however, revenged himself by besieging Freiburg (June 27), and Turenne's first attempt to relieve the place failed During July, as the siege progressed, the French Government sent the duc d'Enghien, who was ten years younger still than Turenne, but had just gained his great victory of Rocroy, to take over the command Enghien brought with him a veteran army, called the "Army of France," Turenne remaining in command of the Army of Weimar. The armies met at Breisach on Aug 2, by which date Freiburg had surrendered At this point most commanders of the time would have decided not to fight, but to manoeuvre Mercy away from Freiburg; Enghien, however, was a fighting general, and Mercy's entrenched lines at Freiburg seemed to him a target rather than an obstacle A few hours after his arrival, therefore, without waiting for the rearmost troops of his columns, he set the combining armies in motion for Krozingen, a village on what was then the main road between Breisach and Freiburg The total force immediately available numbered only 16,000 combatants Enghien and Turenne had arranged that the Army of France was to move direct upon Freiburg by Wolfenweiter, while the Army of Weimar was to make its way by hillside tracks to Wittnau and thence to attack the rear of Mercy's lines while Enghien assaulted them in front. Turenne's march (Aug. 3, 1644) was slow and painful as had been anticipated, and late in the afternoon, on passing Wittnau, he encountered the enemy. His men carried the outer lines of defence without much difficulty, but as they pressed on towards Merzhausen the resistance became more and more serious. Turenne's force was little more than 6,000, and these were wearied with a long day of marching and fighting on the steep and wooded hillsides of the Black Forest Thus the turning movement came to a standstill far short of Uffingen, the village on Mercy s line of retreat that Turenne was to have seized, nor was a flank attack possible against Mercy's main line, from which he was separated by the crest of the Schonberg Meanwhile, Enghien's army had at the prearranged hour (4 P M) attacked Mercy's position on the Ebringen spur A steep slope, vineyards, low stone walls and abatis had all to be surmounted, under a galling fire from the Bavarian musketeers, before the Army of France found itself, breathless and in disorder, in front of the actual entrenchments of the crest A first attack failed, as did an attempt to find an unguarded path round the shoulder of the Schonberg The situation was grave in the extreme, but Enghien resolved on Turenne's account to renew the attack although only a quarter of his original force was still capable of making an effort He himself and all the young nobles of his staff dismounted and led the infantry forward again, the prince threw his baton into the enemy's lines for the soldiers to retrieve, and in the end, after a bitter struggle, the Bavarians, whose reserves had been taken away to oppose Turenne in the Merzhausen defile, abandoned the entrenchments and disappeared into the woods of the adjoining spur. Enghien hurriedly re-formed his troops, fearing at every moment to be hurled down the hill by a counterstroke; but none came The French bivouacked in the rain, Turenne making his way across the mountain to confer with the prince, and meanwhile Mercy quietly drew off his army in the dark to a new set of entrenchments on the ridge on which stood the Loretto Chapel On Aug 4 the Army of France and the Army of Weimar met at Merzhausen, the rearmost troops of the Army of France came in, and the whole was arranged by the major-generals in the plain facing the Loretto ridge This position was attacked on the 5th Enghien had designed his battle even more carefully than before, but as the result of a series of accidents the two French armies attacked prematurely and straight to their front, one brigade after another, and though at one moment Enghien, sword in hand, broke the line of defence with his last intact reserve, a brilliant counterstroke, led by Mercy's brother Kaspar (who was killed), drove out the assailants It is said that Enghien lost half his men on this day and Mercy one-third of his, so severe was the battle But the result could not be gainsaid, it was for the French a complete and costly failure.



PLAN OF THE BATTLE OF FREIBURG, AUGUST 3RD, 5TH AND 10TH, 1644

For three days after this the armies lay in position without fighting, the French well supplied with provisions and comforts from Breisach, the Bavarians suffering somewhat severely from want of food, and especially forage, as all their supplies had to be hauled from Villingen over the rough roads of the Black Forest Enghien then decided to make use of the Glotter Tal to interrupt altogether this already unsatisfactory line of supply, and thus to force the Bavarians either to attack him at a serious disadvantage, or to retreat across the hills with the loss of their artillery and baggage and the disintegration of their army by famine and desertion With this object, the Army of Weimar was drawn off on the morning of Aug 9 and marched round by Betzenhausen and Lehen to Langen Denzling The infantry of the Army of France, then the trains, followed, while Enghien with his own cavalry faced Freiburg and the Loretto position.

Before dawn on the 10th the advance guard of Turenne's army was ascending the Glotter Tal But Mercy had divined his adversary's plan, and leaving a garrison to hold Freiburg, the

Bavarian army had made a night march on the 9–10th to the Abbey of St Peter, whence on the morning of the 10th Mercy fell back to Graben, his nearest magazine in the mountains Turenne's advanced guard appeared from the Glotter Tal only to find a stubborn rearguard of cavalry in front of the abbey A sharp action began, but Mercy hearing the drums and fifes of the French infantry in the Glotter Tal broke it off and continued his retreat in good order Enghien thus obtained little material result from his manoeuvre Only two guns and such of Mercy's wagons that were unable to keep up fell into the hands of the French Enghien and Turenne did not continue the chase farther than Graben, and Mercy fell back unmolested to Rothenburg on the Tauber

The moral results of this sanguinary fighting were, however, important and perhaps justified the sacrifice of so many valuable soldiers Enghien's pertinacity had not achieved a decision with the sword, but Mercy had been so severely punished that he was unable to interfere with his opponent's new plan of campaign This, which was carried out by the united armies and by reinforcements from France, while Turenne's cavalry screened them by bold demonstrations on the Tauber, led to nothing less than the conquest of the Rhine Valley from Basle to Coblenz, a task which was achieved so rapidly that the Army of France and its victorious young leader were free to return to France in two months from the time of their appearance in Turenne's quarters at Breisach

FREIDANK (VRÎDANC), the name by which a Middle High German didactic poet of the early 13th century is known It has been disputed whether the word, which is equivalent to "free-thought," is to be regarded as the poet's real name or only as a pseudonym; the latter is probably the case Little is known of Freidank's life He accompanied Frederick II on his crusade to the Holy Land, where, in 1228–29, a portion of his work was composed, and it is said that on his tomb at Treviso there was inscribed, with allusion to the character of his style, "he always spoke and never sang" Wilhelm Grimm originated the hypothesis that Freidank was to be identified with Walther von der Vogelweide, but this is no longer tenable Freidank's work, *Bescheidenheit, i e*, "practical wisdom," consists of a collection of proverbs, and moral and satirical reflections, arranged under general heads. Its popularity till the end of the 16th century is shown by the great number of mss extant.

Sebastian Brant published the *Bescheidenheit* in a modified form in 1508 Wilhelm Grimm's edition appeared in 1834 (2nd ed. 1860), H F Bezzenberger's in 1872 A later edition is by F Sandvoss (1877) The old Latin translation, *Fridangi Discretio*, was printed by C Lemcke in 1868; and there are two translations into modern German, A Bacmeister's (1861) and K Simrock's (1867) *See* also F Pfeiffer, *Über Freidank* (*Zur deutschen Literaturgeschichte*, 1855), and H Paul, *Über die ursprungliche Anordnung von Freidanks Bescheidenheit* (1870).

FREIENWALDE, a town of Germany in the Prussian province of Brandenburg, on the Oder, 28 m N.E. of Berlin by rail Pop. (1925) 8,800 It has a small palace, built by the Great Elector, and manufactures machinery and pianos It is a favourite summer resort of the inhabitants of Berlin Freienwalde, as distinguished from the smaller town of the same name in Pomerania, first appears as a town in 1364

FREIESLEBENITE, a rare mineral consisting of sulphantimonite of silver and lead $(PbAg_2)_5Sb_4S_{11}$ The monoclinic crystals are prismatic in habit, with deeply striated prism and dome faces The colour is steel-grey, and the lustre metallic, hardness 2½, specific gravity 6 2 It occurs with argentite, chalybite and galena in the silver veins at Freiberg, Saxony, where it has been known since 1720 The species was named after J K Freiesleben, who had earlier called it *Schilf-Glaserz* Groups of large crystals have come from Hiendelaencina near Guadalajara in Spain

FREIGHT: *see* AFFREIGHTMENT.

FREILIGRATH, FERDINAND (1810–1876), German poet, was born at Detmold on June 17, 1810. He was educated for a commercial career The years from 1831 to 1836 he spent in a bank at Amsterdam, and 1837 to 1839 in a business house at Barmen In 1838 his *Gedichte* appeared, and he abandoned commerce His repudiation of the political poetry of 1841 and its revolutionary ideals induced Frederick William IV., to give him a pension of 300 thalers a year He married, and, to be near his friend Emanuel Geibel, settled at St Goar Before long, however, Freiligrath was himself carried away by the rising tide of liberalism In the poem *Ein Glaubensbekenntnis* (1844) he avowed his sympathy with the political movement led by his old adversary, Georg Herwegh, the day, he declared, of his own poetic trifling with romantic themes was over, romanticism itself was dead He sacrificed his pension, went to Switzerland, and then after the publication of his *ça ira!* (1846), for greater safety, to London, where he resumed the commercial life he had broken off seven years before When the revolution of 1848 broke out, it seemed to Freiligrath, as to all the liberal thinkers of the time, the dawn of an era of political freedom; and in his *Politische und soziale Gedichte* (1849–1851), he welcomed it with unbounded enthusiasm He returned to Germany and settled in Dusseldorf, but the publication of his poem, *Die Toten an die Lebenden* (1848) led to his arrest on a charge of *lèse-majesté* He was acquitted, but his association with the democratic movement rendered him suspect, and in 1851 he returned to London, where he lived for 17 years In 1868 he returned to Germany, settling first in Stuttgart and in 1875 in the neighbouring town of Cannstatt, where he died on March 18, 1876

Literary Significance.—Freiligrath was the most gifted poet of the German revolutionary group His own purely lyric poetry re-echoes for the most part the familiar thoughts and imagery of his romantic predecessors, but at an early age he had been attracted by the work of French contemporary poets, and he reinvigorated the German lyric by grafting upon it the orientalism of Victor Hugo In this reconciliation of French and German romanticism lay Freiligrath's significance for the development of the lyric in Germany Freiligrath, when he is at his best, displays a vigour and strength, a power of direct and cogent poetic expression, not to be found in any other political singer of the age He translated many English and Scottish ballads, and much contemporary English verse (*Englische Gedichte aus neuerer Zeit*, 1846, *The Rose, Thistle and Shamrock*, 1853, 6th ed 1887), he also translated Shakespeare's *Cymbeline, Winter's Tale* and *Venus and Adonis*, as well as Longfellow's *Hiawatha* (1857)

Freiligrath's *Gedichte* have passed through some 50 editions and his *Gesammelte Dichtungen*, first published in 1870, have reached a considerable number *Nachgelassenes* (including a translation of Byron's *Mazeppa*) was published in 1883 A selection of Freiligrath's best-known poems in English translation was edited by his daughter, Mrs Freiligrath-Kroeker, in 1869; also *Songs of a Revolutionary Epoch* were translated by J L Jovnes in 1888 Cf E Schmidt-Weissenfels, *F Freiligrath, eine Biographie* (1876), W Buchner, *F Freiligrath, ein Dichterleben in Briefen* (2 vols, 1881), G Freiligrath, *Erinnerungen an F Freiligrath* (1889); P Besson, *Freiligrath* (Paris, 1899), K. Richter, *Freiligrath als Übersetzer* (1899), E G Gudde, *Freiligrath Entwicklung als politischer Dichter* (Berlin, 1922).

FREISCHÜTZ, in German folklore, a marksman who by a compact with the devil has obtained a certain number of bullets destined to hit without fail whatever object he wishes As the legend is usually told, six of the *Freikugeln* or "free bullets" are thus subservient to the marksman's will, but the seventh is at the absolute disposal of the devil himself Stories about the Freischutz were especially common in Germany during the 14th, 15th and 16th centuries, but the first time that the legend was turned to literary profit is said to have been by Apel in the *Gespensterbuch* or "Book of Ghosts" It formed the subject of Weber's opera *Der Freischutz* (1821) The name by which the Freischutz is known in French is Robin des Bois

See Kind, *Freyschutzbuch* (Leipzig, 1843); *Revue des deux mondes* (Feb 1855), Grasse, *Die Quelle des Freischutz* (Dresden, 1875).

FREISING, a town of Germany, in the republic of Bavaria, on the Isar, 16 m. by rail N N.E. of Munich. Pop. (1925) 14,972 The cathedral, which dates from about 1160 is famous for its crypt Noteworthy also are the old palace of the bishops, now a clerical seminary, and the town-hall. Near the town is the site of the Benedictine abbey of Weihenstephan, which existed from 725 to 1803. Freising is said to have been founded by the Romans.

Destroyed by the Hungarians in 955, it was fortified by the emperor Otto II. in 976 and by Duke Welf of Bavaria in 1082. A bishopric was established here in 724 by St Corbinianus, whose brother Erimbert was consecrated second bishop by St. Boniface in 739 In the 17th century the bishops became princes of the Empire. In 1802 the see was secularized, the bulk of its territories being assigned to Bavaria and the rest to Salzburg, of which Freising had been a suffragan bishopric There are iron-foundries and trade is in corn and cattle

FRÉJUS, a town in the department of the Var in S E France Pop. (1926) 3,577. It is 18 m S E of Draguignan It has fine Roman remains. Since the 4th century it has been a bishop's see, in the ecclesiastical province of Aix en Provence In modern times the neighbouring fishing village at St Raphael (2½ m by rail S E, and on the seashore) has become a town of 5,627 inhabitants (1926). In 1799 Napoleon disembarked there on his return from Egypt, and re-embarked for Elba in 1814, while nowadays it is much frequented as a health resort, as is also Valescure (2 m N W on the heights above). The cathedral church in part dates from the 12th cent, and small portions of the mediaeval episcopal palace are now visible, as it was rebuilt about 1823 The ramparts of the old town can still be traced for a long distance, and there are fragments of two moles, of the theatre and of a gate The amphitheatre, which seated 12,000 spectators, is better preserved The ruins of the great aqueduct which brought the waters of the Siagnole, an affluent of the Siagne, to the town, can still be traced for a long distance. The town of Forum Iulii was founded by Julius Caesar on this site, formerly the capital of the Oxybii, to secure a harbour independent of Marseilles. The buildings, of which ruins exist, were mostly built by Caesar or by Augustus, and show that it was an important naval station and arsenal But the town suffered much at the hands of the Arabs and Barbary pirates, and its inhabitants have used the ruined Roman buildings as a quarry. The old harbour (really a portion of the lagoons) is now completely silted up.

Corks, bricks, tiles and fine pottery are made, and rushes are woven There are mines of coal and bituminous shale

FRELINGHUYSEN, FREDERICK THEODORE (1817–1885), American lawyer and statesman, of Dutch descent, was born at Millstone, N J., on Aug 4, 1817. His grandfather, Frederick Frelinghuysen (1753–1804), was an eminent lawyer, a soldier in the American Revolution, and a member (1778–79 and 1782–83) of the continental congress, and in 1793–96 of the U S Senate, and his uncle, Theodore (1787–1862), was a U S senator from New Jersey in 1829–35, the Whig candidate for vice-president on the Clay ticket in 1844, chancellor of the University of New York in 1839–50 and president of Rutgers college in 1850–62. Frederick Theodore, left an orphan at the age of three, was adopted by his uncle, graduated at Rutgers in 1836 and studied law in Newark with his uncle, to whose practice he succeeded in 1839. He became attorney for the Central railroad of New Jersey, the Morris Canal and Banking company and other corporations, and from 1861 to 1867 was attorney-general of New Jersey In 1861 he was a delegate to the peace congress at Washington, and in 1866 was appointed by the governor of New Jersey, as a republican, to fill a vacancy in the U S Senate In the winter of 1867 he was elected to fill the unexpired term, but a democratic majority in the legislature prevented his re-election in 1869. From 1871 to 1877 he was again a member of the U S Senate, in which he was prominent in debate and in committee work, and was chairman of the committee on foreign affairs during the Alabama claims negotiations He was a strong opponent of the reconstruction measures of President Johnson, for whose conviction he voted in the impeachment trial He was a member of the joint committee which drew up and reported (1877) the Electoral Commission bill, and subsequently served as a member of the commission. In 1881 he was appointed secretary of State by President Arthur to succeed James G. Blaine, and served until the inauguration of President Cleveland in 1885. He died in Newark, May 20, 1885.

See John F. Hageman, "The Life, Character and Services of Frederick T Frelinghuysen," *New Jersey Hist. Proc.*, 2nd sec, vol ix, p. 45–75 (1887)

FREMANTLE, a seaport of Swan county, Western Australia, at the mouth of the Swan river, 12 m by rail S W of Perth It is the terminus of the State and Australian Trans-Continental railways, and is a town of some industrial activity, shipbuilding, soap-boiling, saw-milling, smelting, iron-founding, furniture-making, flour-milling, brewing and tanning being its chief industries. The harbour, by the construction of two long moles and the blasting away of the rocks at the bar, has been rendered secure Mail steamers call at the port Fremantle became a municipality in 1871, and its population in 1925 was 29,168

FRÉMIET, EMMANUEL (1824–1910), French sculptor, born in Paris, was a nephew and pupil of Rude, he chiefly devoted himself to animal sculpture and to equestrian statues in armour His earliest work was in scientific lithography (osteology), and for a while he served in the gruesome office of "painter to the Morgue" In 1843 he sent to the Salon a study of a "Gazelle" His "Wounded Bear" and "Wounded Dog" were produced in 1850 (Luxembourg Museum) He produced the following equestrian statues. "Chef Gaulois" in 1864 (Museum at St Germain); "Louis d'Orléans" in 1869 (at the Château de Pierrefonds), "Joan of Arc," in 1874 (Place de Rivoli, Paris), this he afterwards (1889) replaced with another version, "Velasquez" in 1891 (Gardens of the Louvre); "Dugueschn" in 1902 (Dinan), "Colonel Howard" in 1903 (Baltimore) His masterly "Gorilla and Woman" won him a medal of honour at the Salon of 1887. Of the same character is his "Ourang-Outangs and Borneo Savage" of 1895, at the Paris Museum of Natural History. He became a member of the Académie des Beaux Arts in 1892, and of the Royal Academy in London in 1904, and succeeded Barye as professor of animal drawing at the Natural History Museum of Paris He died in Paris on Sept. 10, 1910

FRÉMONT, JOHN CHARLES (1813–1890), American explorer, soldier and political leader, was born in Savannah, Georgia His father, a native of France, died when the boy was in his sixth year, and his mother, a member of an aristocratic Virginia family, removed to Charleston, S C, where Frémont's youth was spent In 1828 he entered the junior class of the College of Charleston, where he displayed marked ability, especially in mathematics His degree was withheld because of irregular attendance but finally conferred in 1836 Joel R Poinsett's influence secured his appointment in 1833 as teacher of mathematics on board the sloop-of-war "Natchez" and Frémont sailed with that vessel on a cruise along the South American coast which lasted two and a half years Upon his return he declined an appointment as professor of mathematics in the United States navy and chose instead to serve as assistant engineer of a survey undertaken to find the best pass for a proposed railway from Charleston to Cincinnati Following this Poinsett secured for him an appointment as second lieutenant of topographical engineers in the United States army, and for the next three years he was an assistant to the French explorer, Jean Nicholas Nicollet, employed by the war department to survey and map a large part of the country lying between the upper waters of the Mississippi and Missouri rivers In 1841 Frémont alone headed an expedition to survey the Des Moines river to complete Nicollet's map These years under Nicollet furnished invaluable training and experience for use in his later career and gave him a desire for further western adventure. Upon his return he married Jessie Benton, daughter of Senator Thomas Hart Benton of Missouri, and it was in no small measure Benton's great interest in the West and his influence with the Government that enabled Frémont to accomplish within the next few years the exploration of much of the territory between the Mississippi valley and the Pacific ocean

When emigration over the Oregon trail to the Oregon country began to be important in 1842, Frémont was sent at the head of a party to explore the route beyond the Mississippi as far as South pass in Wyoming He surveyed the trail thoroughly and his excellent descriptions greatly aided the emigrants of following years He ascended to the summit of the second highest peak of the Wind River mountains, since known as Frémont's peak The year following he was sent to complete the survey of the trail to the

mouth of the Columbia. His guide on this as well as on the previous expedition was the famed and picturesque Kit Carson. The Oregon settlements were quickly reached, and then Frémont turned south and east via the Klamath lakes to north-western Nevada, continuing to the Truckee and Carson rivers. This portion of the journey over hitherto untravelled country added greatly to geographical knowledge of the West. Frémont then accomplished with his entire expedition an extremely difficult and rash crossing of the Sierra Nevada mountains in midwinter—an exploit which added greatly to his fame—and spent the winter near Sutter's Fort on the Sacramento river in California His return was round the southern end of the Sierra Nevada range and across to Great Salt lake mainly via the old Spanish trail from Santa Fé to California

Thousands of copies of his report of this expedition were printed and eagerly read War with Mexico over the annexation of Texas seemed imminent and in the spring of 1845 Frémont was again despatched on a third expedition for the professed purpose of further exploring the Great basin and Pacific coast, but with secret instructions for action in case of a war with Mexico He and his party of 62, after traversing the Great basin by a new route directly west from Great Salt lake and down the valley of the Humboldt, reached California, in Jan 1846, after a second winter crossing of the Sierras. The Mexican authorities became suspicious and ordered Frémont out of the province Frémont refused to leave at once and fortified his position, but later thought better of this indiscreet action and led his party toward the Oregon border He was overtaken by a messenger direct from Washington and at once turned about and led his force back into California The official documents delivered gave Frémont no excuse for hostile actions, but what orders the private letters and verbal instructions contained is unknown While Frémont's men were in camp the Americans in northern Mexico revolted from Spain and created the Bear-Flag republic Frémont took no part in the hostilities but certainly gave his moral support When news of the declaration of war with Mexico did reach California all the northern region was already in American hands Frémont was appointed by Commodore Stockton major of a battalion made up mainly of American volunteers, and by Jan 1847 he and Stockton had completed the conquest of the future State Gen Stephen W Kearney, in the meantime, entered California from the south-east with orders similar to those of Stockton, namely to conquer the region and establish a government This conflict of orders led to a conflict of authorities between which Frémont was caught Stockton had already appointed him governor of California, but Kearney would not recognize the appointment Frémont, obeying the officer from whom he had received his commission, disregarded Kearney's contradictory orders and was arrested by the latter, who by this time, unknown to Frémont, had received later orders from Washington establishing his authority without contradiction Frémont was tried by court martial in Washington, found guilty of mutiny, disobedience and conduct prejudicial to military discipline, and sentenced to be dismissed President Polk approved of the verdict except as to mutiny, but remitted the penalty Frémont, in a bitter mood, resigned

The explorer now intended to establish his home on an estate which he had purchased in California, and on his way thither decided to lead, at his own and Senator Benton's expense, a fourth expedition to find passes for a Pacific railroad which he was eager to see built Kit Carson not being available, Frémont employed the eccentric "Bill" Williams as guide Westward from the headwaters of the Rio Grande the party tried to penetrate the massive San Juan range in December Williams led them into a high, unknown pass where they were caught by a blizzard After weeks of intense cold and the loss of 11 men and the entire outfit, the exhausted party in retreat reached the first settlements in the upper Rio Grande Frémont continued by the southern route to California and was greeted with news of the discovery of gold Rich veins were discovered on his great 40,000ac estate on the Mariposa river at the base of the Sierras, and he spent the next few years developing mines which quickly made him a multimillionaire In Dec 1849 he was elected one of the first two senators from California, but drawing the short term he served only from Sept 1850 to March 1851 He was defeated for re-election by the pro-slavery party. His opposition to slavery, however, together with the popularity his explorations and his part in the conquest of California had won for him, led to his nomination for the presidency in 1856 by the newly formed Republican Party In the ensuing election he was defeated by James Buchanan by 174 to 114 votes

Soon after the Civil War began, Frémont was appointed major-general and placed in command of the western department with headquarters at St Louis The task of organizing an effective army with insufficient arms, insufficient supplies and but a few thousand untrained men in a slave State which needed policing at all points proved too much of a task for Frémont's ability Political and military enemies made the most of his failures, and he was blamed for several distressing defeats, though it is doubtful if they could have been avoided Furthermore, on Aug 30, 1861, he issued a proclamation in which he declared the property of Missourians in rebellion confiscated and their slaves emancipated President Lincoln regarded this proclamation as premature, fearing that it might alienate the border States whose loyalty he still hoped to keep The adverse reports of agents sent by Lincoln to investigate Frémont's management led to his removal by the president Out of consideration for the "radicals" who backed Frémont, he was placed in command of the mountain department of Virginia, Kentucky and Tennessee in 1862 but was ineffective and seemingly dazed by the rapid manoeuvres of "Stonewall" Jackson, his opponent When his army was united with the army of the Potomac to form the army of Virginia which was placed under the command of his old enemy in Missouri, Gen John Pope, Frémont resigned He was still popular enough to be nominated for the presidency in 1864 by the radical wing of the Republican Party, but when he saw that he had no chance and would possibly only split the party to defeat Lincoln, he withdrew He retired from public life and devoted himself to building a railroad by the southern route to the Pacific The finances of the enterprise were unsound and in the collapse in 1870 Frémont lost the fortune he had made in California. In his embarrassment he welcomed the relief and change of occupation that came with an appointment as governor of Arizona territory in 1878, an office which he occupied until 1881 He died in New York city on July 13, 1890

It is for the splendid achievements of his early life as an explorer that Frémont will be most gratefully remembered by the American people It is true that trappers had long before travelled where he followed, but he first surveyed and described the routes If he was not a "pathfinder" he was a "path-marker" "From the ashes of his campfires have sprung cities"

See his *Report of the Exploring Expedition to the Rocky Mountains, 1842, and to Oregon and North California, 1843–44* (1845), and *Memories of My Life* (1887) The best biography is Allan Nevins, *Frémont, the West's Greatest Adventurer* (1927) *See* also H Bashford and H Wagner, *A Man Unafraid, the Story of John C Frémont* (San Francisco, 1927) Frémont's own account of "The Conquest of California" is in the *Century Magazine* for April, 1890

FREMONT, a city of eastern Nebraska, U S A , on the Platte river, 37m N W. of Omaha, at an altitude of 1,196ft ; the county seat of Dodge county It is on the Lincoln highway and Number 77, and is served by the Burlington, the Chicago and North Western and the Union Pacific railways. The population was 9 605 in 1920, of whom 1,252 were foreign-born white, and was estimated locally at over 14,000 in 1928 Picturesque bluffs, wooded islands and beautifully shaded streets give charm to the city It is an important grain and live stock market, and has poultry-packing plants, creameries, incubator and refrigerator factories, and many smaller industries Midland college (Lutheran), founded at Atchison, Kan., in 1887, was moved here in 1919 Fremont was founded in 1856 (incorporated 1871) and was named after Gen. John C. Frémont. It was on the old Overland Trail, the main route of pioneer travel from the Missouri river to California and Oregon

FREMONT, a city of northern Ohio, U S.A., 25m from Lake Erie, at the head of navigation on the Sandusky river; the county seat of Sandusky county. It is on Federal highway 20,

and is served by the New York Central railroad and by steamers to ports on Lake Erie The population was 12,468 in 1920 (90% native white) Fremont is surrounded by a rich agricultural and oil-producing region Natural gas is abundant Its manufactures were valued in 1925 at $9,119,588 Ft Stephenson, built during the war of 1812, and gallantly defended on Aug 2, 1813, by Major George Croghan, with 160 men, against 1,000 British and Indians, still stands in the heart of the city Fremont was named in 1849 after J C. Frémont Before that it had been called Lower Sandusky

FRÉMY, EDMOND (1814–1894), French chemist, was born at Versailles on Feb 28, 1814 He entered Gay-Lussac's laboratory in 1831, and became *préparateur* at the École Polytechnique in 1834 and at the Collège de France in 1837, he was *répétiteur* at the École Polytechnique, where in 1846 he became professor In 1850 he succeeded Gay-Lussac in the chair of chemistry at the Muséum d'Histoire Naturelle, of which he was director, in succession to M E Chevreul, from 1879 to 1891 He died at Paris on Feb 3, 1894 His work included investigations of osmic acid, of the ferrates, stannates, plumbates, etc, and of ozone, attempts to obtain free fluorine by the electrolysis of fused fluorides, and the discovery of anhydrous hydrofluoric acid and of a series of *acides sulphazotés,* the precise nature of which long remained a matter of discussion He also studied the colouring matters of leaves and flowers, the composition of bone, cerebral matter and other animal substances, and the processes of fermentation, in regard to the nature of which he was an opponent of Pasteur's views In the field of technical chemistry he contributed to our knowledge of the manufacture of iron and steel, sulphuric acid, glass and paper, and in particular worked at the saponification of fats with sulphuric acid and the utilization of palmitic acid for candle-making In the later years of his life he applied himself to the problem of obtaining alumina in the crystalline form, and succeeded in making rubies identical with the natural gem not merely in chemical composition but also in physical properties He wrote a *Traité de chimie générale* in 6 vols

FRENCH, DANIEL CHESTER (1850–), American sculptor, was born at Exeter (N H), on April 20, 1850, the son of Henry Flagg French, a lawyer, who for a time was assistant secretary of the U S Treasury After a year at the Massachusetts Institute of Technology, French spent a month in the studio of John Q A Ward, then began to work on commissions, and at the age of 23 received from the town of Concord, Mass, an order for his well-known statue, "The Minute Man," which was unveiled (April 19, 1875) on the centenary of the battle of Concord Previously French had gone to Florence, Italy, where he spent a year with Thomas Ball French's best-known work is "Death Staying the Hand of the Sculptor," a memorial for the tomb of the sculptor Martin Milmore, in the Forest Hills cemetery, Boston

Among French's early works are a monument to John Boyle O'Reilly, Boston; "Gen Cass," National hall of statuary, Washington, "Dr Gallaudet and his First Deaf-Mute Pupil" (Washington), the colossal "Statue of the Republic," for the Columbian exposition at Chicago, statues of Rufus Choate (Boston), John Harvard (Cambridge, Mass), and Thomas Starr King (San Francisco, Calif); a memorial to the architect Richard M. Hunt, New York, and a large "Alma Mater," near the approach to Columbia university, New York His important recent works are the four groups, Europe, America, Asia and Africa, for the New York custom-house; the Melvin memorial at Concord, Mass (1916), the 1st Division war memorial, Washington, D C (1924), and the statue "Memory" (1911) in the Metropolitan Museum of Art In 1920 he completed his statue of Lincoln for the Lincoln memorial, Washington, D C., and in 1922 his statue of Lafayette

See Lorado Taft, *The History of American Sculpture* (1903, 2nd ed, 1924), Mrs W H. French, *Memories of a Sculptor's Wife* (1928)

FRENCH, NICHOLAS (1604–1678), bishop of Ferns, Ireland, was an Irish political pamphleteer, born at Wexford He was educated at Louvain, and before 1646 was appointed bishop of Ferns His political activities made it prudent for him to leave Ireland in 1651. He acted as coadjutor to the archbishops of Santiago de Compostella and Paris, and to the bishop of Ghent, and died at Ghent on Aug 23, 1678.

The *Historical Works* of Bishop French, comprising three pamphlets and some letters, were published by S H. Bindon at Dublin in 1846 *See* T. D McGee, *Irish Writers of the 17th Century* (Dublin, 1846), Sir J T Gilbert, *Contemporary History of Affairs in Ireland, 1641–1652* (Dublin, 1870–1880), and T Carte, *Life of James, Duke of Ormond* (new ed, Oxford, 1851)

FRENCH AFRICAN LITERATURE. The outbreak of the World War brought home to France her need for man power, and she then began to turn her attention towards a race which sent her its men by thousands In the midst of the madness and destruction that overwhelmed Europe, she was forced to recognize that, in spite of solid, imposing and well-documented volumes, the theories with regard to the natural superiority of the Aryan races, set forth by Count Gobineau in his *Essai sur l'inégalité des races humaines* (1853–5), had received an unpleasant shock Moreover, the ideas which Dr Cureau, a former Governor of French Equatorial Africa, and a follower of Gobineau, expressed in his learned and interesting *Sociétés primitives de l'Afrique equatoriale* (1912) have, after much discussion, been strongly attacked, first by Jean Finot, in his widely known work *Le préjugé des races* (1905), and by Doctor Huot, in *L'âme noire*

The soul of the negro, as compared with that of the white man, is emotional, unstable, variable and incomprehensible It cannot be fathomed either in the tales of the old navigators—they dealt too much in fable and fantasy—or in the journals of contemporary explorers We cannot number among the initiated either Pierre Loti, impassioned admirer of the exotic, or even Fromentin, whose *Un été dans le Sahara* (1874) and *Une année dans le Sahel* (1859) conjure up before us burning sand and blinding light, but we must include Isabelle Eberhardt, the *bonne nomade,* whose whole work is a glorification of Islam, and a group of other writers of whom the most outstanding are Robert Randau, whose novels *Les Colons* (1907), *Les Algérianistes* (1912) and *Cassard le Berbère* are powerful and vivid, F Duchene with *Au pas lent des caravanes* (1922), *Thamil'la* (1923) and *Le roman du Meddah* (1924), Maximilienne Heller with *La mer rouge* (1923) and many others These works, however, have been inspired less by the influence of Africa than by that of the Mediterranean In spite of such works as *Terres de soleil et de sommeil* (1916) and *Le voyage du centurion* (1916) by Lucien Psichari, *Visions congolaises* by Louis de Raulin and *Les explorateurs* (1909) and *Le commandant et les Foulbé* (1910) by Robert Randau the true African influence has only prevailed since 1919

Since that time there has been a harvest of such literature, including the remarkable *Visage de la Brousse* by Pierre Bonardi (1920) and *l'isolement* by Dominique Combatte, which exude the stifling atmosphere of a tropical forest *Des inconnus chez moi* (1920), by Lucie Cousturier, is a work profoundly true, profoundly human as well as infinitely pathetic *Batouala* (1921) and *Djouna, chien de la Brousse,* by René Maran, *La randonnée de Samba Diouf* (1922) by the brothers Tharaud, *Koffi* (1922) by Gaston Joseph, *Diato,* a mine of Mandingo folk-lore, by André Demaison (1923), *Métempsycose* by Madeleine de Valcombe (1923), *Pellobellé, gentilhomme soudanais,* by Oswald Durand, *Ulyse, cafre* (1924) by the brothers Marius-Ary Lebland, *Les Chansons de Kou-Singa* by Jean Marville have also contributed to the researches of such men as Delafosse, Bruel and missionaries of all classes, lay, military, commercial and religious These works may not perhaps have the lyric character which runs through *A travers l'Afrique* (1910) by Captain Baratier, nor the humour of that caustic adventurer to whom Pierre Mille, the French Kipling, has given the name Barnavaux They are, however, a valuable contribution to the study of the negro mind, and as such increase our knowledge of humanity André Gide has written *Le Voyage au Congo* (1927), in which he announces the sequel *Le Retour,* while the works of Jean d'Esme, *Thi-Ba* (1925) *and l'Âme de la Brousse* (1925) should also be mentioned J F Boeuf *La Soudanaise et son Amant* (1924) and *Sous le triste Soleil splendide* and Cl Breton's *Bilali* (1927) are worthy of comment One of the most remarkable recent works is Paul Morand's *Magie noire* (1928) which contains an exhaustive bibliography (R Mn)

FRENCH AND INDIAN WAR, THE (1754–60), some-

times called the Fourth Intercolonial War, was the last and most decisive of the conflicts in North America between France and England in their struggle for possession of the continent It was the American counterpart to the Seven Years' War (*q v*) in Europe Control of the Ohio valley was the issue which caused the reopening of hostilities To the French the Ohio valley was the essential link between their colonies on the St Lawrence and those on the Mississippi To the English it represented room for westward expansion as an alternative to being surrounded by the French Fighting began when the troops of Virginia under George Washington, which were sent to build a fort at the junction of the Monongahela and Allegheny rivers, were fired on by a detachment of French troops on the same mission The first two years of the war brought only disaster to the English, chiefly because of poor organization and divided councils Notable among the failures was the defeat of an expedition sent under Gen Edward Braddock (*q v*) to capture Ft Duquesne With the assumption of the secretaryship of state in England by William Pitt (*q v*) the attack was renewed all along the line with such energy that the tide turned and success resulted Louisburg surrendered to Amherst in July, 1758 and the fall of Ft Frontenac followed soon after. In November Forbes occupied Ft Duquesne and rebuilt the fort under the name of Ft Pitt, the nucleus of the present city of Pittsburgh In May, 1759, the French commandant, Bourlamaque, withdrew from Ticonderoga and Crown Point Ft Niagara surrendered to Amherst in July The decisive victory for the English was the daring and successful assault on Quebec by Wolfe in September, 1759 On Sept 8, 1760, after the fall of Montreal, the French signed terms of capitulation which ended the war in America Final peace came only with the end of the war in Europe and the signing of the Treaty of Paris (1763) by which the French transferred Canada and all its dependencies to the English crown, thus ending a rivalry in North America which had lasted a hundred and fifty years

See F Parkman, *Montcalm and Wolfe* (1884), H R Casgrain, *Wolfe and Montcalm* (1905), W Wood, *The Fight for Canada* (1906), J Windsor, *The Mississippi Basin* (1895), H L Osgood, *The American Colonies in the 18th Century* (1926)

FRENCH CONGO, the official name of the French possessions in Equatorial Africa from 1888 to 1910 In the last-named year these possessions were renamed *l'Afrique Équatoriale française,* abbreviated to A É F (*See* FRENCH EQUATORIAL AFRICA)

FRENCH EQUATORIAL AFRICA, the common name for the Gabun, Middle Congo, Ubangi-Shari and Chad colonies The combined area of these colonies is approximately 982,000 sq m , the population (official estimates, 1926), 3,127,000 natives and 2,503 Europeans, of whom 2,113 were French

Stretching across two-thirds of the width of Africa these colonies extend from the Lower Guinea coast, eastward to the Congo-Nile watershed and northward to Lake Chad and the central Sahara No part of French Equatorial Africa lies south of the Congo river; for the greater part the southern frontier, separating it from the Belgian Congo colony, is the middle stretch of the Congo and the northern banks of the Ubangi and Mboma (the great northern affluents of the Congo) On the east, French Equatorial Africa adjoins the Anglo-Egyptian Sudan, on the north the hinterland of the Italian colonies of Tripolitania and Cyrenaica, north-west it is conterminous with French West Africa On the west, north of the Gabun, it is bordered by Spanish Guinea and the Cameroons The south-east part of the Cameroons comes within 130 m of the Ubangi, so that French Equatorial Africa consists of two large areas joined by a comparatively narrow strip of land As, since 1919, the Cameroons have been under French mandate (save for an area adjoining Nigeria), this constriction causes no difficulty

Physical Features.—The country falls into divisions corresponding, roughly, to its river systems, of which there are three These are: (1) The rivers which flow into the Atlantic, (2) those belonging to the Congo basin, and (3) those to the inland basin of Lake Chad The coast extends from 1° N. to 5° S. At the northern end is Corisco bay, and not far south of that bay is the deep indentation of the Gabun (a large estuary fed, however, by unimportant rivers). Still further south is Cape Lopez, at the delta of the Ogowé Near the southern border are the roadstead of Loango and Pointe Noire. Behind the coast plains the Crystal and other mountains, with heights of 3,000 to 4,500 ft., form the western edge of a tableland, part of the plateau which covers the greater part of inner Africa In the west and north-west this plateau has a general elevation of from 1,500 to 2,800 feet Further east it marks the northern limit of the Congo basin; and, where it bounds the valley of the Ubangi, is undulating land 1,000 to 2,000 ft high, falling rather steeply to the north towards Lake Chad In the north-east a hilly region separates Wadai from the Nile basin

The chief rivers flowing to the Atlantic are the Ogowé (*q v.*), navigable from its mouth for some 250 m , the Nyanga (120 m. long), and the meandering Kwila (320 m long) All these rivers are in the Gabun colony Of rivers belonging to the Congo system are the Sanga—navigable for over 300 m from its confluence with the Congo—smaller streams which also flow direct into the Congo and various tributaries and sub-tributaries of the Ubangi The many rivers of the Chad basin in French Equatorial Africa join the Shari (*q.v*) before reaching the lake

Primeval forest, with trees 150 to 200 ft high, covers a great part of the Gabun, Middle Congo and Ubangi regions In the Gabun, besides dense forests, are open lagoons, mangrove swamps, park-like stretches, grass-covered prairies and patches of cultivation The rivers, as they descend from the plateau in rapids and cataracts, form deep and often narrow valleys By none of them is there any navigable route to the higher ground The plateau, scored in the west by rivers going north to Lake Chad and south to the Congo, as well as west to the Atlantic, is in parts barren, but for the most part the apparently interminable forest continues As the great rivers are in flood nearly half the year, and various channels connect the Sanga and the Ubangi, the valleys present a picture of forest and swamp The Ubangi-Shari plateau is largely savannah land, the dividing line between the southern forests and the open country being, roughly, 7° N lat About 14° N is "the strip of herbage strown that just divides the desert from the sown" and this gives place to sand dunes and sandy wastes where wind erosion has carved the rocks into fantastic shapes Borku and Ennedi are typical Saharan regions, and altogether fully 140,000 sq m of the Chad colony are pure desert, with here and there small oases The contrast between these regions and the almost impenetrable forests of the south is complete

Geology.—The geological formations are imperfectly known. The coast zone, covered with alluvium and superficial deposits is underlain by Tertiary and Cretaceous rocks, the Crystal mountains zone is composed of granite, metamorphic and ancient sediments, the plateau of the Congo basin is occupied by Karroo sandstones These plateau sandstones lie horizontally—a lower red sandstone group and an upper white sandstone group, alluvial deposits cover considerable areas A superficial iron-cemented sandstone, erroneously termed laterite, covers a large part of the littoral zone, the flanks of the mountains and the high plateau. Copper deposits are found in the Crystal mountains The northern zone has great plains of lacustrine origin (indicating the former extent of Lake Chad) from which rise hills and ridges of older rocks East of this region of recent deposits is a sandstone plateau, from which again granitic rocks emerge

Climate.—Over the greater part of French Equatorial Africa temperature is high and the air moist throughout the year In the Gabun and Middle Congo the mean annual rainfall is from about 80 to nearly 100 in , being greater in the north than in the south, the heaviest rainfall is between September and December, when the sun is moving southward, as the sun moves northward there is a second rainy season, from mid-February to mid-May. But there is no month without rain The average temperature at Libreville, on the Gabun estuary, is 79° F, with a very limited range (75° F to 80° F) It is somewhat cooler on the plateau. At Brazzaville, on Stanley Pool, the mean temperature is about 77° F.

In Ubangi-Shari there are only one wet and one dry season in the year, the wet season—which comes when the sun is in the north—lasting from May to October. In the south the average

rainfall is about 70 in , decreasing in the north to 50 and 40 inches Here November–February inclusive are often rainless Temperature increases from south to north, but is uniformly high, the monthly mean varying from 74° F to 83° F In the Chad colony the air is dry and the heat great, rising to an average of 90° F in May and June. Here the variation in temperature between night and day is marked There is only one wet season—July, August and September.

Flora and Fauna.—The forests contain many species of trees growing side by side The tree most used for export is *okume*, a kind of light mahogany, there are also the true mahogany, ebony and walnut trees The wood of the silk-cotton and tulip trees is also exported The silk-cotton and the baobab, the screw-pines and palms are all characteristic forest trees Of palms, there are in the forest region the raphai, a fan-palm (*Hypanae guineensis*), the oil palm, and the *Attalea funifera* from which piassava fibre is obtained "Wild" rubber trees (*funtumea*) are abundant in the forests, as are also rubber vines and other lianas, which twine round the undergrowth in an altogether baffling manner Along the rivers, papyrus grows to a height sometimes of 20 ft , and by the banks of the streams are the cottony *Hibiscus tiliaceus* and fragrant jasmines The kola nut tree is common in various regions as is also the gum-copal In Ubangi-Shari are species of wild coffee trees, and here also the cotton plant grows wild, as also in Chad colony Negro-pepper, a variety of capsicum, and ginger are found, and among fruit trees are the mango and the papaw, the orange and the lemon The date palm grows freely in the northern regions The natives in the southern regions cultivate maize, manioc, bananas and sweet potatoes, in the north millet is the staple food of the people

The fauna of the forest belt is notable for the gorilla (first found in the Gabun by Paul du Chaillu in 1856), chimpanzees and many varieties of monkeys, some with startling coloration Elephants are still numerous, as are leopards, especially the forest leopard The lion is not so common and does not inhabit the dense forest The spotted hyena is found in the north-easterly regions The golden cat (many varieties), lemurs and galago, forest pigs, the wild dog and a giant squirrel are all met with There are red-buffaloes, the rare okapi, various species of antelope and, in the north, gazelles Hippopotami and crocodiles abound in the rivers The snakes are very numerous They include the cobra, python, puff-adder and several species of viper Insects are innumerable and include disease-carrying mosquitoes, the tsetse fly, ants, termites, fireflies and sandflies The mason wasp (and other wasps) and bees are common in many regions There are birds in infinite variety, from the ostrich (in the north) to the dwarfish *Alcedo cristata*

Inhabitants.—The great majority of the natives are negroes, in the south speaking Bantu, in the north Sudanese. Among the forest tribes are the Okande, the Fiot and the Fang—all found in the Gabun The Bateka and the Banda dwell further east, and the Zandeh (Niam Niam) live toward the Nile watershed The Sara cover a wide area in the middle Shari region, by Lake Chad are tribes of mixed negroid and Semitic strains, as well as Arabs proper and Hausa and Fula immigrants from West Africa There are also (in Chad colony) Tibbu, probably a negro-Berber mixture Pigmy tribes are found in the forests—it was in 1865, in the middle Ogowé country, that Paul du Chaillu definitely proved the existence of these dwarfish people The northern tribes are Mohammedans, and had organized states and a fair degree of culture. The Fang and the Zandeh were cannibals

Neither the dense forests nor the semi-arid regions in the north favour a large population; the country is, indeed, even for Africa, very sparsely inhabited, and up to 1921, at least, the population tended to decrease. This was due to the poor stamina of many of the forest tribes, among whom malaria, dysentery, leprosy, sleeping sickness and other serious scourges are rife. The demands for labour for Europeans also told heavily upon them. The French administration devoted much attention to hygiene, and to seeing that natives were not taken to labour for whites at a time when they had to attend to their own affairs, such as getting in their harvest These measures met with some success, and the 1926 census showed a slight upward trend in numbers

Towns.—The largest town and the seat of government is Brazzaville (pop 40,000) on Stanley Pool The ports are Libreville (pop. 20,000) on the Gabun estuary, Port Gentil (Cape Lopez), at the mouth of the Ogowé, the roadstead of Loango and Pointe Noire, the last named developed since 1925 as the ocean terminus of a railway to Brazzaville Other centres are Bangui on the Ubangi and Fort Lamy (pop 10,000) on the lower Shari The natives have few large towns, the largest is Abeshr, the capital of Wadai

Economic Conditions.—For a considerable period the energies of the French were given mainly to the acquisition of territory and the establishment of authority, and this delayed serious efforts at economic development In 1899 the French Government, despite the opposition of the local authorities, introduced the concession system, allotting a huge area to various companies, and giving them the sole right for 30 years to the natural products of the territory The companies helped to make known the riches of the country and developed transport on the rivers, but the system worked badly, and from 1910 onward the administration restricted the area and powers of the concession companies, and by 1920 the concession system was moribund, while the activity of private traders increased A serious obstacle to development was the small number and backward character of the natives of the forest belt, a still greater obstacle was the lack of an outlet to the sea for all regions except the Gabun There are in all over 1,200 m of navigable waters on the Congo, Ubangi, Sanga and Shari rivers within French Equatorial Africa, but the cataract region of the Lower Congo prevents access by water to the Atlantic Road transport was excessively costly, but after 1898, when the railway from Leopoldville, on Stanley Pool, to Matadi was completed by the Congo Free State, the French took advantage of that route as far as possible—schemes for building a railway of their own from Stanley Pool to the Atlantic were propounded, but nothing was done Thus, apart from timber from the Gabun, only goods which could afford to pay high transport rates were exported In the early days these exports were "wild" rubber and ivory In 1905, after 20 years occupation of the Middle Congo the total external trade was valued at £850,000 (annual exports and imports nearly equal). By 1913 the value had risen to £2,320,000 During the World War trade almost ceased and recovery was slow. In 1926 the figures were, in francs, exports 104 million, imports 164 million, roughly (taking a mean rate of exchange), about the value of trade in 1913.

Post-war exports were timber—everyone, white and black, on the Ogowé, lives upon and thinks and dreams of timber—palm kernels and palm oil, and cocoa (a growing industry) "Wild" rubber has been supplanted by plantation rubber, grown elsewhere than in French Equatorial Africa The imports are miscellaneous, cotton goods figuring largely Of internal trade no figures are available, the Chad colony has a developing trade in livestock and ostrich feathers A small caravan trade exists between Wadai and Kufra, in the east, after 1915, trade with Darfur developed, and in the north-west there was some trade between the districts adjoining Lake Chad and Nigeria

At length, in 1921, the building of a line on a gauge of 1 06 metres and some 340 m long, to connect Pointe Noire with Brazzaville was begun, together with harbour works at Pointe Noire, though it was not till 1925 that the work was seriously taken in hand In 1927 the line was open to Minduli (75 m), where copper is worked This line replaced a Decauville line, built 1908–11 by the company which owns the copper mines

The financial position of French Equatorial Africa may be gauged from the increase in the general budget—services common to all colonies—from 4,200,000 fr. in 1919 to 28,550,000 in 1926. In the last named year the public debt was 492,000,000 francs. Of this amount 300,000,000 francs was authorized in Sept. 1926 for public works, an indication that a more rapid development of the riches of the country might be expected

HISTORY

French interest in equatorial Africa began with settlements on the Gabun estuary It was not until after H M Stanley's dis-

covery (1876–77) of the course of the Congo that the ambition arose to extend French influence far inland, later, efforts to acquire a footing in the Upper Nile basin led to the occupation of another large area, stretching to the frontier of the Anglo-Egyptian Sudan

The ports of the Gabun had been centres of the slave trade and, to a lesser degree, of other commerce, and various European firms had factories on the coast No rights of sovereignty were, however, acquired by any European Power In 1839 Captain (afterwards Admiral) Bouet-Willaumez obtained for France the right of residence on the south bank of the Gabun estuary, and in 1842 he secured better positions on the north bank The primary object of the French settlement was to secure a port wherein men-of-war could revictual The chief establishment, Libreville, was founded in 1849, with negroes taken from a slave ship The settlement grew, Cape Lopez was ceded to France in 1862, and the colony's coast-line extended, nominally, to a length of 200 miles In consequence of the Franco-Prussian War, the colony was practically abandoned in 1871, Libreville being maintained as a coaling depot merely In 1875, however, France again turned her attention to the Gabun estuary, the hinterland of which had already been partly explored by Paul du Chaillu and an English merchant named Walker In 1872–73 Alfred Marche, a French naturalist, and the marquis de Compiègne[1] explored a portion of the Ogowé basin, but it was not until the expedition of 1875–78 that the country east of the Ogowé was reached This expedition, which was led by Savorgnan de Brazza (*q v*) ascended the Ogowé over 400m , and beyond the basin of that stream discovered the Alima, which was, though the explorers were ignorant of the fact, a tributary of the Congo Returning to Europe, de Brazza learned that H M Stanley had revealed the mystery of the Congo, and in his next journey, begun Dec 1879, de Brazza found a way to the Congo above the rapids via the Ogowé In Sept 1880 he reached Stanley Pool, on the north side of which Brazzaville was subsequently founded Returning to the Gabun by the lower Congo, de Brazza met Stanley Both explorers were nominally in the service of the International African Association (which became the Congo Free State), but de Brazza in reality acted solely in the interests of France and concluded treaties with Makoko, "king of the Batekas," and other chieftains, placing very large areas under the protection of that country The conflicting claims of the Congo Free State and France in the Stanley Pool and lower Congo regions were adjusted by a convention signed in Feb 1885

The Marchand Expedition.—Much energy was shown in the establishment of posts on the Ubangi river and elsewhere and disputes arose with the Congo Free State, which was pushing north and east in territory claimed by France Both France and the Congo State had their eyes on the Upper Nile basin, finally in Aug 1894 an agreement was reluctantly signed by the Congo State conceding the French claims This left the road to the Nile open to the French The story of these international rivalries is told in the article AFRICA *History* Here it need only be recalled that the Marchand expedition, despatched to the support of Victor Liotard, the lieutenant-governor of the upper Ubangi, reached Tambura in July 1897 and Fashoda in July 1898 Great Britain at once raised objections to the presence of a French force on the Nile, and it was decided that the expedition should evacuate Fashoda The declaration of March 21, 1899, ended the dispute and fixed the eastern frontier of the French colony except for a region on the borders of Wadai and Darfur This area was finally divided (1919), and in 1923 the frontier was demarcated

Besides expanding eastwards the authority of France was extended northwards to Lake Chad, and over the countries of the central Sudan between Lake Chad and Darfur and, lastly, north again, the French occupied Tibesti and other Saharan regions Here French territory adjoins the backland of the Italian colonies of Tripolitania and Cyrenaica Reaching out to Lake Chad the French had to meet the rivalry of Germany, which country desired a share of the Chad region for its Cameroons protectorate In the end Germany obtained part of the south shore of the lake. (For the French conquests between Chad and the Nile basin *see* BAGIRMI, RABAH ZOBEIR, and WADAI)

Development and Administration.—France had thus possession of a very large territory, rich in resources, but with a very sparse (and decreasing) population of, for the most part, a very primitive type The seaboard served only the Gabun, for the escarpment of the inner plateau shut off the inland river systems, and in fact most of the country was almost cut off from the world's markets The Gabun made fair progress and had a large timber trade But with the acquisition of part of the Congo basin French expectations ran high, Brazzaville was founded and made the seat of government and de Brazza himself, as commissioner-general, took charge of affairs In 1888 the Gabun and the newly acquired territories were officially declared to be one "colony" under the style of Congo français The country in 1904 was divided into four parts, corresponding to geographical and ethnological differences, the northern divisions, Ubangi-Shari and Chad, were for years under military rule, but by 1920 all had attained the status of colonies The first commissioner-general under the scheme put in force in 1904 was Emile Gentil, the explorer of the Shari and Chad In 1905 de Brazza was sent out from France to investigate charges of cruelty and maladministration brought against officials of the colony, several of which proved well founded De Brazza died at Dakar when on his way home Gentil, who was free from any personal blame, devoted the next two years to the reorganization of the finances of the country and the development of its commerce, resigning his post in Feb 1908 He was succeeded by M Merlin, whose title was changed (June 1908) to that of governor-general In 1910 the name of the country was appropriately, changed to *l'Afrique Equatoriale française* or A E F

With a view to rapid development the Government had by 1899 granted very large land concessions to French citizens, after the manner of Leopold II in the Congo State, and with similar results The system worked to the detriment of the natives and of non-concessionnaire traders and, as de Brazza's 1905 mission showed, led to abuses Reforms followed and M Merlin and his successors devoted their energies mainly to improving the condition of the natives, witchcraft-ridden and ravaged by many diseases, including sleeping sickness, dysentery and leprosy (There were 52,000 lepers in the country in 1927—one in 60 of the whole population) The employment of large numbers of natives as porters, a necessary but wasteful proceeding, kept them from land work, and the local authorities repeatedly asked for funds for transport purposes But the French parliament was hard to move and slow to grant funds, so that A E F came to be regarded as the Cinderella of the colonies And it was made to suffer for French projects elsewhere To obtain German consent for a free hand for France in Morocco two large areas of the Middle Congo colony were in 1911 added to the German Cameroons colony, these areas stretching south, tongue-like, to the Congo and Ubangi rivers respectively However, as the result of the World War, these "tongues" were restored to France The building of a railway to connect the Congo at Brazzaville (Stanley Pool) with the Atlantic was at length begun in 1921, its completion being fixed for 1932 At the same time a new harbour, Pointe Noire (near Loango), was built to serve the railway

The governor-general has control over the whole country For administrative purposes the separate colonies are under lieutenant-governors, the governor-general himself being lieutenant-governor of the Middle Congo colony The Gabun colony includes the Gabun estuary and most of the coast-line, together with the basin of the Ogowé river The inland frontier is so drawn that no part of the Gabun is within the Congo free-trade zone The Middle Congo colony, which has access to the sea at Pointe Noire, extends inland to the easterly bend of the Ubangi river There is a general budget for the whole country; each colony has also a separate budget and administrative autonomy. The legislative power is in the French chambers only. There is a judicial service independent of the executive Educational facilities are

[1]Louis Eugène Henri Dupont, marquis de Compiègne (1846–77), on his return from the West coast replaced Georg Schweinfurth at Cairo as president of the geographical commission Arising out of this circumstance de Compiègne was killed in a duel by a German named Mayer.

deficient; while there are Government schools, teaching is done mainly by missionaries, Roman Catholic and Protestant. The converts to Christianity are comparatively few, but the missionaries, who care for the body as well as the soul of the people, exercise a considerable and beneficent influence.

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FRENCH GUINEA, a French colony in West Africa. It is bounded west by the Atlantic, north by Portuguese Guinea and Senegal, east by the French Sudan and the Ivory Coast, and south by Liberia and Sierra Leone. With a sea-board running N.N.W. and S.S.E. from 10° 50′ N. to 9° 2′ N., a distance, without reckoning the indentations, of 170 m., the colony extends eastward 450 m. in a straight line and attains a maximum width north to south of nearly 300 m., covering fully 242,000 sq. km. and containing a population of 2,096,000.

Physical Features.—Though in one or two places rocky headlands jut into the sea, the coast is in general sandy, low, and much broken by rivers and deep estuaries, dotted with swampy islands, giving it the appearance of a vast delta. In about 9° 30′ N., off the promontory of Konakry, lie the Los islands (*q.v.*), forming part of the colony. The coast plain, formed of alluvial deposits, is succeeded about 30 m. inland by a line of cliffs, the Susu hills, which form the first step in the terrace-like formation of the interior, culminating in the massif of Futa Jallon, composed chiefly of Archaean and granite rocks. While the coast lands are either densely forested or covered with savannas or park-like country, the Futa Jallon tableland is mainly covered with short herbage. This tableland, the hydrographic centre of West Africa, is most elevated in its southern parts, where heights of 5,000 ft. are found. Near the Sierra Leone frontier this high land is continued westward to within 20 m. of the sea, where Mount Kakulima rises over 3,300 ft. East and south of Futa Jallon the country slopes to the basin of the upper Niger, the greater part of which is included in French Guinea. The southern frontier is formed by the escarpments which separate the Niger basin from those of the coast rivers of Liberia. Besides the Niger, Gambia and Senegal, all separately noticed, a large number of streams running direct to the Atlantic rise in Futa Jallon. Among them are the Great and Little Scarcies, whose lower courses are in Sierra Leone, and the Rio Grande which enters the sea in Portuguese Guinea. Those whose courses are entirely in French Guinea include the Cogon (or Componi), the Rio Nuñez, the Fatalla (which reaches the sea through an estuary named Rio Pongo), the Konkure, whose estuary is named Rio Bramaya, the Forekaria and the Melakori. The Cogon, Fatallah and Konkure are all large rivers which descend from the plateaux through deep, narrow valleys in rapids and cataracts, and are only navigable for a few miles from their mouth.

Climate.—The climate of the coast district is hot and moist, with a season of heavy rain lasting from May to November, during which time variable winds, calms and tornadoes succeed one another. The mean temperature in the dry season, when the *harmattan* is frequent, is 62° Fahr., in the wet season 86°. Throughout the year the humidity of the air is very great. There is much rain in the Futa Jallon highlands, but the Niger basin is somewhat drier.

Flora and Fauna.—The seashore and the river banks are lined with mangroves, but the most important tree of the coast belt is the oil-palm. The dense forests also contain many varieties of lianas or rubber vines and bamboos. Gum-producing trees are abundant, and there are many fruit trees, the orange and citron growing well in the Susu and Futa Jallon districts. The cotton and coffee plants are indigenous, banana plantations surround the villages. The baobab and the karite (shea butter tree) are found only in the Niger districts. The fauna is not so varied as was formerly the case, large game having been to a great extent driven out of the coast regions. The lion is now only found in the northern parts of Futa Jallon, leopards, hyenas and wild cats are more common and the civet is found. Hippopotamus and wild boar are numerous, a species of wild ox of small size with black horns and very agile is also found. Antelope are widespread but rather rare. Serpents are very common, both venomous and non-venomous, the pythons attain a great size. Crocodiles infest all the rivers. Birds are very numerous, they include the egret, the marabout and the pelican, turacos and parrots are common.

Inhabitants.—On the banks of the Cogon dwell the Tendas and Iolas, primitive Negro tribes allied to those of Portuguese Guinea (*q.v.*). The Baga, the Nalu, the Landuman and the Timni, regarded as typical Negroes (*q.v.*) migrated southward before the 17th century. To-day the Baga occupy the coast land between the Cogon and the Rio Pongo, and the Landuman the country immediately behind that of the Baga. The coast region south of the Nuñez and all the interior up to Futa Jallon is occupied by the Susu, a tribe belonging to the great Mandingan race, which forced its way seaward about the beginning of the 18th century and pressed back the Timni into Sierra Leone. Futa Jallon is peopled principally by Fula (*see* FULANI), and the other districts by Malinké and other tribes of Mandingo (*q.v.*). The Mandingo, the Fula and the Susu are Mohammedans, though the Susu retain many of their ancient rites and beliefs—those associated with spirit worship and fetish, still the religion of the Baga and other tribes. In the north-west part of Futa Jallon are found remnants of the aborigines, such as the Tiapi, Koniagui and the Bassari, all typical Negro tribes. Thus at the Rio Pongo there are numerous mulattos. South of that river the coast tribes speak largely pidgin English.

Towns.—The principal towns are Konakri the capital, Boké, on the Rio Nuñez, Dubreka, on the coast, a little north of Konakri, Benty, on the Melakori, Timbo and Labe, the chief towns of Futa Jallon, Heremakono and Kindia, on the main road to the Niger, Kurussa and Siguiri, on a navigable stretch of that river, and Bissandugu, formerly Samory's capital, an important military station east of the Niger. Konakri, in 9° 30′ N., 13° 46′ W., (pop. 8,866), is the one port of entry on the coast. It is built on the little island of Tombo which lies off the promontory of Konakri, the town being joined to the mainland by an iron bridge. During the administration of Noel Ballay (1848–1902), governor of the colony 1890–1900, Konakri was transformed from a place of small importance to one of the chief ports on the west coast of Africa. It has since grown considerably, and is provided with wharves and docks and a jetty 1,066 ft. long. Konakri is a port of call for French, British and German steamship companies, and is in telegraphic communication with Europe. It is the starting-point of a railway 662 km. long, completed in 1914, to Kurussa on the Niger and Kankan.

Products and Industry.—French Guinea possesses a fertile soil, and is rich in tropical produce. The chief products are rubber, brought from the interior, and palm oil and palm kernels, obtained in the coast regions. Cotton is cultivated in the Niger basin. Gum copal, ground-nuts and sesame are largely cultivated, partly for export. Large herds of cattle and flocks of sheep are raised in Futa Jallon, these are sent in considerable numbers to Sierra Leone, Liberia and French Congo. The trade in hides is also of considerable value. The chief grain raised is millet, the staple food of the people.

The principal imports are cotton goods, of which 80% come from Great Britain, rice, kola nuts, chiefly from Liberia, spirits, tobacco, building material, and arms and ammunition, chiefly "trade guns." The great bulk of the trade of the colony is with France and Great Britain, the last-named country taking about 45% of the total, Germany comes third. Since April 1905 a surtax of 7% has been imposed on all goods of other than French origin. (X.)

History.—This part of the coast was made known by the Portuguese voyagers of the 15th century. In consequence, largely, of the dangers attending its navigation, it was not visited by the European traders of the 16th–18th centuries so frequently as other regions north and east, but in the Rio Pongo, at Matakong

(a diminutive island near the mouth of the Forekaria), and elsewhere, slave traders established themselves, and ruins of the strongholds they built, and defended with cannon, still exist. When driven from other parts of Guinea the slavers made this difficult and little known coast one of their last resorts, and many barracoons were built in the late years of the 18th century It was not until after the restoration of Goree to her at the close of the Napoleonic wars that France evinced any marked interest in this region At that time the British, from their bases at the Gambia and Sierra Leone, were devoting considerable attention to these Rivières du Sud, *i e*, south of Senegal, and also to Futa Jallon René Caillié, who started his journey to Timbuktu from Boké in 1827, did much to quicken French interests in the district, and from 1838 onward French naval officers, Bouet-Willaumez and his successors, made detailed studies of the coast General Faidherbe was appointed governor of Senegal in 1854 and under his direction vigorous efforts were made to consolidate French influence in the region Already in 1848 treaty relations had been entered into with the Nalu, and between that date and 1865 treaties of protectorate were signed with several of the coast tribes During 1870–80 new treaties were concluded with the chief tribes, and in 1881 the almany (or emir) of Futa Jallon placed his country under French protection, the French thus effectually preventing the junction, behind the coast lands, of the British colonies of the Gambia and Sierra Leone The right of France to the littoral as far south as the basin of the Melakori was recognized by Great Britain in 1882, Germany (which had made some attempt to acquire a protectorate at Konakry) abandoned its claims in 1885, while in 1886 the northern frontier was settled in agreement with Portugal, which had ancient settlements in the same region (*See* PORTUGUESE GUINEA) In 1904 the Los Islands (off the coast of French Guinea) were ceded by Great Britain to France, in part return for the abandonment of French fishing rights in Newfoundland waters (*See* also SENEGAL *History*)

Until 1890 the newly gained territories were administratively part of Senegal, they were then formed into a separate colony called Rivières du Sud, a name changed some five years later to Guinée Française In 1895 the colony came under the supreme authority of the newly constituted governor-generalship of French West Africa It retained administrative and financial autonomy and was administered by a lieutenant-governor assisted by a nominated council The Fula, Mandingo and other tribes were encouraged to develop the resources of the country For a number of years the mainstay, economically, of the country was rubber, after a period of retrogression during and in the years following the World War, a partial recovery was noted in 1925 Other resources, such as banana and pineapple plantations, were developed These plantations were by the railway line, the building (1900–10) of the railway from Konakry to the Niger being the most important work undertaken for the benefit of agriculture and trade The promotion of education and hygiene occupied much attention If after 40 years of French rule the country was still largely undeveloped the colony had remained tranquil and progress had been made

See André Arcin, *La Guinée française* (1906), a valuable monograph, and *Histoire de la Guinée française* (1911), J Machat, *Les Rivières du Sud et la Fouta-Diallon* (1900), *French Guinea* (1920), a British Foreign Office handbook (F R C)

FRENCH LANGUAGE. After the period during which Vulgar Latin, as spoken in Gaul, was acquiring a specific character (*see* ROMANCE LANGUAGES), the history of French is divisible into three periods (1) Old French (9th to 14th century), (2) Middle French (15th and 16th centuries), (3) Modern French (17th century to the present day) The outstanding features of (A) the External History, (B) the Internal History of French during these three periods are as follows

A. EXTERNAL HISTORY

The Mediaeval Period.—During the Old French period the name "French" is applied to the Romance language spoken in the north of France in contradistinction to that spoken in the south. Old French is divided into numerous dialects which may be classified (1) Bourguignon, Franc-comtois, Lorrain, Champenois, in eastern France, (2) Picard and Wallon in north-eastern France, (3) Normand in north-western France, (4) Poitevin, Angevin, Saintongeais in western France, (5) Français (or Francien, as it is now usually termed, to distinguish it from French *lato sensu*) in the Ile-de-France The French dialects have converted into *é* the free tonic *a* of Latin conserved by the Provençal dialects. Thus Latin *amare* becomes in French *amer* (later *aimer*), but in Provençal *amar* (later *ama*) In the Lyons region, Savoy and "romande" Switzerland in an intermediary dialect called Franco-provençal, because it blended French and Provençal characteristics, Latin *portare* yielded *portar* as in Provençal, whilst Vulgar Latin *taliare* gave *taillier* (mod *tailler*) as in French Despite their common points these dialects differed so widely that (as is still the case with the patois) the Frenchman speaking one of them was often unable to understand those who spoke another Roger Bacon, who travelled in France in 1260, testifies to this state of affairs in his *Opus Majus* Till the beginning of the 13th century the French dialects are known by literary monuments only, with the single exception of the *Strasbourg Oaths*, the most ancient documentary evidence of French The text of the oaths sworn on Feb 14, 842, is preserved in the *Historiarum libri IV* (lib III, cap 5) of the historian Nithard (*q v*) (d 844), who copied them very carefully in their original language In the course of the 13th century purely literary texts are supplemented by documents from archives, the oldest from northern and eastern France being in Picard, Wallon and Lorrain; for Anjou, Touraine and Berry the earliest documents date from the middle of the 13th century French was not used for recording acts of the royal chancery till Louis IX The ratification of the Treaty of Paris in 1259, the original of which is in London (*cf* Rymer, *Foedera*, Hague ed tome 1, pt 2, p 50) is among the earliest acts of royal chancery in French Under Philip le Bel, French begins to preponderate and is used for administrative correspondence and for more solemn deeds. From the 14th century French steadily gains in such documents till during the 15th Latin becomes the exception (*See* A Giry, *Manuel de diplomatique* [2nd ed, 1924]) In literary texts the progress of Francien is similar, all other dialects sinking into the shade by the beginning of the 15th century This triumph of Francien has been attributed to the high level of the literary productions of the Ile-de-France, but a review of the literary output of the various dialects down to the close of the 12th century shows that for quality Francien could as yet claim no superiority over, say, Norman or Picard Francien owed its preponderance to a series of social factors starting with the accession of Hugh Capet, son of Hugh the Great, to the throne of France By the creation, extension and consolidation of the royal domain, by the rise of the royal family to the first rank among the great families of the realm, and of France, under Louis IX, to the first rank among the nations of Europe, by the continuous development of political and administrative institutions, the descendants of the duke of France had become sovereigns of France The unity of the kingdom created by them between 987 and 1328 resulted in the predominance of the language of Paris, their capital; and as Paris became the king's settled abode, all scientific, artistic and literary movements centred increasingly about the king's court and were intensified by the prestige of the University of Paris. A further consequence of Capetian policy was to weaken the feudal system to which the political and social shocks of the Hundred Years War administered the death-blow The decadence of the feudal system, which was not, however, utterly abolished till 1789, involved the decadence of the provincial dialects and French entered upon a new period of transformation the close of which coincides with the dawn of absolute monarchy.

The 16th Century.—Since the 15th century the dialects have ceased to be means of literary expression, and survive only as patois. (*See* PROVENÇAL.) In the 16th century the use of French was made compulsory throughout the royal jurisdiction, from which it ousted Latin in virtue of the Ordinance of Lyons (Louis XII., 1520) and the Ordinance of Villers-Cotterets (Francis I.,

1539). Charles IX by the Edict of Paris decreed that all *"vérifications de nos cours de Parlement sur nos édits, ordonnances ou lettres patentes et les réponses sur requestes seront faites doresenavant en langage françois et non en latin, comme ci-devant on avait accoutumé faire en nostre cour de Parlement de Paris; ce que voulons et entendons estre pareillement gardé par nos procureurs généraux"* French invades the theological domain with Calvin's translations (1541) of his *Institutio christianae religionis,* written by him in Latin in 1536; in 1550 it becomes the language of the Protestant Church; scientists begin to employ it; the Pléiade issues its manifesto, the *Défense et Illustration de la langue françoyse,* and certain humanists, drawn towards the study of the origin and development of the vernacular, expound the results of their research in treatises composed in the vernacular The efforts of the writers of the 16th century had for result the concoction of a language thick with provincialisms, a hotchpotch of terms raked together from all dialects or coined on Greek and Latin models Against these excesses reaction was inevitable

From the 17th Century to the Present Day.—Centres of influence such as the French Academy, founded by Richelieu in 1635, the court of Louis XIV, focusing the whole life of the kingdom, intellectual and artistic as well as political, the *"salons"* typified by the Hôtel de Rambouillet (if men are not strong enough, come women to the rescue!), poets like Malherbe, critics like Chapelain, stylists like Guez de Balzac, grammarians like Vaugelas, united to secure the triumph of *"le bon usage,"* which Vaugelas, prefacing his *Remarques,* defined as "that way of speaking used by the healthiest portion of the Court, conformably with that way of writing used by the healthiest portion of living authors" Thus was the reign of "Reason" set up and the masterpieces of Descartes, Racine, La Fontaine, Pascal, Bossuet, etc, contributed to fix the characters of the classical spirit and concurrently of the classical language. naturalness, simplicity, clarity. In the 18th century that language acquired such prestige through great authors like Rousseau, Voltaire and Diderot, that in 1783 the Berlin Academy proposed as subjects for a prize essay: "What has made French the universal tongue? To what does it owe this prerogative? Is it to be surmised that it will retain it?" and awarded the prize to Rivarol for his *"De l'universalité de la langue française"* (1784) Then came the romantic school, with Victor Hugo at its head, by whom lyric poetry was lifted to heights hitherto unattained in France, whilst French prose, enriched in vocabulary and syntactical resources, became a tool of wondrous strength and pliancy. Such indeed was its quality that with but little modification the most diverse branches of literature found in it ample means of expression, and scientists like Pasteur, H Poincaré, J H Fabre, philosophers like Bergson; poets like Heredia, Verlaine, Mallarmé, Rostand, Valéry, novelists like Anatole France, André Gide, Marcel Proust; critics like Jules Lemaître, Brunetière, Faguet and Thibaudet had at their disposal an instrument admirably fitted to their most exacting needs Such was the metal that, despite the superadded alloy of the last 20 years, it still rings true and its secular repute stands unimpaired This literary prestige greatly furthered the diffusion of French in France, but this diffusion was yet more potently accelerated by various social causes, most important amongst which were the French Revolution, increasing political and administrative centralization, the multiplication of means of communication, more developed commercial and industrial life, the spread of schools, compulsory elementary education, conscription, the power of the press, and the bringing together as soldiers, during the World War, of natives from every part of the republic. The special idioms and patois have been affected by repercussion, the patois being so weakened that they may be now regarded as having abandoned their secular struggle against French, notwithstanding the transient lustre regained by a few

The French Language in Foreign Countries.—If parts of the territory of France have been and still are occupied by non-French idioms, Corsican, Biscayan, Breton, Flemish, Alsatian, all of which are, moreover, gradually disappearing, French has been and still is spoken beyond the French frontiers Even before the invasion of William the Conqueror it had won firm foothold in England and from 1066 till the close of the 14th century was spoken and written in England as one of the chief languages (*See* ANGLO-NORMAN LITERATURE) For many generations it was current in Piedmont, where Italian became the official idiom as late as 1577 There were besides important focuses of French influence in many other parts of western and central Europe and, during the crusades, in the Morea, the Holy Land and especially the island of Cyprus In the 16th century French crossed the Atlantic to North America Under Louis XIV it became the official language of diplomacy and as such was used up to the Treaty of Versailles It was carried to numerous parts of Europe and America by the 200,000 French Huguenots whom the revocation of the Edict of Nantes (1685) drove from their native land It is now spoken by some 48,000,000 persons, about 3,000,000 in Belgium, 3,000 in the Duchy of Luxembourg, 800,000 in Switzerland (cantons of Geneva, Vaud, Neuchâtel and parts of those of Fribourg, Valais and Berne), 140,000 in Italy (in part of the Pô Valley and especially in the Val d'Aosta), 90,000 in the Channel Islands, 1,600,000 in Canada, and the rest in the French colonies, particularly Tunisia, Algeria, the island of Réunion, Tonkin, Cochin China or in colonies now lost to France (Mauritius, Haiti, Louisiana). French is spoken by many educated persons in central and eastern Europe, Egypt and Asia Minor In the islands of Réunion, Mauritius, Cayenne, Martinique, Trinidad, Haiti and in Louisiana the Creoles speak mixed idioms, known as French Creole, in which the indigenous tongues are fused with the dialects or patois imported by the French settlers

B. INTERNAL HISTORY

Vocabulary.—The primitive word stock examined in ROMANCE LANGUAGES was increased by an intense system of derivation and composition and a supply of words coming from (1) foreign languages, (2) French dialects and patois, and idioms special to some classes or professions The figures between parenthesis indicate the number of words which the *Dictionnaire Général,* the best authority in the matter, states to be still in use in the French language of the 20th century

Latin and Greek From the 9th to the 14th centuries French borrowed from these languages a few words, chiefly substantives, relating to religion and law, *e g, apostle, diable, pape, paradis, prophète, criminel, héritage, justice* Such loans increased in number from the 14th century (beginning of the classical revival), multiplied enormously in the 15th and during the 16th century became overwhelming Many of the words which then appeared still live, *e g, anarchie, aristocratie, démocratie, économie, poème, politique, abstrait, caduc, patrie, patriote,* but many have perished, *e g, angustie, experiment, extoller, mulièbre, pristin* During the 17th century new coinages from Greek continued *anachronisme, anecdote* were introduced by G de Balzac, *anonyme, apologiste* by d'Aubigné Since the 18th century science in its progress has turned increasingly to Greek for terminology as in the terms of the decimal system (established Dec 11, 1799), in physics and chemistry, in medicine neologisms abound, such as *euphorie* for good health Most new inventions receive Greek names by a system, not always very sound, which borrows single Greek words, compounds them with other Greek words or welds with them non-Greek elements, *e g, cycle, téléphone, télégraphe, taximètre, cinématographe, graphophone, phonographe, aéroplane, hélicoptère, autobus, automobile,* etc

German. (About 450 words) Until the 10th century French borrowed a large number of words from various Germanic dialects; among those still surviving are· the substantives *aigrette, balafre, balle, ban, bannière, beffroi, bourg, brèche, brique, canif, coiffe, écharpe, échelle, échine, gant, guerre, hameau, hanche, hareng, hâte, honte, maréchal, nord, ouest, sud, tache, trève,* etc; the adjectives *blafard, blanc, bleu, brun, fauve, franc, gris, laid, riche,* etc; the verbs *avachir, bannir, bâtir, choisir, haïr,* etc; one adverb, *guère.* To these a few were added later, in the 15th century, *e.g, blocus, boulevard, lansquenet;* in the 16th, *e g., arquebuse, bière, cauchemar, coche, espiègle, huguenot, hutte, rosse, trinquer;* in the 17th, *e g, bivouac, calèche, havresac, obus,*

sabre, vaguemestre, valse; in the 18th, *e g , glaçure, loustic, nouilles, vampire, vermout;* in the 19th, *e g , blague, bock, choucroute, dolman, gamin, képi, schlague* Two further points may be noticed. (*a*) a few French words have modified their pronunciation under the influence of peculiarly German sounds, thus Lat *altus* became in French *haut*, but owes aspiration to O G *hôh;* Lat *vespa* should have yielded French *vêpe* but gave *guespe* (later *guêpe*) with *gu* due to German *wespe*, O G *wefsa* (*b*) Many French proper names are of Germanic origin, the very name *France* is from *Francia, i e* , German *Franc* and Lat suffix *-ia.*

Scandinavian (About 60 words) As a result of the settlement of the Vikings in that portion of Neustria which received the name of Normandy (9th century) certain Scandinavian words, chiefly relating to the sea and seafaring, were absorbed into French, *e g , bâbord, bateau, cingler, étrave, guichet, goupillon, hanter, hauban, hisser, rade, tillac, tribord, vague* During the O F period Scandinavian contributed to the formation of certain names of persons, *e g , Anquetil, Burnouf, Toutain,* to quote names still in use, or of towns, *e g , Blainville, Sotteville, Trouville* Of more recent Scandinavian origin are, *e g , édredon, fiord, geyser, nickel, rutabaga, saga, ski*

Netherlandish. (About 100 words) Netherlandish has contributed a certain number of words which, like those from Scandinavian, mostly concern the sea, *e g , amarrer, bac, digue, dock, dune, foc, gréer, marsouin, matelot, quille, vase, vrac,* or relate to commerce, trade or peculiar customs, *e g , brandevin, brodequin, cliver, colza, frelater, houblon, kermesse, vacarme, vilebrequin*

English (About 300 words) During the middle ages the influence of English was to all intents negligible From the 16th century onwards and especially during the 19th and 20th centuries it became very considerable, owing to the active social intercourse between England, the United States of America and France The following may be cited as illustrating the wide diversity of matters involved, *e g., abolitionniste, albatros, banknote, bébé, bifteck, bol, bouledogue, boulingrin, boxer, cabine, câble, chèque, clown, comité, confort, contredanse, dandy, dancing, derby, détective, dogue, dollar, essayiste, franc-maçon, gentleman, gigue, grog, guinée, hourra, humoriste, jockey, jury, lord, lunch, meeting, paquebot, record, snob, tramway, tunnel* Some like *budget, humour, sport, tunnel* are words of French origin borrowed by English and then reborrowed by French with altered form and meaning.

Italian (About 1,000 words) Italian words begin to appear in French from the 14th century, becoming particularly numerous in the 16th They stand for ideas pertaining to manifold categories, *e g , accaparer, accolade, accort, accoster, adagio, affidé, affront, agio, agrouper, alarme, alerte, alpiou, altesse, altier, alto*

Spanish (About 300 words) A few Spanish words entered the French vocabulary from the 11th to the 15th centuries, and between the 18th and the 20th The second half of the 16th century and the 17th are the Hispanizing period par excellence As examples may be cited. *abaca, abricot, accastiller, adjudant, alcade, alcarazas, alcôve, alezan, alfange, algarade, alguazil*

Provençal (About 350 words) A few Provençal words found their way into French between the 11th and 13th centuries, and again from the 17th century to the present day; the influx was considerable only during the 16th because Henry IV and a few greater writers, notably Monluc, du Bartas and Montaigne, were natives of the south Amongst those retained by modern French may be mentioned *amadou, asperge, aubade, badaud, bague, ballade, bastide, bastille, béret, bourrique, brancard, câble, cabri, cadastre, cadeau, cadenas, cadet, cargaison.*

Arabic (About 260 words) These words were obtained partly during the middle ages from scientific treatises translated from Arabic into Latin, partly from contact with the Arabs inhabiting Spain down to the 15th century, or with the Arabs encountered during the crusades A few more were introduced during the 19th and 20th centuries as a consequence of the French colonization of north Africa Among those still in use in modern French are: *alambic, alcali, alchimie, alcôve, alfa, algèbre, almée, amiral, arsenal, artichaut, assassin, azur, babouche, café, chiffre, coton, épinard, fez.* In addition, Hebrew, Celtic, Portuguese, Franco-Provençal, Rumanian, Finnish, Hungarian, Slavonic, Turkish, Persian, the languages of India and the Far East, Oceania, and various native African and American tongues have supplied a contingent totalling about 500 words

French dialects and patois (About 250 words) Francien till the 14th century borrowed only a very limited number of dialect words The dialect and patois terms found in considerable number in the present-day French vocabulary are importations of the modern period They denote local objects, products, customs, etc. They are still felt to be imperfectly naturalized in the common language Such are *affûtiau, bèquebois, catiche, champis, chouquet, écobuer, escarbille, esquipot, étoquiau, hachotte, margoulette, triqueballe, varaigne, yole*

Slang The *Dictionnaire Général* records as still in use in Modern French only 20 words belonging to this category This element is indeed extremely variable, at all periods French has contained slang-words in fair number They are to be found in Jean Bodel's *Jeu de Saint Nicolas* (about A D 1200), and in some of Villon's ballads (15th century) The "argot des coquillars" also of the 15th century is notable The World War created or revived a number of slang words, some of which are likely to live on for many years, *e g , amocher* (to injure), *chérer* (to overstep, overdo), *embusqué* (shirker), *marmite* (heavy shell), *boche* (Hun, German), *Paname* (Paris)

Finally onomatopoeia has enriched French with a certain number of words, about 100 belong to this category, says the *Dictionnaire Général, e g , chuchoter, coquerico, craquer, cricri, crincrin, dada, dodo, tictac, toutou,* but the advance of etymology may whittle down the number of these terms, some of which perhaps figure in this class for want of better knowledge

Phonetics, Pronunciation and Orthography.—The phonetic system of Vulgar Latin comprised only seven pure vowels, *a, é, è, i, ò, o, u,* one diphthong, *au,* 15 consonants, *b, p, d, t, g, c, f, v, s, j, h, l, m, r, n,* 2 semi-consonants, *j* (pronounced *y*) and *u* (pronounced *w*) In the 10th century French possessed.

(*a*) nine pure vowels *a, è, é è, e, i, ò, ó, u*

(*b*) ten diphthongs *ai, éi, òi, ói, ui, éu, òu, óu, ié, uó*

(*c*) two triphthongs *ièu, uòu*

(*d*) 22 consonants *b, p, d, t, v, f, g* (as in M F *gant*), *c,* (as in M F *camp*), *u* (as in M F *lui*), *s* (as in M F *son*), *ʃ* (as in M F *aise*), *tch, ts, dj, j* (as in M F *bien*), *h, l, r, m, n, ñ, l̃*

From the 11th century onwards this was transformed into the modern phonetic system definitely constituted since the 17th century as follows 11 vowels, *a, è, é, i, ò, ó, ou, u, cù, eú, e;* four nasal vowels *ã, ẽ, õ, ũ,* and 22 consonants *b, p, f, v, t, d, s* (as in French *son*), *ʃ* (as in French *aise*) or *z, k, g, ch, j, l, r, m, n, ñ, l̃,* aspirate *h, i* (as in French *bien*), *ou* (as in French *oui*), *u* (as in French *cuivre*)

The chief differences between the phonetic system of the 11th century and that of the 17th are. (1) The genesis of the nasal vowels *ã, ẽ,* and the nasal diphthongs *ãi, ẽi* (11th century), *õ, õi* (12th), *iẽ* (13th), *ĩ, ũ* (16th) In the 17th century confusion took place between *ẽ* and *ĩ,* both of which came to be pronounced *ẽ,* as in M F *faim* and *fin,* and *ũ* became *œ̃* as in M F *à jeun* and *parfum.* (2) Vocalization of *l* (12th century), which became *u* in the groups *al, el, òl, ól, eul* (*altre, autre; bel, beau; mols, mous; dols, dous; aeuls, aieus*), and as a sequel the genesis of four new diphthongs *au, eu, ou, òu* and of two new triphthongs *eau, ieu* (3) Reduction of all diphthongs and triphthongs to one diphthong *au,* which itself disappears at the close of the 16th century, and to one triphthong *eau,* which vanishes in the course of the 17th. Modern French contains no diphthongs or triphthongs (4) Reduction of *tch* to *ch, ts* to *s,* final *z* to *s, dj* to *j.* (5) Loss of intervocalic *d, e g , armedure* becomes *armeure, armure,* and final *t, e.g., vertut* becomes *vertu,* both taking place during the 11th and 12th centuries (6) Loss of *s* before *j, f, v, b, d, g, l, m, n, r* (first half of 11th century), before *p, t, c* (12th and 13th centuries).

From the reign of Louis XIV. the pronunciation of the aristocracy evolved with extreme slowness and with the French Revolution the pronunciation of the third estate won complete predominance. The main developments since the 17th century have been:

—(1) Dropping of the "feminine *e*," *e g*, *pâle, prête, forte, soulever*, which in some cases leads to the dropping of the final of a consonantal group, *e g*, *peup' fort* instead of *peuple fort, semb'-t-il* instead of *semble-t-il*. (2) Substitution of *y* for *l*, a special character indicating *l* mouillé, *e g*, *faillir* pronounced *fayir* instead of *falir*. (3) Loss of the aspirate *h*, which has now become a mere isolating sign, *e g*, *le haut, la haine, les haies* (4) Substitution of "*r* grasseyé" for "*r* roulé," a feature to be found among the Parisian third estate during the 18th century (5) Loss of final consonants, which popular pronunciation is now completing, replacing *il* by *i*, for instance, in *il dit, ils disent, dit-il*, etc (pronounced *i di, i diz, dit i*)

Till the 16th century spelling corresponded more or less adequately to pronunciation During that century, through the influence of the humanists, learned spelling was introduced and has since prevailed despite attempts such as those of Meygret and Ramus, in the 16th century, Poisson, Ménage in the 17th, Dumaisais, de Wailly in the 18th, Marle in the 19th century. Some apostles of reformed spelling would have liked to change the very form of the letters and confound the entire alphabet How little their attempts succeeded may be judged from the successive editions of the *Dictionnaire de l'Académie Française* since that of 1740 After adopting the so-called "etymological" spelling in the first and second editions (1694, 1718) of its dictionary, the Academy altered the spelling of 5,000 words in the third edition (1740), but since then has made only insignificant modifications (1762, 1795, 1835, 1878). The reaction of spelling upon pronunciation has increased apace with the spread of public education, and in consequence letters come to be pronounced which completely distort the phonetic physiognomy of many words, introducing into them sounds that either never had existed or had disappeared for generations, *e g*, a *p* is now frequently heard in *dompter;* the double consonant is by many distinctly articulated double in *assemblée, illustre, innocent.*

Morphology.—The essential feature of Old French morphology was its declension of substantives and adjectives, which reached its highest development in the 12th century, and, after successive mutilations in the 13th and 14th, disappeared in the 15th. It was restricted to the two cases, nominative and accusative, which had been preserved by Vulgar Latin. In the 12th century all masculine substantives as well as feminine substantives originally of the Latin 3rd, 4th and 5th declensions followed an identical paradigm sing nom *murs, prestres, cuens, mains;* acc *mur, prestre, conte, main* Feminine substantives primitively of the Latin 1st declension possessed one form only for each number, *e g*, sing nom acc. *rose,* plur. nom. acc *roses* Certain proper names (masc. from Germanic *-o, -un;* fem. from Germanic *-a, -an*) were declined. nom *Charle,* acc *Charlon;* nom. *Berte,* acc. *Bertain* A few feminine nouns such as *ante, nonne,* were declined similarly, and had a single form for the plural, nom acc *antains, nonnains* This system of declensions (except in Anglo-Norman) still flourished in the 13th century. By the 15th only one case survived for each number respectively, viz, the accusative sing *mur, main, rose, nonne;* plur *murs, mains, roses, nonnes,* these forms serving both as subject and object

French preserved, here and there, relics of old declensions and traces of genitives and ablatives Thus, the nominative forms are preserved in *fils, soeur, prêtre, pâtre, chantre, vierge, Jules, Jacques, Georges,* etc.; nom and acc. forms in *sire, seigneur; gars, garçon; nonne, nonnain,* etc ; gen sing in the names of days: *lundi* (O F. *lunsdi* from *lunis diem*), *mardi* (*Martis diem*), etc gen. plur. in names such as *vavasseur, la Chandeleur,* etc.; ablat in some proper names: *Aix* (O F. *Ais* from Lat. *Aquis*), *Reims, Londres,* etc. Ancient feminine adjectival forms (of the *grandis* type) are still found in *grand' mère, grand' route; fort* (in the phrase *se faire fort*), *Rochefort, raifort* (fem. in O F., masc. in Mod F.); and in all adverbs in *-emment, -amment, e.g, prudemment, constamment.* The personal, relative and demonstrative pronouns of O.F. preserved a few nom., acc and dat cases, most of which survive in Mod. F., *e g., je, tu, il, ils, elle, elles, me, te, le, les, moi, toi, soi, lui, leur; qui, que* (O.F. *cui* has perished); *celui* (O.F. dat), *autrui* (formed by analogy with *celui*).

As to conjugation, until the 14th century the laws of phonetic evolution apply rigorously Lat. *amo, amas, amat, amant,* with their free tonic initial, yielded regularly *aim, aimes, aimet, aiment;* whereas *amare, amabam, amavi, amaraio* (Vulg Lat future), *amarea* (Vulg. Lat. conditional), protonic *a* remaining unaltered, gave *amer, ameie* (later *amoie, amois, amais*), *amai, amerai, ameroie* (later *amerois, amerais*) In the 16th century force of analogy reduced this duality of the stem-vowels *a-, ai-* to uniform *ai-*. As analogy preferred now the tonic stem, now the protonic, the final result is that while some verbs generalize the former, others generalize the latter, whilst a few entirely escape its levelling effects Thus verbs like *jouer, prouver, courir,* etc , have throughout adopted the protonic stem. *joue, jouons, prouve, prouvons; cours, courons,* etc ; whereas in verbs like *demeurer, pleurer,* etc , the tonic stem everywhere prevails: *demeure, demeurons; pleure, pleurons,* etc ; finally in verbs like *devoir, pouvoir,* etc., the stem-system of the mediaeval period is still perpetuated. *dois, devons; peux, pouvons,* etc By strange irony of fate the grammarians style verbs of this last category "irregular," whilst to the philologist they alone are "regular." Although, during the Renaissance, the conjugational forms were fixed, as regards the written language, by the 17th century analogy was actively modifying conjugation on the lips of the masses Forms like *boivons* (instead of *buvons*), *moudons* (for *moulons*), *bouera* (for *boullira*), *sentu* (for *sentі*), etc., are of common occurrence

Syntax.—From the 9th to the 14th century wonderful variety was possible in the order of words. The subject could follow the verb (*Dist li rois,* said the king); the object could head the sentence (*Lo rei veit,* the king he saw) or could intervene between subject and verb (*Cist om lo rei veit,* this man saw the king), or, in compound tenses, between auxiliary and past participle (*Jo ai lo rei veu,* I have the king seen), or between verb and dependent infinitive (*Il cuida lo rei veoir,* he thought the king to see), a noun could even figure before a noun dependent upon it (*Jo sui de France chiés,* I am of France the head) All these constructions were perfectly intelligible, thanks to the case-flexions then still accurately applied in most dialects, certainly in Francien With the decay of these flexions in the course of the 14th century (as early as the middle of the 12th in Anglo-Norman) a new word-order gradually established itself after a period of about two centuries, during which the influence of Latin was sufficiently strong to induce all kinds of syntactical anomalies By the 17th century, however, the normal order had definitely become what it is now: (1) subject, (2) verb, (3) object Variations from this form are thenceforth (17th century to present day) rare save in poetical diction which is prone to archaism So, too, with the personal tenses of the verbs. As long as the personal flexions remained distinct and characteristic in pronunciation no need existed for any further sign indicating person, thus *aim, aimes, aime, aiment* were sufficiently explicit as long as the sounds *s,* feminine *e* and *nt* were audible, but when all these forms came to be pronounced in one and the same way, *èm,* as in Modern French, the use with them of *je, tu, il, ils* became an absolute necessity Such are the two features fundamentally differentiating the Old French sentence, which was naturally variable, from the modern, which, in order to escape the almost inevitable monotony consequent on the rigid order prevailing since the 17th century, has been obliged at times to resort to cumbrous devices Let one example suffice Instead of *"Veit lo rei"* and *"Lo rei veit"* Modern French has *"Il a vu le roi";* to emphasize the object it constructs *"Le roi, il l'a vu" or C'est le roi qu'il a vu,"* thus multiplying words uselessly

Since the 17th century there have been but slight changes in syntax. Three tendencies should, however, be noted: (1) the subjunctive is more and more declining in use, especially the imperf. subj of the first conjugation; (2) the past simple is more and more giving place to the past compound, *e.g, "Il est venu hier"* has supplanted, except in southern France, the form *"Il vint hier";* (3) new over-compound tenses are taking over functions of the past and future compound, *e.g, il a eu vite fait de se taire; il aura eu facilement compris la raison de mon silence.* The main characteristic of the French language and its syntax is its "clarity," which rendered French popular both in the middle ages,

when Brunetto Latino and Martino Canale proclaimed it "most delectable of all languages to read and to hear," and in the 18th century, when Rivarol accounted for its universality by stating: "French syntax is incorruptible From it results that admirable clearness, the eternal basis of our syntax. What is not clear is not French" This instinct for clarity is as lively as ever

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FRENCH LAW AND INSTITUTIONS. In the historical evolution of French institutions, those of the Celts of Gaul are of little importance None of them are known to have survived in later law It was Roman rule which really formed Gaul The institutions of Roman Gaul became identical with those of the Roman empire, provincial and municipal government undergoing the same evolution as in the other parts of the empire The law for the Gallo-Romans was that which was administered by the *conventus* of the magistrate; there are only a few peculiarities, mere Gallicisms, resulting from usage, which are pointed out by Roman jurisconsults of the classical age The administrative reforms of Diocletian and Constantine applied to Gaul as to the rest of the empire The Gallo-Romans became Christian with the other subjects of the empire, the Church extended thither her organization framed on the administrative model, each *civitas* having a bishop, just as it had a *curia* and municipal magistrates The church had the right of acquiring property, of holding councils, subject to the imperial authority, and of the free election of bishops But only the first germs of ecclesiastical jurisdiction are to be traced in the bishop's powers of arbitration, and in his disciplinary supervision of the morals of clergy and laity After the fall of the Western empire, there was left to the Gallo-Romans a body of written law which consisted of the imperial constitutions and the writings of the five jurists (Gaius, Papinian, Paulus, Ulpian and Modestinus), to which Valentinian III had in 426 given the force of law

The invasions and settlements of the barbarians open a new period The various barbarian kingdoms in Gaul were established under different conditions Under the Burgundians and Visigoths, the owners of the great estates, which had been the prevailing form of landed property in Roman Gaul, suffered partial dispossession, according to a regular system It is doubtful whether a similar process took place in the case of the Frankish settlements, for their first conquests in the north and east seem to have led to the extermination or total expulsion of the Gallo-Roman population In each case, however, the barbarian king wished to use rather than destroy the existing Roman administrative systems The kings of the Visigoths and Burgundians were at first actually representatives of the Western empire, and Clovis himself was ready to accept from the emperor Anastasius the title of consul

The Merovingians.—The first administrative change which followed the Merovingian conquest was the replacement of the *provincia* by the *civitas* as the fundamental unit The *civitas*, generally known under the name *pagus*, was placed under a count (*comes*), and several *pagi* could be united under a *dux* The *pagus* was generally divided into "hundreds" (*centenae*). But the Roman administrative machinery was too delicate to be handled by barbarians Thus the Merovingians tried to levy the same direct taxes as the Romans had done, but they ceased to be imposts reassessed periodically and became fixed annual taxes on lands or persons They disappeared at last as general imposts, continuing to exist only as personal or territorial dues In the same way the Roman municipal organization survived for a considerable time under the Merovingians but was used only for the registration of written deeds; under the Carolingians it disappeared, and with it the old senatorial nobility which had been that of the Empire The administration of justice seems to have been organized on a system borrowed partly from Roman and partly from Germanic institutions Justice is administered by the count (*comes*) or his deputy (*centenarius* or *vicarius*), but on the verdict of notables called in the texts *boni homines* or *rachimburgii*. This takes place in an assembly, the *mallus*, at which every free man is bound to attend a certain number of times a year, and in which are promulgated the general acts emanating from the king. The latter could issue commands or prohibitions, the violation of which entailed a fine of 60 *solidi*; he also administered justice, assisted by the officers of his household, his jurisdiction being unlimited and undefined He could hear all causes, but was not bound to hear any, except, apparently, accusations of deliberate failure of justice and breach of trust on the part of the *rachimburgii*.

But what proved the great disturbing element in Gallo-Roman society was the fact that the conquerors were all warriors, whose normal state was that of war. It is true that under the Roman empire all the men of a *civitas* had been obliged, in case of necessity, to march against the enemy, and under the Frankish monarchy the count still called together his *pagenses* for this object But the condition of the barbarian was very different; he lived essentially for fighting Moreover, this military class, though not an aristocracy (for among the Franks the royal race alone was noble), was to a large extent independent, and the king had to attach these *leudes* or *fideles* to himself by gifts and favours At the same time the authority of the king gradually assumed the personal character which, among the Germans, marked most of the relations between men The household of the king gained in political importance, because the chief officers in the palace became also high public officials and the king's bodyguard, the *antrustions*, remained a class apart

The Frankish monarch had also the power of making laws, after consulting the chief men of the kingdom, both lay and ecclesiastical, in *placita*, meetings apparently modelled on the councils of the Church But throughout the kingdom in many places the direct authority of the king over the people ceased to make itself felt The *immunitates*, granted chiefly to the great ecclesiastical landowners, limited this authority in a curious way by forbidding public officials to exercise their functions in the precinct of land which was *immunis* Judicial and fiscal rights frequently passed to the landowner, who became of necessity the intermediary between the supreme power and the people Other principles contributed towards the weakening of the royal power The monarch considered the kingdom to be his property and this gave rise to the concessions of royal rights to individuals, and later to partitions of the kingdom between the sons of the king, as in the division of an inheritance in land This proved one of the chief weaknesses of the Merovingian monarchy

In order to rule the Gallo-Romans, the barbarians had sought the help of the Church, the representative of Roman civilization Further, the Merovingian monarch and the Catholic Church had come into close alliance in their struggle with the Arians The Church therefore gained new privileges, but at the same time became to a certain extent dependent Under the Merovingians the election of the bishop by clergy and people is only valid if it obtains the assent of the king, who often directly nominates the prelate But the Church retains her full right of acquiring property, and her jurisdiction is partially recognized. She not only exercises more freely than ever a disciplinary jurisdiction, but the bishop, in place of the civil power, administers civil and criminal justice over the clergy The councils had for a long time forbidden the clergy to cite one another before secular tribunals; they had also, in the 6th century, forbidden secular judges under pain of excommunication to cite before them and judge the clergy, without permission of the bishop A decree of Clotaire II (614) acknowledged, if only partially, the validity of these claims.

Carolingian Period.—The Merovingian dynasty perished amid increasing anarchy The crown passed, with the approval of the papacy, to an Austrasian mayor of the palace and his family, who had been the last support of the preceding dynasty. Under these conditions there developed a number of institutions, which were in reality the direct precursors of feudalism One was the royal benefice (*beneficium*), of which the Church provided both the model and, in the first instance, the material. The model was the *precaria*, a form of concession by which it was customary for the Church to grant the possession of her lands to free men; this practice she herself had copied from the five-years leases granted by the Roman exchequer Gradually, however, the *precaria* had

become a grant made, in most cases, freely and for life. As regards the material, when the Austrasian mayors of the palace wished to secure the support of the *fideles* by fresh benefits, the royal treasury being exhausted, they turned to the Church and took lands from her to give to their warriors. In order to disguise the robbery it was decided that these lands should be held as *precariae* from the Church which had furnished them Later, when the royal treasury was reorganized, grants of land made by the kings naturally took a similar form, the *beneficium*, as a free grant for life The *beneficium* inevitably crystallized into a perpetual and hereditary right Another institution akin to the *beneficium* was the *senioratus* By the *commendatio*, a form of solemn contract, a man swore absolute fidelity to another man, who became his *senior*. It became the generally received idea that it was natural and normal for every free man to have a *senior* At the same time a benefice was never granted unless accompanied by the *commendatio* of the beneficiary to the grantor. As the most important *seniores* were thus bound to the king and received from him their benefices, he expected through them to command their men; but in reality the king disappeared little by little in the *senior* The king granted as benefices not only lands, but public offices such as those of count or *dux*, which thus became possessions, held, first for life, and later as hereditary properties.

Charlemagne, while sanctioning these institutions, reorganized the administration of justice, fixing the respective jurisdictions of the count and the *centenarius*, substituting for the *rachimburgi* permanent *scabini*, chosen by the count in the presence of the people, and defining the relations of the count, as the representative of the central authority, with the *advocati* or *judices* of *immunitates* and *potestates* He reorganized the army, determining the obligations and the military outfit of free men according to their means Finally, he established those regular inspections by the *missi dominici* which are the subject of so many of his capitularies and founded two general assemblies in the year, one in the autumn, the other in the spring, which were attended by the chief officials, lay and ecclesiastical It was here that the capitularies (*q v*) and all important measures were first drawn up and then promulgated The revenues of the Carolingian monarch consisted chiefly in the produce of the royal lands There were also the free gifts which the great men were bound, according to custom, to bring to the *conventus*, the regular personal or territorial dues into which the old taxes had resolved themselves, the profits arising from the courts and numberless requisitions in kind, a usage which had without doubt existed continuously since Roman times The Church added a fresh prerogative to her former privileges, namely, the right of levying a real tax in kind, the *tithe* Since the 3rd century she had tried to exact the payment of tithes from the faithful, and from the reign of Pippin the Short onwards the civil law recognized and sanctioned this obligation Ecclesiastical jurisdiction extended farther and farther, but Charlemagne, the protector of the papacy, maintained firmly his authority over the Church He nominated its dignitaries, both bishops and abbots, who were true ecclesiastical officials, parallel with the lay officials In each *pagus*, bishop and count owed each other mutual support, and the *missi* on the same circuit were ordinarily a count and a bishop In the first collection of capitularies, that of Ansegisus, two books out of four are devoted to ecclesiastical capitularies

The Law Under the Frank Monarchy.—What then, was the private and criminal law of this Frankish monarchy which had come to embrace so many different races? Men of Roman descent remained under Roman law, and the conquerors could not hope to impose their customs upon them. As to the barbarians, they had hitherto had nothing but customs, and these customs, of which the type nearest to the original is to be found in the oldest text of the *Lex Salica*, were nothing more than a series of tariffs of compensations, that is to say, sums of money due to the injured party or his family in case of crimes committed against individuals. They also introduced barbarous systems of trial, that by compurgation, *i.e.*, exculpation by the oath of the defendant supported by a certain number of *cojurantes*, and that by ordeal, later called *judicium Dei*. In each new kingdom the barbarians naturally kept their own laws, and when these men of different races all became subject to the Frankish monarchy, there evolved itself a system (called the *personnalité des lois*) by which every subject had, in principle, the right to be tried by the law of the race to which he belonged. When the two adversaries were of different race, it was the law of the defendant which had to be applied The customs of the barbarians had been drawn up in Latin At this period only these written documents bear the name of "law" (*leges romanorum, leges barbarorum*), and at least the tacit consent of the people seems to have been required for these collections of laws, in accordance with an axiom laid down in a later capitulary; *lex fit consensu populi et constitutione regis* It is noteworthy, too, that in the process of being drawn up in Latin, most of the *leges barbarorum* were very much Romanized

In the midst of this diversity, a certain number of causes tended to produce a partial unity The capitularies, which had themselves the force of law, when there was no question of modifying the *leges*, constituted a legislation which was the same for all, often they inflicted corporal punishment for grave offences, which applied to all subjects without distinction The Gallo-Romans, and even the Church itself, to a certain extent, adopted the barbarous methods of trial introduced by the Germans On the other hand, written acts became prevalent among the barbarians, and at the same time they assimilated a certain amount of Roman law, for these acts continued to be drawn up in Latin, after Roman models During this period, too, the Gallican Church adopted the collection of councils and decretals by Dionysius Exiguus, which was sent to Charlemagne in 774 by Pope Adrian I

All the subjects of the Frankish monarchy were not of equal status There was, strictly speaking, no nobility, both the Roman and the Germanic nobility having died out, but slavery continued to exist The Church, however, was transforming the slave into the serf, by giving validity to their marriages, at least, when the master had approved of them, and by protecting the slave's *peculium*. But between the free man and the slave lay many persons of intermediate status. There was, to begin with, the Roman colonist (*colonus*), a class of which there is no clear mention in the laws before the 4th century, they and their children after them were attached perpetually to a certain piece of land, which they were allowed to cultivate on payment of a rent. There were, further, the *liti*, a similar class of Germanic origin Many free men who had fled to the great landowners for protection accepted a similar position Under the Merovingian régime, and especially under the Carolingians, the occupation of land tended to assume the character of tenure, but free ownership of land continued to exist under the name of *alod*, and the capitularies contain numerous complaints and threats against the counts, who endeavoured by the abuse of their power to obtain the surrender of small properties held by free men

PERIOD OF ANARCHY AND THE RISE OF FEUDALISM

The 10th and 11th centuries were a period of profound anarchy, during which feudalism took a more definite shape. The sovereigns no longer made laws, the old capitularies and *leges* fell into disuse and in their place territorial customs arose which were at first ill-defined and strictly local Apart from the influence of the church, government rested on brute force In this anarchy, men drew together and formed themselves into groups for mutual defence A nucleus was formed which was to become the new social unit, that is to say, the feudal group. Of this the centre was a chief, around whom gathered men capable of bearing arms, who commended themselves to him according to the old form of vassalage. They owed him fidelity, assistance and the support of their arms; while he owed them protection. Some of them lived in his castle or fortified house, receiving their equipment only and eating at his table. Others received lands from him, which became the fiefs of a later time. The fief was generally held for life and did not become universally hereditary till the second half of the 11th century. All these conditions had already existed previously in much the same form; but the new development is that the chief was no longer, as before, merely an intermediary between his men and the royal power The group had become in effect

independent, so organized as to be socially and politically self-sufficient. It constituted a small army, led, naturally, by the chief, and composed of his feudatories, supplemented in case of need by the *rustici* It also formed an assembly in which common interests were discussed, the lord, according to custom, being bound to consult his feudatories and they to advise him to the best of their power It also formed a court of justice, in which the feudatories gave judgment under the presidency of their lord; and all of the them claimed to be subject only to the jurisdiction of this tribunal composed of their peers Generally they also judged the villeins (*villani*) and the serfs dependent on the group, except in the rare cases where the latter obtained as a favour judges of their own status Under these conditions a nobility was formed, those men becoming nobles who were able to devote themselves to the profession of arms and this nobility was not a caste but could be indefinitely recruited by the granting of fiefs and admission to knighthood (*see* KNIGHTHOOD AND CHIVALRY)

Private War.—The state of anarchy was by now so far advanced that the custom of private war arose Every man claimed the right of making war to defend his rights or to avenge his wrongs Later on, this was a privilege of the noble but the texts defining the limits which the Church endeavoured to set to this abuse, namely, the Peace of God and the Truce of God, show that at the outset it was a power possessed by men of all classes Even a man who had appeared in a court of law and received judgment had the choice of refusing to accept the judgment and of making war instead

In this state of political disintegration each part of the country which had a homogeneous character tended to form itself into a higher unit In this unit there arose a powerful lord, generally a duke, a count or a viscount, either a former official of the monarchy, whose function had become hereditary, or a usurper who had formed himself on this model He laid claim to an authority other than that conferred by the possession of real property. His court of justice was held in the highest honour, and to it were referred the most important affairs But in such a district there were generally a number of more or less powerful lords, with as yet no particular feudal title who had generally commended themselves to this duke or count by doing homage

The Royal Power.—On the other hand, the royal power continued to exist Under the last Carolingians it had in fact become elective, as is shown by the elections of Odo and Robert before that of Hugh Capet The electors were the chief lords and prelates of the *regnum Francorum* But each king during his lifetime secured the coronation of his eldest son so that the first of the Capetians revived the principle of heredity in favour of the eldest son, while establishing the hereditary indivisibility of the kingdom But the only real authority of the king lay where his own possessions were, or where there had not arisen a duke, a count or lord of equal rank with them He maintained, however, a court, the jurisdiction of which seems to have been universal, though the parties in a suit could accept or reject the judgment given The king dispensed justice surrounded by the officers of his household, who formed a permanent council Periodically, at the great yearly festivals, he called together the chief lords and prelates of his kingdom, thus carrying on the tradition of the Carolingian *placita* or *conventus;* but little by little the character of the gathering changed; it was no longer an assembly of officials but of independent lords This was the origin of the *curia regis*

The Church.—While the power of the State was almost disappearing, that of the Church continued to grow Her jurisdiction gained ground, since her procedure was reasonable and comparatively scientific Not only was the privilege of clergy, by which accused clerks were brought under her jurisdiction, almost absolute, but she had cognizance of a number of causes in which laymen only were concerned, marriage and everything nearly or remotely affecting it, wills, crimes and offences against religion and even contracts, when the two parties wished it or when the agreement was made on oath The Church, moreover, remained in close connection with the crown, while the royal prerogatives with regard to the election of bishops were maintained more successfully than other rights of the crown, though in many of the great fiefs they none the less passed to the count or the duke. It was at this time too that the Church tried to break the last ties which still kept her more or less dependent on the civil power (*see* INVESTITURE and CHURCH HISTORY)

Roman Law and Feudalism.—The period of the true feudal monarchy is embraced by the 12th and 13th centuries It was at this time that the crown again assumed real strength and authority, but so far it had no organs and instruments save those which were furnished by feudalism, now organized under a regular hierarchy, of which the king was the head This new position of affairs was the result of three great factors the revival of Roman Law, the final organization of feudalism and the rise of the privileged towns Roman law spread rapidly in the French schools and universities, except that of Paris, which was closed to it by the papacy, and the influence of this study was so great that it transformed society On the one hand it contributed largely to the reconstitution of the royal power, modelling the rights of the king on those of the Roman emperor On the other hand it wrought a no less profound change in private law From this time dates the division of old France into the *Pays de droit écrit,* in which Roman law, under the form in which it was codified by Justinian, was received as the ordinary law, and the *Pays de coutume,* where it played only a secondary part, being generally valid only as *ratio scripta* and not as *lex scripta* In this period the customs also took definitive form, and over and above the local customs properly so called there were formed customs known as *general,* which held good through a whole province or *bailliage,* and were based on the jurisprudence of the higher jurisdictions (For the privileged towns of France *see* COMMUNE, MEDIAEVAL)

In the final organization of feudalism, the chief lord, the duke or count, had beneath him a whole hierarchy, and was himself a part of the feudal system of France (*see* FEUDALISM) Doubtless in the case of lords like the dukes of Brittany and Burgundy, the king could not actually demand the strict fulfilment of feudal obligations, but the principle was established Free and absolute property, the ancient *allodium,* continued to exist in most districts, though by way of exception In the administration of justice, the feudal hierarchy had absolute sway The fiefs themselves became hereditary, and the rules of succession were established The most salient features of feudal succession were the right of primogeniture and the preference given to heirs-male, but from the 13th century onwards the right of primogeniture, which had at first involved the total exclusion of the younger members of a family, tended to be modified, except in the case of the chief lords, the eldest son obtaining the preponderant share or *préciput* Non-noble (*roturier*) tenancies followed a similar development, except that in their case there was no right of primogeniture nor any privilege of males

Great Officers of the Crown.—The chief instruments of the crown in government were its great officers, the seneschal, butler, constable and chancellor, who were to become irremovable officials But this period saw the rise of a special college of dignitaries, that of the Twelve Peers of France, consisting of six laymen and six ecclesiastics, which took definitive shape at the beginning of the 13th century We cannot yet discern with any certainty by what process it was formed, why those six prelates and those six great feudatories in particular were selected rather than others equally eligible But there is no doubt that we have here a normal feudal development; the formation of a similar assembly of 12 peers occurs also in some of the great fiefs Besides the part which they played at the consecration of kings, the peers of France formed a court in which they judged one another under the presidency of the king, their overlord, according to feudal custom But the *cour des pairs* in this sense was not separate from the *curia regis,* nor yet, later, from the *parlement* of Paris, of which the peers of France were by right members From this time, too, dates another important institution, that of the *maîtres des requêtes.*

Growth of the Royal Power.—The legislative power of the crown again began to be exercised during the 12th century, and in the 13th century had full authority over all the territories subject to the crown. The kings of this century were able narrowly to limit

the custom of private war. But the most appreciable progress took place in the administrative and judicial institutions Under Philip Augustus arose the royal *baillis* (*see* BAILIFF), and seneschals (*q v.*), who were the representatives of the king in the provinces, and superior judges. At the same time the form of the feudal courts tended to change, as they began more and more to be influenced by the Romano-canonical law. Saint Louis had striven to abolish trial by combat, and the Lateran Council of 1216 condemned other forms of ordeal Of the seigniorial jurisdictions there soon remained only the *hautes* or *basses justices* (in the 14th century arose an intermediate grade, the *moyenne justice*), all of which were considered to be delegations of the royal power. As a result of the application of Roman and canon law, there arose the practice of appeal from seignorial justice to the royal court. In the 13th century too appeared the theory of crown cases (*cas royaux*) which were reserved for the royal court Finally, the *curia regis* was gradually transformed into a regular court of justice, the *parlement* (*q v*), as it was already called in the second half of the 13th century At this time the king no longer appeared in it regularly, and before each session (for it was not yet a permanent body) a list of properly qualified men was drawn up in advance to form the *parlement,* only those whose names were on the list being capable of sitting in it Its main function had come to be that of a final court of appeal At the various sessions, which were regularly held at Paris, appeared the *baillis* and seneschals, who were called upon to answer for the cases they had judged and also for their administration The accounts were received by members of the *parlement* at the Temple, and this was the origin of the *cour* or *chambre des comptes*

Nobles, Commons and the Church.—At the end of this period the nobility became an exclusive class It became an established rule that a man had to be noble in order to be made a knight, and even in order to acquire a fief, but in this latter respect the king made exceptions in the case of *roturiers,* who were licensed to take up fiefs, subject to a payment known as the *droits de franc-fief* The Church maintained her privileges, a few attempts only were made to restrain the abuse, not the extent, of her jurisdiction This jurisdiction was, during the 12th century, to a certain extent regularized, the bishop nominating a special functionary to hold his court, this was the *officialis* (Fr *official*), whence the name of *officialité* later applied in France to the ecclesiastical jurisdictions On one point, however, her former rights were diminished She preserved the right of freely acquiring personal and real property, but though she could still acquire feudal tenures she could not keep them, she must alienate the property again within a year and a day The reason for this new rule was that the Church is a proprietor who does not die and in principle does not surrender her property, consequently, the lords had no longer the right of exacting the payments on the alienations of those tenures which she acquired In this period the form of the episcopal elections underwent a change, the electoral college coming to consist only of the canons composing the chapter of the cathedral church

Changes in Criminal Law.—Finally, it must be added that during the 13th century criminal law was profoundly modified Under the influence of Roman law a system of arbitrary penalties replaced those laid down by the customs, which had usually been fixed and cruel. The criminal procedure of the feudal courts had been based on the right of accusation vested only in the person wronged and his relations, for this was substituted the inquisitorial procedure which had developed in the canon law at the very end of the 12th century, and was to become the *procédure à l'extraordinaire* of the *ancien régime,* which was conducted in secret and without free defence and debate Of this procedure torture came to be an ordinary and regular part

The customs, which at that time contained almost the whole of the law for a great part of France, were not fixed by being written down. In that part of France which was subject to customary law (*la France coutumière*) they were defined when necessary by the verdict of a jury in what was called the *enquête par turbes;* some of them, however, were, in part at least, authentically recorded in seigniorial charters. *chartes ce ville* or *chartes de coutume* Their rules were also recorded by experts in private works or collections called *livres coutumiers,* or simply *coutumiers* (customaries) The most notable of these are *Les Coutumes de Beauvoisis* of Philippe de Beaumanoir, the *Très ancienne coutume de Normandie* and the *Grand Coutumier de Normandie;* the *Conseil à un ami* of Pierre des Fontaines; the *Établissements de Saint Louis;* the *Livre de jostice et de plet* At the same time the clerks of important judges began to collect in registers notable decisions, it is in this way that we have preserved to us the old decisions of the exchequer of Normandy, and the *Olim* registers of the *parlement* of Paris

THE LIMITED MONARCHY

The 14th and 15th centuries were the age of the limited monarchy In this period certain rules for the succession to the throne were fixed by precedents, the exclusion of women and of male descendants in the female line, and the principle that a king could not by an act of will change the succession of the crown The old *curia regis* disappeared Its judicial functions were discharged by the *parlement*, while to fulfil its deliberative functions there was formed a new body, the royal council (*conseil du roi*), an administrative and governing council, which was in no way of a feudal character The number of its members was at first small, but tended to increase, soon the brevet of *conseiller du roi en ses conseils* was given to numerous representatives of the clergy and nobility, the great officers of the crown becoming members by right Side by side with these officials, whose power was then at its height, there were gradually evolved more subservient ministers who could be dispensed with at will, the *secrétaires des commandements du roi* of the 15th century, who in the 16th century developed into the *secrétaires d'état,* and were themselves descended from the *clercs du secret* and *secrétaires des finances* of the 14th century The College of the Twelve Peers of France had not its full numbers at the end of the 13th century, the six ecclesiastical peerages existed, but several of the great fiefs to which six lay peerages had been attached had been annexed to the crown To fill these vacancies, Philip the Fair raised the duchies of Brittany and Anjou and the countship of Artois to the rank of peerages of France This really amounted to changing the nature of the institution, for the new peers owed their rank merely to the king's will, though the rank continued to be hereditary Before long peers began to be created when there were no gaps in the ranks of the College, and there was a constant increase in the numbers of the lay peers

The States General.—At the beginning of the 14th century appeared the States General (*états généraux*) Their power reached its height at the crisis of the Hundred Years' War during the reign of King John At the same time there arose side by side with them, and from the same causes, the provincial estates, which were in miniature for each province what the states general were for the whole kingdom Later it became a privilege for a province to have its own assembly, those which did so were never rightfully subject to the royal *taille,* and kept, at least formally, the right of sanctioning, by means of the assembly, the subsidies which took its place Hence it became the endeavour of the crown to suppress these provincial assemblies, which in the 14th century were to be found everywhere, from the outset of the 15th century they began to disappear in central France

Royal Taxation.—The most characteristic feature of this period was the institution of universal taxation by the Crown Hitherto, the king's sole revenues were those which he exacted in his capacity of feudal lord together with the income arising from certain crown rights which he had preserved or regained But these revenues, known later as the income of the royal domain and later still as the *finances ordinaires,* became insufficient in proportion as the royal power increased, it became a necessity for the monarch to be able to levy imposts throughout the whole extent of the provinces annexed to the Crown, even upon the subjects of the different lords This he could only do by means of the co-operation of those lords, lay and ecclesiastical, who alone had the right of taxing their subjects, the co-operation of the privileged towns, which had the right to tax themselves was also necessary.

It was in order to obtain this consent that the States General, in most cases, and the provincial assemblies, in all cases, were convoked In some cases, however, the king adopted different methods, for instance, he sometimes utilized the principle of the feudal aids In cases where his vassals owed him, as overlord, a pecuniary aid, he substituted for the sum paid directly by his vassals a tax levied by his own authority on their subjects It is in this way that for 30 years the necessary sums were raised, without any vote from the States General, to pay the ransom of King John But in principle the taxes were sanctioned by the States General in the 14th century Whatever form they took, they were given the general name of Aids or *auxilia,* and were considered as occasional and extraordinary subsidies, the king being obliged in principle to "live of his own" Certain aids, it is true, tended to become permanent under the reign of Charles VI.; but the taxes subject to the consent of the States General were at first the sole resource of Charles VII. In the second half of his reign two chief taxes became permanent in 1435 the *aids* (a tax on the sale of articles of consumption, especially on wine), with the formal consent of the States General, and the *taille* in 1439 These imposts were increased, on the royal authority, by Louis XI and became permanent after his death

Together with the taxes there was evolved the system of their administration For the administration of the subsidies which they granted, the States General nominated from among their own numbers *surintendants généraux* or *généraux des finances,* and further, for each diocese or equivalent district, *élus* Both had judicial as well as fiscal powers, the latter constituting courts of first instance and the former courts of final appeal. After 1360 both *généraux* and *élus* were nominated by the king The *élus,* or *officiers des élections,* only existed in districts which were subject to the royal *taille*, hence the division, so important in old France, into *pays d'élections* and *pays d'états* The *élus* kept both administration and jurisdiction, but in the higher stage a differentiation was made: the *généraux des finances,* who numbered four, kept the administration, while their jurisdiction as a court of final appeal was handed over to another body, the *cour des aides,* which had already been founded at the end of the 14th century Besides the four *généraux des finances* there were four treasurers of France (*trésoriers de France*), who administered the royal domain, and these eight officials formed in the 15th century a kind of ministry of finance to the monarchy

The Army.—The army also was reorganized On the one hand, the military service attached to the fiefs was transformed for the profit of the king, who alone had the right of making war it became the *arrière-ban,* a term which had formerly applied to the *levée en masse* of all the inhabitants in times of national danger Before the 14th century the king had only had the power of calling upon his own immediate vassals for service Henceforth all possessors of fiefs owed him, whether within the kingdom or on the frontiers, military service without pay and at their own expense This was for long an important resource for the king But Charles VII organized an army on another footing It comprised the *francs-archers* furnished by the parishes, a militia which was only summoned in case of war, and companies of *gendarmerie* or heavy cavalry, which were called *compagnies d'ordonnance* It was chiefly to provide for the expense of this first nucleus of a permanent army that the *taille* itself had been made permanent.

The new army led to the institution of the governors of provinces, who were to command the troops quartered there At first they were only appointed for the frontiers and fortified places, but later the kingdom was divided into *gouvernements généraux* There were at first 12 of these, which were called in the middle of the 16th century the *douze anciens gouvernements* Although, strictly speaking, they had only military powers, the governors, always chosen from among the great lords, became in the provinces the direct representatives of the king and caused the *baillis* and seneschals to take a secondary place.

Law Courts.—The courts of law continued to develop on the lines already laid down The *parlement,* which had come to be a judicial committee nominated every year, but always consisting in fact of the same persons, changed in the course of the 14th century into a body of magistrates who were permanent but as yet subject to removal (*see* PARLEMENT). The provincial *parlements* had arisen after and in imitation of that of Paris, and had for the most part taken the place of some superior jurisdiction which had formerly existed in the same district when it had been independent (like Provence) or had formed one of the great fiefs (like Normandy or Burgundy) It was during this period also that the *parlements* acquired the right of opposing the registration, that is to say, the promulgation of laws, of revising them, and of making representations to the king when they refused registration. The other royal jurisdictions were completed (*see* BAILIFF, CHÂTELET). Besides them arose another of great importance, which was of military origin, but came to include all citizens under its sway These were the provosts of the marshals of France (*prévôts des maréchaux de France*), who were officers of the *maréchaussée* (the gendarmerie of the time), they exercised criminal jurisdiction without appeal over crimes committed by vagabonds and fugitives from justice, and over a number of crimes of violence, whatever the rank of the offender Further, another class of officers was created in connection with the law courts the "king's men" (*gens du roi*), the *procureurs* and *avocats du roi,* who were at first simply those lawyers who represented the king in the law courts, or pleaded for him when his interests were involved From the 14th century onwards the *procureurs du roi* had full control over public prosecutions In this period, too, appeared what was afterwards called *justice retenue,* that is to say, the justice which the king administered, or was supposed to administer, in person It was based on the idea that, since all justice and all judicial power reside in the king, he could not deprive himself of them by delegating their exercise to his officers and to the feudal lords Consequently he could, if he thought fit, take the place of the judges and call up a case before his own council He could reverse even the decisions of the courts of final appeal, and in some cases used this means of appealing against the decrees of the *parlements* In these cases the king was supposed to judge in person, in reality they were examined by the *maîtres des requêtes* and submitted to the royal council (*conseil du roi*), at which the king was always supposed to be present and which had in itself no power of giving a decision For this purpose there was soon formed a special committee of the council, which was called the *conseil privé* or *de justice* The king frequently, by means of *lettres de justice,* intervened in the procedure of the courts, by granting *bénéfices,* by which rules which were too severe were modified, and judgments were given in cases not covered by the common law By *lettres de grâce* he granted reprieve or pardon in individual cases. The most extreme form of royal intervention was made by means of *lettres de cachet* (*q v*), which ordered a subject to go without trial into a state prison or into exile.

The Church.—The condition of the Church changed greatly during this period. The jurisdiction of the *officialités* was very much reduced, even over the clergy The development of jurisprudence gradually removed from the *officialités* causes of a purely secular character in which laymen only were concerned, such as wills and contracts; and in matrimonial cases their jurisdiction was limited to those in which the *foedus matrimonii* was in question For the acquisition of real property by ecclesiastical establishments the consent of the king was always necessary

In ecclesiastical patronage, from the 14th century onwards the papacy encroached more and more upon the rights of the bishops over the inferior benefices, and of the electors, who usually conferred the superior benefices; at the same time it exacted from newly appointed incumbents heavy dues, which were included under the generic name of annates (*q.v*) During the Great Schism these abuses grew, until by a series of edicts, promulgated with the consent and advice of the *parlement* and the clergy, the Gallican Church was restored to the possession of its former liberties, under the royal authority. Thus France was ready to accept the decrees of reform issued by the council of Basel (*q.v.*), which she did, with a few modifications, in the Pragmatic Sanction of Charles VII , adopted after a solemn assembly of the clergy and nobles at Bourges and registered by the *parlement* of Paris in 1438 It suppressed the annates and most of the means by which

the popes disposed of the inferior benefices For the choice of bishops and abbots, it restored election by the chapters and convents The Pragmatic Sanction, however, was never recognized by the papacy, nor was it consistently and strictly applied by the royal power

THE ABSOLUTE MONARCHY

From the 16th century to the Revolution was the period of the absolute monarchy The reigns of Francis I and Henry II clearly laid down the principle of the absolute power of the crown The States General were not assembled under these two reigns, though they reappeared in the second half of the 16th century. They were summoned in 1560 at Orleans, in 1561 at Pontoise, and in 1576 and 1588 at Blois The League even convoked one, which was held at Paris in 1593 But the states general of the 16th century, in spite of their good intentions and the great talents which were at their service, were dominated by religious passions, which made them powerless for any practical purpose They were, however, to be called together yet again, as a result of the disturbances which followed the death of Henry IV ; but their dissentions and powerlessness were again strikingly exemplified and they did not reappear until 1789 Other bodies, however, which the royal power had created, were to carry on the struggle against it There were the *parlements*, the political rivals of the States General Thanks to the principle according to which no law came into effect so long as it had not been registered by them, they had won the right of refusing registration, explaining their reasons to the king by means of the *remonstrances* Before the end of the 17th century they had lost this power The ordinance of 1667 on civil procedure, and above all a declaration of 1673, ordered the *parlement* to register the laws as soon as it received them and without any modification It was only after this registration that they were allowed to draw up remonstrances, which were henceforth futile The nobles, as a body, had also become politically impotent At the same time the central government underwent changes The great officers of the crown disappeared one by one Of those in the first rank only the chancellor survived till the Revolution Apart from him, the king's real ministers were the secretaries of State, generally four in number, who were always removable and were not chosen from among the great nobles For purposes of internal administration, the provinces were divided between them, each of them corresponding by despatches with the areas which were assigned to him Any other business (with the exception of legal affairs, which belonged to the chancellor, and finance, of which we shall speak later) was divided among them according to convenience At the end of the 16th century, however, were evolved two regular departments, those of war and foreign affairs Under Francis I and Henry II , the chief administration of finance underwent a change; for the four *généraux des finances*, who had become too powerful, were substituted the *intendants des finances*, one of whom soon became a chief minister of finance, with the title *surintendant* The *généraux des finances*, like the *trésoriers de France*, became provincial officials, each at the head of a *généralité* (a superior administrative district for purposes of finance); under Henry III the two functions were combined and assigned to the *bureaux des finances*. The fall of Fouquet led to the suppression of the office of *surintendant;* but Colbert soon again became practically a minister of finance, under the name of *contrôleur général des finances*, both title and office continuing to exist up to the Revolution

The *conseil du roi* was an important organ of the central government, and for a long time included among its members representatives of the nobility and clergy. Besides the councillors of State (*conseillers d'état*), its ordinary members, the great officers of the crown and secretaries of State, princes of the blood and peers of France were members of it by right Further, the king was accustomed to grant the brevet of councillor to a great number of the nobility and clergy, who could be called upon to sit in the council and give an opinion on matters of importance. But in the 17th century the council tended to differentiate its functions, forming three principal sections, one for political, one for financial, and the third for legal affairs. Under Louis XIV. it took a definitely professional, administrative and technical character The *conseillers à brevet* were all suppressed in 1673, and the peers of France ceased to be members of the council The political council, or *conseil d'en haut,* had no *ex officio* members, not even the chancellor; the secretary of State for foreign affairs, however, necessarily had entry to it; it also included a small number of persons chosen by the king and bearing the title of ministers of state (*ministres d'état*) The other important sections of the *conseil du roi* were the *conseil des finances*, organized after the fall of Fouquet, and the *conseil des dépêches*, in which sat the four secretaries of State, where everything concerned with internal administration (except finance) was dealt with, including the legal business connected with this administration

Provincial Administration.—The chief authority in the provincial administration belonged in the 16th century to the governors of the provinces But at the end of this century were created the intendants of the provinces, who, after a period of conflict with the governors and the *parlements*, became absolute masters of the administration in all those provinces which had no provincial estates, and the instruments of a complete administrative centralization (*see* INTENDANT)

The towns having a municipal organization, preserved in the 16th century a fairly wide autonomy Under Louis XIV their dependence rapidly declined They were placed under the tutelage of the intendants, whose sanction, or that of the *conseil du roi*, was necessary for all acts of any importance. In the closing years of the 17th century, the municipal officials ceased, even in principle, to be elective. Their functions ranked as offices which were, like royal offices, saleable and heritable

The sale of royal offices is one of the characteristic features of the *ancien régime* In the 16th century, under Francis I at the latest, the crown itself began officially to sell offices taking a fee from those upon whom they were conferred In the judicial system, the practice had a favourable result, assuring security of office to the judges; for the king could not reasonably dismiss an official arbitrarily without refunding the fee which he had paid On the other hand, it contributed to the development of the dues paid by litigants to the judges The system of sale, and with it irremovability, was extended to all official functions, even to financial posts The process was completed by the recognition of the rights in the sale of offices as hereditary, *i e* , the right of resigning the office on payment of a fee, either in favour of a competent descendant or of a third party, passed to the heirs of an official who had died without having exercised this right himself Through this development there arose a class of men who, though bound in many ways to the crown, were actually independent Hence the tendency in the 18th century to create new and important functions under the form, not of offices, but of simple commissions

Fundamental Laws of France.—In this period the essential principles of public law were defined There were, in the first place, the *fundamental laws of the realm*, which were true constitutional principles, considered as binding the king himself; so that, although he was sovereign, he could neither abrogate, nor modify, nor violate them There was, however, some discussion as to what rules actually came under this category, except in the case of two series about which there was no doubt These were, on the one hand, those which dealt with the succession to the crown and forbade the king to change its order, and those which proclaimed the inalienability of the royal domain, against which no title by prescription was valid This last principle admitted only two exceptions· the formation of appanages (*q v*), and the sale of land to meet the necessities of war, with a perpetual option of redemption.

There was in the second place the theory of the rights, franchises and liberties of the Gallican Church This body of doctrine rested chiefly on three principles: firstly, that the temporal power was absolutely independent of the spiritual power; secondly, that the pope had authority over the clergy of France in temporal matters and matters of discipline only by the consent of the king; thirdly, that the king had authority over and could legislate for the Gallican Church in temporal matters and matters of discipline. The old public law provided a safeguard against the violation of these

rules in the process known as the *appel comme d'abus*, definitely established during the 16th century. It was heard before the *parlements*, but could, like every other case, be evoked before the royal council. Its effect was to annul any act of the ecclesiastical authority due to abuse or contrary to French law. The Pragmatic Sanction had been abrogated and replaced by the Concordat of 1515, which remained in force until suppressed by the Constituent Assembly, and preserved many of the enactments of the Pragmatic Sanction, notably those which protected the collation of the inferior benefices from the encroachments of the papacy. The *parlement* of Paris was unwilling to register the Concordat, but the crown easily overcame its resistance.

In the 16th century also, contributions to the public services drawn from the immense possessions of the clergy were regularized Since the second half of the 12th century at least, the kings had in times of urgent need asked for subsidies from the church, and ever since the Saladin tithe of Philip Augustus this contribution had assumed the form of a tithe Such tithes were fairly frequently granted by the clergy of France. After the conclusion of the Concordat, Leo X granted the king a tithe (*décime*) under the pretext of a projected war against the Turks The concession was several times renewed, until, by force of custom, the levying of these tithes became permanent But in the middle of the 16th century the system changed The crown was heavily in debt, and its needs had increased The property of the clergy having been threatened by the States General of 1560 and 1561, the king proposed to them to remit the bulk of the tithes and other dues, in return for the payment by them of a sum equivalent to the proceeds of the taxes which he had mortgaged A formal contract to this effect was concluded at Poissy in 1561 between the king and the clergy of France In 1580 a new assembly of the clergy renewed the agreement, which was henceforward always renewed every ten years Thus every ten years a great elective assembly of the clergy became necessary There were two stages in the election, a preliminary one in the dioceses and a further election in the ecclesiastical provinces, each province sending four deputies to the general assembly, two of the first rank, that is to say, chosen from the episcopate, and two of the second rank, which included all the other clergy The *dons gratuits* (benevolences) voted by the assembly comprised a fixed sum equivalent to the old tithes together with supplementary sums levied for some particular occasion The church, on her side, profited by this arrangement in order to obtain the commutation or redemption of the taxes affecting ecclesiastics considered as individuals This settlement only applied to the "clergy of France," that is to say, to the clergy of those districts which were united to the crown before the end of the 16th century. The provinces annexed later, called *pays étrangers*, or *pays conquis*, had in this matter, as in many others, an arrangement of their own

At the end of the 16th century a reasonable balance had been established among the Christians of France The Edict of Nantes, in 1598, granted the Protestants full civil rights, liberty of conscience and public worship in many places, and notably in all the royal *bailliages* The Catholics, whose religion was essentially a state religion, had never accepted this arrangement as final, and at last, in 1685, under Louis XIV, the Edict of Nantes was revoked and the Protestant pastors expelled from France Their followers were forbidden to leave the country, but many succeeded nevertheless in escaping abroad The position of those who remained behind was peculiar Laws passed in 1715 and 1724 established the legal theory that there were no longer any Protestants in France, but only *vieux catholiques* and *nouveaux convertis* The result was that henceforth they had no longer any regular civil status, the registers containing the lists of Catholics enjoying civil rights being kept by the Catholic clergy

The form of government established under Louis XIV was preserved without any fundamental modification under Louis XV. The *parlements* had regained their ancient rights in consequence of the *parlement* of Paris having, in 1715, set aside the will of Louis XIV as being contrary to the fundamental laws of the kingdom, in that it laid down rules for the composition of the council of regency, and limited the power of the regent This newly revived power they exercised freely, and all the more so since they were the last surviving check on the royal authority. They became at this period the avowed representatives of the nation; they contested the validity of the registration of laws in the *lits de justice*, asserting that laws could only be made obligatory when the registration had been freely endorsed by themselves. Before the registration of edicts concerning taxation they demanded a statement of the financial situation and the right of examining the accounts. Finally, by the theory of the *classes*, which considered the various *parlements* of France as parts of one and the same body, they established among them a political union. These pretensions the crown refused to recognize. Louis XV. solemnly condemned them in a *lit de justice* of Dec. 1770, and in 1771 the chancellor Maupeou took drastic measures against them The magistrates of the *parlement* of Paris were removed, and a new *parlement* was constituted, including the members of the *grand conseil*, which had also been abolished. The *cour des aides* of Paris, which had made common cause with the *parlement*, was also suppressed and many of the provincial *parlements* were reorganized These actions, the *coup d'état* of the chancellor Maupeou, as they were called, produced an immense sensation. The repeated conflicts of the reign of Louis XV had already given rise to a whole literature in which the rights of the crown were discussed At the same time the political philosophy of the 18th century was disseminating new principles, and especially those of the supremacy of the people Thus men's minds were being prepared for the Revolution

The Army.—The permanent army was developed and organized during the *ancien régime* The *gendarmerie* or heavy cavalry was continuously increased in numbers On the other hand, the *francs archers* fell into disuse after Louis XI ; and, after a fruitless attempt had been made under Francis I to establish a national infantry, a system of voluntary enlistment was introduced The system of purchase underlay the whole military organization Each regiment was the property of a great lord, the captain was, so to speak, owner of his company, or rather a contractor, who, in return for the sums paid him by the king, recruited his men and gave them their uniforms, arms and equipment In the second half of the reign of Louis XIV appeared the militia (*milices*). To this force each parish had to furnish one recruit The militia was very rarely raised from the towns The purpose for which these men were employed varied from time to time Sometimes, as under Louis XIV., they were formed into special active regiments Under Louis XV and Louis XVI they were formed into *régiments provinciaux*, which constituted an organized reserve But their chief use was during the war, when they were individually incorporated into various regiments to fill up the gaps.

Under Louis XV , the duc de Choiseul suppressed what he called the "farming of companies" (*compagnie-ferme*), recruiting became a function of the State, and voluntary enlistment a contract between the recruit and the State Arms, uniform and equipment were furnished by the king Choiseul also equalized the numbers of the military units, and his reforms, together with a few others effected under Louis XVI , produced the army which fought the first campaigns of the Revolution

Taxation.—One of the most distinctive features of the *ancien régime* was excessive taxation The taxes imposed by the king were numerous, and, moreover, hardly any of them fell on all parts of the kingdom To this territorial inequality was added the inequality arising from privilege Ecclesiastics, nobles and many of the crown officials were exempted from the heaviest imposts In the 17th and 18th centuries certain important new taxes were established. between 1695 and 1698 the *capitation*, and in 1710 the tax of the *dixième*, which became under Louis XV. the tax of the *vingtièmes* These two imposts had been intended to affect every subject in proportion to his income; but so strong was the system of privilege, that as a matter of fact the chief burden fell upon the roturiers The income of a roturier who was not exempt was thus subject in turn to three direct imposts: the *taille*, the *capitation* and the *vingtièmes*, and the apportioning or assessment of these was extremely arbitrary In addition to indirect taxation strictly so called, France under the *ancien régime* was subject to

the *traites*, or customs, which were not only levied at the frontiers on foreign trade, but also included many internal custom-houses for trade between different provinces Their origin was generally due to historical reasons, thus, among the *provinces reputées étrangères* were those which in the 14th had refused to pay the aids for the ransom of King John, also certain provinces which had refused to allow customs offices to be established on their foreign frontier. Colbert had tried to abolish these internal duties, but had only succeeded to a limited extent

The indirect taxes, the *traites* and the revenues of the royal domain were farmed out by the crown At first a separate contract had been made for each impost in each *élection*, but later they were combined into larger blocks, as is shown by the name of one of the customs districts, *l'enceinte des cinq grosses fermes*. From the reign of Henry IV on the levying of each indirect impost was farmed *en bloc* for the whole kingdom, a system known as the *fermes générales*, but the real *ferme générale*, including all the imposts and revenues which were farmed in the whole of France, was only established under Colbert The *ferme générale* was a powerful company, employing a vast number of men, most of whom enjoyed various privileges Besides the royal taxes, seigniorial imposts survived under the form of tolls and market dues The lords also often possessed local monopolies, *e g*, the right of the common bakehouse (*four banal*), which were called the *banalités*

Ecclesiastical Courts.—The organization of the royal courts of justice underwent but few modifications during the *ancien régime* The ecclesiastical jurisdictions survived to the end, but with diminished scope A series of ingenious legal theories had gradually deprived them of most of the cases which they had formerly entertained In the 18th century civil suits in which the clergy were defendants were normally taken before secular tribunals, and ever since the first half of the 17th century, for all grave offences, the royal judge could pronounce a sentence of corporal punishment on a guilty cleric without this necessitating his previous degradation The inquiry into the case was, it is true, conducted jointly by the royal and the ecclesiastical judge, but each of them pronounced his sentence independently All cases concerning benefices came before the royal judges Finally, the *officialités* only possessed a very limited jurisdiction over laymen, even in the matter of marriage The parish priests, however, continued to enter declarations of baptisms, marriages and burials in registers kept according to the civil laws

The "Customs."—The general customs of the *pays coutumiers* were almost all officially recorded in the 16th century Drafts were prepared by the officials of the royal courts in the chief town of the district in which the particular customs were valid, and were then submitted to the Government The king then appointed commissioners to visit the district and promulgate the customs on the spot For the purpose of this *publication* the lords, lay and ecclesiastical, of the district, with representatives of the towns and of various bodies of the inhabitants, were summoned for a given day to the chief town In this assembly each article was read, discussed and put to the vote Those which were approved by the majority were thereupon decreed (*décrétés*) by the commissioners in the king's name, those which gave rise to difficulties were put aside for the *parlement* to settle when it registered the *coutume*. The *coutumes* in this form became practically written law; henceforward their text could only be modified by a formal revision carried out according to the same procedure as the first version.

Legislation by *ordonnances, édits, déclarations* or *lettres patentes*, emanating from the king, became more and more frequent; but the character of the *grandes ordonnances*, which were of a far-reaching and comprehensive nature, underwent a change during this period. In the 14th, 15th and 16th centuries they had been mainly *ordonnances de réformation* (*i.e*, revising previous laws), which were most frequently drawn up after a sitting of the States General, in accordance with the suggestions submitted by the deputies. The last of this type was the ordinance of 1629, promulgated after the States General of 1614 and the assemblies of notables which had followed it. In the 17th and 18th centuries they became essentially *codifications*, comprising a systematic and detailed statement of the whole branch of law. There are two of these series of codifying ordinances. the first under Louis XIV, inspired by Colbert and carried out under his direction The chief ordinances of this group are that of 1667 on civil procedure, that of 1670 on the examination of criminal cases, that of 1673 on the commerce of merchants, and that of 1681 on the regulation of shipping, which form between them a complete code of commerce by land and sea The second series of codifications was made under Louis XV., through the action of the chancellor d'Aguesseau Its chief result was the regulation, by the ordinances of 1731, 1735 and 1747, of deeds of gift between living persons, wills, and property left in trust Under Louis XVI some mitigation was made of the criminal law, notably the abolition of torture

The system of land tenure which prevailed in the 18th century preserved many features which descended from the feudal régime The fief, although it still implied homage from the vassal, no longer involved any service on his part (excepting that of the *arrière-ban* due to the king); but when a fief changed hands the lord still exacted his *profits* Tenures held by *roturiers* were generally subject to periodical and fixed contributions for the profit of the lord Serfdom had disappeared from most of the provinces of the kingdom, among all the *coutumes* which were officially codified, not more than ten or so still recognized this institution An edict of Louis XVI of 1779 abolished serfdom on crown lands, and mitigated the condition of the serfs who still existed on the domains of individual lords

THE REVOLUTION

The Revolution entirely abolished the *ancien régime*, and with it whatever remained either of serfdom or of feudal privilege The Legislative Assembly declared the abolishment, without indemnity, of all feudal rights for which the original deed of concession could not be produced The Convention entirely abolished all feudal rights, though it maintained, subject to redemption, those tenures and charges which were solely connected with landed property and not feudal The Constituent Assembly suppressed nobility, and forbade any one to bear its titles, emblems and arms

Administrative Reorganization.—The Constituent Assembly gave to France a new administrative division, into departments, districts, cantons and communes; and this division, which was intended to make the old provincial distinctions disappear, had to serve all purposes, the department being the unit for all public services Apart from certain changes in detail, this settlement was definitive and exists to the present day But there was a peculiar administrative organism depending on this arrangement The constitution of 1791, it is true, made the king the titulary head of the executive power; but the internal administration of the kingdom was not actually in his hands It was deputed, under his orders, to bodies elected in each department, district and commune The municipal bodies were directly elected by citizens duly qualified; other bodies were chosen by the method of double election. Each body consisted of two parts a council, for deliberative purposes, and a *bureau* or *directoire* chosen by the council from among its numbers to form the executive These were the only instruments for the general administration and for that of the direct taxes The king could, it is true, annul the illegal acts of these bodies, but not dismiss their members, he could merely suspend them from exercising their functions, but the matter then went before the Legislative Assembly, which could maintain or remit the suspension as it thought fit The king had not a single agent chosen by himself for general administrative purposes. This was a reaction, though a very exaggerated one, against the excessive centralization of the *ancien régime*, and resulted in an absolute administrative anarchy. The organization of the revolutionary Government partly restored the central authority; the councils of the departments were suppressed; the Committee of Public Safety and the "representatives of the people on mission" were able to remove and replace the members of the elected bodies; and also, by an ingenious arrangement, national agents were established in the districts The constitution of the year III. continued on these lines, simplifying the organization established by the Constituent Assembly, while

maintaining its principle The department had an administration of five members, elected as in the past, but having executive as well as deliberative functions The district was suppressed The communes retained only a municipal agent elected by themselves, and the actual municipal body, the importance of which was considerably increased, was removed to the canton, and consisted of the municipal agents from each commune, and a president elected by the duly qualified citizens of the canton The Directory was represented in each departmental and communal administration by a commissary appointed and removable by itself, and could dismiss the members of these administrations

Judicial System.—The Constituent Assembly decided on the complete reorganization of the administration of justice This was accomplished on a very simple plan, which realized that ideal of the two degrees of justice which, as we have noticed, was that of France under the *ancien régime* In the lower degrees it created in each canton a justice of the peace (*juge de paix*), the idea and name of which were borrowed from England, but which differed very much from the English justice of the peace He judged, both with and without appeal, civil cases of small importance, and, in cases which did not come within his competency, it was his duty to try to reconcile the parties In each district was established a civil court composed of five judges This completed the judicial organization, except for the court of cassation, which had functions peculiar to itself, never judging the facts of the case but only the application of the law For cases coming under the district court, the Assembly had preserved the right of appeal in cases involving sums above a certain figure With regard to criminal prosecutions, there was in each department a court which judged crimes with the assistance of a jury, it consisted of judges borrowed from district courts, and had its own president and public prosecutor Correctional tribunals, composed of *juges de paix*, dealt with misdemeanours The Assembly preserved the commercial courts, or consular jurisdictions, of the *ancien régime* There was a court of cassation, the purpose of which was to preserve the unity of jurisprudence in France, it dealt with matters of law and not of fact, considering appeals based on the violation of law, whether in point of matter or of form, and if such violation were proved, sending the matter before another tribunal of the same rank for re-trial All judges were elected for a term of years The Constituent Assembly required proof of professional qualifications from all judges except the *juges de paix* But the system was really the same as that of the administrative organization The king appointed the *commissaires du roi* attached to the district courts, criminal tribunals and the court of cassation, but could not revoke an appointment once made The Convention did not change this general organization, but it suppressed the professional guarantees required in the case of candidates for a judgeship, so that henceforth all citizens were eligible; and it also caused new elections to take place Moreover, the Convention not infrequently removed and replaced judges without further election The constitution of the year III preserved this system, but introduced one considerable modification It suppressed the district courts, and in their place created in each department a civil tribunal consisting of 20 judges The idea was a happy one, for it gave the courts more importance, and therefore more weight and dignity

The Army.—The Constituent Assembly suppressed the militia and maintained the standing army, essentially according to the old type. The Assembly proclaimed, however, the principle of compulsory and personal service, under the particular form of the National Guard, to which all qualified citizens belonged, and in which almost all ranks were conferred by election This was an institution which, with many successive modifications, and after various long periods of inactivity followed by a revival, lasted more than three-quarters of a century, and was not suppressed till 1871 For purposes of war the Convention, in addition to voluntary enlistments and the resources furnished by the National Guard, and apart from the forced levy of 200,000 men in 1793, decided on the expedient of calling upon the communes to furnish men, a course which revived the principle of the old militia But the Directory drew up an important military law, that of the 6th Fructidor of the year VI , which established compulsory military service for all, under a strict form of conscription. Thus, Frenchmen aged from 20 to 25 (*défenseurs conscrits*) were divided into five classes, each including the men born in the same year, and were liable until they were 25 years old to be called up for active service, the whole period of service not exceeding four years No class was called upon until the younger classes had been exhausted, and the sending of substitutes was forbidden This law, with a few later modifications, provided for the French armies up to the end of the empire

Taxation.—The Constituent Assembly abolished nearly all the taxes of the *ancien régime* except the stamp duty and that on the registration of acts (the old *contrôle* and *centième denier*) The customs were maintained only at the frontiers for foreign trade In the establishment of new taxes the Assembly did away with indirect taxation on objects of consumption, and made the principal direct tax the tax on land Next in importance were the *contribution personnelle et mobilière* and the *patentes,* which, though considerably modified later, are still essentially the basis of the French system of direct taxation Under the Directory there was a partial reappearance of indirect taxation in the *octrois* of the towns, which had been suppressed by the Constituent Assembly

Religious Liberty.—The Constituent Assembly gave the Protestants liberty of worship and full rights, it also gave Jews the status of citizen, and political rights With regard to the Catholic Church, the Assembly placed at the disposal of the nation the property of the clergy, which had already, in the course of the 18th century, been regarded by most political writers as a national possession, at the same time it provided for salaries for the members of the clergy and pensions for those who had been monks It abolished tithes and the religious orders, and forbade the re-formation of the latter in the future The ecclesiastical districts were next reorganized, the department being always taken as the chief unit, and a new church was organized by the civil constitution of the clergy, the bishops being elected by the electoral assembly of the department, and the curés by the electoral assembly of the district This was an unfortunate piece of legislation, inspired partly by the old Gallican spirit, partly by the theories on civil religion of J J Rousseau and his school, and, together with the civic oath imposed on the clergy, it was a source of endless troubles The constitutional church established in this way was, however, abolished as a state institution by the Convention By laws of the years III and IV the Convention and the Directory, in proclaiming the liberty of worship, declared that the republic neither endowed nor recognized any form of worship

Civic and Criminal Law.—The Assemblies of the Revolution, besides the laws which, by abolishing feudalism, altered the character of real property, passed many others concerning civil law The most important are those of 1792, passed by the Legislative Assembly, which organized the registers of the *état civil* kept by the municipalities, and laid down rules for marriage as a purely civil contract Divorce was admitted to a practically unlimited extent, it was possible not only for causes determined by law, and by mutual consent, but also for incompatibility of temper and character proved, by either husband or wife, to be of a persistent nature Next came the laws of the Convention as to inheritance, imposing perfect equality among the natural heirs and endeavouring to ensure the division of properties Illegitimate children were considered by these laws as on the same level with legitimate children In criminal law their work was still more important In 1791 the Constituent Assembly gave France her first penal code It was inspired by humanitarian ideas, still admitting capital punishment, though accompanied by no cruelty in the execution; but none of the remaining punishments was for life Long imprisonment with hard labour was introduced Finally, as a reaction against the former system of arbitrary penalties, there came a system of fixed penalties determined, both as to its assessment and its nature, for each offence, which the judge could not modify The Constituent Assembly also reformed the procedure of criminal trials, and taking English law as model, introduced the jury, with the double form of *jury d'accusation* and *jury de jugement.*

THE CONSULATE AND THE EMPIRE

The constitutional changes of the consulate and Empire, though all, either in their full text or in principle, were submitted to popular vote by means of a *plébiscite,* had all the same object: to assure absolute power to Napoleon, while preserving the forms and appearance of liberty. Popular suffrage became universal; but the citizens in effect merely nominated the candidates, and it was the senate which chose from among them the members of the various so-called elected bodies, even those of the political assemblies According to the constitution of the year VIII , the first consul possessed the executive power in the widest sense of the word, and he alone could initiate legislation There were three representative assemblies in existence, but one of them, the *corps législatif,* passed laws without discussing them, and without the power of amending the suggestions of the Government The tribunate, on the contrary, discussed them, but its vote was not necessary for the passing of the law The senate was the guardian and preserver of the constitution, its chief function was to annul laws and acts submitted to it by the tribunate as being unconstitutional This original organization was naturally modified during the course of the consulate and the empire; and a whole body, the tribunate, which was the only one which could preserve some independence, disappeared, without resort to a plebiscite. The importance of another body, on the contrary, the *conseil d'état,* which consisted of members appointed by Napoleon, continually increased It was this body which really prepared and discussed the laws, and it was its members who advocated them before the *corps législatif,* to which the tribunate also sent orators to speak on its behalf The ministers, who had no relation with the legislative power, were merely the agents of the head of the state, freely chosen by himself Napoleon, however, found these powers insufficient, and arrogated to himself others, a fact which the senate did not forget when it proclaimed his downfall. Thus he frequently declared war upon his own authority, in spite of the provisions to the contrary made by the constitution of the year VIII , and similarly, under the form of *décrets,* made what were really laws. They were afterwards called *décrets-lois,* and those that were not indissolubly associated with the political régime of the Empire, and survived it, were subsequently declared valid by the court of cassation, on the ground that they had not been submitted to the senate as unconstitutional, as had been provided by the constitution of the year VIII

Administrative Changes.—This period saw the rise of a whole new series of great organic laws For administrative organization, the most important was that of the 28th Pluviôse in the year VIII It established as chief authority for each department a prefect, and side by side with him a *conseil général* for deliberative purposes; for each *arrondissement* (corresponding to the old *district*) a sub-prefect (*sous-préfet*) and a *conseil d'arrondissement;* and for each *commune,* a mayor and a municipal council But all these officials, both the members of the councils and the individual agents, were appointed by the head of the state or by the prefect, so that centralization was restored more completely than ever Together with the prefect there was also established a *conseil de préfecture,* having administrative functions, and generally acting as a court of the first instance in disputes and litigation arising out of the acts of the administration; for the Constituent Assembly had removed such cases from the jurisdiction of the civil tribunals, and referred them to the administrative bodies themselves The final appeal in these disputes was to the *conseil d'état,* which was supreme judge in these matters In 1807 was created another great administrative jurisdiction, the *cour des comptes,* after the pattern of that which had existed under the *ancien régime*

Judicial Changes.—Judicial organization had also been fundamentally altered The system of election was preserved for a time in the case of the *juges de paix* and the members of the court of cassation, but finally disappeared there, even where it had already been no more than a form The magistrates were in principle appointed for life, but under the empire a device was found for evading the rule of irremovability For the judgment of civil cases there was a court of first instance in every *arrondissement,* and above these a certain number of courts of appeal, each of which had within its province several departments. The separate criminal tribunals and the *jury d'accusation* were abolished in 1809 by the *Code d'Instruction Criminelle,* and the right of pronouncing the indictment was transferred to a chamber of the court of appeal The correctional tribunals were amalgamated with the civil tribunals of the first instance. The *tribunal de cassation,* which took under the Empire the name of *cour de cassation,* consisted of magistrates appointed for life, and still kept its powers The *ministère public* (consisting of imperial *avocats* and *procureurs*) was restored in practically the same form as under the *ancien régime*

The former system of taxation was preserved in principle, but with one considerable addition: Napoleon re-established indirect taxation on articles of consumption, which had been abolished by the Constituent Assembly, the chief of these were the duties on liquor (*droits réunis,* or excise) and the monopoly of tobacco

The Concordat.—The Concordat concluded by Napoleon with the papacy on the 26th Messidor of the year IX re-established the Catholic religion in France as the form of worship recognized and endowed by the State It was in principle drawn up on the lines of that of 1516, and assured to the head of the French State in his dealings with the papacy the same prerogatives as had formerly been enjoyed by the kings; the chief of these was that he appointed the bishops, who afterwards had to ask the pope for canonical institution The territorial distribution of dioceses was preserved practically as it had been left by the civil constitution of the clergy The State guaranteed the payment of salaries to bishops and curés, and the pope agreed to renounce all claims referring to the appropriation of the goods of the clergy made by the Constituent Assembly Later on, a decree restored to the *fabriques* (vestries) such of their former possessions as had not been alienated, and the churches which had not been alienated were restored for the purposes of worship The law of the 18th Germinal in the year X , ratifying the Concordat, reasserted, under the name of *articles organiques du culte catholique,* all the main principles contained in the old doctrine of the liberties of the Gallican Church The Concordat did not include the restoration of the religious orders and congregations, Napoleon sanctioned by decrees only a few establishments of this kind

The University.—One important creation of the Empire was the university The *ancien régime* had had its universities for purposes of instruction and for the conferring of degrees, it had also, though without any definite organization, such secondary schools as the towns admitted within their walls, and the primary schools of the parishes The Revolution suppressed the universities and the teaching congregations The constitution of the year III proclaimed the liberty of instruction and commanded that public schools, both elementary and secondary, should be established Under the Directory there was in each department an *école centrale,* in which all branches of human knowledge were taught Napoleon, developing ideas which had been started in the second half of the 18th century, founded by laws and decrees of 1806, 1808 and 1811 the Université de France, which provided and organized higher, secondary and primary education; this was to be the monopoly of the state, carried on by its *facultés, lycées* and primary schools No private educational establishment could be opened without the authorization of the State

The Codes.—But chief among the documents dating from this period are the codes, which still give laws to France These are the Civil Code of 1804, the *Code de Procédure Civile* of 1806, the *Code de Commerce* of 1807, the *Code d'Instruction Criminelle* of 1809, and the *Code Pénal* of 1810 These monumental works, in the elaboration of which the *conseil d'état* took the chief part, contributed, to a greater or less extent, towards the fusion of the old law of France with the laws of the Revolution. It was in the case of the *Code Civil* that this task presented the greatest difficulty (*see* CODE NAPOLÉON). The *Code de Commerce* was scarcely more than a revised and emended edition of the *ordonnances* of 1673 and 1681; while the *Code de Procédure Civile* borrowed its chief elements from the *ordonnance* of 1667 In the case of the *Code d'Instruction Criminelle* a distinctly new departure was

made; the procedure introduced by the Revolution into courts where judgment was given remained public and oral, with full liberty of defence, the preliminary procedure, however, before the examining court (*juge d'instruction* or *chambre des mises en accusation*) was borrowed from the *ordonnance* of 1670; it was the procedure of the old law, without its cruelty, but secret and written, and generally not in the presence of both parties The *Code Pénal* maintained the principles of the Revolution, but increased the penalties It substituted for the system of fixed penalties, in cases of temporary punishment, a maximum and a minimum, between the limits of which judges could assess the amount Even in the case of misdemeanours, it admitted the system of extenuating circumstances, which allowed them still further to decrease and alter the penalty in so far as the offence was mitigated by such circumstances (*See* further under NAPOLEON I)

THE RESTORED MONARCHY

The Restoration and the Monarchy of July, though separated by a revolution, form one period in the history of French institutions It was a period of constitutional monarchy, with a parliamentary body consisting of two chambers, a system imitated from England The revolution of 1830 took place in defence of the charter granted by Louis XVIII in 1814, which Charles X had violated by the *ordonnances* of July The two chambers then acquired the initiative in legislation, which had not been recognized as theirs under the Restoration, but from this time on belonged to them equally with the king The sittings of the house of peers were henceforth held in public, but this chamber underwent another and more fundamental transformation The peers were nominated by the king, with no limit of numbers, and according to the charter of 1814 their appointment could be either for life or hereditary Under Louis XVIII, during the Restoration they were always appointed under the latter condition, but under the July Monarchy their tenure of office was for life, and the king had to choose them from among 22 classes of notables fixed by law The franchise for the election of the chamber of deputies had been limited by a system of money qualifications, but while, under the Restoration, it had been necessary, in order to be an elector, to pay 300 francs in direct taxation, this sum was reduced in 1831 to 200 francs, while in certain cases even a smaller amount sufficed In order to be elected as a deputy it was necessary, according to the charter of 1814, to pay 1,000 francs in direct taxation, and according to that of 1830, 500 francs From 1817 onwards there was direct suffrage, the electors directly electing the deputies The idea of those who had framed the charter of 1814 had been to give the chief influence to the great landed proprietors, in 1830 the chief aim had been to give a preponderating influence to the middle and lower middle classes

In another respect also the Restoration and the July Monarchy were at one, viz in maintaining in principle the civil, legal and administrative institutions of the empire The preface to the charter of 1814 sanctioned and guaranteed most of the legal rights won by the Revolution, even the alienation of national property was confirmed Judicial and administrative organization, the system of taxation, military organization, the relations of church and state, remained the same, and the university also continued to exist. The Government did, it is true, negotiate a new concordat with the papacy in 1817, but did not dare even to submit it to the chambers The most important reform was that of the law concerning recruiting for the army The charter of 1814 had promised the abolition of conscription, in the form in which it had been created by the law of the year VI The law of March 10, 1818, established a new system The contingent voted by the chambers for annual incorporation into the standing army was divided up among all the cantons, and, in order to furnish it, lots were drawn among all the men of a certain class, that is to say, among the young Frenchmen who arrived at their majority that year Those who were not chosen by lot were definitely set free from military service. The sending of substitutes, a custom which had been permitted by Napoleon, was recognized This was the type of all the laws on recruiting in France up to 1867.

The Restoration produced a code, the *Code forestier* of 1827, for the regulation of forests (*eaux et forêts*) In 1816 a law had abolished divorce, making marriage indissoluble, as it had been in the old law But the best laws of this period were those on finance Now, for the first time, was introduced the practice of drawing up regular budgets, voted before the year to which they applied, and divided since 1819 into the budget of expenditure and budget of receipts

Together with other institutions of the empire, the Restoration had preserved the exaggerated system of administrative centralization established in the year VIII It was only relaxed under the July Monarchy The municipal law of March 21, 1831, made the municipal councils elective, and extended widely the right of voting in the elections for them, the *maires* and their assistants continued to be appointed by the Government, but had to be chosen from among the members of the municipal councils The law of June 22, 1833, made the general councils of the departments also elective, and brought the *adjonction des capacités* into effect for their election The powers of these bodies were enlarged in 1838, and they gained the right of electing their president In 1833 was granted another liberty, that of primary education, but in spite of violent protestations, coming especially from the Catholics, secondary and higher education continued to be a monopoly of the state A law of June 11, 1842, established the great railway lines In 1832 the *Code Pénal* and *Code d'Instruction Criminelle* were revised, with the object of lightening penalties, the system of extenuating circumstances, as recognized by a jury, was extended to the judgment of all crimes There was also a revision of Book III of the *Code de Commerce,* treating of bankruptcy Finally, from this period date the laws of May 3, 1841, on expropriation for purposes of public utility, and of June 30, 1838, on the treatment of the insane Judicial organization remained substantially unaltered

THE SECOND REPUBLIC

From the point of view of constitutional law, the Second Republic and the Second Empire were each in a certain sense a return to the past The former revived the tradition of the Assemblies of the Revolution, the latter was obviously and avowedly an imitation of the consulate and the First Empire

Republican Constitution of 1848.—The provisional government set up by the revolution of Feb 24, 1848, proclaimed universal suffrage, and by this means was elected a Constituent Assembly, which sat till May 1849, and passed the Republican constitution of Nov 4, 1848 This constitution gave the legislative power to a single permanent assembly, elected by direct universal suffrage, and entirely renewed every three years The executive authority, with very extensive powers, was given to a president of the Republic, also elected by the universal and direct suffrage of the French citizens On the other hand, the president was not immediately eligible for re-election on giving up his office Now Louis Napoleon, who was elected president on Dec 10, 1848, by a huge majority, wished to be re-elected The result was the *coup d'état* of Dec 2, 1851 A detail of some constitutional importance is to be noticed in this period The *conseil d'état,* which had remained under the Restoration and the July Monarchy an administrative council and the supreme arbiter in administrative trials, acquired new importance under the Second Republic The ordinary *conseillers d'état* (*en service ordinaire*) were elected by the Legislative Assembly, and consultation with the *conseil d'état* was often insisted on by the constitution or by law During its short existence the Second Republic produced many important laws. It abolished the penalty of death for political crimes, and suppressed negro slavery in the colonies The election of *conseillers généraux* was thrown open to universal suffrage, and the municipal councils were allowed to elect the *maires* and their colleagues The law of March 15, 1850, established the liberty of secondary education, but it conferred certain privileges on the Catholic clergy, a clear sign of the spirit of social conservatism which was the leading motive for its enactment Certain humanitarian laws were passed, applying to the working classes

Constitution of 1852.—With the *coup d'état* of Dec. 2, 1851,

began a new era of constitutional plebiscites and disguised absolutism The proclamations of Napoleon on Dec 2 contained a criticism of parliamentary government, and formulated the wish to restore to France the constitutional institutions of the consulate and the empire, just as she had preserved their civil, administrative and military institutions Napoleon asked the people for the powers necessary to draw up a constitution on these principles, the plebiscite issued in a vast majority of votes in his favour, and the constitution of Jan 14, 1852, was the result It bore a strong resemblance to the constitution of the First Empire after 1807 The executive power was conferred on Louis Napoleon for ten years, with the title of president of the Republic and very extended powers. Two assemblies were created The conservative senate was charged with the task of opposing the promulgation of unconstitutional laws, and of receiving the petitions of citizens; it had also the duty of providing everything not already provided but necessary for the proper working of the constitution The second assembly was the *corps législatif*, elected by direct universal suffrage for six years, which passed the laws, the Government having the initiative in legislation Its powers were very limited, and it could only discuss and put to the vote amendments approved by the *conseil d'état*, the ministers did not in any way come into contact with it and could not be members of it, being responsible only to the head of the State, and only the senate having the right of accusing them before a high court of justice The *conseil d'état* was composed in the same way and had the same authority as it had possessed from the year VIII to 1814, and it was the members of it who supported projected laws before the corps législatif To this was added a Draconian press legislation; press offences were judged not by a jury but by the correctional tribunals, and political papers could not be founded without an authorization They were subject to a regular administrative discipline and could be warned, suspended or suppressed without a trial, by a simple act of the administration The constitution of Jan 1852 was still Republican in name, though less so than that of the year VIII The period corresponding with the consulate was also shorter in the case of Louis Napoleon The year 1852 had not come to an end before a *senatus consulte*, that of Nov 10, ratified by a plebiscite, re-established the imperial rank in favour of Napoleon III (J P E ; X)

THE SECOND EMPIRE

Numerous legislative reforms were introduced by the Second Empire, aiming at the development of commerce, industry and agriculture, and the material prosperity of the country in general Such were the decrees and laws of 1852 and 1853 relating to land-banks (*établissements de crédit foncier*), that of 1857 on trade-marks, that of 1858 on general stores (*magasins généraux*) and warrants, those of 1863 and 1867 on commercial companies, that of 1865 on cheques and that of 1866 on the mercantile marine Economic treaties were also concluded by the emperor with foreign Powers, the chief of these being concluded with Great Britain on Jan 23, 1860 In another direction, the law of May 25, 1864, recognized for the first time the right of strikes among workmen and employees, while the superannuation fund (*caisses des retraites pour la vieillesse*) created by the law of June 18, 1850, was reorganized and perfected, and a law of July 11, 1868, established, under the guarantee of the State, two funds for voluntary insurance, one in case of death, the other against accidents occurring in industrial or agricultural employment

Criminal law was the subject of important legislation Thus the total loss of civil rights which hitherto accompanied condemnation to imprisonment for life was abolished in 1854, and in the same year transportation to the colonies was substituted for the system of Continental convict prisons The law of July 17, 1856, increased the power of independence of the *juges d'instruction*, and useful improvements were introduced by the laws of 1856 and 1865 as regards precautionary detention and provisional release with or without bail. Finally a general revision of the Code Pénal took place in 1863

In civil legislation may be noted the law of March 23, 1855, on *hypothèques;* that of July 22, 1857, which abolished seizure of the person (*contrainte par corps*) for civil and commercial debts, and finally the law of July 14, 1866, on literary copyright

The system of taxation was hardly modified at all, except for the establishment of a tax on the income from investments (shares and bonds of companies) in 1857, and a tax on carriages (1862) In Feb 1868 an important military law was promulgated which asserted the principle of universal compulsory military service in time of war, but preserved the system of drawing lots to determine the annual contingent to be incorporated in the standing army The term of service was fixed at five years, and it was still permissible to send a substitute Able-bodied men who were not included in the annual contingent formed a reserve force, called the *Garde Nationale Mobile*, which took part in the war of 1870–71

THE THIRD REPUBLIC

The Third Republic had at first a provisional Government set up by the people of Paris But immediately after the capitulation of the capital and in order to treat with Germany, a national assembly was elected in accordance with the electoral law of 1849, which had been revived for the occasion with a few modifications, and met at Bordeaux on Feb 13, 1871 Its majority was frankly monarchist, though divided as to the choice of a monarch, and pending a settlement of this question it ruled the country until 1875, with one man elected by it as head of the executive power Thiers was the first to be elected in 1871, after his fall on May 24, 1873, he was succeeded by Marshall MacMahon, on whom the assembly later conferred, in the month of November following, the position of president of the republic for seven years when the refusal of the Comte de Chambord to accept the tricolor in place of the white flag of the Bourbons had made any attempt to restore the monarchy impossible However, the recognition of the republic by the assembly did not become definitive until Jan 30, 1875, when an amendment was adopted providing for the election of an indefinite succession of presidents of the republic Shortly afterwards, two constitutional laws were passed and promulgated, that of Feb 24, 1875, on the organization of the senate, and that of Feb 25, 1875, on the organization of the public powers In the middle of the year they were supplemented by a third, that of July 16, 1875, on the relations between the public powers

The French Constitution.—Thus was built up the actual constitution of France It differs fundamentally both in form and content from previous constitutions As to its form, instead of a single methodical text divided into an uninterrupted series of articles, it consisted of three distinct laws As to matter, it is obviously a work of an essentially practical nature, the result of compromise and reciprocal concessions It does not lay down any theoretical principles and its provisions confine themselves strictly to what is necessary to ensure the proper working of the Governmental machinery The result is a compromise between Republican principles and the rules of constitutional and parliamentary monarchy

Its composition is as follows The legislative power is given to two elective chambers, the vote of both of which is necessary for legislation, both have the right of initiating and amending laws. One house, the chamber of deputies, is elected by direct universal suffrage and is entirely renewed every four years, the other, the senate, consists of 300 members, whom the law of Feb 27, 1875, divides into two categories. Seventy-five of the senators are elected for life, the senate itself holding elections to fill up the vacancies The 225 remaining senators are elected in each department by an electoral college which includes the deputies, the members of the general council of the department and of the councils of the arrondissements, and one delegate elected by each municipal council, whatever the importance of the commune They are elected for nine years, a third of the house being renewed every three years

The executive power is entrusted to a president elected for seven years by the chamber and the senate combined into a single body under the name of national assembly. He is always eligible for re-election and is independent except in case of high treason His powers are of the widest, including the initiative in legisla-

tion jointly with the two chambers, the appointment to all civil and military offices, the disposition and, if he wish it, the leadership of the armed forces, the right of pardon, the right of negotiating treaties with foreign Powers and in principle of ratifying them on his own authority, the consent of the two chambers being required only in certain cases defined by the constitution But these powers he can only exercise through the medium of a Ministry, politically and jointly responsible to the chambers and forming a council over which the president usually presides The right of dissolving the chamber of deputies before the expiration of its term of office also belongs to him, but in order to do so he must have, besides a Ministry which will take the responsibility for it, the preliminary sanction of the senate The senate is at the same time a high court of justice which can judge the president of the republic and ministers accused of crimes committed in the exercise of their functions In 1884 the 75 senators for life were suppressed for the future by a process of extinction, their seats being divided amongst the most populous departments, and on Aug 14 of the same year a law was passed declaring that no proposition for a revision of the constitution could be accepted which aimed at changing the republican form of Government Since 1871 the mode of election of the chamber of deputies, which was not fixed by the constitution, has oscillated between the *scrutin de liste* for the departments and the *scrutin uninominal* for the arrondissements The latter system was established by the organic law of Nov 30, 1875, superseded in 1885 by the *scrutin de liste*, it was restored in 1889 The law of July 12, 1919, re-established the *scrutin de liste* combined with proportional representation, but the old system of *scrutin d'arrondissement* was finally reverted to in view of the elections of 1928

Reforms Under the Third Republic.—The legislative reforms carried out under the Third Republic are very numerous As to public law, it is only possible to mention here those of a really organic character, chief among which are those which safeguard and regulate the freedom of the individual The law of June 30 modified by that of March 28, 1907, established the right of holding public meetings, whether for ordinary or electoral purposes, without preliminary authorization; they must not be held, however, in the public highway, but in an enclosed space The law of July 29, 1881, on the press, as subsequently modified in 1882, 1889, 1895, 1908 and 1919, is one of the most liberal in the world by it, all offences committed by any kind of publication are submitted to a jury, and only slander, libel, defamation, incitement to crime, and in certain cases the publication of false news, are punished The law of July 1, 1901, established the right of forming associations, the objects of which are not contrary to law or to public order or morality On the condition of a simple declaration to the administrative authority, it grants them a civil status in a wide sense of the term Religious congregations on the contrary, which are not authorized by a law, are forbidden by this law

A law passed in 1875 by the national assembly established the liberty of higher education that of primary education was confirmed and reorganized by the law of Oct 30, 1886, which simply deprived the clergy of the privileges granted them by the law of 1850, though the latter remains in force with regard to the liberty of secondary education The law of March 22, 1882, made primary education obligatory, though it allowed parents to send their children either to private schools or to those of the State; the law of June 16, 1881, established secular (*laique*) education in the case of the latter Secondary education was also organized for girls in lycées or special colleges (*collèges de filles*) Finally, a law of July 10, 1896, dealing with higher education and the faculties of the State, reorganized the universities, which form distinct bodies, enjoying a fairly wide autonomy

A law of Dec 19, 1905, abrogating that of the 18th Germinal in the year X, which had sanctioned the Concordat, proclaimed the separation of the church from the State. It is based on the principle of the secular State (*état laique*) which recognizes no form of religion, though it respects the right of every citizen to worship according to his beliefs, and it aimed at organizing associations of citizens, the object of which was to collect the funds and acquire the property necessary for the maintenance of worship, under the form of *associations cultuelles*, differing in certain respects from the associations sanctioned by the law of July 1, 1901, but having a wider scope. It also handed over to these regularly formed associations the property of the ecclesiastical establishments formerly in existence, while taking precautions to ensure their proper application, and allowed the associations the free use of the churches and places of worship belonging to the State, the departments or the communes If no *association cultuelle* was founded in a parish, the property of the former *fabrique* should devolve to the commune But this law was condemned by the papacy, as contrary to the church hierarchy; and almost nowhere were *associations cultuelles* formed, except by Protestants and Jews, who complied with the law After many incidents, but no church having been closed, a new law of Jan. 2, 1907, was enacted It permits the public exercise of any cult, by means of ordinary associations regulated by the law of July 1, 1901, and even of public meetings summoned by individuals Failing all associations, either cultuelles or others, churches, with their ornaments and furniture, are left to the disposition of the faithful and ministers, for the purpose of exercising the cult, and, on certain conditions, the long-use of them can be granted as a free gift to ministers of the cult

Among the organic laws concerning administrative affairs, there are two of primary importance, that of Aug. 10, 1871, on the *conseils généraux* considerably increased the powers and independence of these elective bodies, which have become important deliberative assemblies The law of 1871 also created a new administrative organ for the departments, the *commission départementale* elected by the *conseil général* of the department and associated with the administration of the prefect The other law is the municipal law of April 5, 1884, which effected a widespread decentralization, the *maires* and their adjoints are elected by the municipal council

Reorganization of the Army.—The war of 1870–71 had necessarily led to a modification of the military organization The law of July 25, 1872, established the principle of compulsory service for all, first in the standing army, the period in which was fixed at five years, then in the reserve and finally in the territorial army. But the application of this principle was by no means absolute, and only held good in time of war, the former exemptions still being allowed in time of peace Moreover the system of conditional engagement for a year allowed young men for the purposes of study or apprenticeship to their professions to serve only a year with the active army in time of peace A new law of July 15, 1889, reduced the term of service in the active army to three years, and the exemptions which were still preserved merely reduced the period to a year in time of peace The same reduction was also granted to those who were pursuing important scientific, technical or professional studies. Later, the law of March 21, 1905, reduced the term of service in the active army to two years but made it equal for all, admitting of no exemption, but only certain facilities as to the age at which it had to be accomplished In 1913, as an answer to the extensive armaments carried out by the German Government, the chamber voted the return to the former term of service of three years which was just being put into force when the War broke out After the War, the law of April 1, 1923, reduced the term in the active army to one year and a half, and a law of July 14, 1927, completely reorganized the army for time of peace and for time of war

In 1883 the judicial personnel was reorganized and reduced in number, and except for a few modifications the main lines of judicial organization remained the same until the law of Sept. 3, 1926, which, for purposes of economy, suppressed the *tribunaux d'arrondissements*, and replaced them by departmental tribunals

The system of taxation remained practically unaltered until the War, with the exception of the financial law of 1901 which re-arranged and increased the transfer fees and established a system of progressive taxation. A law of July 15, 1914, created income-tax; after the War, a tax on turnover and a tax on commercial and industrial profits were also imposed, whilst the rate

of the taxes themselves and stamp duties were increased all round. Owing to the rapid growth of fiscal legislation it was felt necessary to codify the various texts, which was done through a decree of Dec 28, 1926.

Labour Legislation.—The labour laws, which generally partook of the nature both of public and private law, are a sign of our times. Under the Third Republic they have been numerous, the most notable being the law of March 21, 1884, on professional syndicates, which introduced the liberty of association in matters of this kind before it became part of the common law (*see* TRADE UNIONS); the law of Dec 22, 1892, on conciliation and arbitration in the case of collective disputes between employers and workmen; that of June 29, 1893, on the hygiene and safeguarding of workers in industrial establishments, and the laws which regulate the work of children and women in factories; that of July 15, 1893, on free medical attendance, and that of April 9, 1898, on the liability for accidents incurred during work, with those which have completed it On Dec 30, 1910, a *Code du Travail et de la Prévoyance Sociale* was promulgated, codifying the previous legislation, dealing particularly with contracts for work, imposing special rules and regulations as to conditions of work, Sunday rest, precautions to be taken for the safety of workmen, industrial diseases, etc, and creating work inspectors A law of June 21, 1924, added a new part to this code, organizing special courts of law, called *conseils prud 'hommes,* before which disputes between employers and workmen have to be taken

As to criminal law there have been more than 50 enactments mostly involving important modifications due to more scientific ideas of punishment, so that we may say that it has been almost entirely recast since the establishment of the Third Republic. The chief results of this legislation were the separate system applied in cases of preventive detention and imprisonment for short periods; liberation before the expiry of the term of sentence, subject to the condition that no fresh offence shall be committed within a given time, transportation to the colonies of habitual offenders, remission of the penalty in the case of first offenders; greater facilities for the rehabilitation of condemned persons Finally the law of Dec 8, 1897, made the examination before the *juge d'instruction* a real hearing on both sides, and the appearance of counsel for the defence practically compulsory

Private Law.—As to private law, both civil and commercial, hundreds of laws have been passed between 1871 and 1928 modifying it, sometimes profoundly Amongst the more important there was the law of July 27, 1884, and those which re-established divorce, prohibited since 1816, but only permitted it for certain definite causes determined by law On the other hand the law of Feb. 6, 1893, increased the liberty and independence of a woman who was simply judicially separated, in order to encourage separation as opposed to divorce, when the conditions allowed it The law of March 25, 1896, on the succession of illegitimate children who were recognized by the parents did not treat them in the same way as legitimate children, but gave them the title of heirs in the succession of their father and mother together with much greater rights than they had hitherto possessed under the Code Civil The law of July 24, 1899, on the protection of children who are ill-treated or morally neglected, also modified some of the provisions of the law as applied to the family, with a view to greater justice and humanity The formalities of marriage were simplified and marriage itself made easier through the laws of June 20, 1896, and July 1, 1914 The law of Dec 30, 1915, made the legitimation of adulterine children possible; that of March 20, 1917, allowed women, who had hitherto been debarred from so doing, to act as guardians of infant children Consent to marriage was facultative by the law of Feb. 28, 1922, and under the law of April 28, 1922, ceased to be required for parties above 25 years of age Finally the law of Aug 10, 1927, codified the various dispositions concerning acquisition and loss of French nationality, and permitted French women marrying foreigners to retain their nationality of origin instead of acquiring as heretofore that of their husbands

In commercial matters the law as to cheques was altered by laws of Dec 30, 1911, and Aug. 12, 1926; a law of July 4, 1914, completed that of July 10, 1885, on maritime mortgage. A law of March 18, 1919, created a commercial registry (*registre du commerce*), reinforcing the existing measures of publicity imposed on traders, and that of Aug. 25, 1919, created the *Office National du Commerce Extérieur* Finally life-insurance companies were regulated and placed under strict supervision on the part of the State (law of March 17, 1905, as modified by that of May 21, 1921). (F AL)

FRENCH LITERATURE. Literature proper began to be cultivated in France, in the vernacular, during the 10th and 11th centuries The earliest writings are *cantilenae,* or songs in the vulgar language (*e g*, on St Eulalia), a *Life of St Leger* and a *Life of St. Alexis* (perhaps about 1050), but the first real monument of French Literature is the *Chanson de Roland,* which remains the greatest achievement of that literature until the Renaissance The *Chanson de Roland* is the masterpiece of a flourishing type of epic poetry, the *chansons de geste,* of which we possess about 100 specimens

Chansons de geste.—These deal with subjects of traditional French history. The line generally used is of ten syllables, and in later poems of 12, there is a regular caesura The lines are arranged in *laisses* or *tirades* of very irregular numbers The earlier poems are assonanced, only the vowel sound of the last syllables being identical Later the poems are rhymed in a regular manner In subject matter there are three chief groups one dealing with Charlemagne, one with Doon of Mayence, one with Garin de Monglane There are other groups, not so numerous, on the Lorrainers, on the crusades, etc

The earliest versions alone of the various poems would amount to over 300,000 lines The successive development of the *chansons de geste* may be illustrated by the fortunes of *Huon de Bordeaux,* one of the most lively, varied and romantic of the older epics, and one which is interesting from the use made of it by Shakespeare, Wieland and Weber In the oldest form now extant, though even this is probably not the original, *Huon* consists of over 10,000 lines A subsequent version contains 11,000 more, and lastly, in the 14th century, a later poet has amplified the legend to the extent of 30,000 lines When this point had been reached *Huon* began to be turned into prose being, with many of its fellows, published and republished during the subsequent centuries, and retaining, in popular forms and garbs, the favour of the country districts and of the school children of France to the present day. But the best period of the *chanson de geste* was the 11th and 12th centuries The *Chanson de Roland* is the earliest we possess and belongs in its present form to the early 12th century Two classes of persons are chiefly associated with the *chansons de geste.* There was the *trouvère* who composed them, and the *jongleur* who carried them about in manuscript or in his memory from castle to castle and sang them intermixing frequent appeals to his audience for silence, declarations of the novelty and the strict copyright character of the *chanson,* revilings of rival minstrels and frequent requests for money in plain words. Not a few of the manuscripts which we now possess appear to have been actually used by the *jongleurs* But the names of the authors are known only in very few cases, the names of copyists, continuators and mere owners of manuscripts having often been mistaken for them

The characters of a *chanson* of the older style are somewhat uniform. There is the hero who is unjustly suspected of guilt or sore beset by Saracens, the heroine who falls in love with him, the traitor who accuses him or delays help There are friendly paladins and the subordinate traitors. There is Charlemagne, in the later *chansons* an incapable and venal dotard, in the earlier still the great emperor; and with Charlemagne the Duke Naimes of Bavaria, invariably wise, brave, loyal and generous In *La Chanson de Roland* the love interest does not appear at all except in the incident of Aude's death when she hears of Roland's fall. Even in the later *chansons* the love interest is very little marked. Fighting, counsels and religion hold the literary field In a few *chansons* appears a very interesting class: the man of low birth or condition who rescues the high born hero from his enemies. Thus Rainvart in *Aliscans,* Gautier in *Gaydon,* Robastre in *Gaufrey,* etc. The subjects are handled with great uniformity and

even monotony of style, with constant repetitions But the verse is generally harmonious and often stately Some passages rise to high poetry The most remarkable of the *chansons* are *Roland, Aliscans, Gérard de Roussillon, Ami et Amile, Raoul de Cambrai, Garin le Loherain, Les Quatre Fils Aymon, Les Saisnes* The series of *le Chevalier au Cygne* deals with the first crusaders, and a remarkable group centres round William of Orange, dealing with the defence of the south of France against Mohammedan invasion

Arthurian Romances.—The second class of early French epics consists of the Arthurian cycle, the *Matière de Bretagne,* the earliest known compositions of which are at least a century junior to the earliest *chanson de geste,* but which soon succeeded the *chansons* in popular favour, and obtained a vogue both wider and far more enduring It is not easy to conceive a greater contrast in form, style, subject and sentiment than is presented by the two classes In both the religious sentiment is prominent, but the religion of the *chansons* is of the simplest, not to say of the most savage character To pray to God and to kill his enemies constitutes the whole duty of man In the romances the mystical element becomes on the contrary prominent, and furnishes, in the Holy Grail, one of the most important features In the Carlovingian knight the courtesy and clemency which we have learnt to associate with chivalry are almost entirely absent The *gentix ber* contradicts, jeers at, and execrates his sovereign and his fellows with the utmost freedom He thinks nothing of striking his *cartoise moullier* so that the blood runs down her *cler vis* If a servant or even an equal offends him, he will throw the offender into the fire, knock his brains out, or set his whiskers ablaze The Arthurian knight is far more of the modern model in these respects But his chief difference from his predecessor is undoubtedly in his amorous devotion to his beloved, who, if not morally superior to Bellicent, Floripas, Esclairmonde and the other Carlovingian heroines, is somewhat less forward Even in minute details the difference is strongly marked The romances are in octosyllabic couplets or in prose, and their language is different from that of the *chansons,* and contains much fewer of the usual epic repetitions and stock phrases The earliest romances, the *Saint Graal,* the *Quête du Saint Graal, Joseph d'Arimathie* and *Merlin* bear the names of Walter Map and Robert de Borron *Artus* and part at least of *Lancelot du Lac* appear to be due to unknown authors *Tristan* came later, and has a stronger mixture of Celtic tradition At the same time as Walter Map, or a little later, Chrétien (or Chrestien) de Troyes turned the legends of the Round Table into octosyllabic verse of a singularly spirited and picturesque character The chief poems attributed to him are the *Chevalier au Lyon* (Sir Ewain of Wales), the *Chevalier à la Charette* (one of the episodes of *Lancelot*) also *Erec, Tristan* and *Percivale.* These poems, independently of their merit, which is great, had an extensive literary influence They were translated by the German minnesingers, Wolfram von Eschenbach, Gottfried of Strasbourg and others

With the romances to which we have already referred Chrétien's poems complete the earlier forms of the Arthurian story, and supply the matter of it as it is best known to English readers in Malory's book. Nor does that book, though far later than the original forms, convey a very false impression of the characteristics of the older romances Indeed, the Arthurian knight, his character and adventures, are so much better known than the heroes of the Carlovingian *chansons* that there is less need to dwell upon them The romances had, as has been already pointed out, great influence upon their rivals, and their comparative fertility of invention, the much larger number of their *dramatis personae,* and the greater variety of interests to which they appealed, sufficiently explain their increased popularity. The ordinary attractions of poetry are also more largely present in them than in the *chansons;* there is more description, more life, and less of the mere chronicle. They have been accused of relaxing morality, and there is perhaps some truth in the charge But the change is after all one rather of manners than of morals, and what is lost in simplicity is gained in refinement and the beginnings of a sense of literary form

Romances of Antiquity.—There is yet a third class of early narrative poems, differing from the two former in subject, but agreeing, sometimes with one, sometimes with the other in form These are the classical romances—the *Matière de Rome*—which are not much later than those of Charlemagne and Arthur The chief subjects with which their authors busied themselves were the conquests of Alexander and the siege of Troy, though other classical stories come in. The most remarkable of all is the romance of *Alixandre* by Lambert le Tort and Alexander of Bernay

Alexander is made in many respects a prototype of Charlemagne He is regularly knighted, he has 12 peers, he holds tournaments, he has relations with Arthur, and comes in contact with fairies, he takes flights in the air, dives in the sea and so forth There is perhaps more avowed imagination in these classical stories than in either of the other divisions of French epic poetry Some of their authors even confess to the practice of fiction, while the *trouvères* of the *chansons* invariably assert the historical character of their facts and personages, and the authors of the Arthurian romances at least start from facts vouched for, partly by national tradition, partly by the authority of religion and the church The classical romances, however, are important in two different ways In the first place, they connect the early literature of France, however loosely, and with links of however dubious authenticity, with the great history and literature of the past They show a certain amount of scholarship in their authors, and in their hearers they show a capacity for taking an interest in subjects which are not merely those directly connected with the village or the tribe The *chansons de geste* had shown the creative power and independent character of French literature There is, at least about the earlier ones, nothing borrowed, traditional or scholarly They smack of the soil, and they rank France among the very few countries which, in this matter of indigenous growth, have yielded more than folksongs and fireside tales The Arthurian romances, less independent in origin, exhibit a wider range of view, a greater knowledge of human nature, and a more extensive command of the sources of poetical and romantic interest The classical epics superadd the only ingredient necessary to an accomplished literature—*i e* , the knowledge of what has been done by other peoples and other literatures already, and the readiness to take advantage of the materials thus supplied

Romans d'Aventures.—There remain to be mentioned a considerable number of narrative poems written after the 13th century, which cannot be brought into any one of the three previous categories As literary taste spread, *romans* were written about any possible subject, and in many various forms Thus *Guillaume de Palerme* deals with the adventures of a Sicilian prince who is befriended by a were-wolf, *Le Roman de l'escoufle* with a heroine whose ring is carried off by a sparrow-hawk, *Guy of Warwick, Meraugis de Portlèguez, Cléomadès, Partenopeu de Blois, Floire et Blanchefleur* are among the best known To this category may be added a number of early romances and fictions in prose, the most celebrated of which is *Aucassin et Nicolette* (13th century)

Such was the literature produced for the enjoyment of the higher classes from the 11th to the 13th century The habit of private wars and of insurrection against the sovereign supply the motives of the *chanson de geste,* the love of gallantry, adventure and foreign travel those of the romances, Arthurian and miscellaneous None of these motives much affected the lower classes, who were, with the early developed temper of the middle- and lower-class Frenchman, already apt to think and speak cynically enough of tournaments, courts, crusades and the other occupations of the nobility. The communal system was springing up, the towns were receiving royal encouragement as a counterpoise to the authority of the nobles The corruptions and maladministration of the church attracted the satire rather of the citizens and peasantry who suffered by them, than of the nobles who had less to fear and even something to gain On the other hand, the gradual spread of learning, inaccurate and ill-digested perhaps, but still learning, not only opened up new classes of subjects, but opened them to new classes of persons. The thousands of students who flocked to the schools of Paris were not all princes

or nobles Hence there arose two new classes of literature, the first consisting of the embodiment of learning of one kind or other in the vulgar tongue. The other, one of the most remarkable developments of sportive literature which the world has seen, produced the second indigenous literary growth of which France can boast, namely, the *fabliaux,* and the almost more remarkable work which is an immense conglomerate of *fabliaux,* the great beast-epic of the *Roman de Renart.*

Fabliaux.—There are few literary products which have more originality and at the same time more diversity than the *fabliau.* The epic and the drama, even when they are independently produced, are similar in their main characteristics all the world over But there is nothing in previous literature which exactly corresponds to the *fabliau* The story is the first thing, the moral the second, and the latter is never suffered to interfere with the former. These observations apply only to the *fabliaux,* properly so called, but the term has been used with considerable looseness The collectors of those interesting pieces, *Barbazan, Méon, Le Grand d'Aussy,* have included in their collections large numbers of miscellaneous pieces such as *dits* (rhymed descriptions of various objects, the most famous known author of which was Baudouin de Condé, 13th century), and *débats* (discussions between two persons or contrasts of the attributes of two things), sometimes even short romances, farces and mystery plays Not that the fable proper—the prose classical beast-story of "Aesop"—was neglected Marie de France—the poetess to be mentioned again for her more strictly poetical work—is the most literary of not a few writers who composed what were often, after the mysterious original poet, named *Ysopets* Aesop, Phaedrus, Babrius were translated and imitated in Latin and in the vernacular by this class of writer, and some of the best known of "fablers" date from this time. The *fabliau,* on the other hand, according to the best definition of it yet achieved, is "the recital, generally comic, of a real or possible incident occurring in ordinary human life" The comedy, it may be added, is usually of a satiric kind, and occupies itself with every class and rank of men, from the king to the villein There is no limit to the variety of these lively verse-tales, which are invariably written in eight-syllabled couplets Now the subject is the misadventure of two Englishmen, whose ignorance of the French language makes them confuse donkey and lamb, now it is the fortunes of an exceedingly foolish knight, who has an amiable and ingenious mother-in-law; now the deserved sufferings of an avaricious or ill-behaved priest, now the bringing of an ungrateful son to a better mind by the wisdom of babes and sucklings Not a few of the *Canterbury Tales* are taken directly from *fabliaux;* indeed, Chaucer, with the possible exception of Prior, is the nearest approach to a *fabliau*-writer in England At the other end of Europe the prose novels of Boccaccio and other Italian tale-tellers are largely based upon *fabliaux* But their influence in their own country was the greatest They were the first expression of the spirit which has since animated the most national and popular developments of French literature Simple and unpretending as they are in form, the *fabliaux* announce not merely the *Cent Nouvelles Nouvelles* and the *Heptameron, L'Avocat Patelin,* and *Pantagruel,* but also *L'Avare* and the *Roman comique, Gil Blas* and *Candide.* They indeed do more than merely prophesy the spirit of these great performances—they directly lead to them The prose-tale and the farce are the direct outcomes of the *fabliau,* and the prose-tale and the farce once given, the novel and the comedy inevitably follow.

The special period of *fabliau* composition appears to have been the 12th and 13th centuries It signifies on the one side the growth of a lighter and more sportive spirit than had yet prevailed, on another the rise in importance of other and lower orders of men than the priest and the noble, on yet another the consciousness on the part of these lower orders of the defects of the two privileged classes, and of the shortcomings of the system of polity under which these privileged classes enjoyed their privileges There is, however, in the *fabliau* proper not so very much of direct satire, this being indeed excluded by the definition given above, and by the thoroughly artistic spirit in which that definition is observed The *fabliaux* are so numerous and so various that it is difficult to select any as specially representative We may, however, mention, both as good examples and as interesting from their subsequent history, *Le Vair Palfroi,* treated in English by Leigh Hunt and by Peacock, *Le Vilain Mire,* the original consciously or unconsciously followed in *Le Médecin malgré lui; Le Roi d'Angleterre et le jongleur d'Eli; La houce partie; Le Sot Chevalier,* an indecorous but extremely amusing story, *Les deux bordeors ribaus,* a dialogue between two *jongleurs* of great literary interest, containing allusions to the *chansons de geste* and romances most in vogue; and *Le vilain qui conquist paradis par plait.*

Roman de Renart.—If the *fabliaux* are not remarkable for direct satire, that element is supplied in more than compensating quantity by an extraordinary composition which is closely related to them *Le Roman de Renart,* or *History of Reynard the Fox,* is a poem, or rather series of poems, which, from the end of the 12th to the middle of the 14th century, served the citizen poets of northern France, not merely as an outlet for literary expression, but also as a vehicle of satirical comment—now on the general vices and weaknesses of humanity, now on the usual corruptions in church and State, now on the various historical events which occupied public attention from time to time The enormous popularity of the subject is shown by the long vogue which it had, and by the empire which it exercised over generations of writers who differed from each other widely in style and temper Nothing can be farther from the allegorical erudition, the political diatribes and the sermonizing moralities of the authors of *Renart le Contrefait* than the sly naïveté of the writers of the earlier branches Yet these and a long and unknown series of intermediate bards the fox-king pressed into his service, and it is scarcely too much to say that, during the two centuries of his reign, there was hardly a thought in the popular mind which, as it rose to the surface, did not find expression in an addition to the huge cycle of *Renart*

The French poems which we possess on the subject amount in all to nearly 100,000 lines, independently of mere variations, but including the different versions of *Renart le Contrefait* The separate branches are the work of different authors, hardly any of whom are known, and, but for their community of subject and to some extent of treatment, might be regarded as separate poems The history of Renart, his victories over Isengrim the wolf, Bruin the bear, and his other unfortunate rivals, his family affection, his outwittings of King Noble the Lion and all the rest, are too well known to need fresh description here It is perhaps in the subsequent poems, though they are far less known and much less amusing, that the hold which the idea of Renart had obtained on the mind of northern France, and the ingenious uses to which it was put, are best shown. The first of these is *Le Couronnement de Renart,* a poem of between 3,000 and 4,000 lines, attributed, on no grounds whatever, to the poetess Marie de France, and describing how the hero by his ingenuity got himself crowned king This poem already shows signs of direct moral application and generalizing These are still more apparent in *Renart le Nouvel,* a composition of some 8,000 lines, finished in the year 1288 by the Fleming Jacquemart *Gelée.* Here the personification, of which, in noticing the *Roman de la rose,* we shall soon have to give extended mention, becomes evident Instead of or at least beside the lively personal Renart who used to steal sausages, set Isengrim fishing with his tail, or made use of Chanticleer's comb for a purpose for which it was certainly never intended, we have *Renardie,* an abstraction of guile and hypocrisy, triumphantly prevailing over other and better qualities Lastly, as the *Roman de la rose* of William of Lorris is paralleled by *Renart le Nouvel,* so its continuation by Jean de Meung is paralleled by the great miscellany of *Renart le Contrefait,* which, even in its existing versions, extends to fully 50,000 lines Here we have, besides floods of miscellaneous erudition and discourse, political argument of the most direct and important kind The wrongs of the lower orders are bitterly urged.

Early Lyrics.—The song literature of mediaeval France is extremely abundant and beautiful From the 12th to the 15th century it received constant accessions, some signed, some anony-

mous, some purely popular in their character, some the work of more learned writers, others again produced by members of the aristocracy Of the latter class it may fairly be said that the catalogue of royal and noble authors boasts few if any names superior to those of Thibaut de Champagne, king of Navarre at the beginning of the 13th century, and Charles d'Orléans, the father of Louis XII , at the beginning of the 15th. Although much of this lyric poetry is anonymous, the most popular part of it almost entirely so, yet we are able to enumerate some hundreds of French *chansonniers* between the 11th and the 13th century

The earliest song literature is mainly sentimental in character The collectors divide it under the two heads of romances and *pastourelles*, the former being usually the celebration of the loves of a noble knight and maiden, and recounting how Belle Doette or Eglantine or Oriour sat at her windows or in the tourney gallery, or embroidering silk and samite in her chamber, with her thoughts on Gerard or Guy or Henry,—the latter somewhat monotonous but naive and often picturesque recitals, very often in the first person, of the meeting of an errant knight or minstrel with a shepherdess, and his cavalier but not always successful wooing With these, some of which date from the 12th century, may be contrasted, at the other end of the mediaeval period, the more varied and popular collection dating in their present form from the 15th century, and published in 1875 by Gaston Paris In both alike, making allowance for the difference of their age and the state of the language, may be noticed a charming lyrical faculty and great skill in the elaboration of light and suitable metres Especially remarkable is the abundance of refrains of an admirably melodious kind It is said that more than 500 of these exist

Among the lyric writers of these four centuries whose names are known may be mentioned Audefroi le Bastard (12th century), the author of the charming song of *Belle Idoine*, and others no way inferior, Quesnes de Bethune, the ancestor of Sully, whose song-writing inclines to a satirical cast in many instances, the Vidame de Chartres, Charles d'Anjou, King John of Brienne, the châtelain de Coucy, Gace Bruslé, Colin Muset, while not a few writers mentioned elsewhere—Guyot de Provins, Adam de la Halle, Jean Bodel and others—were also lyrists But none of them, except perhaps Audefroi, can compare with Thibaut IV. (1201–53), who united by his possessions and ancestry a connection with the north and the south, and who employed the methods of both districts but used the language of the north only Thibaut was supposed to be the lover of Blanche of Castille, the mother of St Louis, and a great deal of his verse is concerned with his love for her But while knights and nobles were thus employing lyric poetry in courtly and sentimental verse, lyric forms were being freely employed by others, both of high and low birth, for more general purposes Blanche and Thibaut themselves came in for contemporary lampoons, and both at this time and in the times immediately following, a cloud of writers composed light verse, sometimes of a lyric, sometimes of a narrative kind, and sometimes in a mixture of both By far the most remarkable of these is Rutebeuf

Rutebeuf is among the earliest French writers who tell us their personal history and make personal appeals But he does not confine himself to these He discusses the history of his times, he composes pious poetry too, and in at least one poem takes care to distinguish between the church which he venerates and the corrupt churchmen whom he lampoons. Besides Rutebeuf the most characteristic figure of his class and time (about the middle of the 13th century) is Adam de la Halle, commonly called the Hunchback of Arras The earlier poems of Adam are of a sentimental character, the later ones satirical and somewhat ill-tempered Such, for instance, is his invective against his native city But his chief importance consists in his *jeux*, the *Jeu de la feuillée*, the *Jeu de Robin et Marion*, dramatic compositions which led the way to the regular dramatic form. Indeed the general tendency of 13th century is to satire, fable and farce, even more than to serious or sentimental poetry. We should perhaps except the *lais*, the chief of which are known under the name of Marie de France These lays are exclusively Breton in origin, though not in application, and the term seems originally to have had reference rather to the music to which they were sung than to the manner or matter of the pieces. The subjects of the *lais* are indifferently taken from the Arthurian cycle, from ancient story, and from popular tradition, and, at any rate in Marie's hands, they give occasion for some passionate, and in the modern sense really romantic, poetry. The most famous of all is the *Lay of the Honeysuckle*, traditionally assigned to Sir Tristram.

Satiric and Didactic Work.—Direct satire began early in the 13th century with Guyot de Provins and Hugues de Brégy. Travesties of the romances of chivalry were written in which the chief heroes and situations were mercilessly parodied The disputes of Philippe le Bel with the pope and the Templars had an immense literary influence, partly in the concluding portions of the *Renart*, partly in the *Roman de la rose*, still to be mentioned, and partly in other satiric allegories of which the chief is the romance of *Fauvel*, attributed to François de Rues The hero of this is an allegorical personage, half man and half horse, signifying the union of bestial degradation with human ingenuity and cunning Fauvel (the name, it may be worth while to recall, occurs in Langland) is a divinity in his way All the personages of State, from kings and popes to mendicant friars, pay their court to him

But this serious and discontented spirit betrays itself also in compositions which are not parodies or travesties in form One of the latest, if not absolutely the latest (for Cuvelier's still later *Chronique de Du Guesclin* is only a most interesting *imitation* of the *chanson* form adapted to recent events), of the *chansons de geste* is *Baudouin de Sebourc*, one of the members of the great romance or cycle of romances dealing with the crusades, and entitled *Le Chevalier au Cygne*. *Baudouin de Sebourc* dates from the early years of the 14th century It is strictly a *chanson de geste* in form, and also in the general run of its incidents The hero is dispossessed of his inheritance by the agency of traitors, fights his battle with the world and its injustice, and at last prevails over his enemy Gaufrois, who has succeeded in obtaining the kingdom of Friesland and almost that of France Gaufrois has as his assistants two personages who were very popular in the poetry of the time,—viz the Devil, and Money These two sinister figures pervade the *fabliaux*, tales and fantastic literature generally of the time The abuse of usury at the time, and the exactions of the Jews and Lombards, were severely felt, and Money itself, as personified, figures largely in the popular literature

Roman de la Rose.—A work of very different importance from all of these, though with seeming touches of the same spirit, a work which deserves to take rank among the most important of the middle ages, is the *Roman de la Rose* The author of the earlier part was Guillaume de Lorris, who lived in the first half of the 13th century, the author of the later part was Jean de Meung, who was born about the middle of that century, and whose part in the *Roman* dates at least from its extreme end This great poem exhibits in its two parts very different characteristics, which yet go to make up a not inharmonious whole It is a love poem, and yet it is satire But both gallantry and raillery are treated in an entirely allegorical spirit. The lover meets all sorts of obstacles in his pursuit of the rose, though he has for a guide the metaphorical personage Bel-Accueil. The early part, which belongs to William of Lorris, is remarkable for its gracious and fanciful descriptions. Forty years after Lorris's death, Jean de Meung completed it in an entirely different spirit He keeps the allegorical form, and indeed introduces two new personages of importance, Nature and Faux-semblant In the mouths of these personages and of another, Raison, he puts the most extraordinary mixture of erudition and satire. At one time we have the history of classical heroes, at another theories against the hoarding of money, about astronomy, about the duty of mankind to increase and multiply. Accounts of the origin of loyalty, which would have cost the poet his head at some periods of history, and even communistic ideas, are also to be found here. In Faux-semblant we have a real creation of the theatrical hypocrite All this miscellaneous and apparently incongruous material in fact explains the success of the poem. There are to be found in the *Roman de la rose* the characteristics of the later middle age, its

gallantry, its mysticism, its economic and social troubles and problems, its scholastic methods of thought, its naïve acceptance as science of everything that is written, and at the same time its shrewd and embracing criticism of much that the age of criticism has accepted without doubt or question The *Roman de la rose,* as might be supposed, set the example of an immense literature of allegorical poetry, which flourished more and more until the Renaissance.

Didactic Verse.—An example of early didactic verse is the *Bestiary* of Philippe de Thaun, a Norman *trouvère* who lived and wrote in England during the reign of Henry Beauclerc Besides the *Bestiary,* which from its dedication to Queen Adela has been conjectured to belong to the third decade of the 12th century, Philippe wrote also in French a *Liber de creaturis,* both works being translated from the Latin These works of mystical and apocryphal physics and zoology became extremely popular in the succeeding centuries, and were frequently imitated A moralizing turn was also given to them, which was much helped by the importation of several miscellanies of oriental origin, partly tales, partly didactic in character, the most celebrated of which is the *Roman des sept sages,* which, under that title and the variant of *Dolopathos,* received repeated treatment from French writers both in prose and verse. Art, too, soon demanded exposition in verse, as well as science The favourite pastime of the chase was repeatedly dealt with, notably in the *Roi Modus* (1325), mixed prose and verse, the *Deduits de la chasse* (1387), of Gaston de Foix, prose, and the *Tresor de Venerie* of Hardouin (1394), verse Very soon didactic verse extended itself to all the arts and sciences Vegetius and his military precepts had found a home in French octosyllables as early as the 12th century, the end of the same age saw the ceremonies of knighthood solemnly versified, and *napes* (maps) *du monde* also soon appeared In 1245, Gautier of Metz translated from various Latin works into French verse a sort of encyclopaedia, while another incongruous work, known as *L'Image du monde,* exists from the same century Profane knowledge was not the only subject which occupied didactic poets at this time Religious handbooks and commentaries on the scriptures were common in the 13th and following centuries, and, under the title of *Castoiements, Enseignements* and *Doctrinaux,* moral treatises become common The most famous of these, the *Castoiement d'un père à sons fils,* falls under the class of works due to oriental influence, being derived from the Indian *Panchatantra*

In the 14th century the influence of the *Roman de la rose* helped to render moral verse frequent and popular The same century, moreover, which witnessed these developments of well-intentioned if not always judicious erudition witnessed also a considerable change in lyrical poetry Hitherto such poetry had chiefly been composed in the melodious but unconstrained forms of the romance and the *pastourelle* In the 14th century the writers of northern France subjected themselves to severer rules In this age arose the forms which for so long a time were to occupy French singers—the ballade, the rondeau, the rondel, the triolet, the chant royal and others These received considerable alterations as time went on We possess not a few *Artes poeticae,* such as that of Eustache Deschamps at the end of the 14th century and that of Thomas Sibilet in the 16th, giving particulars of them, and these particulars show considerable changes The earliest poets who appear to have practised them extensively were born at the close of the 13th and the beginning of the 14th centuries Of these Guillaume de Machault (*c* 1300–80) is the oldest. He has left us 80,000 verses Eustache Deschamps (*c.* 1340–*c.* 1410) was nearly as prolific. Froissart the historian (1333–1410) was also an agreeable and prolific poet. Less known but not less noteworthy, and perhaps the earliest of all, is Jehannot de Lescurel, whose personality is obscure, and most of whose works are lost, but whose fragments are full of grace Froissart appears to have had many countrymen in Hainault and Brabant who devoted themselves to the art of versification; and the *Livre des cent ballades* of the Marshal Boucicault (1366–1421) and his friends—*c.* 1390—shows that the French gentleman of the 14th century was as apt at the ballade as his Elizabethan peer in England was at the sonnet.

Beginnings of Drama.—The mysteries (subjects taken from the sacred writings) and miracle plays (subjects taken from the legends of the saints and the Virgin) are of very early date The mystery of the *Foolish Virgins* (partly French, partly Latin), that of *Adam* and perhaps that of *Daniel,* are of the 12th century, though due to unknown authors Jean Bodel and Rutebeuf, already mentioned, gave, the one that of *Saint Nicolas* at the confines of the 12th and 13th, the other that of *Théophile* later in the 13th itself But the later moralities, *sotties,* and farces seem to be also in part a very probable development of the simpler and earlier forms of the *fabliau* and of the *tenson* or *jeu-parti,* a poem in simple dialogue Of the *jeux-partis* there are many examples, varying from very simple questions and answers to something like regular dramatic dialogue, even short romances, such as *Aucassin et Nicolette,* were easily susceptible of dramatization But the *Jeu de la feuillie* (or *feuillée*) of Adam de la Halle seems to be the earliest piece, profane in subject, containing something more than mere dialogue The poet has not indeed gone far for his subject, for he brings in his own wife, father and friends, the interest being complicated by the introduction of stock characters (the doctor, the monk, the fool), and of certain fairies —personages already popular from the later romances of chivalry. Another piece of Adam's, *Le Jeu de Robin et Marion,* also already alluded to, is little more than a simple throwing into action of an ordinary *pastourelle* with a considerable number of songs to music Nevertheless later criticism has seen, and not unreasonably, in these two pieces the origin in the one case of farce, and thus indirectly of comedy proper, in the other of comic opera.

For a long time, however, the mystery and miracle plays remained the mainstay of theatrical performance, and until the 13th century actors as well as performers were more or less taken from the clergy It has, indeed, been well pointed out that the offices of the church were themselves dramatic performances, and required little more than development at the hands of the mystery writers The occasional festive outbursts, such as the Feast of Fools, that of the Boy Bishop and the rest, helped on the development The variety of mysteries and miracles was very great A single manuscript contains 40 miracles of the Virgin, averaging from 1,200 to 1,500 lines each, written in octosyllabic couplets, and at least as old as the 14th century, most of them perhaps much earlier. The mysteries proper, or plays taken from the scriptures, are older still Many of these are exceedingly long There is a *Mystère de l'Ancien Testament,* which extends to many volumes, and must have taken weeks to act in its entirety The *Mystère de la Passion,* though not quite so long, took several days, and recounts the whole history of the gospels The best apparently of the authors of these pieces, which are mostly anonymous, were two brothers, Arnoul and Simon Gréban (authors of the *Actes des apôtres,* and in the first case of the *Passion*), *c* 1450, while a certain Jean Michel (d 1493) is credited with having continued the *Passion* from 30,000 lines to 50,000 But these performances, though they held their ground until the middle of the 16th century and extended their range of subject from sacred to profane history—legendary as in the *Destruction de Troie,* contemporary as in the *Siège d'Orléans*—were soon rivalled by the more profane performances of the moralities, the farces and the *sotties.* The palmy time of all these three kinds is the 15th century, while the Confrérie de la Passion itself, the special performers of the sacred drama, only obtained the licence constituting it by an ordinance of Charles VI. in 1402. In order, however, to take in the whole of the mediaeval theatre at a glance, we may anticipate a little. The Confraternity was not itself the author or performer of the profaner kind of dramatic performance This latter was due to two other bodies, the clerks of the Bazoche and the Enfans sans Souci. As the Confraternity was chiefly composed of tradesmen and persons very similar to Peter Quince and his associates, so the clerks of the Bazoche were members of the legal profession of Paris, and the Enfans sans Souci were mostly young men of family. The morality was the special property of the first, the *sotie* of the second. But as the moralities were sometimes decidedly tedious plays, though by no means brief, they were varied

by the introduction of farces, of which the *jeux* already mentioned were the early germ, and of which *L'Avocat Patelin,* dated by some about 1465 and certainly about 200 years subsequent to Adam de la Halle, is the most famous example.

The morality was the natural result on the stage of the immense literary popularity of allegory in the *Roman de la rose* and its imitations The *sotie* was directly satirical, and only assumed the guise of folly as a stalking-horse for shooting wit It was more Aristophanic than any other modern form of comedy, and like its predecessor, it perished as a result of its political application. Encouraged for a moment as a political engine at the beginning of the 16th century, it was soon absolutely forbidden and put down, and had to give place in one direction to the lampoon and the prose pamphlet, in another to forms of comic satire more general and vague in their scope. The farce, on the other hand, having neither moral purpose nor political intention, was a purer work of art, enjoyed a wider range of subject, and was in no danger of any permanent extinction. Farcical interludes were interpolated in the mysteries themselves; short farces introduced and rendered palatable the moralities, while the *sotie* was itself but a variety of farce, and all the kinds were sometimes combined in a sort of tetralogy. It was a short composition, 500 verses being considered sufficient, while the morality might run to at least 1,000 verses, the miracle play to nearly double that number, and the mystery to some 40,000 or 50 000

Of the pieces represented one only, that of *Maître Patelin,* is now much known, but many are almost equally amusing *Patelin* itself has an immense number of versions and editions. Other farces are too numerous to attempt to classify, they bear, however, in their subjects, as in their manner, a remarkable resemblance to the *fabliaux,* their source Conjugal disagreements, the unpleasantness of mothers-in-law, the shifty or, in the earlier stages, clumsy valet and chambermaid, the mishaps of too loosely given ecclesiastics, the abuses of relics and pardons, the extortion, violence, and sometimes cowardice of the seigneur and the soldiery, the corruption of justice, its delays and its pompous apparatus, supply the subjects. The treatment is rather narrative than dramatic in most cases, as might be expected, but makes up by the liveliness of the dialogue for the deficiency of elaborately planned action and interest. All these forms, it will be observed, are directly or indirectly comic. Tragedy in the middle ages is represented only by the religious drama, except for a brief period towards the decline of that form, when the "profane" mysteries referred to above came to be represented These were, however, rather "histories," in the Elizabethan sense, than tragedies proper.

History.—For a time the French chroniclers contented themselves with Latin prose or with French verse, after the fashion of Wace and the Belgian, Philippe Mousket (1215–83). These, after a fashion universal in mediaeval times, began from fabulous or merely literary origins; and just as Wyntoun later carries back the history of Scotland to the terrestrial paradise, so does Mousket start that of France from the rape of Helen But soon prose chronicles, first translated, then original, became common. Then came French selections and versions from the great series of historical compositions undertaken by the monks of St Denys, the so-called *Grandes Chroniques de France* from the date of 1274, when they first took form in the hands of a monk styled Primat, to the reign of Charles V, when they assumed the title just given But the first really remarkable author who used French prose as a vehicle of historical expression is Geoffroi de Villehardouin, marshal of Champagne, who was born rather after the middle of the 12th century, and died in Greece in 1212. Under the title of *Conquête de Constantinople* Villehardouin has left us a history of the fourth crusade, which has been accepted by all competent judges as the best picture extant of feudal chivalry in its prime. The *Conquête de Constantinople* has been well called a *chanson de geste* in prose, and indeed in the surprising nature of the feats it celebrates, in the abundance of detail, and in the vivid and picturesque poetry of the narration, it equals the very best of the *chansons.* Even the repetition of the same phrases, which is characteristic of epic poetry, appears in this prose epic; and as in the *chansons* so in Villehardouin, few motives appear but religious fervour and the love of fighting, though neither of these excludes a lively appetite for booty and a constant tendency to disunion and disorder

The rhymed chronicles of Philippe Mousket and Guillaume Guiart belong to the next half-century; and in prose the most remarkable works are the *Chronique de Reims,* a well written history, having the interesting characteristics of taking the lay and popular side, and the great compilation edited (in the modern sense) by Baudouin d'Avesnes (1213–89). Joinville (1224?–1317), whose special subject is the Life of St. Louis, is far more modern than even the half-century which separates him from Villehardouin would lead us to suppose. There is nothing of the knight-errant about him personally, notwithstanding his devotion to his hero He is an admirable writer, but far less simple than Villehardouin, the good King Louis tries in vain to make him share his own rather high-flown devotion. Joinville is shrewd practical, has political ideas and antiquarian curiosity, and his descriptions are often very creditable pieces of deliberate literature.

What Villehardouin is to the 12th and Joinville to the 13th century, so Jean Froissart (1337–1410) is to the 14th. His picture is the most famous as it is the most varied of the three, but it has special drawbacks as well as special merits Society is still to him all knights and ladies, tournaments, skirmishes and feasts He depicts these, not like Joinville, still less like Villehardouin as a sharer in them, but with the facile and picturesque pen of a sympathizing literary onlooker As the comparison of the *Conquête de Constantinople* with a *chanson de geste* is inevitable, so is that of Froissart's *Chronique* with a *roman d'aventures*

Poetry in the 15th Century.—First among the poets of the period falls to be mentioned the shadowy personality of Olivier Basselin Modern criticism has attacked the identity of the jovial miller, who was once supposed to have written and perhaps invented the songs called *vaux de vire,* and to have also carried on a patriotic warfare against the English. But though Jean le Houx may have written the poems published under Basselin's name two centuries later, it is not unlikely that an actual Olivier wrote actual *vaux de vire* at the beginning of the 15th century About Christine de Pisan (1363–1430) and Alain Chartier (1385–c. 1430) there is no such doubt. Christine was the daughter of an Italian astrologer who was patronized by Charles V She was born in Italy but brought up in France, and she enriched the literature of her adopted country with much learning, good sense and patriotism She wrote history, devotional works and poetry; and though her literary merit is not of the highest, it is very far from despicable Alain Chartier, best known to modern readers by the story of *Margaret of Scotland's Kiss,* was a writer of somewhat similar character.

A very different person is Charles d'Orléans (1394–1465), one of the greatest of *grands seigneurs,* for he was the father of a king of France, and heir to the duchies of Orléans and Milan. Charles, indeed, if not a Roland or a Bayard, was an admirable poet. He is the best-known and perhaps the best writer of the graceful poems in which an artificial versification is strictly observed, and helps by its recurrent lines and modulated rhymes to give to poetry something of a musical accompaniment even without the addition of music properly so called. His ballades are certainly inferior to those of Villon, but his rondels are unequalled. For fully a century and a half these forms engrossed the attention of French lyrical poets Exercises in them were produced in enormous numbers, and of an excellence which has only recently obtained full recognition even in France. Charles d'Orléans is himself sufficient proof of what can be done in them in the way of elegance, sweetness and grace which some have unjustly called effeminacy But that this effeminacy was no natural or inevitable fault of the ballades and the rondeaux was fully proved by the most remarkable literary figure of the 15th century in France.

To François Villon (1431–63?), as to other great single writers, no attempt can be made to do justice in this place. His remarkable life and character especially lie outside our subject. But he is universally recognized as the most important single figure of French literature before the Renaissance. His work is very strange in form, the undoubtedly genuine part of it consisting



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CLASSIC AND CONTEMPORARY FRENCH AUTHORS

1 François Rabelais (1494–1553) 2 Jean-Baptiste Poquelin Molière (1622–73) 3 François Marie Arouet de Voltaire (1694–1778) 4 Denis Diderot (1713–84) 5 Stendhal (Marie Henri Beyle) (1783–1842) 6 Honoré de Balzac (1799–1850) 7 Victor Marie Hugo (1802–85) 8 Alexandre Dumas, *pere* (1802–70) 9 Gustave Flaubert (1821–80) 10 Guy de Maupassant (1850–93) 11 George Sand (Aurore Dupin Dudevant) (1804–76) 12 Madame de Staël (1766–1817). 13 Edmond Rostand (1868–1918) 14 Henri Bergson (1859–) 15 Anatole France (Jacques Anatole Thibault) (1844–1924). 16 Romain Rolland (1868–)

merely of two compositions, known as the great and little Testament, written in stanzas of eight lines of eight syllables each, with lyrical compositions in ballade and rondeau form interspersed Nothing in old French literature can compare with the best of these, such as the "Ballade des dames du temps jadis," the "Ballade pour sa mère," "La Grosse Margot," "Les Regrets de la belle Heaulmière," and others; while the whole composition is full of poetical traits of the most extraordinary vigour, picturesqueness and pathos. Towards the end of the century the poetical production of the time became very large. The artificial measures already alluded to, and others far more artificial and infinitely less beautiful, were largely practised The typical poet of the end of the 15th century is Guillaume Crétin (d. 1525), who distinguished himself by writing verses with punning rhymes, verses ending with double or treble repetitions of the same sound, and many other tasteless absurdities, in which, as Pasquier remarks, "il perdit toute la grâce et la liberté de la composition " The other favourite direction of the poetry of the time was a vein of allegorical moralizing drawn from the *Roman de la rose* through the medium of Chartier and Christine, which produced "Castles of Love," "Temples of Honour," and such like The combination of these drifts in verse-writing produced a school known in literary history, from a happy phrase of the satirist Coquillart (*v. inf.*), as the "Grands Rhétoriqueurs "

The most remarkable representative of purely light poetry outside the theatre is Guillaume Coquillart (1450–1510), a lawyer of Champagne, who resided for the greater part of his life in Reims This city, like others, suffered from the pitiless tyranny of Louis XI The beginnings of the standing army which Charles VII had started were extremely unpopular, and the use to which his son put them by no means removed this unpopularity Coquillart described the military man of the period in his *Monologue du gendarme cassé*. Again, when the king entertained the idea of unifying the taxes and laws of the different provinces, Coquillart, who was named commissioner for this purpose, wrote on the occasion a satire called *Les Droits nouveaux*

15th Century Prose.—This period produced, indeed, no prose writer of great distinction, except Comines; but it witnessed serious, if not entirely successful, efforts at prose composition. Christine de Pisan and Alain Chartier were at least as much prose writers as poets; and the latter, while he, like Gerson, dealt much with the reform of the church, used in his *Quadriloge invectif* really forcible language for the purpose of spurring on the nobles of France to put an end to her sufferings and evils These moral and didactic treatises were but continuations of others, which for convenience sake we have hitherto left unnoticed. Though verse was in the centuries prior to the 15th the favourite medium for literary composition, it was by no means the only one; and moral and educational treatises already existed in pedestrian phrase. Certain household books (*Livres de raison*) have been preserved, some of which date as far back as the 13th century. These contain not merely accounts, but family chronicles, receipts and the like. Accounts of travel, especially to the Holy Land, culminated in the famous *Voyage* of Mandeville which, though it has never been of so much importance in French as in English, perhaps first took vernacular form in the French tongue Of the 14th century, we have a *Menagier de Paris*, intended for the instruction of a young wife, and a large number of miscellaneous treatises of art, science and morality, while private letters, mostly as yet unpublished, exist in considerable numbers, and are generally of the moralizing character; books of devotion, too, are naturally frequent.

Froissart had been followed as a chronicler by Enguerrand de Monstrelet (*c.* 1390–1453) and by the historiographers of the Burgundian court, Chastelain, whose interesting *Chronique de Jacques de Lalaing* is much the most attractive part of his work, and Olivier de la Marche. The memoir and chronicle writers, who were to be of so much importance in French literature, also begin to be numerous at this period. Juvenal des Ursins (1388–1473), author of the *Chronique scandaleuse*, may be mentioned as presenting the characteristic of minute observation and record which has distinguished the class ever since. Jean Lemaire de Belges (1473–*c.* 1525) was historiographer to Louis XII. and wrote *Illustrations des Gaules*. But Comines (1445–1509) is no imitator of Froissart or of any one else The last of the quartette of great French mediaeval historians, he does not yield to any of his three predecessors in originality or merit, but he is very different from them He fully represents the mania of the time for statecraft, and his book has long ranked with that of Machiavelli as a manual of the art, though he has not the absolutely non-moral character of the Italian His memoirs, considered merely as literature, show a style well suited to their purport—not, indeed, brilliant or picturesque, but clear, terse and thoroughly well suited to the expression of the acuteness, observation and common sense of their author.

The best prose of the century, and almost the earliest which deserves the title of a satisfactory literary medium, was employed for the telling of romances in miniature The *Cent Nouvelles Nouvelles* is undoubtedly the first work of prose *belles-lettres* in French, and the first, moreover, of a long and most remarkable class of literary work in which French writers may challenge all comers with the certainty of victory—the short prose tale of a comic character The subjects of the *Cent Nouvelles Nouvelles* are by no means new They are simply the old themes of the *fabliaux* treated in the old way. The novelty is in the application of prose to such a purpose, and in the crispness, the fluency and the elegance of the prose used These tales have been attributed to Antoine de la Salle (1398–1461), who, if this attribution and certain others be correct, must be allowed to be one of the most original and fertile authors of early French literature. La Salle's one acknowledged work is the story of *Petit Jehan de Saintré*, a short romance exhibiting great command of character and abundance of delicate draughtsmanship To this not only the authorship, part-authorship or editorship of the *Cent Nouvelles Nouvelles* has been added, the still more famous and important work of *Patelin* has been assigned by respectable, though of course conjecturing, authority to the same paternity The generosity of critics towards La Salle has not even stopped here A fourth masterpiece of the period, *Les Quinze Joies de mariage*, has also been assigned to him

THE 16TH CENTURY

In no country was the literary result of the Renaissance more striking and more manifold than in France The double effect of the study of antiquity and the religious movement produced an outburst of literary developments of the most diverse kinds, which even the fierce and sanguinary civil dissensions of the Reformation did not succeed in checking While the Renaissance in Italy had mainly exhausted its effects by the middle of the 16th century, while in Germany those effects only paved the way for a national literature, and did not themselves greatly contribute thereto, while in England it was not till the extreme end of the period that a great literature was forthcoming—in France almost the whole century was marked by the production of capital works in every branch of literary effort Not even the 17th century, and certainly not the 18th, can show such a group of prose writers and poets as is formed by Calvin, St. Francis de Sales, Montaigne, du Vair, Bodin, d'Aubigné, the authors of the *Satire Ménippée*, Monluc, Brantôme, Pasquier, Rabelais, des Periers, Herberay des Essarts, Amyot, Garnier, Marot, Ronsard and the rest of the "Pléiade," and finally Regnier. These great writers are not merely remarkable for the vigour and originality of their thoughts, the freshness, variety and grace of their fancy, the abundance of their learning and the solidity of their arguments in the cases where argument is required Their great merit is the creation of a language and a style able to give expression to these great gifts.

The first note of the new literature was sounded by Clément Marot (1496/7–1544). The son of an older poet, Jehan des Mares called Marot (1463–1523), Clément at first wrote, like his father's contemporaries, allegorical and mythological poetry, afterwards collected in a volume with a charming title, *L'Adolescence clémentine*. It was not till he was nearly 30 years old that his work became really remarkable. From that time forward till his death he was much involved in the troubles and persecutions of the Huguenot party to which he belonged; nor was the protection of Marguerite d'Angoulême, the chief patroness of Huguenots and men

of letters, always efficient But his troubles, so far from harming, helped his literary faculties; and his epistles, epigrams, *blasons* (descendants of the mediaeval *dits*), and *coq-à-l'âne* became remarkable for their easy and polished style, their light and graceful wit, and a certain elegance which had not as yet been even attempted in any modern tongue

Around Marot arose a whole school of disciples and imitators, such as Victor Brodeau (1470?–1540), the great authority on rondeaux, Maurice Scève, a fertile author of *blasons*, Salel, Marguerite herself (1492–1549), of whom more hereafter, and Mellin de Saint Gelais (1491–1558) But the inventive vigour of the age was so great that one school had hardly become popular before another pushed it from its stool, and even of the Marotists just mentioned Scève and Salel are often regarded as chief and member respectively of a Lyonnese coterie, intermediate between the schools of Marot and of Ronsard, containing other members of repute such as Antoine Heroet and Charles Fontaine and claiming Louise Labé (*v inf*) herself

The Pléiade.—Pierre de Ronsard (1524–85) was the chief poet of the period At first a courtier and a diplomatist, physical disqualifications made him change his career He began to study the classics under Jean Daurat (1508–88), and with his master and five other writers, Etienne Jodelle (1532–73), Rémy Belleau (1528–77), Joachim du Bellay (1525–60), Jean Antoine de Baif (1532–89), and Pontus de Tyard (d 1605, bishop of Châlons-sur-Saône), composed the famous "Pleiade" The object of this band was to bring the French language, in vocabulary, constructions and application, on a level with the classical tongues by borrowings from the latter They would have imported the Greek licence of compound words, though the genius of the French language is but little adapted thereto; and they wished to reproduce in French the regular tragedy, the Pindaric and Horatian ode, the Virgilian epic, etc Both in du Bellay's famous manifesto, the *Deffense et illustration de la langue française,* and in Ronsard's own work, caution and attention to the genius and the tradition of French are insisted upon Being all men of the highest talent, and not a few of them men of great genius, they achieved much that they designed, and even where they failed exactly to achieve it, they very often indirectly produced results as important and more beneficial than those which they intended Doubtless they went too far and provoked to some extent the reaction which Malherbe led Their importations were sometimes unnecessary It is almost impossible to read the *Franciade* of Ronsard, and not too easy to read the tragedies of Jodelle and Garnier, fine as the latter are in parts But the best of Ronsard's sonnets and odes, the finest of du Bellay's *Antiquités de Rome* (translated into English by Spenser), the exquisite *Vanneur* of the same author, and the *Avril* of Belleau, even the finer passages of d'Aubigné and du Bartas, are not only admirable in themselves, and of a kind not previously found in French literature, but are also such things as could not have been previously found, for the simple reason that the medium of expression was wanting They constructed that medium for themselves, and no force of the reaction which they provoked was able to undo their work

The effort of the "Pléiade" proper was continued and shared by a considerable number of minor poets, some of them, as has been already noted, belonging to different groups and schools Olivier de Magny (d 1560) and Louise Labé (b. 1526) were poets and lovers, the lady deserving far the higher rank in literature There is more depth of passion in the writings of "La Belle Cordière," as this Lyonnese poetess was called, than in almost any of her contemporaries Jacques Tahureau (1527–55) scarcely deserves to be called a minor poet There is less than the usual hyperbole in the contemporary comparison of him to Catullus, and he reminds an Englishman of the school represented nearly a century later by Carew, Randolph and Suckling The title of a part of his poem—*Mignardises amoureuses de l'admirée*—is characteristic both of the style and of the time Jean Doublet (*c.* 1528–*c* 1580), Amadis Jamyn (*c* 1530–85), and Jean de la Taille (1540–1608) deserve mention at least as poets, but two other writers require a longer allusion. Guillaume de Salluste, seigneur du Bartas (1544–90), whom Sylvester's translation, Milton's imitation, and the copious citations of Southey's *Doctor,* have made known if not familiar in England, was partly a disciple and partly a rival of Ronsard. His poem of *Judith* was eclipsed by his better-known *La Divine Sepmaine* or epic of the Creation. Théodore Agrippa d'Aubigne (1552–1630), like du Bartas, was a Calvinist. His genius was of a more varied character. He wrote sonnets and odes as became a Ronsardist, but his chief poetical work is the satirical poem of *Les Tragiques,* in which the author brands the factions, corruptions and persecutions of the time, and in which there are to be found alexandrines of a strength, vigour and original cadence hardly to be discovered elsewhere, save in Corneille and Victor Hugo. Towards the end of the century, Philippe Desportes (1546–1606) and Jean Bertaut (1552–1611), with much enfeebled strength, but with a certain grace, continue the Ronsardizing tradition Among their contemporaries must be noticed Jean Passerat (1534–1602), a writer of much wit and vigour and rather resembling Marot than Ronsard, and Vauquelin de la Fresnaye (1536–1607), the author of a valuable *Ars poetica* and of the first French satires which actually bear that title Jean le Houx (*fl c* 1600) continued, rewrote or invented the *vaux de vire,* commonly known as the work of Olivier Basselin

The nephew of Desportes, Mathurin Regnier (1573–1613), marks the end, and at the same time perhaps the climax, of the poetry of the century A descendant at once of the older Gallic spirit of Villon and Marot, in virtue of his consummate acuteness, terseness and wit, of the school of Ronsard by his erudition, his command of language, and his scholarship, Regnier is perhaps the best representative of French poetry at the critical time when it had got together all its materials, had lost none of its native vigour and force, and had not yet submitted to the cramping and numbing rules and restrictions which the next century introduced

16th Century Drama.—The change which dramatic poetry underwent during the 16th century was at least as remarkable as that undergone by poetry proper The first half of the period saw the end of the religious mysteries, the licence of which had irritated both the parliament and the clergy Under the patronage of Louis XIII were produced the chief works of Gringore or Gringoire (*c* 1480–1547), by far the most remarkable writer of this class of composition His *Prince des sots* and his *Mystère de St. Louis* are among the best of their kind An enormous volume of composition of this class was produced between 1500 and 1550. One morality by itself, *L'Homme juste et l'homme mondain,* contains some 36,000 lines. But in 1548, when the Confraternity was formally established at the Hôtel de Bourgogne, leave to play sacred subjects was expressly refused it Moralities and *sotties* dragged on under difficulties till the end of the century, and the farce, which is immortal, continually affected comedy But the effect of the Renaissance was to sweep away all other vestiges of the mediaeval drama, at least in the capital An entirely new class of subjects, entirely new modes of treatment, and a different kind of performers were introduced The change naturally came from Italy In the close relationship with that country which France had during the early years of the century, Italian translations of the classical masterpieces were easily imported Soon French translations were made afresh of the *Electra,* the *Hecuba,* the *Iphigenia in Aulis,* and the French humanists hastened to compose original tragedies on the classical model, especially as exhibited in Seneca It was impossible that the "Pléiade" should not eagerly seize such an opportunity of carrying out its principles, and one of its members, Jodelle (1532–73), devoting himself mainly to dramatic composition, fashioned at once the first tragedy, *Cléopatre,* and the first comedy, *Eugène,* thus setting the example of the style of composition which for two centuries and a half Frenchmen were to regard as the highest effort of literary ambition. *Cléopâtre* was followed by *Didon,* which, unlike its predecessor, is entirely in alexandrines, and observes the regular alternation of masculine and feminine rhymes.

Robert Garnier (1534–1590) is the first tragedian who deserves a place not too far below Rotrou, Corneille, Racine, Voltaire and Hugo, and who may be placed in the same class with them. He chose his subjects indifferently from classical, sacred and mediaeval

literature. *Sédécie,* a play dealing with the capture of Jerusalem by Nebuchadrezzar, is held to be his masterpiece, and *Bradamante* deserves notice because it is the first tragi-comedy of merit in French, and because the famous confidant here makes his first appearance Garnier's successor, Antoine de Monchrétien or Montchrestien (*c* 1576–1621), set the example of dramatizing contemporary subjects His masterpiece is *L'Ecossaise,* the first of many dramas on the fate of Mary, queen of Scots While tragedy thus clings closely to antique models, comedy, as might be expected in the country of the *fabliaux,* is more independent. Italy had already a comic school of some originality, and the French farce was too vigorous and lively a production to permit of its being entirely overlooked The first comic writer of great merit was Pierre Larivey (*c.* 1550–*c* 1612), an Italian by descent

16th Century Prose Fiction.—Great as is the importance of the 16th century in the history of French poetry, its importance in the history of French prose is greater still There can be no doubt of the precedence, in every sense of the word, of François Rabelais (*c* 1490–1553), the one French writer (or with Molière one of the two) whom critics the least inclined to appreciate the characteristics of French literature have agreed to place among the few greatest of the world With an immense erudition representing almost the whole of the knowledge of his time, with an untiring faculty of invention, with the judgment of a philosopher, and the common sense of a man of the world, with an observation that let no characteristic of the time pass unobserved, and with a tenfold portion of the special Gallic gift of good-humoured satire, Rabelais united a height of speculation and depth of insight and a vein of poetical imagination rarely found in any writer, but altogether portentous when taken in conjunction with his other characteristics. His great work has been taken for an exercise of transcendental philosophy, for a concealed theological polemic, for an allegorical history of this and that personage of his time, for a merely literary utterance, for an attempt to tickle the popular ear and taste It is all of these, and it is none—all of them in parts, none of them in deliberate and exclusive intention It may perhaps be called the exposition and commentary of all the thoughts, feelings, aspirations and knowledge of a particular time and nation put forth in attractive literary form by a man who for once combined the practical and the literary spirit, the power of knowledge and the power of expression The work of Rabelais is the mirror of the 16th century in France, reflecting at once its comeliness and its uncomeliness, its high aspirations, its voluptuous tastes, its political and religious dissensions, its keen criticism, its eager appetite and hasty digestion of learning, its gleams of poetry, and its ferocity of manners In Rabelais we can divine the "Pléiade" and Marot, the *Cymbalum mundi* and Montaigne, Amyot and the *Amadis,* even Calvin and Duperron

In 1558 appeared two works of high literary and social interest. These are the *Heptaméron* of the queen of Navarre, and the *Contes et joyeux devis* of Bonaventure des Periers (*c.* 1500–44). Des Periers, who was a courtier of Marguerite's, has sometimes been thought to have had a good deal to do with the first-named work as well as with the second, and was also the author of a curious Lucianic satire, strongly sceptical in cast, the *Cymbalum mundi.* Indeed, not merely the queen's prose works, but also the poems gracefully entitled *Les Marguerites de la Marguerite,* are often attributed to the literary men whom the sister of Francis I gathered round her However this may be, some single influence of power enough to give unity and distinctness of savour evidently presided over the composition of the *Heptaméron* Composed as it is on the model of Boccaccio, its tone and character are entirely different, and few works have a more individual charm The *Tales* of des Periers are shorter, simpler and more homely; there is more wit in them and less refinement.

16th Century Historians.—As in the case of the tale-tellers, so in that of the historians, the writers of the 16th century had traditions to continue It is doubtful indeed whether many of them can risk comparison as artists with the great names of Villehardouin and Joinville, Froissart and Comines. The 16th century, however, set the example of dividing the functions of the chronicler, setting those of the historian proper on one side, and of the anecdote-monger and biographer on the other. The efforts at regular history made in this century were not of the highest value But on the other hand the practice of memoir-writing, in which the French were to excel every nation in the world, and of literary correspondence, in which they were to excel even their memoirs, was solidly founded

There are four collections of memoirs concerning this time which far exceed all others in interest and importance. The turbulent dispositions of the time, the loose dependence of the nobles and even the smaller gentry on any single or central authority, the rapid changes of political situations, and the singularly active appetite, both for pleasure and for business, for learning and for war, which distinguished the French gentleman of the 16th century, place the memoirs of François de Lanoue (1531–91), Blaise de Mon[t]luc (1503–77), Agrippa d'Aubigné and Pierre de Bourdeille[s] Brantôme (1540–1614) almost at the head of the literature of their class The name of Brantôme is known to all who have the least tincture of French literature, and the works of the others are not inferior in interest, and perhaps superior in spirit and conception, to the *Dames Galantes,* the *Grands Capitaines* and the *Hommes illustres* The commentaries of Montluc, which Henri IV is said to have called the soldier's Bible, are exclusively military and deal with affairs only Montluc was governor in Guienne, where he repressed the savage Huguenots of the south with a savagery worse than their own He was, however, a partisan of order, not of Catholicism He hung and shot both parties with perfect impartiality, and refused to have anything to do with the massacre of St Bartholomew Though he was a man of no learning, his style is excellent, being vivid, flexible and straightforward Lanoue, who was a moderate in politics, has left his principles reflected in his memoirs. D'Aubigné gives the extreme Huguenot side as opposed to the royalist partisanship of Montluc and the *via media* of Lanoue Brantôme, on the other hand, is quite free from any political or religious prepossessions, and, indeed, troubles himself very little about any such matters. He is the shrewd and somewhat cynical observer, moving through the crowd and taking note of its ways, its outward appearance, its heroisms and its follies. It is really difficult to say whether the recital of a noble deed of arms or the telling of a scandalous story about a court lady gave him the most pleasure, and impossible to say which he did best Certainly he had ample material for both exercises in the history of his time

16th Century Theologians.—In France, as in all other countries, the Reformation was an essentially popular movement, though from special causes, such as the absence of political homogeneity, the nobles took a more active part both with pen and sword in it than was the case in England. But the great textbook of the French Reformation was not the work of any noble Jean Calvin's *Institution of the Christian Religion* is a book equally remarkable in matter and in form, in circumstances and in result. It is the first really great composition in argumentative French prose· Its severe logic and careful arrangement had as much influence on the manner of future thought, both in France and the other regions whither its wide-spread popularity carried it, as its style had on the expression of such thought It was the work of a man of only 27, and it is impossible to exaggerate the originality of its manner when we remember that hardly any models of French prose then existed except tales and chronicles, which required and exhibited totally different qualities of style. It is indeed probable that had not the *Institution* been first written by its author in Latin, and afterwards translated by him, it might have had less dignity and vigour; but it must at the same time be remembered that this process of composition was at least equally likely, in the hands of any but a great genius, to produce a heavy and pedantic style neither French nor Latin in character Something like this result was actually produced in some of Calvin's minor works, and still more in the works of many of his followers, whose lumbering language gained for itself, in allusion to their exile from France, the title of "style refugié" Nevertheless, the use of the vulgar tongue on the Protestant side, and the possession of a work of such importance written therein, gave the Reformers an immense advantage which their adversaries

were some time in neutralizing. Even before the *Institution,* Lefèvre d'Etaples (1455–1537) and Guillaume Farel (1489–1565) saw and utilized the importance of the vernacular Calvin (1509–64) was much helped by Pierre Viret (1511–71), who wrote a large number of small theological and moral dialogues, and of satirical pamphlets, designed to captivate as well as to instruct the lower orders The more famous Beza (Théodore de Bèze) (1519–1605) wrote chiefly in Latin, but he composed in French an ecclesiastical history of the Reformed churches and some translations of the Psalms Marnix de Sainte Aldegonde (1530–93), a gentleman of Brabant, followed Viret as a satirical pamphleteer on the Protestant side On the other hand, the Catholic champions at first affected to disdain the use of the vulgar tongue, and their pamphleteers, when they did attempt it, were unequal to the task Towards the end of the century a more decent war was waged with Philippe du Plessis Mornay (1549–1623) on the Protestant side, whose work is at least as much directed against free-thinkers and enemies of Christianity in general as against the dogmas and discipline of Rome His adversary, the redoubtable Cardinal du Perron (1556–1618), who, originally a Calvinist, went over to the other side, employed French most vigorously in controversial works, chiefly with reference to the eucharist Du Perron was celebrated as the first controversialist of the time, and obtained dialectical victories over all comers At the same time the bishop of Geneva, St Francis of Sales (1567–1622), supported the Catholic side, partly by controversial works, but still more by his devotional writings, the chief of which is the *Introduction to a Devout life*

The literature of doubt was to receive its principal accession in the famous essays of Michel Eyquem, seigneur de Montaigne (1533–92) It would be a mistake to imagine the existence of any sceptical propaganda in this charming and popular book Its principle is not scepticism but egotism, and, the author being profoundly sceptical, this quality automatically rather than intentionally appears. It expresses the mental attitude of the latter part of the century as completely as Rabelais expresses the mental attitude of the early part There is considerably less vigour and life in this attitude Inquiry and protest have given way to a placid conviction that there is not much to be found out, and that it does not much matter; the erudition though abundant is less indiscriminate, and is taken in and given out with less gusto, exuberant drollery has given way to quiet irony, and though neither business nor pleasure is decried, both are regarded rather as useful pastimes incident to the life of a man than with the eager appetite of the Renaissance From the purely literary point of view, the style is remarkable for its absence of pedantry in construction, and yet for its rich vocabulary and picturesque brilliancy

The greatest political writer of the age is Jean Bodin (1530–96), whose *République* is founded partly on speculative considerations like the political theories of the ancients, and partly on an extended historical inquiry Bodin, like most lawyers who have taken the royalist side, is for unlimited monarchy, but notwithstanding this, he condemns religious persecution and discourages slavery. In his speculations on the connection between forms of government and natural causes, he serves as a link between Aristotle and Montesquieu On the other hand, the causes which we have mentioned made a large number of writers adopt opposite conclusions Etienne de la Boétie (1530–63), the friend of Montaigne's youth, composed the *Contre un* or *Discours de la servitude volontaire,* a protest against the monarchical theory The foremost work against the League was the famous *Satire Ménippée* (1594), from a literary point of view one of the most remarkable of political books The *Ménippée* was the work of no single author, but was due, it is said, to the collaboration of five, Pierre Leroi, who has the credit of the idea, Jacques Gillot, Florent Chrétien, Nicholas Rapin (1541–96) and Pierre Pithou (1539–96), with some assistance in verse from Passerat and Gilles Durand The book is a kind of burlesque report of the meeting of the states-general, called for the purpose of supporting the views of the League in 1593 It gives an account of the procession of opening, and then we have the supposed speeches of the principal characters—the duc de Mayenne, the papal legate, the rector of the university (a ferocious Leaguer) and others. But by far the most remarkable is that attributed to Claude d'Aubray, the leader of the *Tiers État,* and said to be written by Pithou, in which all the evils of the time and the malpractices of the leaders of the League are exposed and branded The satire is extraordinarily bitter and yet perfectly good-humoured

16th Century Savants.—One more division, and only one, that of scientific and learned writers pure and simple, remains Much of the work of this kind during the period was naturally done in Latin, the vulgar tongue of the learned But in France, as in other countries, the study of the classics led to a vast number of translations, and it so happened that one of the translators deserves as a prose writer a rank among the highest Many of the authors already mentioned contributed to the literature of translation Des Periers translated the Platonic dialogue *Lysis,* la Boétie some works of Xenophon and Plutarch, du Vair the *De corona,* the *In Ctesiphontem* and the *Pro Milone* Salel attempted the *Iliad,* Belleau the false *Anacreon,* Baif some plays of Plautus and Terence Besides these Lefèvre d'Etaples gave a version of the Bible, Saliat one of Herodotus, and Louis Leroi (1510–77), not to be confounded with the part author of the *Ménippée,* many works of Plato, Aristotle and other Greek writers But while most if not all of these translators owed the merits of their work to their originals, and deserved, much more deserve, to be read only by those to whom those originals are sealed, Jacques Amyot (1513–93), bishop of Auxerre, takes rank as a French classic by his translations of Plutarch, Longus and Heliodorus The admiration which Amyot excited in his own time was immense Montaigne declares that it was thanks to him that his contemporaries knew how to speak and to write, and the Academy in the next age, though not too much inclined to honour its predecessors, ranked him as a model His Plutarch, which had an enormous influence at the time, and coloured perhaps more than any classic the thoughts and writings of the 16th century, both in French and English, was considered his masterpiece

On the other hand, Claude Fauchet (1530–1601) in two antiquarian works, *Antiquités gauloises et françoises* and *L'Origine de la langue et de la poésie française,* displays a remarkable critical faculty in sweeping away the fables which had encumbered history Fauchet had the (for his time) wonderful habit of consulting manuscripts, and we owe to him literary notices of many of the *trouvères* At the same time François Grudé, sieur de la Croix du Maine (1552–92), and Antoine Duverdier (1544–1600) founded the study of bibliography in France Pasquier's *Recherches* carries out the principles of Fauchet independently, and besides treating the history of the past in a true critical spirit, supplies us with voluminous and invaluable information on contemporary politics and literature He has, moreover, the merit which Fauchet had not, of being an excellent writer Henri Estienne [Stephanus] (1528–98) also deserves notice in this place, both for certain treatises on the French language, full of critical crotchets, and also for his curious *Apologie pour Hérodote* The famous potter, Bernard Palissy (1510–90), was not much less skilful as a fashioner of words than as a fashioner of pots, and his description of the difficulties of his experiments in enamelling, which lasted 16 years, is well known The great surgeon Ambrose Paré (*c* 1510–90) was also a writer, and his descriptions of his military experiences at Turin, Metz and elsewhere have all the charm of the 16th-century memoir The only other writers who require special mention are Olivier de Serres (1539–1619), who composed, under the title of *Théâtre d'agriculture,* a complete treatise on the various operations of rural economy, and Jacques du Fouilloux (1521–80), who wrote on hunting (*La Vénerie*). Both became extremely popular and were frequently reprinted.

THE 17TH CENTURY

We come now to the shaping of a literary doctrine that was to last for two centuries, and to determine, not merely the language and complexion, but also the form of French verse during the whole of that time The tradition of respect for Malherbe, an elder and more gifted Boileau, was at one time all-powerful in

France, and, notwithstanding the Romantic movement, is still strong In rejecting a large number of the importations of the Ronsardists, he certainly did good service But it is difficult to avoid ascribing in great measure to his influence the origin of the chief faults of modern French poetry, and modern French in general, as compared with the older language He pronounced against "poetic diction," as such, forbade the overlapping (*enjambement*) of verse, insisted that the middle pause should be of sense as well as sound, and that rhyme must satisfy eye as well as ear The very influences which he despised and proscribed produced in him much tolerable and some admirable verse, though he is not to be named as a poet with Regnier, who had the courage, the sense and the good taste to oppose and ridicule his innovations Of Malherbe's school, Honorat de Bueil, marquis de Racan (1589–1670), and François de Maynard (1582–1646) were the most remarkable

But the vigour, not to say the licence, of the 16th century could not thus die all at once In Théophile de Viau (1591–1626) the early years of the 17th century had their Villon The later poet was almost as unfortunate as the earlier, and almost as disreputable, but he had a great share of poetical and not a small one of critical power Racan and Théophile were followed in the second quarter of the century by two schools which sufficiently well represented the tendencies of each The first was that of Vincent Voiture (1598–1648), Isaac de Benserade (1612–91), and other poets such as Claude de Malleville (1597–1647), author of *La Belle Matineuse*, who were connected more or less with the famous literary coterie of the Hôtel de Rambouillet Théophile was less worthily succeeded by a class, it can hardly be called a school, of poets, some of whom, like Gérard Saint-Amant (1594–1660), wrote drinking songs of merit and other light pieces, others, like Paul Scarron (1610–60) and Sarrasin (1603? 4? 5?–1654), devoted themselves rather to burlesque of serious verse Most of the great dramatic authors of the time also wrote miscellaneous poetry, and there was even an epic school of the most singular kind, in ridiculing and discrediting which Boileau did undoubtedly good service The *Pucelle* of Jean Chapelain (1595–1674), the unfortunate author who was deliberately trained and educated for a poet, who enjoyed for some time a sort of dictatorship in French literature on the strength of his forthcoming work, and at whom from the day of its publication every critic of French literature has agreed to laugh, was the most famous and perhaps the worst of these But Georges de Scudéry (1601–67) wrote an *Alaric*, the Père le Moyne (1602–71) a *Saint Louis*, Jean Desmarets de Saint-Sorlin (1595–1676), a dramatist and critic of some note, a *Clovis*, and Saint-Amant a *Moise*, which were not much better The *Précieuses* of the Hôtel Rambouillet, with all their absurdities, encouraged if they did not produce good literary work In their society there is no doubt that a great reformation of manners took place, if not of morals, and that the tendency to literature elegant and polished, yet not destitute of vigour, which marks the 17th century, was largely developed side by side with much scandal-mongering and anecdotage The *Guirlande de Julie*, in which most of the poets of the time celebrated Julie d'Angennes, daughter of the marquise de Rambouillet, is perhaps the best of all such albums, and Voiture, the typical poet of the coterie, was certainly the best writer of *vers de société* who is known to us The poetical war which arose between the Uranistes, the followers of Voiture, and the Jobistes, those of Benserade, produced reams of sonnets, epigrams and similar verses. This habit of occasional versification long continued It led as a less important consequence to the rhymed *Gazettes* of Jean Loret (d. 1665), which recount in octosyllabic verse of a light and lively kind the festivals and court events of the early years of Louis XIV. It led also to perhaps the most remarkable non-dramatic poetry of the century, the *Contes* and *Fables* of Jean de la Fontaine (1621–95). No French writer is better known than la Fontaine, and there is no need to dilate on his merits It has been well said that he completes Molière, and that the two together give something to French literature which no other literature possesses La Fontaine continues the tradition of the writers of *fabliaux*, in the language and with the manners of his own century.

All the writers we have mentioned belong more or less to the first half of the century, and so do Valentin Conrart (1603–75), Antoine Furetière (1626–88), Chapelle (Claude Emmanuel) l'Huillier (1626–86), and others not worth special mention The latter half of the century is far less productive, and the poetical quality of its production is even lower than the quantity In it Boileau (1636–1711) is the chief poetical figure Next to him can only be mentioned Madame Deshoulières (1638–94), Guillaume de Brébeuf (1618–61), translator of Lucan, and Philippe Quinault (1635–88), the composer of opera libretti Boileau's satire, where it has much merit, is usually borrowed direct from Horace He had a certain faculty as a critic of the slashing order and might have profitably used it if he had written in prose But of his poetry it must be said, not so much that it is bad, as that it is not, in strictness, poetry at all, and the same is generally true of all those who followed him Yet his importance is enormous He elaborated, in the clearest possible manner of expression, those ideals of classicism, which are the soul of his period, and on which lived much greater poets than himself What he condemned has disappeared, and we reap the profit of his activities without always realizing the great necessity there was for them

17th Century Drama.—We have already seen how the mediaeval theatre was formed, and how in the second half of the 16th century it met with a formidable rival in the classical drama of Jodelle and Garnier In 1588 mysteries had been prohibited, and with the prohibition of the mysteries the Confraternity of the Passion lost the principal part of its reason for existence The other bodies and societies of amateur actors had already perished, and at length the Hôtel de Bourgogne itself, the home of the confraternity, had been handed over to a regular troop of actors, while companies of strollers, whose life has been vividly depicted in the *Roman comique* of Scarron and the *Capitaine Fracasse* of Théophile Gautier, wandered all about the provinces. The old farce was for a time maintained or revived by Tabarin, a remarkable figure in dramatic history, of whom but little is known The great dramatic author of the first quarter of the 17th century was Alexandre Hardy (1569–1631), who surpassed even Heywood in fecundity, and very nearly approached the portentous productiveness of Lope de Vega From Hardy to Rotrou is, in point of literary interest, a great step, and from Rotrou to Corneille a greater Jean de Rotrou (1610–50) has been called the French Marlowe, and there is a curious likeness and yet a curious contrast between the two poets The best parts of Rotrou's two best plays, *Venceslas* and *St Genest*, are quite beyond comparison in respect of anything that preceded them, and the central speech of the last-named play will rank with anything in French dramatic poetry

The fertility of France at this moment in dramatic authors was immense; nearly 100 are enumerated in the first quarter of the century The early plays of Pierre Corneille (1606–84) showed all the faults of his contemporaries combined with merits to which none of them except Rotrou, and Rotrou himself only in part, could lay claim His first play was *Mélite*, a comedy, and in *Clitandre*, a tragedy, he soon produced what may perhaps be not inconveniently taken as the typical piece of the school of Hardy A full account of Corneille may be found elsewhere It is sufficient to say here that his importance in French literature is quite as great in the way of influence and example as in the way of intellectual excellence The *Cid* and the *Menteur* are respectively the first examples of French tragedy and comedy which can be called modern.

Beginning with mere farces of the Italian type, and passing from these to comedies still of an Italian character, it was in *Les Précieuses ridicules*, acted in 1659, that Molière (1622–73), in the words of a spectator, hit at last on "la bonne comédie." The next 15 years comprise the whole of his best known work, the finest achievement of a certain class of comedy that any literature has produced The tragic masterpieces of Racine (1639–99) were not far from coinciding with the comic masterpieces of Molière, for, with the exception of the remarkable aftergrowth of *Esther* and *Athalie*, they were produced chiefly between 1667 and 1677 Both Racine and Molière are writers who require separate mention.

The French Academy was founded unofficially by Conrart in 1629, received official standing six years later, and continued the tradition of Malherbe in attempting constantly to school and correct, as the phrase went, the somewhat disorderly instincts of the early French stage Even the *Cid* was formally censured for irregularity by it

Among the immediate successors and later contemporaries of the three great dramatists we do not find any who deserve high rank as tragedians, though there are some whose comedies are more than competent It is at least significant that the restrictions imposed by the academic theory on the comic drama were far less severe than those which tragedy had to undergo Only Thomas Corneille (1625–1709), the inheritor of an older tradition and of a great name, deserves to be excepted from the condemnation to be passed on the lesser tragedians of this period He was unfortunate in possessing his brother's name, and in being, like him, too voluminous in his compositions, but *Camma, Ariane, Le Comte d'Essex*, are not tragedies to be despised On the other hand, the names of Jean de Campistron (1656–1723) and Nicolas Pradon (1632–98) mainly serve to point injurious comparisons, Joseph François Duché (1668–1704) and Antoine La Fosse (1653–1708) are of still less importance, and Quinault's tragedies are chiefly remarkable because he had the good sense to give up writing them and to take to opera The general excellence of French comedy, on the other hand, was sufficiently vindicated Besides the splendid sum of Molière's work, the two great tragedians had each, in *Le Menteur* and *Les Plaideurs*, set a capital example to their successors, which was fairly followed David Augustin de Brueys (1640–1723) and Jean Palaprat (1650–1721) brought out once more the ever new *Avocat Patelin* besides the capital *Grondeur* Quinault and Campistron wrote fair comedies Florent Carton Dancourt (1661–1726), Charles Rivière Dufresny (*c* 1654–1724), Edmond Boursault (1638–1701), were all comic writers of considerable merit But the chief comic dramatist of the latter period of the 17th century was Jean François Regnard (1655–1709), whose *Joueur* and *Légataire* are comedies almost of the first rank

17th Century Fiction.—In the department of literature which comes between poetry and prose, that of romance-writing, the 17th century, excepting one remarkable development, was not very fertile *Polexandre* and *Cléopâtre, Clélie* and the *Grand Cyrus*, have been too heavy for all the industry and energy of literary antiquarians The nearest ancestry which can be found for them is the romances of the *Amadis* type Everybody knows the *Carte de Tendre* which originally appeared in *Clélie*, while most people have heard of the shepherds and shepherdesses who figure in the *Astrée* of Honoré D'Urfé (1568–1625), on the borders of the Lignon, but here general knowledge ends, and there is perhaps no reason why it should go much further It is sufficient to say that Madeleine de Scudéry (1607–1701) principally devotes herself in the books above mentioned to laborious gallantry and heroism, La Calprénède (1610–63) in *Cassandre et Cléopâtre* to something which might have been the historical novel if it had been constructed on a less preposterous scale, and Marin le Roy de Gomberville (1600–47) in *Polexandre* to moralizings

The form which the prose tale took at this period was that of the fairy story Perrault (1628–1703) and Madame d'Aulnoy (d 1705) composed specimens of this kind which have never ceased to be popular since Hamilton (1646–1720), the author of the well-known *Mémoires du comte de Gramont*, wrote similar stories of extraordinary merit in style and ingenuity There is yet a third class of prose writing which deserves to be mentioned It also may probably be traced to Spanish influence, to the picaresque romances which the 16th and 17th centuries produced in Spain in large numbers The most remarkable example of this is the *Roman comique* of the burlesque writer Scarron The *Roman bourgeois* of Antoine Furetière (1619–88) also deserves mention as a collection of pictures of the life of the time, arranged in the most desultory manner, but drawn with great vividness, observation and skill A remarkable writer who had great influence on Molière has also to be mentioned in this connection rather than in any other This is Cyrano de Bergerac (1619–55), who, besides composing doubtful comedies and tragedies, writing political pamphlets, and exercising the task of literary criticism in objecting to Scarron's burlesques, produced in his *Histoires comiques des états et empires de la lune et du soleil*, half romantic and half satirical compositions

One other work, and in literary influence perhaps the most remarkable of its kind in the century, remains Madame de Lafayette, Marie de la Vergne (1634–92), the friend of La Rochefoucauld and of Madame de Sévigné, though she did not exactly anticipate the modern novel, showed the way to it in her stories, the principal of which are *Zaïde* and still more *La Princesse de Clèves* The latter, though a long way from *Manon Lescaut, Clarissa*, or *Tom Jones*, is a longer way still from *Polexandre* or the *Arcadia* The novel becomes in it no longer a more or less fictitious chronicle, but an attempt at least at the display of character *La Princesse de Clèves* has never been one of the works widely popular out of their own country, nor perhaps does it deserve such popularity, for it has more grace than strength, but as an original effort in an important direction its historical value is considerable But with this exception, the art of fictitious prose composition, except on a small scale, is certainly not one in which the century excelled, nor are any of the masterpieces which it produced to be ranked in this class

17th Century Prose.—If, however, this was the case, it cannot be said that French prose as a whole was unproductive at this time On the contrary, it was now, and only now, that it attained the strength and perfection for which it has been so long renowned, and which has perhaps, by a curious process of compensation, somewhat deteriorated since the restoration of poetry proper in France The prose Malherbe of French literature was Jean Guez de Balzac (1594–1654) The writers of the 17th century had practically created the literary language of prose, but they had not created a prose style The charm of Rabelais, of Amyot, of Montaigne, and of the numerous writers of tales and memoirs whom we have noticed, was a charm of exuberance, of naïveté, of picturesque effect—in short, of a mixture of poetry and prose, rather than of prose proper Sixteenth-century French prose is a delightful instrument in the hands of men and women of genius, but in the hands of those who have not genius it is full of defects, and indeed is nearly unreadable Now, prose is essentially an instrument of all work The poet who has not genius had better not write at all, the prose writer often may and sometimes must dispense with this qualification He has need, therefore, of a suitable machine to help him perform his task, and this machine it is the glory of Balzac to have done more than any other person to create He himself produced no great work, his principal writings being letters, a few discourses and dissertations, and a work entitled *Le Socrate chrétien*, a sort of treatise on political theology But if the matter of his work is not of the first importance, its manner is of a very different value. Instead of the endless diffuseness of the preceding century, its ill-formed or rather unformed sentences, and its haphazard periods, we find clauses, sentences and paragraphs distinctly planned, shaped and balanced, a cadence introduced which is rhythmical but not metrical, and, in short, prose which is written knowingly instead of the prose which is unwittingly talked. It has been well said of him that he "*écrit pour écrire*"; and such a man, it is evident, if he does nothing else, sets a valuable example to those who write because they have something to say Voiture seconded Balzac without really intending to do so His prose style, also chiefly contained in letters, is lighter than that of his contemporary, and helped to gain for French prose the tradition of vivacity and sparkle which it has always possessed, as well as that of correctness and grace

17th Century History.—In historical composition, especially in the department of memoirs, this period was exceedingly rich At last there was written, in French, an entire history of France The author was François Eudes de Mézeray (1610–83), whose work, though not exhibiting the perfection of style at which some of his contemporaries had already arrived, and though still more or less uncritical, yet deserves the title of history At the end of the period, comes the great ecclesiastical history of Claude Fleury (1640–1723), a work which perhaps belongs more to the section of

erudition than to that of history proper. Three small treatises, however, composed by different authors towards the middle of the century, supply remarkable instances of prose style in its application to history These are the *Conjurations du comte de Fiesque,* written by the famous Cardinal de Retz (1613–79), the *Conspiration de Walstein* of Sarrasin, and the *Conjuration des Espagnols contre Venise,* composed in 1672 by the abbé de Saint-Réal (1639–92), the author of various historical and critical works deserving less notice Both this and earlier times found chronicle in the singular *Historiettes* of Gédéon Tallemant des Réaux (1619–90), a collection of anecdotes, frequently scandalous, reaching from the times of Henri IV to those of Louis XIV, to which may be joined the letters of Guy Patin (1602–76).

From this time memoirs and memoir writers were ever multiplying The queen of them all is Madame de Sévigné (1626–96), on whom, as on most of the great and better-known writers whom we have had and shall have to mention, it is impossible here to dwell at length The last half of the century produced crowds of similar but inferior writers The memoirs of Roger de Bussy-Rabutin (1618–93) (author of a kind of scandalous chronicle called *Histoire amoureuse des Gaules*) and of Madame de Maintenon (1635–1719) perhaps deserve notice above the others Memoir-writing became the occupation not so much of persons who made history, as was the case from Comines to Retz, as of those who, having culture, leisure and opportunity of observation, devoted themselves to the task of recording the deeds of others The efforts of Balzac and the Academy supplied a suitable language and style, and the increasing tendency towards epigrammatic moralizing, which reached its acme in La Rochefoucauld (1663–80) and La Bruyère (1639–96), added in most cases point and attractiveness to their writings

17th Century Philosophers and Theologians.—René Descartes (1596–1650) was at once a master of prose style, the greatest of French philosophers, and one of the greatest metaphysicians, not merely of France and of the 17th century, but of all countries and times Even before Descartes there had been considerable and important developments of metaphysical speculation in France The first eminent philosopher of French birth was Pierre Gassendi (1592–1655) Gassendi devoted himself to the maintenance of a modernized form of the Epicurean doctrines, but he wrote mainly, if not entirely, in Latin Another sceptical philosopher of a less scientific character was the physicist Gabriel Naudé (1600–53), who, like many others of the philosophers of the time, was accused of atheism But as none of these could approach Descartes in philosophical power and originality, so also none has even a fraction of his importance in the history of French literature Descartes stands with Plato, and possibly Berkeley and Malebranche, at the head of all philosophers in respect of style; and in his case the excellence is far more remarkable than in others, inasmuch as he had absolutely no models, and was forced in a great degree to create the language which he used The *Discours de la méthode* is not only one of the epoch-making books of philosophy, it is also one of the epoch-making books of French style The tradition of his clear and perfect expression was taken up, not merely by his philosophical disciples, but also by Blaise Pascal (1623–62) and the school of Port Royal, who will be noticed presently The very genius of the Cartesian philosophy was intimately connected with this clearness, distinctness and severity of style, and there is something more than a fanciful contrast between these literary characteristics of Descartes, on the one hand, and the elaborate splendour of Bacon, the knotty and crabbed strength of Hobbes, and the commonplace and almost vulgar slovenliness of Locke. Of the followers of Descartes, putting aside the Port Royalists, by far the most distinguished, both in philosophy and in literature, is Nicolas Malebranche (1638–1715). His *Recherche de la vérité,* admirable as it is for its subtlety and its consecutiveness of thought, is equally admirable for its elegance of style. Malebranche cannot indeed, like his great master, claim absolute originality. But his excellence as a writer is as great as, if not greater than, that of Descartes, and the *Recherche* remains to this day the one philosophical treatise of great length and abstruseness which, merely as a book, is delightful to read.

Yet, for all this, philosophy hardly flourished in France It was too intimately connected with theological and ecclesiastical questions, and especially with Jansenism, to escape suspicion and persecution Descartes himself was for much of his life an exile in Holland and Sweden, and though the unquestionable orthodoxy of Malebranche, the strongly religious cast of his works, and the remoteness of the abstruse region in which he sojourned from that of the controversies of the day, protected him, other followers of Descartes were not so fortunate Holland, indeed, became a kind of city of refuge for students of philosophy, though even in Holland itself they were by no means entirely safe from persecution By far the most remarkable of French philosophical sojourners in the Netherlands was Pierre Bayle (1647–1706), a name not perhaps of the first rank in respect of literary value, but certainly of the first as regards literary influence. Bayle, after oscillating between the two confessions, nominally remained a Protestant in religion In philosophy he in the same manner oscillated between Descartes and Gassendi, finally resting in an equally nominal Cartesianism Bayle was, in fact, both in philosophy and in religion, merely a sceptic His style is hardly to be called good, being diffuse and often inelegant But his great dictionary, though one of the most heterogeneous and unmethodical of compositions, exercised an enormous influence It may be called the Bible of the 18th century, and contains in the germ all the desultory philosophy, the ill-ordered scepticism, and the critical but negatively critical acuteness of the *Aufklarung.*

Jansenius himself, though a Dutchman by birth, passed much time in France, and it was in France that he found most disciples. These disciples consisted in the first place of the members of the society of Port Royal des Champs, a coterie after the fashion of the time, but one which devoted itself not to sonnets or madrigals but to devotional exercises, study and the teaching of youth. This coterie early adopted the Cartesian philosophy, and the Port Royal *Logic* was the most remarkable popular hand-book of that school In theology they adopted Jansenism, and were in consequence soon at daggers drawn with the Jesuits, according to the polemical habits of the time The most distinguished champions on the Jansenist side were Jean Duvergier de Hauranne, abbé de St. Cyran (1581–1643), and Antoine Arnauld (1560–1619), but by far the most important literary results of the quarrel were the famous *Provinciales* of Pascal, or, to give them their proper title, *Lettres écrites à un provincial* Their literary importance consists, not merely in their grace of style, but in the application to serious discussion of the peculiarly polished and quiet irony of which Pascal is the greatest master the world has ever seen Pascal set the example of combining the use of the most terribly effective weapons with good humour, good breeding and a polished style. The example was largely followed, and the manner of Voltaire and his followers in the 18th century owes at least as much to Pascal as their method and matter do to Bayle The Jansenists, attacked and persecuted by the civil power, which the Jesuits had contrived to interest, were finally suppressed But the *Provinciales* had given them an unapproachable superiority in matter of argument and literature Their other literary works were inferior, though still remarkable Antoine Arnauld (the younger, often called "the great") (1612–94) and Pierre Nicole (1625–95) managed their native language with vigour if not exactly with grace

17th Century Preachers.—When we think of Gallican theology during the 17th century, it is always with the famous pulpit orators of the period that thought is most busied Nor is this unjust, for though the most prominent of them all, Jacques Bénigne Bossuet (1627–1704) was remarkable as a writer of matter intended to be read, not merely as a speaker of matter intended to be heard, this double character is not possessed by most of the orthodox theologians of the time; and even Bossuet, great as is his genius, is more of a rhetorician than of a philosopher or a theologian. No country has ever been able to show a more magnificent concourse of orators, sacred or profane, than that formed by Bossuet, Fénelon (1651–1715), Esprit Fléchier (1632–1710), Jules Mascaron (1634–1703), Louis Bourdaloue (1632–1704), and Jean Baptiste Massillon (1663–1742), to whom may be justly

added the Protestant divines, Jean Claude (1619–87) and Jacques Saurin (1677–1730) The characteristics of all these were different Bossuet, the earliest and certainly the greatest, was also the most universal He was not merely a preacher, he was, as we have said, a controversialist, indeed somewhat too much of a controversialist, as his battle with Fénelon proved He was a philosophical or at least a theological historian, and his *Discours sur l'histoire universelle* is equally remarkable from the point of view of theology, philosophy, history and literature Turning to theological politics, he wrote his *Politique tirée de l'écriture sainte,* to theology proper his *Méditations sur les évangiles* and his *Elévations sur les mystères* But his principal work, after all, is his *Oraisons funèbres.*

While Bossuet made himself chiefly remarkable in his sermons and in his writings by an almost Hebraic grandeur and rudeness, the more special characteristics of Christianity, largely alloyed with a Greek and Platonic spirit, displayed themselves in Fénelon In pure literature he is not less remarkable than in theology, politics and morals His practice in matters of style was admirable, as the universally known *Télémaque* sufficiently shows to those who know nothing else of his writing But his taste, both in its correctness and its audacity, is perhaps more admirable still. Despite Malherbe, Balzac, Boileau and the traditions of nearly a century, he dared to speak favourably of Ronsard, and plainly expressed his opinion that the practice of his own contemporaries and predecessors had cramped and impoverished the French language quite as much as they had polished or purified it

The two Protestant ministers whom we have mentioned, though inferior to their rivals, yet deserve honourable mention among the ecclesiastical writers of the period Claude engaged in a controversy with Bossuet, in which victory is claimed for the invincible eagle of Meaux Saurin, by far the greater preacher of the two, long continued to occupy, and indeed still occupies, in the libraries of French Protestants, the position given to Bossuet and Massillon on the other side

17th Century Moralists.—The interests of many different classes of persons were concentrated upon moralizings, which took indeed very different forms in the hands of Pascal and other grave and serious thinkers of the Jansenist complexion in theology, and in those of literary courtiers as, for example, Saint-Evremond and La Rochefoucauld, whose chief object was to depict the motives and characters prominent in the brilliant and not altogether frivolous society in which they moved Both classes, however, were more or less tempted by the cast of their thoughts and the genius of the language to adopt the tersest and most epigrammatic form of expression possible, and thus to originate the *"pensée"* in which, as its greatest later writer, Joubert, has said, "the ambition of the author is to put a book into a page, a page into a phrase, and a phrase into a word" The great genius and admirable style of Pascal are certainly better shown in his *Pensées* than in his *Lettres Provinciales,* which, though admirable, if not unequalled in their particular genre, do not evoke the same depth of thought and power of expression

There arose only a little later a very different group of moralists, whose writings have been as widely read, and who have had as great a practical and literary influence as perhaps any other class of authors The earliest to be born and the last to die of these was Charles de Saint-Denis, seigneur de Saint-Evremond (1613–1703) Saint-Evremond was long known rather as a conversational wit, some of whose good things were handed about in manuscript, or surreptitiously printed in foreign lands, than as a writer, and this is still to a certain extent his reputation He was at least as cynical as his still better known contemporary La Rochefoucauld, if not more so, and he had less intellectual force and less nobility of character But his wit was very great, and he set the example of the brilliant societies of the next century

In direct literary value, however, no comparison can be made between Saint-Evremond and the author of the *Sentences et maximes morales* François, duc de la Rochefoucauld (1613–80), has other literary claims besides those of this famous book His *Mémoires* were very favourably judged by his contemporaries, and they are still held to deserve no little praise even among the numerous and excellent works of the kind which that age of memoir-writers produced. But while the *Mémoires* thus invite comparison, the *Maximes et sentences* stand alone Even allowing that the mere publication of detached reflections in terse language was not absolutely new, it had never been carried, perhaps has never since been carried, to such a perfection Beside La Rochefoucauld all other writers are diffuse, vacillating, unfinished, rough Not only is there in him never a word too much, but there is never a word too little The thought is always fully expressed, not compressed Frequently as the metaphor of minting or stamping coin has been applied to the art of managing words, it has never been applied so appropriately as to the maxims of La Rochefoucauld The form of them is almost beyond praise, and its excellencies, combined with their immense and enduring popularity, have had a very considerable share in influencing the character of subsequent French literature Of hardly less importance in this respect, though of considerably less intellectual and literary individuality, was the translator of Theophrastus and the author of the *Caractères,* Jean de la Bruyère (1645–96), but though frequently epigrammatic, he did not aim at the same incredible terseness as the author of the *Maximes*

17th Century Scholars.—The institution of the Academy led to various linguistic works One of the earliest of these was the *Remarques* of the Savoyard Claude Favre de Vaugelas (1595–1650), afterwards re-edited by Thomas Corneille Pellisson wrote a history of the Academy itself when it had as yet but a brief one The famous *Examen du Cid* was an instance of the literary criticism of the time which was afterwards represented by René Rapin (1621–87), Dominique Bouhours (1628–1702) and René de Bossu (1631–80), while Adrien Baillet (1649–1706) has collected the largest thesaurus of the subject in his *Jugemens des savants* Boileau set the example of treating such subjects in verse, and in the latter part of the century *Reflexions, Discours, Observations,* and the like, on particular styles, literary forms and authors, became exceedingly numerous In earlier years France possessed a numerous band of classical scholars of the first rank, such as Scaliger and Casaubon, who did not lack followers

The famous quarrel between the Ancients and the Moderns, of Italian origin, was mainly started in France by Charles Perrault (1628–1703), who thereby rendered much less service to literature than by his charming fairy tales The opposite side was taken by Boileau, and the fight was afterwards revived by Antoine Houdar[d, t] de la Motte (1672–1731), a writer of little learning but much talent in various ways, and by the celebrated Madame Dacier, Anne Lefèvre (1654–1720) The discussion was conducted, as is well known, without very much knowledge or judgment among the disputants on the one side or on the other But at this very time there were in France students and scholars of the most profound erudition Fleury is only the last and the most popular of a race of omnivorous and untiring scholars, whose labours have ever since, until the modern fashion of first-hand investigations came in, furnished the bulk of historical and scholarly references and quotations To this century belong le Nain de Tillemont (1637–98), whose enormous *Histoire des empereurs* and *Mémoires pour servir à l'histoire ecclésiastique* served Gibbon and a hundred others as quarry, Charles Dufresne, seigneur de Ducange (1614–88), whose well-known glossary was only one of numerous productions; Jean Mabillon (1632–1707), one of the most voluminous of the voluminous Benedictines; and Bernard de Montfaucon (1655–1741)

THE 18TH CENTURY

The beginning of the 18th century is among the dead seasons of French literature Fénelon and Malebranche still survived, but they were emphatically men of the last age, as was Massillon, though he lived till nearly the middle of the century. The characteristic literary figures of the opening years of the period are d'Aguesseau, Fontenelle, Saint-Simon, personages in many ways interesting and remarkable, but purely transitional in their characteristics Bernard le Bovier de Fontenelle (1657–1757) is, indeed, perhaps the most typical figure of the time. He was a dramatist, a moralist, a philosopher, physical and metaphysical, a critic, an historian, a poet and a satirist. The manner of his

works is always easy and graceful, and their matter rarely contemptible.

18th Century Poetry.—The dispiriting signs shown during the 17th century by French poetry proper received entire fulfilment in the following age The two poets who were most prominent at the opening of the period were the abbé de Chaulieu (1639–1720) and the marquis de la Fare (1644–1712), poetical or rather versifying twins who are always quoted together They were followed, however, by the one poet who succeeded in producing something resembling poetry in this artificial style, J B. Rousseau (1671–1741) Rousseau, who in some respects was nothing so little as a religious poet, was nevertheless strongly influenced, as Marot had been, by the Psalms of David His *Odes* and his *Cantates* are perhaps less destitute of that spirit than the work of any other poet of the century excepting André Chénier Rousseau was also an extremely successful epigrammatist, having in this respect, too, resemblances to Marot

The universal genius of Voltaire (1694–1778) showed itself in his poetical productions no less than in his other works, and it is perhaps not least remarkable in verse It is impossible nowadays to regard the *Henriade* as anything but a highly successful prize poem, but the burlesque epic of *La Pucelle*, discreditable as it may be from the moral point of view, is remarkable enough as literature The epistles and satires are among the best of their kind, the verse tales are in the same way admirable, and the epigrams, impromptus, and short miscellaneous poems generally are the *ne plus ultra* of verse which is not poetry The Anglomania of the century extended into poetry, and the *Seasons* of Thomson set the example of a whole library of tedious descriptive verse, which in its turn revenged France upon England by producing or helping to produce English poems of the Darwin school

André Chénier (1762–94) stands far apart from the art of his century, though the strong chain of custom, and his early death by the guillotine, prevented him from breaking finally through the restraints of its language and its versification Chénier, half a Greek by blood, was wholly one in spirit and sentiment The manner of his verses, the very air which surrounds them and which they diffuse, are different from those of the 18th century, and his poetry is probably the utmost that its language and versification could produce To do more, the revolution which followed a generation after his death was required

18th Century Drama.—The results of the cultivation of dramatic poetry at this time were even less individually remarkable than those of the attention paid to poetry proper Here again the astonishing power and literary aptitude of Voltaire gave value to his attempts There is no doubt that no work of Voltaire's comes up to *Polyeucte* and *Rodogune*, as certainly no single passage in any of his plays can approach the best passages of *Cinna* and *Les Horaces* But the remaining tragic writers of the century, with the single exception of Crébillon *père*, are scarcely third-rate C Jolyot de Crébillon (1674–1762) himself had genius, and there are to be found in his work evidences of a spirit which had seemed to die away with *Saint-Genest*, and was hardly to revive until *Hernani*

Very early in the century Alain René le Sage (1668–1747), in the admirable comedy of *Turcaret*, produced a work not unworthy to stand by the side of all but his master's best Philippe Destouches (1680–1754) was also a fertile comedy writer in the early years of the century, and in *Le Glorieux* and *Le Philosophe marié* achieved considerable success As the age went on, comedy, always apt to lay hold of passing events, devoted itself to the great struggle between the Philosophes and their opponents. Curiously enough, the party which engrossed almost all the wit of France had the worst of it in this dramatic portion of the contest, if in no other. The *Méchant* of Gresset and the *Métromanie* of Alexis Piron (1689–1773) were far superior to anything produced on the other side, and the *Philosophes* of Charles Palissot de Montenoy (1730–1814), though scurrilous and broadly farcical, had a great success. On the other hand, it was to a Philosophe that the invention of a new dramatic style was due, and still more the promulgation of certain ideas on dramatic criticism and construction, which, after being filtered through the German mind, were to return to France and to exercise the most powerful influence on its dramatic productions This was Denis Diderot (1713–84), the most fertile genius of the century, but also the least productive in finished and perfect work His chief dramas, the *Fils naturel* and the *Père de famille*, are certainly not great successes, the shorter plays, *Est-il bon? est-il méchant?* and *La Pièce et le prologue*, are better. But it was his follower Michel Jean Sédaine (1719–97) who, in *Le Philosophe sans le savoir* and other pieces, produced the best examples of the bourgeois as opposed to the heroic drama Diderot is sometimes credited or discredited with the invention of the *Comédie Larmoyante*, a title which indeed his own plays do not altogether refuse, but this special variety seems to be, in its invention, rather the property of Pierre Claude Nivelle de la Chaussée (1692–1754) The most original dramatist of the century is perhaps Pierre de Marivaux (1688–1763) whose *Jeu de l'Amour et du Hasard*, for delicacy of style and feeling, is one of the permanent masterpieces of the comic stage He reaches at times to an astonishing modernity of tone and sensibility

At the extreme limit of our present period there appears the remarkable figure of Pierre Caron de Beaumarchais (1732–99). The *Mariage de Figaro* and the *Barbier de Séville* are well known as having had attributed to them no mean place among the literary causes and forerunners of the Revolution Their dramatic and literary value would itself have sufficed to obtain attention for them at any time, though there can be no doubt that their popularity was mainly due to their political appositeness The most remarkable point about them, as about the school of comedy of which Congreve was the chief master in England at the beginning of the century, was the abuse and superfluity of wit in the dialogue, indiscriminately allotted to all characters alike

18th Century Fiction.—Le Sage in his *Diable boiteux* and *Gil Blas* went to Spain not merely for his subject but also for his inspiration and manner, following the lead of the picaresque romance of Rojas and Scarron Like Fielding, however, whom he much resembles, Le Sage mingled with the romance of incident the most careful attention to character and the most lively portrayal of it, while his style and language are such as to make his work one of the classics of French literature The novel of character was really founded in France by the abbé Prévost d'Exilles (1697–1763), the author of *Cleveland* and of the incomparable *Manon Lescaut* The popularity of this style was much helped by the immense vogue in France of the works of Richardson Side by side with it, however, and for a time enjoying still greater popularity, there flourished a very different school of fiction, of which Voltaire, whose name occupies the first or all but the first place in every branch of literature of his time, was the most brilliant cultivator This was a direct development of the earlier *conte*, and consisted usually of the treatment, in a humorous, satirical, and not always over-decent fashion, of contemporary foibles, beliefs, philosophies and occupations These tales are of every rank of excellence and merit both literary and moral, and range from the astonishing wit, grace and humour of *Candide* and *Zadig* to the book which is Diderot's one hardly pardonable sin, and the similar but more lively efforts of Crébillon *fils* (1707–77).

A third class of 18th-century fiction consists of attempts to return to the humorous *fatrasie* of the 16th century, attempts which were as much influenced by Sterne as the sentimental novel was by Richardson The *Homme aux quarante écus* of Voltaire has something of this character, but the most characteristic work of the style is the *Jacques le fataliste* of Diderot, which shows it nearly at its best

The great vogue and success of *Télémaque* produced a certain number of didactic works, in which moral or historical information was sought to be conveyed under a more or less thin guise of fiction Such was the *Voyage du jeune Anacharsis* of Jean Jacques Barthélemy (1716–95), such the *Numa Pompilius* and *Gonzalve de Cordoue* of Florian (1755–94), who also deserves notice as a writer of pastorals, fables and short prose tales, such the *Bélisaire* and *Les Incas* of Jean François Marmontel (1723–99). Between this class and that of the novel of sentiment may perhaps be placed *Paul et Virginie* and *La Chaumière indienne;* though Bernardin de Saint-Pierre (1737–1814) should more prop-

erly be noticed after Rousseau and as a moralist Diderot's fiction-writing has already been referred to, but his *Religieuse* deserves citation here as a powerful specimen of the novel both of analysis and polemic; while his undoubted masterpiece, the *Neveu de Rameau*, though very difficult to class, comes under this head as well as under any other There are, however, two of the novelists of this age, and of the most remarkable, who have yet to be noticed, and these are the author of *Marianne* and the author of *Julie* We do not mention Pierre de Marivaux (1688–1763) in this connection as the equal of Jean Jacques Rousseau (1712–1778), but merely as being in his way almost equally original and equally remote from any suspicion of school influence Gray's definition of happiness, "to lie on a sofa and read endless novels by Marivaux," is well known, and the production of mere pastime by means more or less harmless has since become so well-recognized a function of the novelist that Marivaux, as one of the earliest to discharge it, deserves notice The name, however, of Jean Jacques Rousseau is of far different importance His two great works, the *Nouvelle Héloïse* and *Émile*, are as far as possible from being perfect as novels But no novels in the world have ever had such influence as these To a great extent this influence was due mainly to their attractions as novels, imperfect though they may be in this character, but it was beyond dispute also owing to the doctrines which they contained, and which were exhibited in novel form In the other works of Rousseau, especially in the *Confessions*, there is not merely shown passion as fervid though perhaps less unaffected than that of Mademoiselle de Lespinasse—there appear in them two literary characteristics which, if not entirely novel, were for the first time brought out deliberately by powers of the first order, being for the first time made the mainspring of literary interest, and thereby set an example which for more than a century has been persistently followed, and which has produced some of the finest results of modern literature The first of these was the elaborate and unsparing analysis and display of the motives, the weaknesses and the failings of individual character This process, which Rousseau unflinchingly performed on himself, has been followed usually in respect to fictitious characters by his successors The other novelty was the feeling for natural beauty and the elaborate description of it, the credit of which latter must, it has been agreed by all impartial critics, be assigned rather to Rousseau than to any other writer His influence in this direction was, however, soon taken up and continued by Bernardin de Saint-Pierre, the connecting link between Rousseau and Chateaubriand, some of whose works have been already alluded to In particular the author of *Paul et Virginie* set himself to develop the example of description which Rousseau had set, and his word-paintings, though less powerful than those of his model, are more abundant, more elaborate, and animated by a more amiable spirit

18th Century History, Memoirs and Letters.—The historical studies and results of 18th-century speculation in France are of especial and peculiar importance There is no doubt that what is called the science of history dates from this time, and though the beginning of it is usually assigned to the Italian Vico, its complete indication may perhaps with equal or greater justice be claimed by the Frenchman Turgot Before Turgot, however, there were great names in French historical writing, and perhaps the greatest of all is that of Charles Secondat de Montesquieu (1689–1755). The three principal works of this great writer are all historical and at the same time political in character In the *Lettres persanes* he handled, with wit inferior to the wit of no other writer even in that witty age, the corruptions and dangers of contemporary morals and politics The literary charm of this book is very great, and its plan was so popular as to lead to a thousand imitations, of which all, except those of Voltaire and Goldsmith, only bring out the immense superiority of the original Few things could be more different from this lively and popular book than Montesquieu's next work, the *Grandeur et décadence des Romains*, in which the same acuteness and knowledge of human nature are united with considerable erudition, and with a weighty though perhaps somewhat grandiloquent and rhetorical style His third and greatest work, the *Esprit des lois*, is again different both in style and character, and such defects as it has are as nothing when compared with the merits of its fertility in ideas, its splendid breadth of view, and the felicity with which the author, in a manner unknown before, recognizes the laws underlying complicated assemblages of fact. The style of this great work is equal to its substance; less light than that of the *Lettres*, less rhetorical than that of the *Grandeur des Romains*, it is still a marvellous union of dignity and wit Around Montesquieu, partly before and partly after him, is a group of philosophical or at least systematic historians, of whom the chief are Jean Baptiste Dubos (1670–1742), and G Bonnot de Mably (1709–85)

Montesquieu was, as we have said, followed by Anne Robert Jacques Turgot (1727–81), whose writings are few in number, and not remarkable for style, but full of original thought Turgot in his turn was followed by Condorcet (1743–94), whose tendency is somewhat more sociological than directly historical Towards the end of the period, too, a considerable number of philosophical histories were written, the usual object of which was, under cover of a kind of allegory, to satirize and attack the existing institutions and government of France The most famous of these was the *Histoire des Indes*, nominally written by the Abbé Guillaume Thomas François Raynal (1713–96), but really the joint work of many members of the Philosophe party, especially Diderot. Side by side with this really or nominally philosophical school of history there existed another and less ambitious school, which contented itself with the older and simpler view of the science The Abbé René de Vertot (1655–1735) belongs almost as much to the 17th as to the 18th century In the same class, too, far superior as is his literary power, must be ranked the historical works of Voltaire, *Charles XII*, *Pierre le Grand*, *Histoire du Siècle de Louis XIV*

The century opened with the memoirs of the duc de Saint-Simon (1675–1755), an extraordinary series of pictures of the court of Louis XIV and the Regency, written in a powerful style, with something of the irregular excellence of the great 16th-century writers, and most striking in the sombre bitterness of its tone The subsequent and less remarkable memoirs of the century are so numerous that it is almost impossible to select a few for reference, and altogther impossible to mention all Of those bearing on public history the memoirs of Madame de Stael (Mlle Delaunay) (1684–1750), of Pierre Louis de Voyer, marquis d'Argenson (1694–1757), of Charles Pinot Duclos (1704–72), of Stephanie Félicité de Saint-Aubin, Madame de Genlis (1746–1830), of Pierre Victor de Bésenval (1722–91), of Madame Campan (1752–1822) and of the cardinal de Bernis (1715–94), may perhaps be selected for mention, of those bearing on literary and private history, the memoirs of Madame d'Epinay (1726–83), those of Mathieu Marais (1664–1737), the so-called *Mémoires secrets* of Louis Petit de Bachaumont (1690–1770), and the innumerable writings having reference to Voltaire and to the Philosophe party generally Here, too, may be mentioned a remarkable class of literature, consisting of purely private and almost confidential letters, which were written at this time with very remarkable literary excellence As specimens may be selected those of Mademoiselle Aissé (1694–1757), which are models of easy and unaffected tenderness, and those of Mademoiselle de Lespinasse (1732–76) the companion of Madame du Deffand and afterwards of d'Alembert These latter, in their extraordinary fervour and passion, not merely contrast strongly with the generally languid and frivolous gallantry of the age, but also constitute one of its most remarkable literary monuments It has been said of them that they "burn the paper," and the expression is not exaggerated Madame du Deffand's (1697–1780) own letters, many of which were written to Horace Walpole, are noteworthy in a very different way Of lighter letters the charming correspondence of Diderot with Mademoiselle Voland deserves special mention

18th Century Philosophy.—The Philosophes, as a general rule, have but little claim to their title There were some who manifested, however, an aptitude for purely philosophical argument, and one who confined himself strictly thereto Among these the most remarkable are Julien Offroy de la Mettrie (1709–51)

and Denis Diderot. La Mettrie in his works *L'Homme machine, L'Homme plante,* etc , applied a lively and vigorous imagination, a considerable familiarity with physics and medicine, and a brilliant but unequal style, to the task of advocating materialistic ideas on the constitution of man. Diderot, in a series of early works, *Lettre sur les aveugles, Promenade d'un sceptique, Pensées philosophiques,* etc , exhibited a good acquaintance with philosophical history and opinion, and gave sign in this direction, as in so many others, of a far-reaching intellect But the French metaphysician of the century is undoubtedly Étienne Bonnot, abbé de Condillac (1714–80), almost the only writer of the time in France who succeeded in keeping strictly to philosophy without attempting to pursue his system to its results in ethics, politics and theology In the *Traité des sensations,* the *Essai sur l'origine des connaissances humaines* and other works Condillac elaborated and continued the imperfect sensationalism of Locke

It has never been at all accurately decided how far what may be called the scoffing school of Voltaire represents a direct revolt against Christianity, and how far it was merely a kind of guerilla warfare against the clergy It is positively certain that Voltaire was not an atheist, and that he did not approve of atheism But his *Dictionnaire philosophique,* which is typical of a vast amount of contemporary and subsequent literature, consists of a heterogeneous assemblage of articles directed against various points of dogma and ritual and various characteristics of the sacred records From the literary point of view, it is one of the most characteristic of all Voltaire's works, though it is perhaps not entirely his The desultory arrangement, the light and lively style, the extensive but not always too accurate erudition, and the somewhat captious and quibbling objections, are intensely Voltairian But there is little seriousness about it, and certainly no kind of rancorous or deep-seated hostility With many, however, of Voltaire's pupils and younger contemporaries, the case was altered They were distinctively atheists and anti-supernaturalists The atheism of Diderot, unquestionably the greatest of them all, has been keenly debated, but in the case of Étienne Damilaville (1723–68), Jacques André Naigeon (1738–1810), Paul Henri Dietrich, baron d'Holbach, and others there is no room for doubt By these persons a great mass of atheistic and anti-Christian literature was composed and set afloat. The characteristic work of this school, its last word indeed, is the famous *Système de la nature,* attributed to Holbach (1723–89), but known to be, in part at least, the work of Diderot In this remarkable work, which caps the climax of the metaphysical materialism or rather nihilism of the century, the atheistic position is clearly stated

As the Revolution approached, and the victory of the Philosophe party was declared, there appeared for a brief space a group of cynical and accomplished phrase-makers presenting some similarity to that of which, 100 years before, Saint-Evremond was the most prominent figure The chief of this group were Nicolas Chamfort (1747–94) on the republican side, and Antoine Rivarol (1753–1801) on that of the royalists Like the older writer to whom we have compared them, neither can be said to have produced any one work of eminence, and in this they stand distinguished from moralists like La Rochefoucauld The floating sayings, however, which are attributed to them, or which occur here and there in their miscellaneous work, yield in no respect to those of the most famous of their predecessors in wit and a certain kind of wisdom, though they are frequently more personal than aphoristic.

18th Century Moralists and Politicians.—Not the least part, however, of the energy of the period in thought and writing was devoted to questions of a directly moral and political kind. With regard to morality proper the favourite doctrine of the century was what is commonly called the selfish theory, the only one indeed which was suitable to the sensationalism of Condillac and the materialism of Holbach. The pattern book of this doctrine was the *De l'esprit* of Claude Adrien Helvétius (1715–71), the most amusing book perhaps which ever pretended to the title of a solemn philosophical treatise There is some analogy between the principles of this work and those of the *Système de la nature*

Luc de Clapiers, marquis de Vauvenargues (1715–47) has produced maxims and reflections of considerable mental force and literary finish From Voltaire downwards it has been usual to compare him with Pascal, from whom he is chiefly distinguished by a striking but somewhat empty stoicism Between the moralists and the politicians may be placed Rousseau, who in his novels and miscellaneous works is of the first class, in his famous *Contrat social* of the second All his theories, whatever their originality and whatever their value, were made novel and influential by the force of their statement and the literary beauties of their form.

Political economy and administrative theories received much attention The earliest writer of eminence on these subjects was the great engineer Sébastien le Prestre, marquis de Vauban (1633–1707), whose *Oisivetés* and *Dime royale* exhibit both great ability and extensive observation A more utopian economist of the same time was Charles Irénée Castel, abbé de Saint-Pierre (1658–1743), not to be confounded with the author of *Paul et Virginie* Soon political economy in the hands of François Quesnay (1694–1774) took a regular form, and towards the middle of the century a great number of works on questions connected with it, especially that of free trade in corn, on which Ferdinand Galiani (1728–87), André Morellet (1727–1819), both abbés, and above all Turgot, distinguished themselves

18th Century Criticism and Periodical Literature.—Literary criticism assumes in this century a sufficient importance to be treated under a separate heading Contributions were made to it of many different kinds and from many different points of view Periodical literature, the chief stimulus to its production, began more and more to come into favour Even in the 17th century the *Journal des savants,* the Jesuit *Journal de Trévoux,* and other publications had set the example of different kinds of it Just before the Revolution the *Gazette de France* was in the hands of J B A Suard (1734–1817), a man who was nothing if not a literary critic Perhaps, however, the most remarkable contribution of the century to criticism of the periodical kind was the *Feuilles de Grimm,* a circular sent for many years to the German courts by Frédéric Melchior Grimm (1723–1807), the comrade of Diderot and Rousseau, and containing a *compte rendu* of the ways and works of Paris, literary and artistic as well as social

The most characteristic critic of the mid-century was the abbé Charles Batteux (1713–80) who illustrated a tendency of the time by beginning with a treatise on *Les Beaux Arts réduits à un même principe* (1746), reduced it and others into *Principes de la littérature* (1764), and added in 1771 *Les Quatres Poétiques* (Aristotle, Horace, Vida and Boileau) Batteux is a very ingenious critic and his attempt to conciliate "taste" and "the rules," though inadequate, is interesting Works on the arts in general or on special divisions of them were not wanting, as, for instance, that of Dubos, the *Essai sur la peinture* of Diderot and others Critically annotated editions of the great French writers also came into fashion Of these Voltaire's edition of Corneille was the most remarkable, and his annotations, united separately under the title of *Commentaire sur Corneille,* form not the least important portion of his works The method of much of the literary criticism of the close of this period was indeed deplorable enough Jean François de la Harpe (1739–1803), who though a little later in time as to most of his critical productions is perhaps the most representative figure, shows criticism in one of its worst forms La Harpe lays it down distinctly that a beauty, however beautiful, produced in spite of rules is a "monstrous beauty" and cannot be allowed

18th Century Savants.—In science and general erudition the 18th century in France was at first much occupied with the mathematical studies for which the French genius is so peculiarly adapted, which the great discoveries of Descartes had made possible and popular, and which those of his supplanter Newton only made more popular still Voltaire took to himself the credit, which he fairly deserves, of first introducing the Newtonian system into France, and it was soon widely popular—even ladies devoting themselves to the exposition of mathematical subjects, as in the case of Gabrielle de Breteuil, marquise du Châtelet (1706–49) Voltaire's "divine Emilie" Indeed ladies played a great part in

the literary and scientific activity of the century, by actual contribution sometimes, but still more by continuing and extending the tradition of "salons" The duchesse du Maine, Mesdames de Lambert, de Tencin, Geoffrin, du Deffand, Necker, and above all, the baronne d'Holbach (whose husband, however, was here the principal personage) presided over coteries which became more and more "philosophical" Many of the greatest mathematicians of the age, such as de Moivre and Laplace, were French by birth, while others like Euler belonged to French-speaking races, and wrote in French The physical sciences were also ardently cultivated, the impulse to them being given partly by the generally materialistic tendency of the age, partly by the Newtonian system, and partly also by the extended knowledge of the world provided by the circumnavigatory voyage of Louis Antoine de Bougainville (1729–1811), and other travels P L de Moreau Maupertuis (1698–1759) and C M de la Condamine (1701–74) made long journeys for scientific purposes and duly recorded their experiences Jean le Rond, called d'Alembert (1717–83), a great mathematician and a writer of considerable though rather academic excellence, is principally known from his connection with and introduction to the *Encyclopédie,* of which more presently Chemistry was also assiduously cultivated, the baron d'Holbach, among others, being a devotee thereof, and helping to advance the science to the point where, at the conclusion of the century, it was illustrated by Berthollet and Lavoisier During all this devotion to science in its modern acceptation, the older and more literary forms of erudition were not neglected, especially by the illustrious Benedictines of the abbey of St Maur Dom Augustin Calmet (1672–1757) the author of the well-known *Dictionary of the Bible,* belonged to this order, and to them also (in particular to Dom Rivet) was due the beginning of the immense *Histoire littéraire de la France,* a work interrupted by the Revolution and long suspended, but diligently continued since the middle of the 19th century The immense *Natural History* of Georges Louis Leclerc, comte de Buffon (1717–88), though not entirely his own, is a remarkable monument of the union of scientific tastes with literary ability As has happened in many similar instances, there is in parts more literature than science to be found in it, yet many fruitful scientific ideas and theories are here propounded for the first time

The *Encyclopédie,* unquestionably on the whole the most important French literary production of the century, if we except the works of Rousseau and Voltaire, was conducted for a time by Diderot and d'Alembert, afterwards by Diderot alone It numbered among its contributors almost every Frenchman of eminence in letters It had, besides a considerable theological and political influence, an immense share in diffusing and gratifying the taste for general information

1789–1830—General Sketch.—The period which elapsed between the outbreak of the Revolution and the accession of Charles X has often been considered a sterile one in point of literature Casimir Delavigne (1793–1843), the author of *Les Messéniennes,* is a writer of very great talent, and, according to the measure of J B Rousseau and Lebrun, no mean poet It is usual to reckon Delavigne as transitionary between the classical and romantic schools, but in strictness he must be counted with the classicists Dramatic poetry exhibited somewhat similar characteristics Jean François Ducis (1733–1816), who passes with Englishmen as a feeble reducer of Shakespeare to classical rules, passed with his contemporaries as an introducer into French poetry of strange and revolutionary novelties Comedy, on the other hand, fared better, as indeed it had always fared Fabre d'Eglantine (1755–94) the companion in death of Danton, Collin d'Harleville (1755–1806), François G J S. Andrieux (1759–1833), Picard, Alexandre Duval, and Népomucène Lemercier (1771–1840) (the most vigorous of all as a poet and a critic of mark) were the comic authors of the period Perhaps the most remarkable work in point of originality of the time was Xavier de Maistre's (1763–1852) *Voyage autour de ma chambre,* an attempt in quite a new style, which has been happily followed up by other writers

The chief philosophical writers were Pierre Paul Royer Collard (1763–1845), F P. G. Maine de Biran (1776–1824), and Théodore Simon Jouffroy (1796–1842). Their influence on literature, however, was altogether inferior to that of the reactionist school, of whom Louis Gabriel, vicomte de Bonald (1754–1840), and Joseph de Maistre (1753–1821) were the great leaders As Bonald is royalist and aristocratic, so Maistre is the advocate of a theocracy pure and simple, with the pope for its earthly head, and a vigorous despotism for its system of government. Joseph Joubert (1754–1824) is the most illustrious successor of Pascal and Vauvenargues, and to be ranked perhaps above both in the literary finish of his maxims, and certainly above Vauvenargues in the breadth and depth of thought which they exhibit In pure literary criticism more particularly, Joubert, though exhibiting some inconsistencies due to his time, is astonishingly penetrating and suggestive Etienne Pivert de Sénancourt (1770–1846), with *Obermann* (1804), had an extraordinary influence on his own and the next generation in the direction of melancholy moralizing

We have already alluded to some of the beginnings of periodical and journalistic letters in France For some time, in the hands of Bayle, Basnage, Des Maizeaux, Jurieu, Leclerc, periodical literature consisted mainly of a series, more or less disconnected, of pamphlets, with occasional extracts from forthcoming works, critical *adversaria* and the like Of a more regular kind were the often-mentioned *Journal de Trévoux* and *Mercure de France,* and later the *Année littéraire* of Fréron and the like The *Correspondance* of Grimm also, as we have pointed out, bore considerable resemblance to a modern monthly review, though it was addressed to a very few persons Of political news there was, under a despotism, naturally very little 1789, however, saw a vast change in this respect An enormous efflorescence of periodical literature at once took place, and a few of the numerous journals founded in that year or soon afterwards survived for a considerable time A whole class of authors arose who pretended to be nothing more than journalists, while many writers distinguished for more solid contributions to literature took part in the movement, and not a few active politicians contributed Thus to the original staff of the *Moniteur,* or, as it was at first called, *La Gazette Nationale,* La Harpe, Lacretelle, Andrieux, Dominique Joseph Garat (1749–1833) and Pierre Ginguené (1748–1826) were attached Among the writers of the *Journal de Paris* André Chénier had been ranked Fontanes contributed to many royalist and moderate journals Guizot and Morellet, representatives respectively of the 19th and the 18th century, shared in the *Nouvelles Politiques,* while Bertin, Fievée and J L Geoffroy (1743–1814), a critic of peculiar acerbity, contributed to the *Journal de l'empire,* afterwards turned into the still existing *Journal des débats* With Geoffroy, François Bénoit Hoffman (1760–1828), Jean F J Dussault (1769–1824) and Charles F Dorimond, abbé de Féletz (1765–1850), constituted a quartet of critics sometimes spoken of as "the *Débats* four," though they were by no means all friends Of active politicians Marat (*L'Ami du peuple*), Mirabeau (*Courrier de Provence*), Barère (*Journal des débats et des décrets*), Brissot (*Patriote français*), Hébert (*Père Duchesne*), Robespierre (*Défenseur de la constitution*), and Tallien (*La Sentinelle*) were the most remarkable who had an intimate connection with journalism. On the other hand, the type of the journalist pure and simple is Camille Desmoulins (1759–94), one of the most brilliant, from a literary point of view, of the short-lived celebrities of the time. Of the same class were Pelletier, Durozoir, Loustalot, Royou. As the immediate daily interest in politics drooped, there were formed periodicals of a partly political and partly literary character Such had been the *décade philosophique,* which counted Cabanis Chénier, and De Tracy among its contributors, and this was followed by the *Revue française* at a later period, which was in its turn succeeded by the *Revue des deux mondes.* On the other hand, parliamentary eloquence was even more important than journalism during the early period of the Revolution Mirabeau naturally stands at the head of orators of this class, and next to him may be ranked the well-known names of Malouet and Meunier among constitutionalists, of Robespierre, Marat and Danton, the triumvirs of the Mountain; of Maury, Cazalès and the vicomte de Mirabeau, among the royalists; and above all of the Girondist speakers Barnave, Vergniaud and Lan-

juinais. The last named survived to take part in the revival of parliamentary discussion after the Restoration But the permanent contributions to French literature of this period of voluminous eloquence are, as frequently happens in such cases, by no means large The union of the journalist and the parliamentary spirit produced, however, in Paul Louis Courier a master of style Courier spent the greater part of his life, tragically cut short, in translating the classics and studying the older writers of France, in which study he learnt thoroughly to despise the pseudo-classicism of the 18th century It was not till he was past 40 that he took to political writing, and the style of his pamphlets, and their wonderful irony and vigour, at once placed them on the level of the very best things of the kind Along with Courier should be mentioned Benjamin Constant (1767–1830), who, though partly a romance writer and partly a philosophical author, was mainly a politician and an orator, besides being fertile in articles and pamphlets

Madame de Stael (1766–1817) on the other hand, as became a daughter of Necker, retained a great deal of the Philosophe character and the traditions of the 18th century, especially its liberalism, its *sensibilité,* and its thirst for general information, to which, however, she added a cosmopolitan spirit, and a readiness to introduce into France the literary and social, as well as the political and philosophical, peculiarities of other countries Her early writings were of the critical kind, half aesthetic, half ethical, of which the 18th century had been fond, and which their titles, *Lettres sur J J Rousseau, De l'influence des passions, De la littérature considérée dans ses rapports avec les institutions sociales,* sufficiently show Her romances, *Delphine* and *Corinne,* had immense literary influence at the time Still more was this the case with *De l'Allemagne,* which practically opened up to the rising generation in France the till then unknown treasures of literature and philosophy, which during the most glorious half century of her literary history Germany had, sometimes on hints taken from France herself, been accumulating The literary importance of Chateaubriand (1768–1848) is far greater, while his literary influence can hardly be exaggerated Chateaubriand's literary father was Rousseau, and his voyage to America helped to develop the seeds which Rousseau had sown In *René* and other works of the same kind, the naturalism of Rousseau received a still further development But it was not in mere naturalism that Chateaubriand was to find his most fertile and most successful theme It was, on the contrary, in the rehabilitation of Christianity as an inspiring force in literature This theme he develops with the most splendid language, and with every conceivable advantage of style, in the *Génie du Christianisme* and the *Martyrs* The splendour of imagination, the summonings of history and literature to supply effective and touching illustrations, analogies and incidents, the rich colouring so different from the peculiarly monotonous and grey tones of the masters of the 18th century, and the fervid admiration for nature which were Chateaubriand's main attractions and characteristics, could not fail to have an enormous literary influence

THE 19TH CENTURY

The literary work of the 19th century and of the great Romantic movement which began in its second quarter was to repeat on a far larger scale the work of the 16th, to break up and discard such literary forms as had become useless or hopelessly stiff, to give strength, suppleness and variety to such as were retained, to invent new ones where necessary, to enrich the language by importations, inventions and revivals, and, above all, to bring into prominence the principle of individualism Authors and even books, rather than groups and kinds, demand principal attention.

The result of this revolution is naturally most remarkable in the *belles-lettres* and the kindred department of history. Poetry, not dramatic, was revived, prose romance and literary criticism were brought to a perfection previously unknown; and history produced works more various and more remarkable than at any previous stage of the language.

At the accession of Charles X. France possessed three writers, and perhaps only three, of already remarkable eminence, if we except Chateaubriand, who was already of a past generation These three were Pierre Jean de Béranger (1780–1857), Alphonse de Lamartine (1790–1869), and Hugues Félicité Robert Lamennais (1782–1854) The first belongs definitely in manner, despite his striking originality of *nuance,* to the past He has remnants of the old periphrases, the cumbrous mythological allusions, the poetical "properties" of French verse His astonishing popularity makes it necessary to mention him, but very little of value remains of his work Béranger's talent was still too much a matter of individual genius to have great literary influence, and he formed no school It was different with Lamartine, who was, nevertheless, like Béranger, a typical Frenchman The *Méditations* and the *Harmonies* exhibit a remarkable transition between the old school and the new In going direct to nature, in borrowing from her striking outlines, vivid and contrasted tints, harmony and variety of sound, the new poet showed himself an innovator of the best class In using romantic and religious associations, and expressing them in affecting language, he was the Chateaubriand of verse But with all this he retained some of the vices of the classical school His versification, harmonious as it is, is monotonous, and he does not venture into the bold lyrical forms which true poetry loves He has still the horror of the *mot propre;* he is always spiritualizing and idealizing, and his style and thought have a double portion of the feminine and almost flaccid softness which had come to pass for grace in French The last of the trio, Lamennais, represents an altogether bolder and rougher genius Strongly influenced by the Catholic reaction, Lamennais also shows the strongest possible influence of the revolutionary spirit His earliest work, the *Essai sur l'indifférence en matière de religion* (1817 and 1818) was a defence of the church on curiously unecclesiastical lines. It was written in an ardent style, full of illustrations, and extremely ambitious in character

In Lamennais's prose, especially as afterwards developed in the apocalyptic *Paroles d'un croyant* (1839), are to be discerned many of the tendencies of the Romantic school, particularly its hardy and picturesque choice of language, and the disdain of established and accepted methods which it professed The signs of the revolution itself were, as was natural, first given in periodical literature The feudalist affectations of Chateaubriand and the legitimists excited a sort of aesthetic affection for Gothicism, and Walter Scott became one of the favourite authors in France Soon was started the periodical *La Muse française,* in which the names of Hugo, Vigny, Deschamps and Madame de Girardin appear Almost all the writers in this periodical were eager royalists, and for some time the battle was still fought on political grounds There could, however, be no special connection between classical drama and liberalism; and the liberal journal, the *Globe,* with no less a person than Sainte-Beuve among its contributors, declared definite war against classicism in the drama The chief "classical" organs were the *Constitutionnel,* the *Journal des débats,* and after a time and not exclusively, the *Revue des deux mondes* Soon the question became purely literary, and the Romantic school proper was born in the famous *cénacle* or clique in which Hugo was chief poet, Sainte-Beuve chief critic, and Gautier, Gérard de Nerval, the brothers Émile (1791–1871) and Antony (1800–69) Deschamps, Petrus Borel (1809–59) and others were officers. Alfred de Vigny and Alfred de Musset stand somewhat apart, and so does Charles Nodier (1780–1844), a versatile and voluminous writer, the very variety and number of whose works have somewhat prevented the individual excellence of any of them from having justice done to it The objects of the school were, briefly stated, the burning of everything which had been adored, and the adoring of everything which had been burnt. They would have no unities, no arbitrary selection of subjects, no restraints on variety of versification, no academically limited vocabulary, no considerations of artificial beauty, and, above all, no periphrastic expression The *mot propre,* the calling of a spade a spade, was the great commandment of Romanticism; but it must be allowed that what was taken away in periphrase was made up in adjectives The representation of *Hernani* in 1830 was the culmination of the struggle, and during a great part of the reign of

Louis Philippe almost all the younger men of letters in France were Romantics The representation of the *Lucrèce* of François Ponsard (1814–67) in 1843 is often quoted as the herald or sign of a classical reaction.

Romantic Drama and Poetry.—Although the immediate subject on which the battles of Classics and Romantics arose was dramatic poetry, the dramatic results of the movement have not been those of greatest value or most permanent character The principal effect in the long run has been the introduction of a species of play called *drame*, as opposed to regular comedy and tragedy, admitting of much freer treatment than either of these two as previously understood in French, and lending itself in some measure to the lengthy and disjointed action, the multiplicity of personages, and the absence of stock characters which characterized the English stage in its palmy days All Victor Hugo's dramatic works are of this class, and each, as it was produced or published (*Cromwell, Hernani, Marion de l'Orme, Le Roi s'amuse, Lucrèce Borgia, Marie Tudor, Ruy Blas* and *Les Burgraves*), was a literary event, and excited the most violent discussion—the author's usual plan being to prefix a prose preface of a very militant character to his work A still more melodramatic variety of *drame* was that chiefly represented by Alexandre Dumas (1802–70), whose *Henri III* and *Antony*, to which may be added later *La Tour de Nesle* and *Mademoiselle de Belle-isle*, were almost as much rallying points for the early Romantics as the dramas of Hugo, despite their inferior literary value. Alfred de Vigny's *Chatterton* is perhaps the best single drama produced by the Romantic movement A special variety of drama of the first literary importance was also cultivated under the title of *scènes* or *proverbes*, slight dramatic sketches in which the dialogue and style are of even more importance than the action The best of all of these are those of Alfred de Musset (1810–57), whose *Il faut qu'une porte soit ouverte ou fermée, On ne badine pas avec l'amour*, etc , are models of grace and wit

In poetry proper, as in drama, Victor Hugo showed the way In him all the Romantic characteristics were expressed and embodied—disregard of arbitrary critical rules, free choice of subject, variety and vigour of metre, splendour and sonorousness of diction, abundant "local colour," and that irrepressible individualism which is one of the chief, though not perhaps the chief, of the symptoms A deficient sense of the ludicrous which characterized many of the Romantics was strongly apparent in their leader, as was also an equally representative grandiosity, and a fondness for the introduction of foreign and unfamiliar words, especially proper names, which occasionally produces an effect of burlesque. Victor Hugo's earliest poetical works, his chiefly royalist and political *Odes*, were cast in the older and accepted forms, but already displayed astonishing poetical qualities But it was in the *Ballades* (*e g* , the splendid *Pas d'armes du roi Jean*, written in verses of three syllables) and the *Orientales* (of which may be taken for a sample the sixth section of *Navarin*, a perfect torrent of outlandish terms poured forth in the most admirable verse, or *Les Djinns*, where some of the stanzas have lines of two syllables each) that the grand provocation was thrown to the believers in alexandrines, careful caesuras and strictly separated couplets *Les Feuilles d'automne, Les Chants du crépuscule, Les Voix intérieures, Les Rayons et les ombres*, the productions of the next 20 years, were quieter in style and tone, but no less full of poetical spirit The Revolution of 1848, the establishment of the empire and the poet's exile brought about a fresh concentration of his genius on lyrical subjects *Les Châtiments* and *La Légende des siècles*, the one political, the other historical, reach perhaps the high-water mark of French verse; and they were accompanied by the philosophical poems *Dieu*, *La Fin de Satan*, and by *Les Contemplations*, and followed by the lighter *Chansons des rues et des bois*, the *Année terrible*, the second *Légende des siècles*, etc. The literary productiveness of Victor Hugo himself has been the measure and sample of the whole literary productiveness of France on the poetical side At 25 he was acknowledged as a master, at 75 he was a master still He is the one single universal literary genius whom France can recognize as her representative, and to be set in world literature on the level of Dante, Cervantes, Shakespeare and Goethe. In the later part of his work, in such poems as *Dieu* and *La Fin de Satan* he takes his place among the religious prophets of mankind.

Hugo's poetical influence has been represented in different schools, from which very few of the poetical writers of the century can be excluded Alfred de Musset, a writer of great talent, felt part of the Romantic inspiration very strongly, but was on the whole unfortunately influenced by Byron, and partly out of wilfulness, partly from a natural want of persevering industry and vigour, allowed himself to be careless and even slovenly in composition. Notwithstanding this, some of his lyrics are among the finest poems in the language, and his verse, careless as it is, has extraordinary natural grace. Auguste Barbier (1805–82) whose *Iambes* shows an extraordinary command of nervous and masculine versification, also comes in here Alfred de Vigny (1799–1865) is a great poet of little bulk and somewhat over-fastidious, but possessing one of the strongest styles to be found in French with a curious restrained passion and a complicated originality, rising to the greater heights of philosophical poetry Madame Ackermann (1813–90) is the philosophical poetess of the Romantic period; but for actual poetical powers, Marceline Desbordes-Valmore (1786–1859) perhaps excelled her, though in a looser and more sentimental fashion. Théophile Gautier (1811–72) is one of the best poets in point of form that France has produced The *Comédie de la mort*, the *Poésies diverses*, and still more the *Emaux et camées*, display a distinctly classical tendency —classical, that is to say, not in the party and perverted sense, but in its true acceptation The tendency to the fantastic and horrible may be taken as best shown by Petrus Borel (1809–59), a writer of singular power almost entirely wasted. Gerard Labrunie or de Nerval (1808–55) adopted a manner also fantastic but more idealistic than Borel's, and distinguished himself by his oriental travels and studies, and by his attention to popular ballads and traditions, while his style has an exquisite but unaffected strangeness hardly inferior to Gautier's Théodore de Banville (1823–91), adopting the principles of Gautier, and combining with them a considerable satiric faculty, composed a large amount of verse, faultless in form, delicate and exquisite in shades and colours, but so entirely neutral in moral and political tone that it has found fewer admirers than it deserved Charles Marie René Leconte de Lisle (1818–94) (*Poèmes Antiques, Poèmes Barbares, Poèmes Tragiques*), carrying out the principle of ransacking foreign literature for subjects, went to Celtic, classical or even oriental sources for his inspiration, and despite a science in verse not much inferior to Banville's, and a far wider range and choice of subject, diffused an air of erudition, not to say pedantry, over his work which disgusted some readers, and a pessimism which displeased others, but has left poetry only inferior to that of the greatest of his countrymen Charles Baudelaire (1821–67) in *Les Fleurs du Mal*, by his choice of unpopular subjects and the terrible truth of his analysis, revolted not a few of those who, in the words of an English critic, cannot take pleasure in the representation if they do not take pleasure in the thing represented, and who thus miss his extraordinary command of the poetical appeal in sound, in imagery and in suggestion generally He is, as Hugo said, the inventor of a *frisson nouveau*, and his influence on French poetry is growing greater and greater.

Post-romantic Poetry.—In 1866 a collection of poems, entitled after an old French fashion *Le Parnasse contemporain*, appeared It included contributions by some of the poets just mentioned, but the mass of the contributors were hitherto unknown to fame A similar collection appeared in 1869, and was interrupted by the German war, but continued after it, and a third in 1876.

The first *Parnasse* had been projected by MM. Xavier de Ricard (b. 1843) and Catulle Mendès (1841–1909) as a sort of manifesto of a school of young poets: but its contents were largely coloured by the inclusion among them of work by representatives of older generations—Gautier, Laprade, Leconte de Lisle, Banville, Baudelaire and others. The continuation, however, of the title in the later issues, rather than anything else, led to the formation and promulgation of the idea of a "Par-

nassien" or an "Impassible" school which was supposed to adopt as its watchword the motto of "Art for Art's sake," to pay especial attention to form, and also to aim at a certain objectivity As a matter of fact the greater poets and the greater poems of the *Parnasse* admit of no such restrictive labelling, which can only be regarded as mischievous, though (or very mainly because) it has been continued Another school, arising mainly in the later '80s and calling itself that of "Symbolism," has been supposed to indicate a reaction against Parnassianism and even against the main Romantic tradition generally, with a throwing back to Lamartine and perhaps Chénier This idea of successive schools ("Decadents," "Naturists," etc) has even been reduced to such an *absurdum* as the statement that "France sees a new school of poetry every 15 years" Those who have studied literature sufficiently widely, and from a sufficient elevation, know that these systematizings are always more or less delusive Parnassianism, symbolism and the other things are merely phases of the Romantic movement itself—as may be proved to demonstration by the simple process of taking, say, Hugo and Verlaine on the one hand, Delille or Escouchard Lebrun on the other, and comparing the two first mentioned with each other and with the older poet. The differences in the first case will be found to be differences at most of individuality in the other of kind We shall not, therefore, further refer to these dubious classifications, but specify briefly the most remarkable poets whom they concern, and all the older of whom, it may be observed, were represented in the *Parnasse* itself Of these the most remarkable were Sully Prudhomme (1839–1907), François Coppée (1842–1908) and Paul Verlaine (1844–96) The first (*Stances et poèmes*, 1865, *Vaines Tendresses*, 1875, *Bonheur*, 1888, etc) is a philosophical and rather pessimistic poet The second (*La Grève des forgerons*, 1869, *Les Humbles*, 1872, *Contes et vers*, 1881–87, etc) a dealer with more generally popular subjects in a more sentimental manner; and the third (*Sagesse*, 1881, *Parallèlement*, 1889, *Poèmes saturniens*, including early work, 1867–90), by far the most original and remarkable poet of the three, starting with Baudelaire and pushing farther the fancy for forbidden subjects, but treating both these and others with wonderful command of sound and image-suggestion Verlaine in fact (he was actually well acquainted with English) endeavoured, and to a small extent succeeded in the endeavour to communicate to French the vague suggestion of visual and audible appeal which has characterized English poetry from Blake and Coleridge onwards Rimbaud (1854–91), an extraordinary personality who gave up writing before he was 20, must be mentioned for his influence, which ranks with that of Baudelaire and Verlaine His *Le Bateau ivre* is a short masterpiece Stéphane Mallarmé (1842–98), afterwards chief of the Symbolists, was also a true poet in his way, but somewhat barren, and the victim of pose and trick, José Maria de Heredia (1842–1905), was a very exquisite practitioner of the sonnet but with perhaps more art than matter in him A Villiers de l'Isle-Adam was another eccentric with but a spark of genius, Léon Dierx, after producing even less than Mallarmé, succeeded him as Symbolist chief.

Yet another flight of poets may be grouped as those specially representing the last quarter of the century and (whether Parnassian, Symbolist or what not) the latest development of French poetry. Verlaine and Mallarmé already mentioned were in a manner the leaders of these The whole tendency of the period has been to relax the stringency of French prosody Albert Samain (1859–1900), a musical versifier, Jean Moréas (1856–1910), who began with a volume called *Les Syrtes* in 1884, Laurent Tailhade (1854–1919) and others are more or less Symbolist, and contributed to the Symbolist periodical (one of many such since the beginning of the Romantic movement which would almost require an article to themselves), the *Mercure de France* Jean Richepin (1849–1926) made for a time considerable noise with poetical work of a colour older even than his age, and harked back somewhat to the type of early Romanticism—*La Chanson des gueux*, *Les Blasphèmes*, etc Maurice Bouchor (b. 1864) started his serious and respectable work with *Les Symboles* in 1888; while Henri de Regnier, born in the same year, has received very high praise for work from *Lendemains* in 1886 and other volumes like *Les Jeux rustiques et divins* (1897) and *Les Médailles d'argile* (1900) His later writings cover a larger field.

Prose Fiction Since 1830.—The romance-writing of France during the period has taken two different directions—the first that of the novel of incident, the second that of analysis and character The first was that which, as was natural when Scott was the model, was formerly most trodden, the second required the genius of George Sand, of Balzac and of Beyle to attract students to it The novels of Victor Hugo are novels of incident, with a strong infusion of purpose, and considerable but rather ideal character drawing They are in fact lengthy prose *dramas* rather than romances proper, and they have found no imitators They display, however, the powers of the master at their fullest On the other hand, Alexandre Dumas originally composed his novels in close imitation of Scott, and they are much less dramatic than narrative in character The best of them, such as *Les Trois Mousquetaires*, *Vingt ans après*, *La Reine Margot*, are probably the best specimens extant of their time Of something the same kind, but of a far lower stamp, are the novels of Eugène Sue (1804–57) Dumas and Sue were accompanied and followed by a vast crowd of companions, independent or imitative Alfred de Vigny had already attempted the historical novel in *Cinq-Mars* By degrees, however, the taste for the novel of incident, at least of an historical kind, died out till it was revived in another form, and with an admixture of domestic interest, by Erckmann-Chatrian The last and one of the most splendid instances of the old style was *Le Capitaine Fracasse*, which Théophile Gautier began early and finished late as a kind of *tour de force* The last-named writer in his earlier days had modified the incident novel in many short tales, a kind of writing for which French has always been famous, and in which Gautier's sketches are masterpieces His only other long novel, *Mademoiselle de Maupin*, belongs rather to the class of analysis. With Gautier, as a writer whose literary characteristics even excel his purely tale-telling powers, may be classed Prosper Mérimée (1803–70), one of the most exquisite 19th-century masters of the language. Already, however, in 1830 the tide was setting strongly in favour of novels of contemporary life and manners

The great master of the novel of character and manners as opposed to that of history and incident is Honoré de Balzac (1799–1850). With him George Sand and Stendhal must be studied Henri Beyle (1798–1865), who wrote under the *nom de plume* of Stendhal, stands by himself His chief books in the line of fiction are *La Chartreuse de Parme* and *Le Rouge et le Noir*, exceedingly powerful novels of the analytical kind, and he also composed a considerable number of critical and miscellaneous works Of little influence at first (though he had great power over Mérimée) being somewhat in front of his time, he has exercised ever increasing authority as a master of pessimist analysis Indeed much of his work was never published till towards the close of the century George Sand (1804–76) began with books strongly tinged with the spirit of revolt against moral and social arrangements, and she sometimes diverged into very curious paths of pseudo-philosophy, such as was popular in the second quarter of the century At times, too, as in *Lucrezia Floriani* and some other works, she did not hesitate to draw largely on her own personal adventures and experiences But later on she devoted herself rather to sketches of country life and manners, and to novels involving bold if not very careful sketches of character and more or less dramatic situations She was one of the most fertile of novelists, continuing to the end of her long life to pour forth fiction at the rate of many volumes a year Of her different styles may be mentioned as fairly characteristic, *Lélia*, *Lucrezia Floriani*, *Consuelo*, *La Mare au diable*, *La Petite Fadette*, *François le champi*, *Mademoiselle de la Quintinie*. Considering the shorter length of his life the productiveness of Balzac was almost more astonishing, especially if we consider that some of his early work was never reprinted, and that he left great stores of fragments and unfinished sketches He is, moreover, the most remarkable example in literature of untiring work and determination to achieve success despite the greatest discouragements. His early work was worse than unsuccessful, it was positively bad

After more than a score of unsuccessful attempts, *Les Chouans* at last made its mark, and for 20 years from that time the astonishing productions composing the so-called *Comédie humaine* were poured forth successively The sub-titles which Balzac imposed upon the different batches, *Scènes de la vie parisienne, de la vie de province, de la vie intime,* etc , show, like the general title, a deliberate intention on the author's part to cover the whole ground of human, at least of French life Such an attempt could not succeed wholly, yet the amount of success attained is astonishing Balzac has, however, with some justice been accused of creating the world which he described, and his personages, wonderful as is the accuracy and force with which many of the characteristics of humanity are exemplified in them, are sometimes not altogether human Balzac stands as the foremost novelist of France, and in the opinion of many as the greatest of all novelists

The so-called realist side of Balzac was developed (but, as he himself acknowledged, with a double dose of intermixed if somewhat transformed Romanticism) by Gustave Flaubert (1821–80), who showed culture, scholarship and a literary power over the language inferior to that of no writer of the century No novelist of his generation has attained a higher literary rank than Flaubert *Madame Bovary* and *L'Éducation sentimentale* are studies of contemporary life, in *Salammbô* and *La Tentation de Saint Antoine* erudition and antiquarian knowledge furnish the subjects for the display of the highest literary skill Eugéne Fromentin (1820–76), best known as a painter, wrote a novel, *Dominique,* which is highly appreciated by good judges

The Naturalists proper chiefly developed or seemed to develop one side of Balzac, but almost entirely abandoned his Romantic element They aimed first at exact and almost photographic delineation of the incidents of modern life, and secondly at still more uncompromising non-suppression of the essential features and functions of that life which are usually suppressed This school may be represented in chief by four novelists (really *three,* as two of them were brothers who wrote together till the rather early death of one of them), Émile Zola (1840–1903), Alphonse Daudet (1840–97), and Edmond (1822–97) and Jules (1830–70) de Goncourt The first, of Italian extraction and Marseillais birth, began by work of undecided kinds and was always a critic as well as a novelist Of this first stage *Contes à Ninon* (1864) and *Thérèse Raquin* (1867) deserve to be specified But after 1870 Zola entered upon a huge scheme (suggested no doubt by the *Comédie humaine*) of tracing the fortunes in every branch, legitimate and illegitimate, and in every rank of society of a family, *Les Rougon-Macquart,* and carried it out in a full score of novels during more than as many years He followed this with a shorter series on places, *Paris, Rome, Lourdes,* and lastly by another of strangely apocalyptic tone, *Fécondité, Travail, Vérité,* the last a story of the Dreyfus case, retrospective and, as it proved, prophetic The repulsiveness of much of his work, and the overdone detail of almost the whole of it, caused great prejudice against him, and will probably always prevent his being ranked among the greatest novelists, but his power is indubitable, and in passages, if not in whole books, does itself justice

The Goncourts, besides their work in Naturalist (they would have preferred to call it "Impressionist") fiction, devoted themselves especially to study and collection in the fine arts, and produced many volumes on the historical side of these, volumes distinguished by accurate and careful research This quality they carried, and the elder of them after his brother's death continued to carry, into novel-writing (*Renée Mauperin, Germinie Lacerteux, Chérie,* etc) with the addition of an extraordinary care for peculiar and, as they called it, "personal" diction On the other hand, Alphonse Daudet (who with the other three, Flaubert to some extent, and the Russian novelist Turgeniev, formed a sort of *cénacle* or literary club) mixed with some Naturalism a far greater amount of fancy and wit than his companions allowed themselves or could perhaps attain; and in the *Tartarin series* (dealing with the extravagances of his fellow-Provençaux) added not a little to the gaiety of Europe His other novels (*Fromont jeune et Risler aîné, Jack, Le Nabab,* etc), also very popular, have been variously judged, there being something strangely like plagiarism in some of them, and in others, in fact in most, an excessive use of that privilege of the novelist which consists in introducing real persons under more or less disguise It should be observed in speaking of this group that the Goncourts, or rather the survivor of them, left an elaborate *Journal* of much importance for the appreciation of the personal side of French literature during the last half of the century

Barbey d'Aurevilly (1808–1889) with *l'Ensorcelée* and *Le Chevalier Destouches* has a place of his own and many passionate admirers He is in his own way a master of fiction and a master of prose. The tales of Villiers de l'Isle-Adam (1840–89) also deserve to be at least mentioned

In 1880 Zola, who had by this time formed a regular school of disciples, issued with certain of them a collection of short stories, *Les Soirées de Médan,* which contains one of his own best things, *L'Attaque du moulin,* and also the capital story, *Boule de suif,* by Guy de Maupassant (1850–93), who in the same year published poems, *Des vers,* of very remarkable if not strictly poetical quality Maupassant developed during his short literary career perhaps the greatest powers shown by any French novelist since Flaubert (his sponsor in both senses) in a series of longer novels (*Une Vie, Bel Ami, Pierre et Jean, Fort comme la mort*) and shorter stories (*Monsieur Parent, Les Soeurs Rondoli, Le Horla*), but they were distorted by the Naturalist pessimism and grime, and perhaps also by the brain-disease of which their author died J K Huysmans (b 1848), also a contributor to *Les Soirées de Médan,* who had begun a little earlier with *Marthe* (1876) and other books, gave his most characteristic work in 1884 with *Au rebours* and in 1891 with *Là-bas,* stories of exaggerated and "satanic" pose, decorated with perhaps the extremest achievements of the school in mere ugliness and nastiness Afterwards, by an obvious reaction, he returned to Catholicism Of about the same date as these two are two other novelists of note, Julien Viaud ("Pierre Loti," b 1850), a naval officer who embodied his experiences of foreign service with a faint dose of story and character interest, and a far larger one of elaborate description, in a series of books (*Aziyadé, Le Mariage de Loti, Madame Chrysanthème,* etc), and Paul Bourget (b 1852), an important critic as well as novelist who deflected the Naturalist current into a "psychological" channel, connecting itself higher with Stendhal, and composed in it books very popular in their way—*Cruelle Enigme* (1885), *Le Disciple, Terre promise, Cosmopolis* As a contrast or complement to Bourget's "psychological" novel may be taken the "ethical" novel of Edouard Rod (1857–1909)—*La Vie privée de Michel Tessier* (1893), *Le Sens de la vie, Les Trois Coeurs* Contemporary with these as a novelist though a much older man; and occupied at different times of his life with verse and with criticism, came Anatole France (1844–1924), who in *Le Crime de Silvestre Bonnard, La Rôtisserie de la reine Pédauque, Le Lys rouge,* and others, made a kind of novel as different from the ordinary styles as Pierre Loti's, and of the highest appeal in its wit, its subtle fancy and its perfect French

Periodical Literature Since 1830. Criticism.—One of the causes which led to this extensive composition of novels was the great spread of periodical literature in France, and the custom of including in almost all periodicals, daily, weekly or monthly, a *feuilleton* or instalment of fiction Of the contributors of these periodicals who were strictly journalists and almost political journalists only, the most remarkable after Carrel were his opponent in the fatal duel, Émile de Girardin, Lucien A Prévost-Paradol (1829–70), Jean Hippolyte Cartier, called de Villemessant (1812–79), and, above all, Louis Veuillot (1815–83), the most violent and unscrupulous but by no means the least gifted of his class. The same spread of periodical literature, together with the increasing interest in the literature of the past, led also to a very great development of criticism, and the most remarkable of the critics was Charles Augustin Sainte-Beuve (1804–69) Sainte-Beuve's first remarkable work (his poems and novels we may leave out of consideration) was the sketch of 16th-century literature which he contributed to the *Globe* But it was not till later that his style of criticism became fully developed and accentuated. During the first decade of Louis Philippe's reign his critical papers,

united under the title of *Critiques et portraits littéraires,* show a gradual advance During the next ten years he was mainly occupied with his studies of the writers of the Port Royal school But it was during the last 20 years of his life, when the famous *Causeries du lundi* appeared weekly in the columns of the *Constitutionnel* and the *Moniteur,* that his most remarkable productions came out Sainte-Beuve's style of criticism (which is the key to so much of French literature of the last half-century that it is necessary to dwell on it at some length), excellent and valuable as it is, lent itself to two corruptions There is, in the first place, in making the careful investigations into the character and circumstances of each writer which it demands, a danger of paying too much attention to the man and too little to his work, and of substituting for a critical study a mere collection of personal anecdotes and traits, especially if the author dealt with belongs to a foreign country or a past age The other danger is that of connecting the genius and character of particular authors too much with their conditions and circumstances, so as to regard them as merely so many products of the age These faults, and especially the latter, have been very noticeable in many of Sainte-Beuve's successors, particularly perhaps in Hippolyte Taine (1828–93), who, however, besides his work on English literature, did much of importance on French, and has been regarded as the first critic who did thorough honour to Balzac in his own country Beginning with philosophical studies, and always maintaining a strong tincture of philosophical determinism, he applied himself later, first to literary history and criticism in his famous *Histoire de la littérature anglaise* (1864), and then to history proper in his still more famous *Origines de la France contemporaine* (1876).

Edmond Scherer (1815–89) and Paul de Saint-Victor (1827–1881) represent different sides of Sainte-Beuve's style in literary criticism, Scherer combining with it a martinet and somewhat prudish precision, while Saint-Victor, with great powers of appreciation, is the most flowery and "prose-poetical" of French critics In theatrical criticism Francisque Sarcey (1827–99), an acute but somewhat severe and limited judge, succeeded to the good-natured sovereignty of Janin The criticism of the *Revue des deux mondes* has played a sufficiently important part in French literature to deserve separate notice in passing Founded in 1829, the *Revue,* after some vicissitudes, soon attained, under the direction of the Swiss Buloz, the character of being one of the first of European critical periodicals Its style of criticism has, on the whole, inclined rather to the classical side—*i e*, to classicism as modified by, and possibly after, the Romantic movement Besides some of the authors already named, its principal critical contributors were Gustave Planche (1808–57), an acute but somewhat truculent critic, Saint-René Taillandier (1817–79), and Émile Montégut (1825–95)

A remarkable writer whose talent, approaching genius, was spoilt by eccentricity and pose, and who belonged to a more modern generation, Jules Barbey d'Aurevilly (1808–89), poet, novelist and critic, produced much of his critical work, and corrected more, in his later days Not only did the critical work in various ways of Renan, Taine, Sarcey and others continue during the latter part of the century, but a new generation, hardly in this case inferior to the old, appeared The chiefs of this were Anatole France, Émile Faguet (1847–1916), Ferdinand Brunetière (1849–1906) and Jules Lemaître (1853–1914) The last, however, though a brilliant writer, was but an "interim" critic, beginning with poetry and other matters, and after a time turning to yet others, while, brilliant as he was, his criticism was often ill-formed So too Anatole France, after compiling four volumes of *La Vie littéraire* in his own inimitable style and with singular felicity of appreciation, also turned away But the body of recent critical literature in France is perhaps larger in actual proportion and of greater value when considered in relation to other kinds of literature than has been the case at any previous period

Philosophy and History: 1830–1890.—In philosophy proper France has been more remarkable for attention to the historical side of the matter than for the production of new systems, and the principal exception among her philosophical writers, Auguste Comte (1793–1857), besides inclining, as far as his matter went to the political and scientific rather than to the purely philosophical side (which indeed he regarded as antiquated), was not very remarkable merely as a man of letters Victor Cousin (1792–1867), on the other hand, almost a brilliant man of letters and for a time regarded as something of a philosophical apostle preaching "eclecticism," betook himself latterly to biographical and other miscellaneous writings Similar phenomena, not so much of inconstancy to philosophy as of a tendency towards the applied rather than the pure branches of the subject, are noticeable in Edgar Quinet (1803–75), in Charles de Rémusat (1797–1875), and in Ernest Renan (1823–92), the first of whom began by translating Herder while the second and third devoted themselves early to scholastic philosophy, de Rémusat dealing with Abélard (1845) and Anselm (1856), Renan with Averroes (1852) Renan is one of the greatest of prose writers of all time, for purity, elegance and fluidity Outside his historical work, his *Souvenirs* and his *Drames* and *Dialogues philosophiques* are imperishable masterpieces His original ideas are best expressed in *L'Avenir de la Science* More single-minded devotion to at least the historical side was shown by Jean Philibert Damiron (1794–1862), who published in 1842 a *Cours de philosophie* and many minor works at different times, but the inconstancy recurs in Jules Simon (1814–96), who, in the earlier part of his life a professor of philosophy and a writer of authority on the Greek philosophers (especially in *Histoire de l'école d'Alexandrie*, 1844–45), began before long to take an active and, towards the close of his life-work, all but a foremost part in politics

Political philosophy and its kindred sciences have naturally received a large share of attention Towards the middle of the century there was a great development of socialist and fanciful theorizing on politics, with which the names of Claude Henri, comte de Saint-Simon (1760–1825), Charles Fourier (1772–1837), Etienne Cabet (1788–1856), and others are connected As political economists Frédéric Bastiat (1801–50), L G L Guilhaud de Lavergne (1809–80), Louis Auguste Blanqui (1805–81), and Michel Chevalier (1806–79) may be noticed In Alexis de Tocqueville (1805–59) France produced a political observer of a remarkably acute, moderate and reflective character

The brothers Thierry devoted themselves to early French history Amédée Thierry (1797–1873) producing a *Histoire des Gaulois* and other works concerning the Roman period, and Augustin Thierry (1795–1856) the well-known history of the Norman Conquest, the equally attractive *Récits des temps Mérovingiens* and other excellent works Philippe de Ségur (1780–1873) wrote a history of the Russian campaign of Napoleon, and some other works chiefly dealing with Russian history The voluminous *Histoire de France* of Henri Martin (1810–83) is an impartial work dealing in detail with the whole subject A G P Brugière, baron de Barante (1782–1866), after beginning with literary criticism, turned to history, and in his *Histoire des ducs de Bourgogne* produced a work of capital importance As was to be expected, many of the most brilliant results of this devotion to historical subjects consisted of works dealing with the French Revolution No series of historical events has ever perhaps received treatment at the same time from so many different points of view, and by writers of such varied literary excellence, among whom it must, however, be said that the purely royalist side is hardly at all represented One of the earliest of these histories is that of François Mignet (1796–1884), a sober and judicious historian of the older school, also well known for his *Histoire de Marie Stuart* About the same time was begun the brilliant if not extremely trustworthy work of Adolphe Thiers (1797–1877) on the Revolution, which established the literary reputation of the future president of the French republic, and was at a later period completed by the *Histoire du consulat et de l'empire* The downfall of the July monarchy and the early years of the empire witnessed the publication of several works of the first importance on this subject Barante contributed histories of the Convention and the Directory, but the three books of greatest note were those of Lamartine, Jules Michelet (1798–1874), and Louis Blanc (1811–82) Lamartine's *Histoire des Girondins* is written from the constitutional-republican point of view, and is sometimes con-

sidered to have had much influence in producing the events of 1848 It is, perhaps, rather the work of an orator and poet than of an historian The work of Michelet is of a more original character Besides his history of the Revolution, Michelet wrote an extended history of France, and a very large number of smaller works on historical, political and social subjects His imaginative powers are of the highest order, and his style stands alone in French for its strangely broken and picturesque character, its turbid abundance of striking images, and its somewhat sombre magnificence, qualities which, as may easily be supposed, found full occupation in a history of the Revolution Edgar Quinet (1803–75), like Louis Blanc a devotee of the republic and an exile for its sake, brought to this subject a mind and pen long trained to literary and historical studies; but *La Révolution* is not considered his best work And Taine, after distinguishing himself, as we have mentioned, in literary criticism, and attaining less success in philosophy (*De l'intelligence*), turned in *Les Origines de la France moderne* to an elaborate discussion of the Revolution, its causes, character and consequences François Pierre Guillaume Guizot (1787–1874), like his rival Thiers, devoted himself much to historical study His earliest works were literary and linguistic, but he soon turned to political history, and for the last half-century of his long life his contributions to historical literature were almost incessant and of the most various character The most important are the histories *Des Origines du gouvernement représentatif, De la révolution d'Angleterre, De la civilisation en France,* and a *Histoire de France,* which he was writing at the time of his death

In the last quarter of the century, under the department of history, the most remarkable names were still those of Taine and Renan Indeed it may be here proper to remark that Renan, in the kind of elaborated semi-poetic style which has most characterized the prose of the 19th century in all countries of Europe, takes pre-eminence among French writers even in the estimation of critics who are not enamoured of his substance and tone The chief work of his life is the *Histoire des origines du Christianisme,* which includes the celebrated *Vie de Jésus* But, under the influence of Taine to some extent and of a general European tendency still more, France during this period attained or recovered a considerable place for what is called "scientific" history—the history which while, in some cases, though not in all, not neglecting the development of style attaches itself particularly to "the document," on the one hand, and to philosophical arrangement on the other The chief representatives of the school were probably Albert Sorel (1842–1906) and Fustel de Coulanges (1830–89) (*La Cité Antique, Histoire des Institutions de l'ancienne France*)

CONTEMPORARY LITERATURE

The Pre-War Generation.—It was about the year 1890 that new tendencies were manifested simultaneously in poetry, in philosophy, in criticism and in the novel While keeping as a fundamental principle the recognition of the fact, that is to say the method of observation, the newcomers insisted upon their observation being complete, upon its taking into account the whole of reality, not merely facts, but also all the stuff of feeling, the impulses of the soul, and spiritual energy As a result of all this, thought became re-invigorated, took a new lease of life Such was the accomplishment of men very different in their inspiration and their convictions Paul Bourget and Barrès among the novelists, Henri de Régnier among the poets, Rémy de Gourmont, Charles Maurras and André Gide among the critics, played a great part in this change Groups like those of the *Mercure de France,* the *Nouvelle Revue Française,* the *Cahiers de la Quinzaine,* under the leadership of Charles Péguy, did their capable share

It may be said that the distinction had been clearly made between science, which establishes laws and fundamental causes and sets them forth in abstract terms, and art, which manifests these causes sympathetically by appealing at one and the same time to the reason, the heart and the senses The works of a mathematician of genius, Jules Henri Poincaré, had made for the development of a more exact conception of science and the scientific method The books of Henri Bergson, especially the one which appeared in 1907 (*L'évolution créatrice*), had created a new spiritual awakening The teaching of Hamelin (*Essai,* 1907) established a new deism based on the most technical disquisitions of intellectualistic philosophy. Everything thus contributed towards liberating the spirit from the narrow boundaries of naturalism A literary outburst was the result, the main characteristic of which is that each work reflects the temperament and the tastes of the author, without dependence on any school Certain writers remain faithful to their conception of the novel (Gustave Geffroy, *Cécile Pommier,* 1922), and the Académie Goncourt continue the tradition of objectivity and naturalism But the brilliant group of psychological writers that followed Paul Bourget and Maurice Barrès goes back to Benjamin Constant and Stendhal, indeed even invokes Balzac, and attempts to make of the novel a complete representation of life, of the spiritual life as well as the social and material

Paul Bourget (b 1852) produced *Le Démon de Midi* (1914), *Némésis* (1918) Maurice Barrès (1862–1923) wrote *Greco, ou Le secret de Tolède* (1912), *La colline inspirée* (1913), and just before his death published that *Enquête aux pays du Levant* (1923), which unites in itself all his peculiar qualities of thought and expression and remains one of his finest books René Bazin (*Les nouveaux Oberlé,* 1919), Henri Bordeaux (*La maison,* 1913, and *La résurrection de la chair,* 1920), René Boylesve (*Tu n'es plus rien,* 1914, *Elise,* 1921), Louis Bertrand (*Jean Serbal,* 1924), Edouard Estaunié (*Les choses vouent,* 1913, *L'ascension de M Baslèvre,* 1920), attest the vitality of a *genre* which was tried with success also by Emile Clermont (1878–1915), author of *Laure* (1913), Louis Codet (1877–1918), author of *La petite Chiquette* (1911), *César Capéran* (1918), *La fortune de Bécot* (1919), and Roger Martin du Gard, of a more philosophical turn (*Jean Barois,* 1914, and *Les Thibault,* 1922–1928)

The analytic and descriptive novel of manners continued with Henri Lavedan (*Irène Olette, Le chemin du salut,* 1920–23), Abel Hermant (*Les Renards,* 1912, *L'aube ardente,* 1919, *La journée brève,* 1920), Gaston Chérau (*La prison de verre,* 1912, *Le monstre,* 1913); Jérôme and Jean Tharaud (*L'ombre de la croix,* 1917, and *Un royaume de Dieu,* 1920), Gilbert de Voisins (*L'enfant qui prit peur,* 1912), the tales of Henri Duvernois (*Le veau gras,* 1912, *Edgar,* 1912); André Gide (*L'immoraliste, La porte étroite, Les faux monnayeurs,* 1926), Edmond Jaloux, Marcel Boulenger, Eugène Montfort (*César Casteldor,* 1927), Claude Anet, Charles Géniaux An offshoot of the symbolist movement, the poetic novel of fantasy has its most illustrious exponents in the poet Henri de Régnier (*La pécheresse,* 1920, *Le divertissement provincial,* 1923), in the poet Francis Jammes (*M le Curé d'Ozeron,* 1918, *Le poète rustique,* 1920), and in the young Alain Fournier (1886–1914), snatched away too soon from letters by the War, whose book *Le grand Meaulnes* (1914) remains a charming and impressive work Finally, exotic literature, dominated by the great name of Pierre Loti, finds brilliant expression in Claude Farrère (*La Bataille,* 1911, *Dix-sept histoires de Marins,* 1914), Jérôme and Jean Tharaud (*La fête Arabe,* 1912); Pierre Mille, Marius-Ary Leblond, and in the posthumous book of Louis Hémon on Canada, *Maria Chapdelaine* (1916), which had a prodigious success. Romain Rolland produced in *Jean Christophe* (10 vols, 1904–12) an epic of French life inspired by ardent enthusiasm for spiritual values, and yet full of the sharpest criticism of the epoch

Women have always excelled in the literature of imagination Three writers occupy the first rank in this respect—Colette, whose works include *La vagabonde* (1910), *L'entrave* (1914), *Chéri* (1920), *La maison de Claudine* (1922) and *La fin de Chéri* (1926); Gérard d'Houville, daughter of the great poet J M de Heredia, wife of Henri de Régnier, who has a rare poetic gift and who tells in the most fluid style prose stories of charming and often profound imagination (*Le séducteur,* 1914, *Jeune fille,* 1916, *Tant pis pour toi,* 1920), and who has written in *L'enfant* (1926) a little masterpiece; and Comtesse de Noailles, a poet of passionate and inspired quality as well, who in 1923 under the title of *Les innocentes* published a series of novelettes and meditations in

which lyricism is made the vehicle of a daring frankness Mme. Marcelle Tinayre published in 1920 *Perséphone* and in 1922 *Priscille Séverac* Mme Lucie Delarue-Mardrus, a very gifted story-teller, observant and poetic, wrote *L'âme aux trois visages* in 1919 and *Graine au vent* in 1925

At the theatre that most personal of writers, François de Curel, produced *Terre inhumaine* (1923), *La viveuse* and *Le moribond* (1925). G de Porto-Riche has made vigorous studies of passion in *Le vieil homme* (1911) and *Le marchand d'Estampes* (1918). Maurice Donnay, so charming, and, at the same time, so melancholy and whimsical, has written social studies in *Les éclaireuses* (1913) and *La chasse à l'homme* (1920) Alfred Capus, a lucid realist, ironical and with a gift for natural dialogue, produced *Hélène Ardouin* in 1913 and *L'institut de beauté* in 1914. Henri Bataille (1872–1922), hypersensitive, slightly involved and exotic, brought out *Le Phalène* in 1914 and *L'homme à la rose* in 1922. Henry Bernstein, after a series of dramatic and violent plays, brought out *Le secret* (1917), in which his effects are drawn from psychology and character. Comedy has owed its greatest successes to Robert de Flers (*L'habit vert*, 1913, *M Brotanneau*, 1914, *Les nouveaux messieurs*, 1925), to Tristan Bernard (*Les petites curieuses*, 1920); to Francis de Croisset (*Le coeur dispose*, 1912); and to Sacha Guitry, whose vivacity and wit find triumphant expression in *Le veilleur de nuit* (1911), *L'illusionniste* (1921) and *L'amour masqué* (1924) The most interesting attempts in the way of original work have been made by François Porché, who in *Les butors et la Finette* (1918) and *Le Chevalier de Colomb* (1922) combines in a curious way the relics of ancient traditions with an entirely modern feeling for symbolism, and by P Claudel, author of *L'otage* (1911), *L'annonce faite à Marie* (1912), *Le père humilié* (1920) and *Le pain dur* (1918), works sometimes obscure, but freighted with purpose of an incontestable quality, and with austere emotion

In the domain of poetry all the squabbles of the schools had already been silenced by 1910 Symbolism had done its work Its most illustrious representative, Henri de Régnier, had returned to traditional forms Master of rhythm and of rhyme, connoisseur of language, sumptuous and self-contained, he has amplitude and richness Cultured, a great reader of history and old books, he knows the past He has at his command all the images supplied by legend, history, nature and art The outcome of this is a magnificent and lordly poetry which is the mirror of the passions, the adventures, the glories and all the multiple forms of human destiny (*Poésies*, 1907, *Vestigia Flammae*, 1921) Much nearer symbolism, Francis Vielé-Griffin has studied the ancient myths and has attempted to interpret their eternal significance (*Voix d'Ionie*, 1914) Francis Jammes is the poet of nature and divinity He knows the country well, and he speaks of it with a charming simplicity and freshness (*Les Géorgiques chrétiennes*, 1911–12) He shows the same ingenuousness, the same healthy realism, the same humility in his poetry of religious inspirations; he has in him something at once bucolic and Christian (*La Vierge et les sonnets*, 1919). Comtesse de Noailles is on the contrary pantheistic and pagan Impetuous and consciously unrestrained, heavy with doom like a priestess of old time, she has sung in eloquent and remarkably rhythmical verse of youth, love, the beauty of the universe, and also of human unhappiness, implacable destiny and death (*Les vivants et les morts*, 1913, *Les forces éternelles*, 1920) In her later verses (*Poème de l'amour*, 1924) she has adopted a deliberately simple and bare style, in which is traceable a growing melancholy, a strange lassitude in her ardent work, and, by way of substitute for resignation, a courage full of serenity. Paul Claudel, a vigorous personality, penetrated by a faith which, unlike the tenderness of Francis Jammes, is austere and sometimes sombre, has written poems (*La cantate à trois voix*, 1914, *Trois poèmes de guerre*, 1915, *La messe là-bas*, 1919) which present a mixture of rather obscure metaphysics, rather self-conscious simplicity, and vivid and powerful imagery

Charles Péguy, Socialist and patriot, has shown in his poems *Le mystère de la Charité de Jeanne d'Arc* (1910), *Le mystère des Saints Innocents* (1912), *Eve* (1914) a fluency which is slightly wearing because of his repetition of the same themes, but at the same time a real power due to sincerity, tenderness and the human need for faith and piety Finally, Paul Valéry, who had made his appearance between 1889 and 1898 in reviews of poetry and letters, *La Conque* and *Le Centaure*, published in 1917 *Le jeune Parque*, and in 1922 *Charmes*. These two extremely slender collections contained much substance under an unpretentious form, and established his reputation Mathematician and philosopher, a subtle and experienced artist, a disciple of Mallarmé, to whom he owes much, he gives expression to an abstract and intellectual life which though slightly arid is still passionate, and his work has a deep full note He has taken his place with *Monsieur Teste* (1896–1927) and *Eupalinos* (1923) among the great writers of prose and the great *moralistes* of the best French tradition. The tendency to return to simple, pure and classical sources is found also with Paul Fort, whose *Ballades françaises* are full of colour and imagination; with J P Toulet, Fernand Gregh, Abel Bonnard, Fanc-Nohain, whose *Fables* (1921) are delightfully humorous, with Alfred Droin and Pierre Camo; while symbolistic description is the more natural vehicle for Jean Royère.

If one were obliged, in spite of this diversity of temperaments, to characterize the period between 1911 and 1914, one might make two observations One is that in matters of form pre-War writers went back almost without exception to classical traditions, to proportion, simplicity, clearness The other is, that as far as guiding principles went they were for the most part occupied with furnishing a moral discipline to their contemporaries, and that in the wake of dilettantism and naturalistic pessimism they laboured to restore notions of order, of decorum, of hierarchy, which to them seemed useful to the national life Whatever may have been the glory of Anatole France, it was not he who was then a leader, and who exercised an influence over men's souls, it was Paul Bourget and Maurice Barrès There appeared at the approach of that danger constituted by the War a phenomenon worthy of remark by historians of the future. The grandson of Renan, Ernest Psichari, wrote in 1913 *L'appel des armes*, and shortly afterwards *Le voyage du centurion* (1916). Political crises and intellectual visionings had brought about a state of uncertainty that might prove a cause of weakness. Under the pressure of national exigencies that were apparent to all thoughtful minds, French literature in 1911 was mainly inspired by the attempt, which has been justified by the facts, to assure the future of the threatened country, to make readers acquainted with the strenuous life and the fundamental principles of the social and moral worlds.

The Post-War Generation.—The War abruptly ended the literary careers of many young men, who were killed on the field of battle, men who in all branches of literary activity gave high promise—novelists like Alain Fournier and Emile Clermont, poets like Paul Drouot and J M Bernard, essayists like Dufresnoy and Pierre Gilbert. But with those who survived it and had passed through its fires it only stimulated the desire for expression During the course of the War there appeared a series of brilliant books of diverse character, but sincere and passionate, retracing the heroic years It is impossible to mention all, but we must at least set down here *Le songe* (1922), by Henry de Montherlant; *Les croix de bois* (1919), by Roland Dorgelès; *Le feu* (1916), by Henri Barbusse; *La flamme au poing* (1917), by H. Malherbe; *Gaspard* (1916), by René Benjamin; *Civilisation* (1918) and *La vie des martyrs* (1917), by Georges Duhamel; *Sous Verdun* (1916), by Maurice Genevoix; *La guerre à vingt ans* (1924), by Philippe Barrès, *Fond de Cantine* (1920), by Pierre Drieu la Rochelle, and *Les récits de guerre dits à une femme*, by Camille Mayran. All these works powerfully represent direct impressions and strong emotions; they have a meaning, and our grandchildren will find in them one day a sincerely moving record of a period that was shaken by a terrible storm

This interesting and noble outburst necessarily faded as the events moved further away. More or less indifferent to the heritage of their elders, the young writers appeared to be under the impression of existing in a new world where they had to recreate everything But nevertheless they remained under the influence

of the past, sometimes without suspecting it themselves. They discovered, by the very fact that they lived in a predetermined epoch, the result of the labours of their elders. Tendencies, varieties of talent and aspirations are very diverse There is little unity in the literature of the younger generation Everyone follows the inclinations of his own temperament

The dominating form in modern literature is still the novel, and it will serve as a type It is not distinctively, in spite of the definition, a narrative representing life, but often consists of recollections like a book of memoirs or of reflections like a book of essays The strongest influence to appear has been that of Marcel Proust (1873–1923) According to the date of his birth he belongs to the pre-War generation, his work has appeared almost entirely during or since the War Only the first volume of his great novel *A la recherche du temps perdu,* namely *Du côté de Chez Swann,* had appeared by the end of the year 1913 All the others appeared in sequence down to 1925 Marcel Proust is remarkable for the depth and daring of his analysis Gifted with an acute, morbid sensitivity, he probed deeply into the motives of the heart and soul With an extraordinary delicacy and detail, he succeeded in expressing new and original nuances of thought in sinuous and often interminable sentences The bold analysis of the emotions in French literature was begun some years before Marcel Proust, by Anatole France, but with discretion, and later with more freedom by the female writers, but Marcel Proust has gone much further He has carried the taste and feeling for introspection to the extreme limits By this one can say he has enlarged the scope of the novel, and that is the reason for his great prestige and influence among post-War writers

This preoccupation with analysis is found in a series of works the most characteristic of which are Jacques Rivière's *Aimée* (1921), Jacques de Lacretelle's *Silbermann* (1922) and *La Bonifas* (1925) In reality a gift as personal and exceptional as that of Marcel Proust encourages tendencies more than it provokes imitation Psychological introspection is part of our period It appeared in the course of the War more acutely and frequently than ever Carried to the extreme, it has resulted in an attempt at the formation of a super-realist (*sur-réaliste*) school

The writers who have been most successful in these last years escape any attempt at classification Each follows his own temperament and inclination Recourse to the past is necessary to distinguish influences, forerunners, schools In contemporary literature the only thing that can be distinguished is the individual The choir of young poets protest their personal freedom (Tristan Derême, Charles Derennes, Géraldy, Roger Allard, Chabaneix) The novelists do the same, M Pierre Benoît is a master of the novel of adventure, he knows how to construct, he knows how to tell a story, and addressing himself to a public which, as after every period of upheaval, is in need of distraction, he has been able to captivate the attention, in a series of well-made novels (*Koenigsmark,* 1918, *L'Atlantide,* 1919; *Mlle de la Ferté,* 1923, *Le puits de Jacob,* 1924), in which he shows a remarkable facility in employing imaginary or historical events and in keeping the reader breathless with suspense over the turns of his stories

It is only necessary to recall *Le kilomètre 83,* by Henry Daguerches (1913), to show that since before the War the taste for the novel of adventure had been revived. The influence of Anglo-Saxon literature, and particularly that of Kipling, had been a powerful stimulant in this development The War naturally only accentuated this tendency A proof of this is found in the books of Pierre MacOrlan (*La cavalière Elsa,* 1921), of Louis Chadourne (*Terre de Chanaan,* 1921) of Jean d'Esme (*Les Barbères,* 1925), of Roland Dorgelès (*Le reveil des morts,* 1923), of René Bizet (*La sirène hurle,* 1921) and of J Kessel (*La Steppe rouge,* 1922, *L'Equipage,* 1924). All of these appeared between 1918 and 1925 Actually, however, it does not seem that this form of literature is capable of much further development, except in the case of the exotic, historical or colonial novel. French literature is traditionally psychological It is characteristic that the best book of Pierre Benoît, the most popular writer of novels of adventure, is a novel of manners, *Mlle. de la Ferté* (1923)

Francis Carco is a painter of the lower depths of society, of the world of the apaches and of the outer boulevards. He deals, as did Villon in his day, with the world of thieves. He has handled this difficult subject with a great deal of tact (*Les innocents,* 1916, *L'homme traqué,* 1922, *Perversités*). Jean Giraudoux is also a subtle analyst He has a capricious imagination and a very individual, if somewhat complicated, poetic manner, which makes him difficult reading, but he is provocative There is in him much humour, often of an unexpected kind, difficult to understand The world of images has no secrets from him Unusual comparisons and strange associations of ideas abound in his books The most successful of these are *Suzanne et le Pacifique* (1921), the story of a shipwrecked young girl who lives alone on a desert island, and *Bella* (1926), a story of contemporary French political life

Henry de Montherlant is one of the most gifted among the young writers He has a sense of style, and is capable of vigorous mental activity After *Le Songe* (1922) he wrote *Les onze devant la porte dorée* (1924) and *Les Bestiaires* (1926)—books which disclose his national and moral preoccupations He is interested in the disciplines which make a human being master of himself, permit him to live under the best conditions, and give the greatest possible value to his acts He is very modern, and at the same time deeply attached to tradition, his works are filled with youthful ardour, strength of will, and an impetuosity which express themselves in vivid and poetic language

François Mauriac is a harsh and powerful novelist His books (*Le baiser au lépreux,* 1922, *Genitrix,* 1923, *Le désert de l'amour,* 1925, *Thérèse Desqueyroux,* 1927) have placed him among the most notable writers of his generation Brought up in the Catholic tradition and attached to his faith, François Mauriac is aware both of the demands imposed by a Christian life and of the weaknesses of most human beings All his work, which incidentally is open-minded, seems dominated by the idea of sin, by the necessary artifices in which egotism and passion entangle human beings, by the nothingness of their desires and the need for discipline

André Maurois, who during the War was interpreter with the British army, made his début with an impressionistic book, entitled *Les silences du Colonel Bramble* (1918), which had a great success This was followed by *Ariel, ou la vie de Shelley* (1923), which had great charm, *Des dialogues sur le Commandement* (1924) and *Disraeli* (1927) He is less a novelist than an essayist He has a penetrating, highly cultivated mind and loves the play of ideas, he excels in delicate analyses, in the nuances of the emotions and in psychological insight

Valéry Larbaud is interested in the manifestations of the international mind, and has written fascinating novels *Firmina Marquez* is an original study of the life of young people in South American schools *Le journal d' A O Barnabooth,* which followed, is a novel in which satire is mingled with poetic fancy

Paul Morand represents the impressionist school at its acme of success His short stories *Ouvert la nuit* (1922), and his novel *Lewis et Irène* (1924) are certainly among the most entertaining studies of the present time Paul Morand has a keen feeling for the feverishness and instability of contemporary life He is also keenly aware of the international aspect of post-War cities

Pierre Hamp (*Le Lin,* 1924) has elaborated a new kind of novel with no hero and no tale He aims at giving a picture of human effort in all its aspects and uses his personal experience and technical knowledge to make up a most vivid presentation chiefly of the life of the working classes

Jean Richard Bloch (*Et Compagnie,* 1925) has written perhaps the most successful Balzacian novel of his generation He has since attempted the novel of adventure on the poetical plane in *La Nuit Kurde* (1925), and produced in *Le Dernier Empereur* (1926) a much more vigorous type of play than the French stage has seen for many years

Jules Romains, known before the War as the founder of the poetical school *l'Unanimisme,* has achieved success in the novel with *Lucienne* (1922) and on the stage with *Dr. Knocke* (1924) and *le Dictateur* (1926). André Chamson is one of the most promising of the newest writers; his vigorous essay *L'Homme contre l'Histoire* (1926) attracted considerable attention after *Roux le Bandit* (1924); and *Les Hommes de la Route* (1927) is the most

important of the recent novels.

The essay seems to be winning back some of its former popularity The most celebrated of contemporary essayists is "Alain" (Emile Chartier) who won notoriety with a series of essays on the War *Mars ou la guerre jugée* (1920) His essays are very short and pregnant, and rise to passionate moral intensity (*Les Idées et les Ages*, 1927) Alain is one of the three or four best writers of French prose of the present day. Henri Brémond should also be noticed.

All the schools, after their trials and struggles, have achieved their work and have transmitted the best that was in them The quarrels between romanticism and naturalism, between the Parnassians and the Symbolists have come to an end The opposition between scientific rationalism and the world of the spirit has become less acute. It was a long struggle, bearing witness to the vitality of literature; of all the doctrines nothing is left but the trace of whatever in them was useful and true. Present-day French literature seems to be going in the direction of a classic revival in which certain other elements are mingled We can conclude on a hopeful note At few periods of French literature has there been so much young talent Genius can be attributed to several of our contemporaries, and the effervescence of the present day in French literature contains much more than mere promises for the literary historian and critic.

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FRENCH POLISH. This material is made by dissolving orange shellac in alcohol It has a turbid orange-brown appearance and dries in about ten minutes with a pale brownish colour. The turbidity is due to the presence of a proportion of wax in the shellac, which is insoluble in alcohol When French polish is allowed to stand, this insoluble wax settles and it is therefore necessary for the polish to be shaken before use

The ordinary process of manufacture is to place orange shellac and industrial methylated spirit in large wooden churns having a capacity from 100–150 gal, which are allowed to revolve slowly for about 18 hours. The polish is then strained through coarse strainers into wooden or earthenware storage receptacles: tin or iron containers must not be used, since the action of the shellac on the metal would turn the polish black

The proportion of orange shellac used varies from 2 to 3 lb. to 1 gal of methylated spirit Other resins such as gum benzoin, gum elemi, Venice turpentine, French rosin, sandarac, etc, are usually added to improve the elasticity and gloss of the polish

French polish is applied by means of a rubber made with cotton wool wrapped in a clean white linen cloth The cotton wool is soaked with the polish, covered with the linen cloth, and then passed quickly all over the work with smooth circular sweeping movements accompanied by a slight pressure This is repeated a very large number of times until the desired highly polished finish is obtained French polishing is a highly skilled trade and the best results can only be obtained by experienced craftsmen (*See* FURNITURE MANUFACTURE)

FRENCH REPUBLICAN CALENDAR, a calendar substituted in France during the Revolution in place of the prevailing Gregorian system Something of the sort had been suggested in 1785 by a certain Riboud, and a definite scheme had been promulgated by Pierre Sylvain Maréchal (1750–1803) in his *Almanach des honnêtes gens* (1788). The objects which the advocates of a new calendar had in view were to strike a blow at the clergy and to divorce all calculations of time from the Christian associations with which they were loaded, in short, to abolish the Christian year, and enthusiasts were already speaking of "the first year of liberty" and "the first year of the republic" when the national convention took up the matter in 1793 The business of drawing up the new calendar was entrusted to the president of

An II 1793–94		An III 1794–95	An IV 1795–96	An V 1796–97	An VI 1797–98	An VII 1798–99	An VIII. 1799–1800	An IX. 1800–01
1 Vendémiaire	22 Sept 1793	22 Sept. 1794	23 Sept. 1795	22 Sept 1796	22 Sept 1797	22 Sept 1798	23 Sept 1799	23 Sept 1800
1 Brumaire	22 Oct ,,	22 Oct ,,	23 Oct ,,	22 Oct. ,,	22 Oct ,,	22 Oct. ,,	23 Oct. ,,	23 Oct. ,,
1 Frimaire	21 Nov ,,	21 Nov. ,,	22 Nov. ,,	21 Nov. ,,	21 Nov. ,,	21 Nov. ,,	22 Nov. ,,	22 Nov ,,
1 Nivôse	21 Déc ,,	21 Déc ,,	22 Déc. ,,	21 Déc. ,,	21 Déc ,,	21 Déc ,,	22 Déc. ,,	22 Déc. ,,
1 Pluviôse	20 Janv 1794	20 Janv 1795	21 Janv. 1796	20 Janv. 1797	20 Janv 1798	20 Janv. 1799	21 Janv. 1800	21 Janv. 1801
1 Ventôse	19 Févr ,,	19 Févr ,,	20 Févr ,,	19 Févr. ,,	19 Févr. ,,	19 Févr. ,,	20 Févr. ,,	20 Févr. ,,
1 Germinal	21 Mars ,,	21 Mars ,,	21 Mars ,,	21 Mars ,,	21 Mars ,,	21 Mars ,,	22 Mars ,,	22 Mars ,,
1 Floréal	20 Avr. ,,	20 Avr. ,,	20 Avr. ,,	20 Avr. ,,	20 Avr. ,,	20 Avr. ,,	21 Avr ,,	21 Avr. ,,
1 Prairial	20 Mai ,,	20 Mai ,,	20 Mai ,,	20 Mai ,,	20 Mai ,,	20 Mai ,,	21 Mai ,,	21 Mai ,,
1 Messidor	19 Juin ,,	19 Juin ,,	19 Juin ,,	19 Juin ,,	19 Juin ,,	19 Juin ,,	20 Juin ,,	20 Juin ,,
1 Thermidor	19 Juil ,,	19 Juil. ,,	19 Juil ,,	19 Juil. ,,	19 Juil. ,,	19 Juil. ,,	20 Juil. ,,	20 Juil. ,,
1 Fructidor	18 Août ,,	18 Août ,,	18 Août ,,	18 Août ,,	18 Août ,,	18 Août ,,	19 Août ,,	19 Août ,,
1 Sans-culottides	17 Sept. 1794	17 Sept 1795	17 Sept. 1796	17 Sept 1797	17 Sept. 1798	17 Sept 1799	18 Sept 1800	18 Sept 1801
6 ,,		22 ,, ,,				22 ,, ,,		

An X. 1801–02		An XI. 1802–03	An XII. 1803–04	An XIII. 1804–05	An XIV. 1805
1 Vendémiaire	23 Septembre 1801	23 Septembre 1802	24 Septembre 1803	23 Septembre 1804	23 Septembre 1805
1 Brumaire	23 Octobre ,,	23 Octobre ,,	24 Octobre ,,	23 Octobre ,,	23 Octobre ,,
1 Frimaire	22 Novembre ,,	22 Novembre ,,	23 Novembre ,,	22 Novembre ,,	22 Novembre ,,
1 Nivôse	22 Décembre ,,	22 Décembre ,,	23 Décembre ,,	22 Décembre ,,	22 Décembre ,,
1 Pluviôse	21 Janvier 1802	21 Janvier 1803	22 Janvier 1804	21 Janvier 1805	
1 Ventôse	20 Février ,,	20 Février ,,	21 Février ,,	20 Février ,,	
1 Germinal	22 Mars ,,	22 Mars ,,	22 Mars ,,	22 Mars ,,	
1 Floréal	21 Avril ,,	21 Avril ,,	21 Avril ,,	21 Avril ,,	
1 Prairial	21 Mai ,,	21 Mai ,,	21 Mai ,,	21 Mai ,,	
1 Messidor	20 Juin ,,	20 Juin ,,	20 Juin ,,	20 Juin ,,	
1 Thermidor	20 Juillet ,,	20 Juillet ,,	20 Juillet ,,	20 Juillet ,,	
1 Fructidor	19 Août ,,	19 Août ,,	19 Août ,,	19 Août ,,	
1 Sans-culottides	18 Septembre 1802	18 Septembre 1803	18 Septembre 1804	18 Septembre 1805	
6 ,,		23 ,, ,,			

the committee of public instruction, **Charles Gilbert Romme** (1750–95), who was aided in the work by the mathematicians Gaspard Monge and Joseph Louis Lagrange, the poet Fabre d'Églantine and others The result of their labours was submitted to the convention in September; it was accepted, and the new calendar became law on Oct 5, 1793 The new arrangement was regarded as beginning on Sept 22, 1792, because it was the day of the proclamation of the republic, and, in this year, the day of the autumnal equinox

By the new calendar the year of 365 days was divided into 12 months of 30 days each, every month being divided into three periods of ten days, each of which were called *décades*, and the tenth, or last, day of each decade being a day of rest. It was also proposed to divide the day on the decimal system, but this arrangement was found to be highly inconvenient and it was never put into practice Five days of the 365 still remained to be dealt with, and these were set aside for national festivals and holidays and were called *Sans-culottides* They were to fall at the end of the year, *i e*, on the five days between Sept 17 and 21 inclusive and were called the festivals of virtue, of genius, of labour, of opinion and of rewards A similar course was adopted with regard to the extra day which occurred once in every four years, but the first of these was to fall in the year III, *i e*, in 1795, and not in 1796, the leap year in the Gregorian calendar This day was set apart for the festival of the Revolution and was to be the last of the *Sans-culottides* Each period of four years was to be called a *Franciade*

Some discussion took place about the nomenclature of the new divisions of time Eventually this work was entrusted to Fabre d'Églantine Beginning with the new year on Sept 22, the autumn months were *Vendémiaire*, the month of vintage, *Brumaire*, the month of fog, and *Frimaire*, the month of frost The winter months were *Nivôse*, the snowy, *Pluviôse*, the rainy, and *Ventôse*, the windy month; the spring months, *Germinal*, the month of buds, *Floréal*, the month of flowers, and *Prairial*, the month of meadows; the summer months, *Messidor*, the month of reaping, *Thermidor*, the month of heat, and *Fructidor*, the month of fruit To the days Fabre d'Églantine gave names which retained the idea of their numerical order, calling them Primedi, Duodi, etc, the last day of the ten, the day of rest, being named Décadi The new order was soon in force in France and the new method was employed in all public documents, but it did not last many years In Sept 1805 it was decided to restore the Gregorian calendar, and the republican one was officially discontinued on Jan 1, 1806.

The connecting link between the old and the new calendars is slight and the expression of a date in one calendar in terms of the other is a matter of some difficulty. A simple method of doing this, however, is afforded by the table on the preceding page, which is taken from the article by J. Dubourdieu in *La Grande Encyclopédie*

Thus Robespierre was executed on 10 Thermidor An II, *i e*., July 28, 1794 The insurrection of 12 Germinal An III took place on April 1, 1795. The famous 18 Brumaire An VIII fell on Nov 9, 1799, and the *coup d'état* of 18 Fructidor An V on Sept 4, 1797

For a complete concordance of the Gregorian and the republican calendars *see* Stokvis, *Manuel d'histoire*, vol. iii. (Leyden, 1889); also G Villain, "Le Calendrier républicain," in *La Révolution Française* for 1884–85

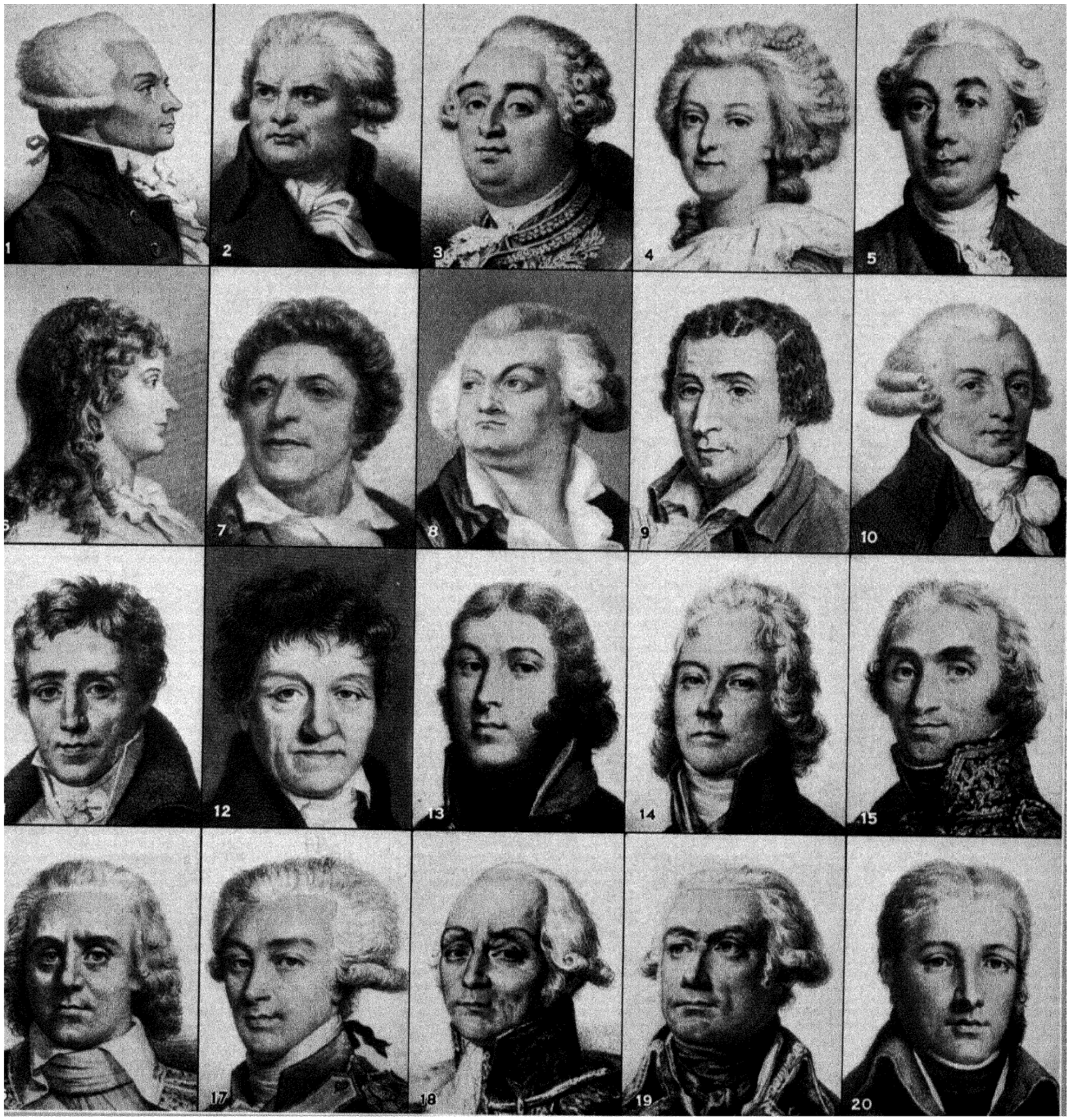
FRENCH REVOLUTION, THE. There have been several revolutions in France, but when the French Revolution is spoken of without qualification it means the great revolution, by which, towards the close of the 18th century, the old order in France was overthrown Though the Revolution passed through many phases and its beginnings must be set far back in the history of France, one event was from the first held to mark its decisive moment When, on the afternoon of July 14, 1789, the Duc de La Rochefoucauld-Liancourt brought to King Louis XVI. at Versailles the news of the capture of the Bastille, the king exclaimed: "Why, this is a revolt!" "No, Sire," replied the duke, "It is a revolution." Three days later the tidings reached Arthur Young at Nancy; he noted in his journal that he had just received the news of the "complete overthrow of the old order." To this day the anniversary of the fall of the Bastille, July 14, is celebrated by the French as the birthday of their national liberties.

It is not proposed here to explain why the capture by the populace of an old castle-prison, garrisoned by a handful of pensioners, was at once taken as marking the downfall of the old autocratic *régime* in France; an account of the Revolution which this heralded, of its antecedent causes, and of its later developments will be found in the article FRANCE. *History*. But the great Revolution was of epoch-making importance, not for France only, but for the whole world, for it set in motion those revolutionary forces—democracy, nationalism, socialism—which have changed the face of Europe and of the world, and are not yet spent. To say this, is not to belittle the importance of the American Revolution, which preceded the French Revolution and to a great extent inspired it July 4, 1776, was certainly also an epoch-making date The American Declaration of Independence first laid down the principle that governments derive their just powers from the consent of the governed, and so for the first time authoritatively proclaimed democracy as the only legitimate foundation of civil society But the American Revolution was not so revolutionary as at first it seemed Though a breach was made with England, no breach was made with English traditions of government and law Of those who signed the Declaration of Independence but very few were democrats at heart They subscribed to the revolutionary principles embodied by Jefferson in the preamble, but they had no idea of giving them a logical and universal application That was reserved for the French The Americans first established modern democracy The French made it a militant creed

There had been revolutions in Europe before 1789; but these revolutions had been strictly limited in their aims, and there had been no idea of setting up one form of constitution as absolutely superior to all others Before 1789 the words "republic" and "democracy" conveyed no suggestion of revolutionary peril Though Rousseau declared the ultimate sovereignty of the people to be inalienable, and all governments not established on this basis usurpations, he agreed with Montesquieu that republicanism and democracy were suitable only to small States, and were therefore peaceful in their tendencies Even when a great new Republic was founded beyond the Atlantic, the monarchs watched its rise without misgiving, and even assisted in its foundation "Time is necessary for the creation of a conquering people," said a contemporary diplomatic report, "It is more difficult to produce the spirit of conquest in a republic than in the head of a government which is entrusted to a single person"

This was an illusion which the history of the French Revolution should have dispelled, though it still persists. It serves partly to explain the apathy displayed at the outset by the Continental monarchs towards the troubles of their brother of France, which they even regarded as providential, since they prevented him from interfering with their plans for the final partition of Poland It was only gradually that they awoke to the fact that the triumph of the Revolution in Paris had introduced a wholly new factor into international politics, and one very perilous to themselves For the principles of the Revolution had an application far beyond the borders of France, since the doctrine of the sovereignty of the people as the only legitimate foundation of government challenged the right to exist of every State in Europe. This was the new thing which the crusading spirit of the Revolution revealed to the world: political idealism in arms, war waged, not in the name of the State for purposes of conquest, but in the name of humanity to set up everywhere on the ruins of the old order the theoretically perfect State. There were those, even at the time, who could read the meaning of the portent. Goethe was present when, at Valmy on Sept. 20, 1792, the ragged levies of the nascent French Republic withstood the attack of Brunswick's Prussian veterans. "From this place and this day," he noted in his diary, "dates a new epoch in the history of the world, and you will be able to say: I was there."

Characteristics of the Revolution.—The French Revolution, by the challenge thrown down to all the old world, had revealed itself as different to any revolution that had hitherto been.



BY COURTESY OF (1, 2, 9, 10) THE TRUSTEES OF THE BRITISH MUSEUM PHOTOGRAPH (4, 7) RISCHGITZ (8, 12) JAMES S PRESS AGENCY

LEADING FIGURES IN THE FRENCH REVOLUTION

1 Maximilien François Isidore de Robespierre (1758–94)
2 Georges Jacques Danton (1759–94)
3 Louis XVI, king of France (1754–93)
4 Marie Antoinette, queen of France (1755–93)
5 Jacques Necker (1732–1804)
6 Jeanne Manon Phlipon, Madame Roland (1754–93)
7 Jean Paul Marat (1743–93)
8 Honoré Gabriel Victor Riqueti, comte de Mirabeau (1749–1791)
9 Jacques Pierre Brissot (1754–93)
10 Pierre Victurnien Vergniaud (1753–93)
11 Emmanuel Joseph Sieyes (Abbé) (1748–1836)
12 Lazare Hippolyte Carnot (1753–1823)
13 General Louis Lazare Hoche (1768–97)
14 Charles Maurice de Talleyrand-Périgord, prince de Bénevent (1754–1838)
15 André Masséna, duc de Rivoli, prince d'Essling (1756–1817)
16 Paul François Jean Nicolas, vicomte de Barras (1755–1829)
17 Marie Joseph Motier, marquis de La Fayette (1757–1834)
18 François Christophe Kellermann, duc de Valmy (1735–1820)
19. Général Charles François Dumouriez (1739–1823)
20 Général Jean Victor Marie Moreau (1763–1813)

In what did this difference consist? and what were its causes? The essential difference was that the French Revolution, increasingly as overturn succeeded overturn, represented not so much an effort to remedy admitted evils in the body politic, as an effort to recreate it on an ideal basis. "What does this mysterious science of government and legislation amount to?" said Robespierre, "To putting into the laws the moral truths culled from the works of the philosophers."

In holding this view Robespierre was not singular, though he was the most rigid in upholding it Of the 1,200 deputies who met in the States-General at Versailles, in May 1789, but few had any experience of the practical problems of government, or had learned politics in any other school than the conversations of the *salons* and the writings of the philosophers. So far as they were not merely conservative, the champions of outworn prerogatives and privilege, they were for the most part—as Talleyrand was to put it—"builders of theories for an imaginary world" The voices of those who, like Mirabeau, realized the force of tradition in human affairs, and tried to hold fast what was good and useful in the old order, were soon silenced by the eloquence of the ideologues and—the roar of the Paris mob And so, beginning with the "orgy" of Aug 4, 1789, the old order was swept away before a new order was ready to take its place The internal history of France during the Revolution is mainly that of successive attempts to build up an ideal order on the ruins

Divergent Tendencies.—The process, of course, was not simple The Revolutionists might agree on the principles embodied in the Declaration of the Rights of Man, but they differed about their application The Constitution of 1791 was ostensibly an effort to apply them logically, but its framers tempered their logic with a *bourgeois* caution, for them "equality" meant at most equality before the law, not equality of opportunity, and they limited the franchise in the interests of the possessing classes The Constitution was overthrown, with the monarchy, on Aug 10, 1792, but the rift it had created in the revolutionary ranks continued, and widened, in the National Convention

The struggle between the Girondins (*see* GIRONDISTS) and the Mountain (*q v*), as M Albert Mathiez has now shown, was no mere struggle of rival groups for power, nor was it primarily a revolt of the provinces against the predominance of Paris and the Paris mob Though the border-line between the factions was never very clearly marked, the essential difference between them was that the Girondins, though republicans and idealists, were champions of the rights of property, while the Mountain, which depended for its power on the organized mob of Paris, tended more and more in the direction of what is now called Socialism It is a question how far this tendency was deliberate, or how far the socialistic laws (Law of the Maximum, etc) put in force under the Terror were merely "war measures." But, at least in the case of Robespierre and his party, it now seems clear that they represented a conscious attempt to realize the ideal of the Socialist Republic. Socialists, from Buonarotti onwards, have claimed him, not without reason, as the apostle and protomartyr of their economic creed

The Revolution and Nationalism.—If modern democracy, in its various developments, received its first great impulse from the Revolution, this is also true of nationalism, which during the 19th century was to prove the most powerful solvent of the established order. The principle of nationality was not, indeed, originally part of the revolutionary gospel, which was beautifully cosmopolitan The orators of the Constituent Assembly held up the ideal of universal peace, and asserted with confidence that regenerated France would never again wage wars of conquest; and those who later, in the Legislative Assembly, clamoured for war spoke of carrying "liberty" to oppressed peoples But already the mood was changing. The threat of foreign invasion had aroused in the French themselves an intense national consciousness, and Danton was not alone in urging that the great object of the war should be to gain for France the frontiers "fixed by nature"—the Rhine, the Alps and the Pyrenees. And so, almost insensibly, the war of defence and revolutionary propaganda developed into a war of conquest, till in the end the rights of man were forgotten, blotted out by the splendour of the man, Napoleon, who had become the incarnation of a Revolution now identified with all the glories of France

The sparks from the conflagration in Paris had meanwhile been carried far and wide, and had started fires even in places unexpected and remote, where they glowed under the surface, to burst into flame later But though the agitations, which were in the end to lead to the rise of a whole series of new nations in eastern Europe, were sometimes inspired at the outset by French revolutionary doctrines, it was not so much these doctrines which gave its mighty impulse to the new spirit of nationality in Europe at large as the example of French nationalism, and the reaction against it when it became a conquering force In Italy Napoleon, for his own purposes, deliberately awakened a national consciousness which had slumbered for a thousand years. In Germany, which like Italy had become little more than "a geographical expression," the humiliations he inflicted stirred up memories of ancient greatness and a new passion for national unity When Spain set the example of national resistance, and with success, all Europe recognized that a new force had come into the world; that war was no longer a mere ordeal by battle, to be fought out according to fixed rules by professional armies, but a trial of strength between nations in arms And so it was that, in their final struggle against the revolutionary doctrine of conquest, as embodied in Napoleon, the monarchs themselves appealed to the new-born national sentiment of the peoples, and not in vain. The battle of Leipzig, which practically sealed Napoleon's doom, is rightly known as "the Battle of the Nations."

The processes of national segregation and national expansion, then, which during the century that followed changed the face of Europe, received their first great impulse from the French Revolution The result has been a complete change in the substance of the old order, even where the outward semblance has remained unaltered Everywhere before the World War, except in the Austrian and Ottoman empires, sovereignty had ceased to be territorial and become national, even in Germany, where territorial sovereignties continued to exist, these were overshadowed by the power and prestige of the German emperor, whose title implied not a territorial but a national authority The World War, a world-wide battle of the nations, completed the process, so far as the principle of national sovereignty is concerned, for Luxembourg, Liechtenstein and Monaco are insignificant exceptions which serve to emphasize the rule Above all, the disappearance of the Habsburg monarchy, the last great purely territorial dominion, proclaimed the World War as the most stupendous phase of the Revolution which started with the capture of the Bastille That it was the last phase cannot be said In their internal affairs the nations are still experimenting in the application of the democratic principles proclaimed by the Revolution, except where—as in most Latin countries—the experiment has conspicuously broken down. As for the social revolution, dreamed of by Robespierre, this has to a large extent been realized even in countries reputed conservative —in universal free education, the duty of the State to provide work or the maintenance of those out of work, and so on In the matter of international relations, too, some return has been made to the revolutionary ideal of the brotherhood of man, and the League of Nations represents an attempt to put into the laws the moral truths culled from the works of the philosophers But the jealous and mutually exclusive sentiment of nationality remains the most fateful legacy of the Revolution, the forces of which for good or evil are not yet spent.

BIBLIOGRAPHY —Albert Sorel, *L'Europe et la Révolution française* (1903–05), though characterized by French bias, remains the most authoritative work of the reaction of the Revolution on contemporary Europe and vice versa. For the significance of the Revolution for France itself *see* Godfrey Elton, *The Revolutionary Idea in France* (1923). (W. A P)

FRENCH REVOLUTIONARY WARS (1792–1800), the general name for the first part of the series of French wars which went on continuously, except for some local and temporary cessations of hostilities, from the declaration of war against Britain in 1792 to the final overthrow of Bonaparte in 1815 The most important of these cessations—viz., the peace of 1801–03—

closes the "Revolutionary" and opens the "Napoleonic" era of land warfare, for which *see* NAPOLEONIC CAMPAIGNS, PENINSULAR WAR and WATERLOO CAMPAIGN The naval history of the period is dated somewhat differently, the first period, treated below, is 1792–99, for the second, 1799–1815, *see* NAPOLEONIC CAMPAIGNS

MILITARY OPERATIONS

France declared war on Austria on April 20, 1792 But Prussia and other powers had allied themselves with Austria in view of war, and it was against a coalition and not a single power that France found herself pitted, at the moment when the "emigration," the ferment of the Revolution, and want of material and of funds had thoroughly disorganized her army The first engagements were singularly disgraceful Near Lille the French soldiers fled at sight of the Austrian outposts, crying *"Nous sommes trahis,"* and murdered their general (April 29) The commanders-in-chief of the armies that were formed became one after another "suspects", and before a serious action had been fought, the three armies of Rochambeau, Lafayette and Luckner had resolved themselves into two commanded by Dumouriez and Kellermann Thus the disciplined soldiers of the Allies had apparently good reason to consider the campaign before them a military promenade On the Rhine, a combined army of Prussians, Austrians, Hessians and *émigrés* under the duke of Brunswick was formed for the invasion of France, flanked by two smaller armies on its right and left, all three being under the supreme command of the king of Prussia In the Netherlands the Austrians were to besiege Lille, and in the south the Piedmontese also took the field The first step, taken against Brunswick's advice, was the issue (July 25) of a proclamation which, couched in terms in the last degree offensive to the French nation, generated the spirit that was afterwards to find expression in the 'armed nation" of 1793–94, and sealed the fate of Louis XVI The duke, who was a model sovereign in his own principality, sympathized with the constitutional side of the Revolution, while as a soldier he had no confidence in the success of the enterprise After completing its preparations in the leisurely manner of the previous generation, his army crossed the French frontier on Aug 19 Longwy was easily captured, and the Allies slowly marched on to Verdun, which was more indefensible even than Longwy The commandant, Col Beaurepaire, shot himself in despair, and the place surrendered on Sept 3 Brunswick now began his march on Paris and approached the defiles of the Argonne. But Dumouriez, who had been training his raw troops at Valenciennes in constant small engagements, with the purpose of invading Belgium, now threw himself into the Argonne by a rapid and daring flank march, almost under the eyes of the Prussian advanced guard, and barred the Paris road, summoning Kellermann to his assistance from Metz The latter moved but slowly, and before he arrived the northern part of the line of defence had been forced Dumouriez, undaunted, changed front so as to face north, with his right wing on the Argonne and his left stretching towards Châlons, and in this position Kellermann joined him at St Menehould on Sept 19.

Valmy.—Brunswick meanwhile had passed the northern defiles and had then swung round to cut off Dumouriez from Châlons At the moment when the Prussian manoeuvre was nearly completed, Kellermann, commanding in Dumouriez's momentary absence, advanced his left wing and took up a position between St Menehould and Valmy The result was the world-renowned cannonade of Valmy (Sept 20, 1792) Kellermann's infantry, nearly all regulars, stood steady The French artillery justified its reputation as the best in Europe, and eventually, with no more than a half-hearted infantry attack, the duke broke off the action and retired This trivial engagement was the turning-point of the campaign and a landmark in the world's history Ten days later, without firing another shot, the invading army began its retreat Dumouriez's pursuit was not seriously pressed, he occupied himself chiefly with a series of subtle and curious negotiations which, with the general advance of the French troops, brought about the complete withdrawal of the enemy from the soil of France.

Meanwhile, the French forces in the south had driven back the Piedmontese and had conquered Savoy and Nice. Another French success was the daring expedition into Germany made by Custine from Alsace Custine captured Mainz itself on Oct 21 and penetrated as far as Frankfurt In the north the Austrian siege of Lille had completely failed, and Dumouriez now resumed his interrupted scheme for the invasion of the Netherlands His forward movement, made as it was late in the season, surprised the Austrians, and he disposed of enormously superior forces On Nov 6 he won the first great victory of the war at Jemappes, near Mons, and, this time advancing boldly, he overran the whole country from Namur to Antwerp within a month

Such was the prelude of what was called the "Great War" in England and the "Épopée" in France Before going farther it is necessary to summarize the special features of the French army —in leadership, discipline, tactics, organization and movement— which made these campaigns the archetype of modern warfare

The French Army 1792–1796.—At the outbreak of the Revolution, the French army, like other armies in Europe, was a "voluntary" long-service army, augmented to some extent in war by drafts of militia One of the first problems that the Constituent Assembly took upon itself to solve was the nationalization of this strictly royal and professional force, and as early as October 1789, the word "conscription" was heard in its debates But it was decreed, nevertheless, that free enlistment alone befitted a free people, and the regular army was left unaltered in form However, a national guard came into existence side by side with it, and the history of French army organization in the next few years is the history of the fusion of these two elements The first step, as regards the regular army, was the abolition of proprietary rights, the serial numbering of regiments throughout the army, and the disbandment of the *Maison du roi* The next was the promotion of deserving soldiers to fill the numerous vacancies caused by the emigration Along with these, however, there came to the surface many incompetent leaders, favourites in the political clubs of Paris, etc , and the old strict discipline became impossible owing to the frequent intervention of the civil authorities in matters affecting it, the denunciation of generals, and especially the wild words and wild behaviour of "Volunteer" (embodied national guard) battalions

When war came, it was soon found that the regulars had fallen too low in numbers and that the national guard demanded too high pay, to admit of developing the expected field strength Arms, discipline, training alike were wanting to the new levies, and the repulse of Brunswick was effected by manoeuvring and fighting on the old lines and chiefly with the old army The cry of *"La patrie en danger,"* after giving, at the crisis, the highest moral support to the troops in the front, dwindled away after victory, and the French Government contented itself with the half-measures that had, apparently, sufficed to avert the peril More, when the armies went into winter quarters, the volunteers claimed leave of absence and went home But in the spring of 1793, confronted by a far more serious peril, the Government took strong measures Universal liability was asserted, and passed into law Yet even now whole classes obtained exemption and the right of substitution as usual forced the burden of service on the poorer classes, so that of the 100,000 men called on for the regular army and 200,000 for the volunteers, only 180,000 men were actually raised Desertion, quite usually regarded as the curse of professional armies, became a conspicuous vice of the defenders of the Republic, except at moments when a supreme crisis called forth supreme devotion

Amalgamation and Universal Service.—While this unsatisfactory general levy was being made, defeats, defections and invasion in earnest came in rapid succession, and to deal with the almost desperate emergency, the ruthless Committee of Public Safety sprang into existence. "The levy is to be universal. Unmarried citizens and widowers without children of ages from 18 to 25 are to be called up first," and 450,000 recruits were immediately obtained by this single act. The complete amalgamation of the regular and volunteer units was decided upon. The white uniforms of the line gave place to the blue of the national guard

in all arms and services. The titles of officers were changed, and in fact every relic of the old régime, save the inherited solidity of the old regular battalions, was swept away This rough combination of line and volunteers, therefore—for the "Amalgam" was not officially begun until 1794—must be understood when we refer to the French army of Hondschoote or of Wattignies It contained, by reason of its universality and also because men were better off in the army than out of it—if they stayed at home they went in daily fear of denunciation and the guillotine—the best elements of the French nation To some extent the political *arrivistes* had been weeded out, and though the informer, here as elsewhere, struck unseen blows, the mass of the army gradually evolved its true leaders and obeyed them It was, therefore, an army of individual citizen-soldiers of the best type, welded by the enemy's fire, and conscious of its own solidarity in the midst of the revolutionary chaos. After 1794 the system underwent but little radical change until the end of the Revolutionary period. Its regiments grew in military value month by month and attained their highest level in the great campaign of 1796 In 1795 the French forces (now all styled national guard) consisted of 531,000 men, of whom 323,000 were infantry (100 3-battalion demi-brigades), 97,000 light infantry (30 demi-brigades), 29,000 artillery, 20,000 engineers and 59,000 cavalry This novel army developed novel fighting methods, above all in the infantry. This arm had just received a new drill-book, as the result of a long controversy (*see* INFANTRY) between the advocates of "lines" and "columns," and this drill-book, while retaining the principle of the line, set controversy at rest by admitting battalion columns of attack, and movements at the "quick" (100–120 paces to the minute) instead of at the "slow" march (76) On these two prescriptions, ignoring the rest, the practical troop leaders built up the new tactics little by little, and almost unconsciously

Tactics.—The earlier battles were fought more or less according to the drill-book, partly in line for fire action, partly in column for the bayonet attack But line movements required the most accurate drill, and what was attainable after years of practice with regulars moving at the slow march was wholly impossible for new levies moving at 120 paces to the minute When, therefore, the line marched off, it broke up into a shapeless swarm of individual firers This was the form, if form it can be called, of the tactics of 1793—"horde-tactics" as they have quite justly been called—and a few such experiences as that of Hondschoote sufficed to suggest the need of a remedy This was found in keeping as many troops as possible out of the firing line In other words, the bravest and coolest marksmen were let loose to do what damage they could, and the rest, massed in close order, were kept under the control of their officers and only exposed to the dissolving influence of the fight when the moment arrived to deliver, whether by fire or by shock, the decisive blow

The cavalry underwent little change in its organization and tactics, which remained as in the drill-books founded on Frederick's practice. But except in the case of the hussars, who were chiefly Alsatians, it was thoroughly disorganized by the emigration or execution of the nobles who had officered it, and for long it was incapable of facing the hostile squadrons in the open

In artillery matters, this period, 1792–96, marks an important progress, due above all to Gribeauval (*q v*) and the two du Teils, Jean Pierre (1722–94) and Jean (1733–1820), who were Bonaparte's instructors. The change was chiefly in organization and equipment—the great tactical development of the arm was not to come until the time of the Grande Armée—and may be summarized as the transition from battalion guns and reserve artillery to batteries of "horse and field."

The engineers, like the artillery, were a technical and non-noble corps. They escaped, therefore, most of the troubles of the Revolution—indeed, the artillery and engineer officers, Bonaparte and Carnot amongst them, were conspicuous in the political regeneration of France—and the engineers carried on with little change the traditions of Vauban and Cormontaigne (*see* FORTIFICATION AND SIEGECRAFT). Both these corps were, after the Revolution as before it, the best in Europe, other armies admitting their superiority and following their precepts.

In all this the army naturally outgrew its old "linear" organization Temporary divisions, called for by momentary necessities, placed under selected generals and released from the detailed supervision of the commander-in-chief, soon became, though in an irregular and haphazard fashion, permanent organisms, and by 1796 the divisional system had become practically universal The next step, as the armies became fewer and larger, was the temporary grouping of divisions; this, too, in turn became permanent as the army corps

New System of War.—This subdivision of forces was intimately connected with the general method of making war adopted by the "New French," as their enemies called them. What astonished the Allies most of all was the number and the velocity of the Republicans These improvised armies had, in fact, nothing to delay them Tents were unprocurable for want of money, untransportable for want of the enormous number of wagons that would have been required, and also unnecessary, for the discomfort that would have caused wholesale desertion in professional armies was cheerfully borne by the men of 1793–94 Supplies for armies of then unheard-of size could not be carried in convoys, and the French soon became familiar with "living on the country." Thus 1793 saw the birth of a new system of war—rapidity of movement, full development of national strength, bivouacs and requisitions, and force, as against cautious manoeuvring, small professional armies, tents and full rations, and chicane The first represented the decision-compelling spirit, the second the spirit of risking a little to gain a little Above all the decision-compelling spirit was reinforced by the presence of the emissaries of the Committee of Public Safety, the "representatives on mission" who practically controlled the guillotine There were civil officials with the armies of the Allies too, but their chief function was not to infuse desperate energy into the military operations, but to see that the troops did not maltreat civilians Such were the fundamental principles of the "New French" method of warfare, but it only reached maturity after a painful period of trial and error

CAMPAIGNS IN THE NETHERLANDS

The year 1793 opened disastrously for the Republic As a consequence of Jemappes and Valmy, France had taken the offensive both in Belgium, which had been overrun by Dumouriez's army, and in the Rhine countries But the execution of Louis XVI raised up a host of new and determined enemies England, Holland, Austria, Prussia, Spain and Sardinia promptly formed the First Coalition England poured out money in profusion to pay and equip her Allies' land armies, and herself began the great struggle for the command of the sea (see *Naval Operations*, below)

Neerwinden.—In the Low Countries, while Dumouriez was beginning his proposed invasion of Holland, Prince Josias of Saxe-Coburg, the new Austrian commander on the Lower Rhine, advanced from the region of Cologne and drove in the various detachments that Dumouriez had posted to cover his right The French general thereupon abandoned his advance into Holland, and, with what forces he could gather, turned towards the Meuse. The two armies met at Neerwinden (*q.v.*) on March 18, 1793. Dumouriez had only a few thousand men more than his opponent, instead of the enormous superiority he had had at Jemappes Thus the enveloping attack could not be repeated, and in a battle on equal fronts the old generalship and the old armies had the advantage. Dumouriez was thoroughly defeated, the house of cards collapsed, and the whole of the French forces retreated in confusion to the strong line of border fortresses, created by Louis XIV and Vauban [1] Dumouriez, witnessing the failure of his political schemes, declared against the Republic and, after a vain attempt to induce his own army to follow his example, fled (April 5) into the Austrian lines. The leaderless Republicans streamed back to Valenciennes. There, however, they found a general. Picot (comte de) Dampierre was a regimental officer of the old army, who, in spite of his vanity and extravagance, pos-

[1] For the following operations see map in SPANISH SUCCESSION WAR.

sessed real loyalty to the new order of things, and brilliant personal courage. At the darkest hour he seized the reins without orders and without reference to seniority, and began to reconstruct the force and the spirit of the shattered army by wise administration and dithyrambic proclamations

France was, however, for a time defenceless, and the opportunity existed for the military promenade to Paris that the allied statesmen had imagined in 1792 But Coburg now ceased to be a purely Austrian commander, for one by one allied contingents, with instructions that varied with the political aims of the various governments, began to arrive Soon the idea of restoring order in France became little more than a pretext for a general intrigue amongst the confederate powers, each seeking to aggrandize itself at France's expense Coburg's plan of campaign was limited to the objects acceptable to all the Allies alike He aimed at the conquest of a first-class fortress—Lille or Valenciennes—his reason being largely that he might gain a depot as near as possible to the front to save the customarily exorbitant hire of transport for supplies As for the other governments which Coburg served as best he could, the object of the war was material concessions, and it would be easy to negotiate for the cession of Dunkirk and Valenciennes when the British and Austrian colours already waved there The Allies, therefore, instead of following up their advantage over the French field army and driving forward on the open Paris road, set their faces westward, intending to capture Valenciennes, Le Quesnoy, Dunkirk and Lille one after the other

Dampierre meanwhile grew less confident as responsibility settled upon his shoulders Quite unable to believe that Coburg would bury himself in a maze of rivers and fortresses when he could scatter the French army to the winds by a direct advance, he was disquieted and puzzled by the Austrian investment of Condé And the result of skirmishes around Valenciennes gave him little confidence in the troops But the representatives on mission bade him relieve Condé at all costs On May 1, Coburg's positions west of Quiévrain were attacked The French won some local successes by force of numbers and surprise, but the Allies recovered themselves, and drove the Republicans in disorder to their entrenchments Dampierre's discouragement now became desperation, and, urged on by the representatives (who, be it said, had exposed their own lives freely enough in the action), he attacked Clerfayt, who was covering the siege of Condé, on the 8th at Raismes The troops fought far better in the woods and hamlets west of the Scheldt than they had done in the plains to the east But in the heat of the action Dampierre risked and lost his life in leading a storming party, and his men retired sullenly, though this time in good order, to Valenciennes Another pause followed, Coburg awaiting the British contingent under the duke of York, and the Republicans endeavouring to assimilate the reinforcements of conscripts, who now arrived Mutiny and denunciations augmented the confusion in the French camp Plan of campaign there was none, save a resolution to stay at Valenciennes in the hope of finding an opportunity of relieving Condé and to create diversions elsewhere These came to nothing, and before they had even started, Coburg, resuming the offensive, had stormed the lines of Famars (May 24), whereupon the French army retired to Bouchain, leaving not only Condé, but also Valenciennes to resist as best they could Here, surrounded by streams and marshes, the French generals thought that their troops were secure from the rush of the dreaded Austrian cavalry Coburg refrained from a regular siege of Condé He wished to gain possession of the fortress in a defensible state, intending to use it as his own depot later in the year He therefore reduced it by famine During the siege of Valenciennes the Allies appear to have been supplied from Mons

Many Commanders.—Custine next took charge of the dispirited army, the fourth commander in two months. His first task was to institute a severe discipline, and his prestige was so great that his mere threat of death sentences for offenders produced the desired effect As to operations, he wished for a concentration of all possible forces from other parts of the frontier towards Valenciennes, even if necessary at the cost of sacrificing his own conquest of Mainz. But the generals of the numerous other armies refused to give up their troops, and on June 17 the idea was abandoned in view of the growing seriousness of the Vendéan insurrection (*see* VENDÉE) Custine, therefore, could do no more than continue the work of reorganization. Coburg, who had all this time succeeded in remaining concentrated, now found himself compelled to extend leftwards towards Flanders, for Custine had infused some energy into the scattered groups of the Republicans in the region of Douai, Lille and Dunkirk—and during this respite the Paris Jacobins sent to the guillotine both Custine and his successor La Marlière before July was ended. Both were "ci-devant" nobles and, so far as is ascertainable, neither was guilty of anything worse than attempts to make his orders respected by his soldiers By this time, owing to the innumerable denunciations and arrests, the confusion in the Army of the North was at its height, and no further efforts were made for the relief of Valenciennes and Condé Condé, starved out as Coburg desired, capitulated on June 10, and Valenciennes, which held out bravely until the civil population began to plot treachery, on July 28 Shortly after this the wreck of the field army retired on Arras By this they gave up the direct defence of the Paris road, but placed themselves in a "flank position" relatively to it Thus ended the second episode of the campaign of 1793 Military operations were few and spasmodic, on the one side because the Allied statesmen were less concerned with the nebulous common object of restoring order in France than with their several schemes of aggrandizement, on the other owing to the almost incredible confusion of France under the *régime* of Danton and Marat The third episode shows little or no change in the force and direction of the allied efforts, but a very great change in France. Thoroughly roused by disaster and now dominated by the furious and bloodthirsty energy of the Terrorists, the French people and armies at last set before themselves clear and definite objects to be pursued at all costs

Jean Nicolas Houchard, the next officer appointed to command, had been a heavy cavalry trooper in the Seven Years' War His bravery, his stature, his bold and fierce manner, his want of education, seemed all to betoken the ideal sans-culotte general But he was incapable of leading an army, and knowing this, carefully conformed to the advice of his staff-officers, Berthelmy and Gay-Vernon, the latter of whom, an exceptionally capable officer, had been Custine's chief of staff and was consequently under suspicion At one moment, indeed, operations had to be suspended altogether because his papers were seized by the civil authorities, and amongst them were all the confidential memoranda and maps required for the business of headquarters It was the darkest hour The Vendéans, the people of Lyons, Marseille and Toulon, were in open and hitherto successful revolt Valenciennes had fallen and Coburg's hussar parties pressed forward into the Somme valley Again the Allies had the decision of the war in their own hands Coburg, indeed, thought an advance on Paris hazardous But, hazardous or not, it would have been attempted but for the English The duke of York had definite orders from his government to capture Dunkirk—at present a nest of corsairs which interfered with the Channel trade, and in the future, it was hoped, a second Gibraltar—and the English and Hanoverians marched away to besiege the coast fortress Thereupon the king of Prussia in turn called off his contingent for operations on the middle Rhine Coburg, therefore, was brought to a complete standstill, and the scene of the decision was shifted to the district between Lille and the coast.

Thither came Carnot, the engineer officer who was in charge of military affairs in the Committee of Public Safety and who is known to history as the "Organizer of Victory." He went no further than to recommend an inroad into Flanders on the ground that no enemy would be encountered there This, however, in the event developed into an operation of almost decisive importance, for at the moment of its inception the duke of York was already on the march. Fighting *en route* a severe but successful action at Lincelles, to extricate the Dutch, the Anglo-Hanoverians entered the district—densely intersected with canals and morasses—around Dunkirk and Bergues on August 21 and 22.

On the right, by way of Furnes, the British moved towards Dunkirk and invested the east front of the weak fortress, while on the left the Hanoverian field-marshal von Freytag moved via Poperinghe on Bergues The French detachments were easily dispersed Houchard was in despair at the bad conduct of his troops. But one young general, Jourdan, anticipating Houchard's orders, had already brought a strong force from Lille to Cassel, whence he incessantly harried Freytag's posts Carnot encouraged the garrisons of Dunkirk and Bergues, and caused the sluices to be opened The *morale* of the defenders rose rapidly. Houchard prepared to bring up every available man of the Army of the North, and only waited to make up his mind as to the direction in which his attack should be made The Allies themselves recognized the extreme danger of their position It was cut in half by the Great Morass, stretches of which extended even to Furnes Neither Dunkirk nor Bergues could be completely invested owing to the inundations, and Freytag sent a message to King George III to the effect that if Dunkirk did not surrender in a few days the expedition would be a complete failure

As for the French, they could hardly believe their good fortune Generals, staff officers and representatives on mission alike were eager for a swift and crushing offensive "'Attack' and 'attack in mass' became the shibboleth and the catch-phrase of the camps" (Chuquet), and fortresses and armies on other parts of the frontier were imperiously called upon to supply large drafts for the Army of the North Gay-Vernon's strategical instinct found expression in a wide-ranging movement designed to secure the annihilation of the duke of York's forces Beginning with an attack on the Dutch posts north and east of Lille, the army was then to press forward towards Furnes, the left wing holding Freytag's left wing in check, and the right swinging inwards and across the line of retreat of both allied corps On Aug 28, consequently, the Dutch posts were attacked and driven away by the mobile forces at Lille, aided by parts of the main army from Arras But even before they had fired their last shot the Republicans dispersed to plunder and compromised their success Houchard and Gay-Vernon began to fear that their army would not emerge successfully from the supreme test they were about to impose on it, and from this moment the scheme of destroying the English began to give way to the simpler and safer idea of relieving Dunkirk The place was so ill-equipped that after a few days' siege it was *in extremis*, and the political importance of its preservation led not merely the civilian representatives, but even Carnot, to implore Houchard to end the crisis at once An army of 37,000 men was left to watch Coburg and to secure Arras and Douai, and the rest, 50,000 strong, assembled at Cassel Everything was in Houchard's favour could he but overcome the indiscipline of his own army The duke of York was more dangerous in appearance than in reality and Freytag's covering army extended in a line of disconnected posts from Bergues to Ypres

Hondschoote.—Against the left and centre of this feeble cordon 40,000 men advanced in many columns on Sept 6 A confused outpost fight, in which the various assailing columns dissolved into excited swarms, ended, long after nightfall, in the orderly withdrawal of the various allied posts to Hondschoote The French generals were occupied the whole of next day in sorting out their troops, who had not only completely wasted their strength against mere outposts, but had actually consumed their rations and used up their ammunition On the 8th, the assailants, having more or less recovered themselves, advanced again They found the enemy entrenched on either side of the village of Hondschoote, the right resting on the great morass and the left on the village of Leysele Houchard, now concerned more with the relief of Dunkirk than with the defeat of the enemy, had sent away one division to Dunkirk, another to Bergues, and a third towards Ypres, and left himself only some 20,000 men for the battle The enemy, however, had only 13,000 Houchard despatched a column, guided by his staff officer Berthelmy, to turn the Hanoverians' left, but this column lost its way in the dense country about Loo The centre waited motionless under the fire of the allied guns near Hondschoote. In vain the representative Delbrel implored the general to order the advance. Houchard was obstinate, and ere long the natural result followed Though Delbrel posted himself in front of the line, conspicuous by his white horse and tricoloured sash and plume, to steady the men, the bravest left the ranks and skirmished forward from bush to bush, and the rest sought cover Then the allied commander ordered forward one regiment of Hessians, and these, advancing at a ceremonial slow march, and firing steady rolling volleys, scattered the Republicans before them At this crisis Houchard uttered the fatal word "retreat," but Delbrel overwhelmed him with reproaches and stung him into renewed activity. He hurried away to urge forward the right wing while Jourdan rallied the centre and led it into the fight again Once more Jourdan awaited in vain the order to advance, and once more the troops broke But at last the exasperated Delbrel rose to the occasion "You fear the responsibility," he cried to Jourdan, "well, I assume it My authority overrides the general's and I give you the formal order to attack at once!" Then, gently, as if to soften a rebuke, he continued, "You have forced me to speak as a superior; now I will be your aide-de-camp," and at once hurried off to bring up the reserves and to despatch cavalry to collect the fugitives This incident, amongst many, serves to show that the representatives on mission were no mere savage marplots, as is too generally assumed They were often wise and able men, brave and fearless of responsibility in camp and in action Jourdan fell wounded, but Delbrel headed a wild irregular bayonet charge which checked the Hanoverians, and Houchard himself, in his true place as a cavalry leader, came up with 500 fresh sabres and flung himself on the Allies The disciplined Hanoverians soon re-formed after the shock, but by this time the fugitives collected by Delbrel's troopers, reanimated by new hopes of victory, were returning to the front in hundreds, and a last assault on Hondschoote met with complete success

Hondschoote was a psychological victory Materially, it was no more than the crushing of an obstinate rearguard at enormous expense to the assailants, for the duke of York was able to withdraw while there was still time But it established the fact that the "New French" were determined to win, at any cost and by sheer weight and energy It was long before they were able to meet equal numbers with confidence, and still longer before they could freely oppose a small corps to a larger one But the nightmare of defeats and surrenders was dispelled Having missed the opportunity of crushing the English, Houchard turned his attention to the Dutch posts about Menin, which he overwhelmed (Sept 12–13) After this engagement, won by immensely superior forces, Houchard pushed still further inland, but missed his target—the Austrian general, Beaulieu—while his own detachments suffered a series of pin-prick defeats Houchard's offensive died away completely, and he halted at Gaverelle, half-way between Douai and Arras, a prey to conflicting rumours from which emerged the conclusion that Coburg was about to join the duke of York in a second siege of Dunkirk In consequence he began to close on his left But his conclusion was entirely wrong The Allies were closing on *their* left inland to attack Maubeuge

Houchard was now denounced and brought captive to Paris. Placed upon his trial, he offered a calm and reasoned defence of his conduct, but when the intolerable word "coward" was hurled at him by one of his judges he wept with rage, pointing to the scars of his many wounds, and then, his spirit broken, sank into a lethargic indifference, in which he remained to the end He was guillotined on Nov 16, 1793. After Houchard's arrest Jourdan accepted the command, though with many misgivings The new levies, instead of filling up the depleted ranks of the line, were assembled in indisciplined and half-armed hordes at various frontier camps, under elected officers who had for the most part never undergone the least training But an enthusiasm equal to that of Hondschoote, and similarly demanding a plain, urgent and recognizable objective, animated it, and although Jourdan and Carnot (who was with him) began to study the general strategic situation, the Committee brought them back to realities by ordering them to relieve Maubeuge at all costs

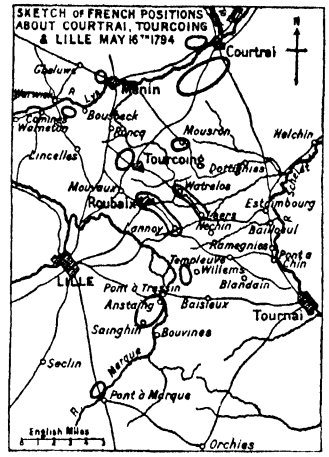
Wattignies.—The Allies disposed in all of 66,000 men around the threatened fortress, but 26,000 of these were actually em-

ployed in the siege, and the remainder, forming the covering army, extended in an enormous semicircle of posts facing west, south and east. Thus the Republicans, as before, had two men to one at the point of contact (44,000 against 20,000) on Oct. 15, and though the Allies' right and centre held their ground, on their left the plateau of Wattignies (*q v*) was stormed on the second day, Carnot, Jourdan and the representatives leading the columns in person Coburg, indeed, fell back in unbroken order, added to which the Maubeuge garrison had failed to co-operate with their rescuers by a sortie, and the duke of York had hurried up with all the men he could spare from the Flanders cordon But the Dutch generals refused to advance beyond the Sambre, and Coburg broke up the siege of Maubeuge and retired whence he had come, while Jourdan, so far from pressing forward, was anxiously awaiting a counter-attack, and entrenching himself with all possible energy The episode gives a perfect picture of the character, at once intense and spasmodic, of the "New French" warfare in the days of the Terror

To complete the story of '93, it remains to sketch, very briefly, the principal events on the eastern and southern frontiers of France It was not merely on the Sambre and the Scheldt, nor against one army of heterogeneous allies that the Republic had to fight for life, but against Prussians and Hessians on the Rhine, Sardinians in the Alps, Spaniards in the Pyrenees, and also (one might say, indeed, above all) against Frenchmen in Vendée, Lyons, Marseilles and Toulon On the Rhine the advance of a Prussian-Hessian army, 63,000 strong, rapidly drove back Custine from the Main into the valleys of the Saar and the Lauter An Austrian corps under Wurmser soon afterwards invaded Alsace Here, as on the northern frontier, there was a long period of trial and error, of denunciations and indiscipline, and of wholly trivial fighting, before the Republicans recovered themselves But in the end the ragged enthusiasts found their true leader in Hoche, and, though defeated by Brunswick at Pirmasens and Kaiserslautern, they managed to develop almost their full strength against Wurmser in Alsace On Dec 26 the latter was driven by main force from the lines of Weissenburg, after which Hoche advanced into the Palatinate and delivered Landau, and Pichegru moved on to recapture Mainz, which had surrendered in July On the Spanish frontier both sides indulged in a fruitless war of posts in broken ground The Italian campaign of 1793, equally unprofitable, will be referred to below Far more serious than either was the insurrection of Vendée (*q v*) and the counter-revolution in the south of France, the principal incidents of which were the terrible sieges of Lyons and Toulon

Campaign of 1794.—For 1794 Carnot planned a general advance of all the northern armies, that of the North (Pichegru) from Dunkirk-Cassel on Brussels, the minor Army of the Ardennes to Charleroi, and the Army of the Moselle (Jourdan) to Liége He counted upon little as regards the two armies near the Meuse, but hoped to force on a decisive battle by the advance of the left wing towards Ypres Coburg, on the other side, intended, if not forced to develop his strength on the Ypres side, to make his main effort against the French centre about Landrecies This produced the siege of Landrecies, which need not concern us, a forward movement of the French to Menin and Courtrai which resulted in the battles of Tourcoing and Tournai, and the campaign of Fleurus, which, almost fortuitously, produced the long-sought decision The first crisis was brought about by the advance of the left wing of the Army of the North to Menin-Courtrai, where it found itself between two hostile masses, the main body of the allied right wing about Tournai and a secondary corps at Thielt Common-sense, therefore, dictated a converging attack for the Allies and a series of rapid radial blows for the French. In the allied camp common-sense had first to prevail over routine, and the emperor's first orders were for a raid of the Thielt corps towards Ypres, which his advisers hoped would of itself cause the French to decamp But the duke of York formed a very different plan, and Clerfayt, in command at Thielt, agreed to co-operate Their proposal was to surround the French on the Lys with their two corps, and by May 15 the emperor had decided to use larger forces in order to accomplish the same object

On that day Coburg himself entered Tournai and took up the general command Orders were promptly issued for a general offensive. Clerfayt's corps was to force its way, on the 16th, across the Lys at Werwick and connect with the main army. The main army was to advance in four columns The first three, under the duke of York, were to move off, at daylight on the 17th, to the line Mouscron-Tourcoing-Mouvaux The fourth and fifth under Kinsky and the archduke Charles, were to defeat the French corps on the upper Marque, and then, leaving Lille on their left, to march rapidly forward towards Werwick, thus completing the investing circle around Souham's and Moreau's isolated divisions Picked volunteers to clear away the enemy's skirmishers were to precede the heads of the columns Then came at the head of the main body the artillery with an infantry escort. All this might have been designed by the Japanese for the attack of some well-defined Russian position in the war of 1904 But in 1904 the Russians stood still, which was the last thing that the Revolutionary armies of 1794 would or could do Souham, who commanded in the temporary absence of Pichegru, had formed his own plan Finding himself with the major part of his forces between York and Clerfayt, he had decided to impose upon the former by means of a covering detachment, and to fall upon Clerfayt near Rousselaer with the bulk of his forces But the appearance of fresh allied troops (Kinsky) on his right at once modified these arrangements Divining Coburg's intentions from the arrival of the enemy near Pont-à-Marque and at Lannoy, he attempted a fresh concentration against the left flank of the columns on the move towards Tourcoing, which his weak centre (12,000 men at Tourcoing, Mouscron, Roubaix) was to stop by frontal defence No rôle was as yet assigned to the principal mass (50,000 under Moreau) about Courtrai



This second plan failed like the first, because the enemy's counter-will was not controlled—as Napoleon usually sought to ensure All along the line Coburg's advance compelled the French to fight as they were without any redistribution But the French were sufficiently elastic to adapt themselves readily to unforseen conditions, and at the end of the first day's operations, the "annihilation plan" of the Allies had already undergone a serious check The archduke did not arrive at Orchies till dawn on the 17th, and had to halt there for rest and food Thence, moving across country in fighting formation, he made his way no farther than Pont-à-Marque Kinsky, after forcing the passage of the Marque at Bouvines, had made little headway in face of a French covering detachment. On the other flank, the right column (Hanoverians) under von dem Bussche, had been driven back from Mouscron. Only the duke of York and Otto had done their share in the centre, and they now stood at Mouvaux and Tourcoing respectively, isolated in the midst of the enemy's main body, with no hope of support from the other columns and no more than a chance of meeting Clerfayt, who had met an unexpected all-day check at Werwick Coburg's entire force was, without deducting losses, no more than 53,000 for a front of 18m , and only half of the enemy's available 80,000 men had as yet been engaged Matters did not, of course, present themselves in this light at Souham's headquarters, where the generals met in an informal council. The outposts, reinforced though they were from the main group, had everywhere been driven in, and the subordinate leaders sent in the most despondent reports. "Councils of war never fight" is an old maxim, justified in 99 cases in 100. But this council determined to do so, and with all possible vigour. The scheme was practically that which Coburg's first threat had produced and his first brusque advance had inhibited. Vandamme was to hold

Clerfayt, the garrison of Lille and a few outlying corps to occupy the archduke and Kinsky, and in the centre, Moreau and Bonnaud, with 40,000 effectives, were to attack the Tourcoing-Mouvaux position in front and flank at dawn with all possible energy

Battle of Tourcoing.—The first shots were fired on the Lys, where Clerfayt's infantry had effected its crossing in the night. Vandamme's troops were, by the chance of a fatigue-enforced halt near Menin, massed on the flank of Clerfayt's subsequent line of advance Vandamme used his advantage well He attacked Clerfayt's columns as they moved on Lincelles with perhaps 12,000 men against 21,000 Clerfayt stopped at once, turned upon him and drove him towards Roncq and Menin Still, fighting, rallying and fighting again, Vandamme's regiments managed to spin out time and to commit Clerfayt deeper and deeper to a false direction till it was too late in the day to influence the battle elsewhere Von dem Bussche's column at Dottignies, still shaken from the day before, did nothing, and actually retreated to the Scheldt On the other flank, Kinsky and the archduke Charles practically remained inactive. There remained the two centre columns, Otto's and the duke of York's The orders of the emperor to the duke were that he should advance to establish communication with Clerfayt at Lincelles as a preliminary to a general advance to crush the French Courtrai group, thereby isolated These airy schemes were destroyed at dawn on the 18th One of Moreau's brigades carried Tourcoing at the first rush, another brigade swarmed round the duke of York's entrenchments at Mouvaux, while Bonnaud's mass from the side of Lille lapped round the flanks of the British posts at Roubaix and Lannoy The duke had used up his reserves in assisting Otto, and by 8 A M the positions of Roubaix, Lannoy and Mouvaux were isolated from each other But the Allies fought magnificently, and by now the Republicans were in confusion, excited to the highest pitch and therefore extremely sensitive to waves of enthusiasm or panic Otto was able to retire gradually, though with heavy losses, to Leers, before he could be cut off, and thither the English fell back, not without confusion, to join him

With the retreat of the two sorely tried columns and the suspension of Clerfayt's attack, the battle of Tourcoing ended It was a victory of which the young French generals had reason to be proud The main attack was vigorously conducted, and the two-to-one numerical superiority which the French possessed at the decisive point is the best testimony at once to Souham's generalship and to Vandamme's bravery As for the Allies, those of them who took part in the battle at all, covered themselves with glory, but the inaction of two-thirds of Coburg's army was the bankruptcy declaration of the old strategical system But Souham's victory, owing to his geographical position, had merely given him air The Allies, except for the loss of some 5,500 men, were in no way worse off The plan had failed, but the army as a whole had not been defeated, while the troops of the duke of York and Otto were far too well disciplined not to take their defeat as "all in the day's work" Souham was still on the Lys and midway between the two allied masses, able to strike each in turn or liable to be crushed between them in proportion as the opposing generals calculated time, space and endurance accurately Souham, therefore, as early as the 19th, had left Bonnaud to hold the main body of the Allies on the side of Tournai, while he concentrated most of his forces towards Courtrai This move had the desired effect, for Clerfayt retired without a contest, and on May 21 Souham issued his orders for an advance on Coburg's army, which, as he knew, had meantime been reinforced Vandamme alone was left to face Clerfayt, and this time with outposts far out so as to ensure his chief, not a few hours', but two or three days', freedom from interference.

Pichegru now returned and took up the supreme command, Souham remaining in charge of his own and Moreau's divisions. On the extreme right, from Pont-à-Tressin, only demonstrations were to be made, the centre, between Baisieux and Estaimbourg, was to be the scene of the holding attack of Bonnaud's command, while Souham, in greater strength, delivered the decisive attack on the allied right by St. Leger and Warcoing. The battle opened in the early morning of the 22nd and was long and desperately contested The demonstration on the French extreme right was soon recognized by the defenders to be negligible, and the allied left wing thereupon closed on the centre There Bonnaud attacked with vigour, dislodging the Allies from Nechin The defenders of Templeuve then fell back, and the attacking swarms—a dissolved line of battle—fringed the brook beyond Templeuve, on the other side of which was the Allies' main position, and even for a moment seized Blandain Meanwhile the French at Nechin pressed on towards Ramegnies in concert with the main attack Macdonald's and other brigades had forced the Espierre rivulet and driven von dem Bussche partly over the Scheldt, partly southward The main front of the Allies was defined by the brook that flows between Templeuve and Blandain and empties into the Scheldt near Pont-à-Chin Here, till close on nightfall, a fierce battle raged Pichegru's main attack was still by his left, and Pont-à-Chin was taken and retaken by French, Austrians, British and Hanoverians in turn Between Blandain and Pont-à-Chin Bonnaud's troops more than once entered the line of defence But the attack was definitively broken off at nightfall and the Republicans withdrew slowly towards Lannoy and Leers They had for the first time in a fiercely contested "soldier's battle" measured their strength, regiment for regiment, against the Allies, and failed, but by so narrow a margin that henceforward the Army of the North realized its own strength and solidity

The Moselle Army.—But the actual strategic decision was destined by a process of evolution to be given by Jourdan's Army of the Moselle, to which we turn. The Army of the Moselle had been ordered to assemble a striking force on its left wing, while maintaining its cordon in Lorraine, and with this striking force to operate towards Liége and Namur Its first movement on Arlon, in April, was repulsed, but early in May the advance was resumed though the troops were ill-equipped and ill-fed, and requisitions had reduced the civil population to semi-starvation and sullen hostility At this moment the general situation east of the Scheldt was as follows The Allies' centre under Coburg had captured Landrecies and now (May 4) lay around that place, about 65,000 strong, while the left under Kaunitz (27,000) was somewhat north of Maubeuge Beyond these again were the detachment of Beaulieu (8,000) near Arlon, and another, 9,000 strong, around Trier On the side of the French, the Army of the Moselle (41,000 effectives) was in cordon between Saargemund and Longwy, the Army of the Ardennes (22,000) between Beaumont and Givet; of the Army of the North, the right wing (38,000) in the area Beaumont-Maubeuge and the centre (24,000) about Guise In the aggregate the Allied field armies numbered 139,000 men, those of the French 203,000 Tactically the disproportion was sufficient to give the latter the victory, if, strategically, it could be made effective at a given time and place. But the French missed their opportunity, as Coburg had missed his in 1793 Pichegru's right was ordered to march on Mons, and his left to master the navigation of the Scheldt so as to reduce the Allies to wagon-drawn supplies, while Jourdan's task was to conquer the Liége or Namur country without unduly stripping the cordon on the Saar and the Moselle Jourdan's orders and original purpose were to march through the Ardennes as rapidly as possible, living on what supplies he could pick up from the enemy or the inhabitants

The movement began on May 21 from Longwy through Arlon towards Neufchâteau Irregular fighting, sometimes with the Austrians, sometimes with the bitterly hostile inhabitants, marked its progress On the 28th the French, after a vain détour made in the hope of forcing Beaulieu to fight, reached Ciney, and there heard that the enemy had fallen back to a strongly entrenched position on the east bank of the Meuse near Namur Jourdan was preparing to attack them there, when considerations of quite another kind intervened to change his direction, and thereby to produce the drama of Charleroi and Fleurus—which military historians have asserted to be the foreseen result of the initial plan At the same moment (29th) Jourdan received new orders from Paris—(*a*) to take Dinant and Charleroi and to clear the country between the Meuse and the Sambre, and (*b*) to attack Namur

either by assault or by regular siege From these orders and from the action of the enemy the campaign at last took a definite shape.

Charleroi.—When the Army of the Moselle passed over to the left bank of the Meuse, it was greeted by the distant roar of guns towards Charleroi and by news that the Army of the Ardennes, which had already twice been defeated by Kaunitz, was for the third time deeply and unsuccessfully engaged beyond the Sambre The resumption of the march again complicated the supply question—for the system of "living on the country" had broken down in the Ardennes, and Jourdan had been dependent on intermittent convoys—and it was only slowly that the army advanced towards Charleroi But at last, on June 3, the concentration of parts of three armies on the Sambre was effected Jourdan took command of the united force (Army of the Sambre and Meuse) with a strong hand, the 40,000 newcomers inspired fresh courage in the beaten Ardennes troops, and in the sudden dominating enthusiasm of the moment pillaging and straggling almost ceased Troops that had secured bread shared it with less fortunate comrades, and even the Liégois peasantry made free gifts of supplies Meanwhile, Tourcoing and Tournai had at last convinced Coburg that Pichegru was his most threatening opponent, and he had therefore, though with many misgivings, decided to move towards his right, leaving the prince of Orange with not more than 45,000 men on the side of Maubeuge-Charleroi-Namur Jourdan crossed the Sambre on June 12, practically unopposed Charleroi was rapidly invested and the covering army extended in a semicircular position Although forced to recross the Sambre on June 16, it was back again two days later, and this time the prince of Orange gave up the effort to interfere with his irrepressible antagonists

Charleroi, garrisoned by less than 3,000 men, was intimidated into surrender (25th), thus the object of the first operations was achieved As to the next, neither Jourdan nor the representatives seem to have had anything further in view than the capture of more fortresses But within 24 hours events had decided for them Coburg had quickly abandoned his intention of closing on his right wing, and (after the usual difficulties with his Allies on that side) had withdrawn 12,000 Austrians from the centre of his cordon opposite Pichegru, and made forced marches to join the prince of Orange On June 24 he had collected 52,000 men at various points round Charleroi, and on the 25th he set out to relieve the fortress, of whose surrender he did not know until in the midst of the battle next day

Fleurus.—On the 26th Jourdan's army (now some 73,000 strong) was still posted in a semicircle of entrenched posts, 20m in extent, round the captured town, but Coburg was still more widely extended Inferior in numbers as he was, he proposed to attack on an equal front, and thus gave himself, for the attack of an entrenched position, an order of battle of three men to every two yards of front, all reserves included The Allies were to attack in five columns, the prince of Orange from the west and north-west towards Trazegnies and Monceau wood, Quasdanovich from the north on Gosselies, Kaunitz from the north-east, the archduke Charles from the east through Fleurus, and finally Beaulieu towards Lambusart The scheme was worked out in such minute detail and with so entire a disregard of the chance of unforeseen incidents, that once he had given the executive command to move, the Austrian general could do no more If every detail worked out as planned, victory would be his; if accidents happened, he could do nothing to redress them, and unless these righted themselves (which was improbable in the case of the stiffly organized old armies) he could only send round the order to break off the action and retreat In these circumstances the battle of Fleurus is the sum rather than the product of the various fights that took place between each allied column and the French division that it met The prince of Orange attacked at earliest dawn and gradually drove in the French left wing to Courcelles, Roux and Marchiennes, but somewhat after noon, the French, under the direction for the most part of Kléber, began a series of counterstrokes which recovered the lost ground, and about five, without waiting for Coburg's instructions, the prince retired north-westward off the battlefield The Quasdanovich column and part of Kaunitz's force pressed the French centre division back on Gosselies, but the brook west of Mellet was a serious obstacle to the rigid order of the Allies and had to be bridged before their guns could be got over Kaunitz's column and Championnet's division met on the battlefield of 1690 The French were gradually driven in from the outlying villages to their main position between Heppignies and Wangenies Here they were so hard pressed as to need the intervention of Jourdan's slender reserves, and the attackers only gave way to this counterstroke at the moment they received Coburg's orders for a general retreat

On the allied left wing the fighting was closer and more severe than at any point Beaulieu on the extreme left advanced upon Velaine and the woods to the south in several small groups of all arms Here were the divisions of the Army of the Ardennes, markedly inferior in discipline and endurance to the rest, and only too mindful of their four previous reverses For six hours, more or less, they resisted the oncoming Allies, but then, in spite of the example and the despairing appeals of their young general Marceau, they broke and fled, leaving Beaulieu free to combine with the archduke Charles, who carried Fleurus after obstinate fighting, and then pressed on towards Campinaire Beaulieu took command of all the allied forces on this side about noon, and from then to 5 P M launched a series of terrible attacks on the French about Campinaire and Lambusart The Austrians came on time after time over ground that was practically destitute of cover Villages, farms and fields of corn caught fire The French grew more and more excited—"No retreat to-day!" they called out to their leaders, and finally, clamouring to be led against the enemy, they had their wish Lefebvre seized the psychological moment when the fourth attack of the Allies had failed, and (though he did not know it) the order to retreat had come from Coburg The losses of the unit that delivered it were small, for the charge exactly responded to the moral conditions of the moment, but the proportion of killed to wounded (55 to 81) is good evidence of the intensity of the momentary conflict So ended the battle Coburg had by now learned definitely that Charleroi had surrendered, and while the issue of the battle was still doubtful—for though the prince of Orange was beaten, Beaulieu was in the full tide of success—he gave (towards 3 P M) the order for a general retreat This was delivered to the various commanders between four and five, and these, having their men in hand even in the heat of the engagement, were able to break off the battle without undue confusion The French were far too exhausted to pursue them (they had lost twice as many men as the Allies), and their leader had practically no formed body at hand to follow up the victory, thanks to the extraordinary dissemination of the army

Tourcoing, Tournai and Fleurus represent the maximum result achievable under the earlier Revolutionary system of making war and show the men and their leaders at the highest point of combined steadiness and enthusiasm they ever reached—that is, as a "Sans-culotte" army. Fleurus was also the last great victory of the French, in point of time, prior to the advent of Bonaparte, and may therefore be considered as illustrating the general conditions of warfare at one of the most important points in its development The sequel of these battles can be told in a few words The Austrian government had, it is said, long ago decided to evacuate the Netherlands, and Coburg retired over the Meuse, practically unpursued, while the duke of York's forces fell back in good order, though pursued by Pichegru through Flanders The English contingent embarked for home, the rest retired through Holland into Hanoverian territory, leaving the Dutch troops to surrender to the victors The last phase of the pursuit reflected glory on Pichegru, for it was conducted in midwinter through a country bare of supplies and densely intersected with dykes and meres. The crowning incident was the dramatic capture of the Dutch fleet, frozen in at the Texel, by a handful of hussars who rode over the ice and browbeat the crews of the well-armed battleships into surrender. It was many years before a prince of Orange ruled again in the United provinces, while the Austrian whitecoats never again mounted guard in Brussels.

The Rhine campaign of 1794, waged chiefly by the Prussians, was not of great importance Mollendorf won a victory at Kaiserslautern on May 23, but operations thereafter became spasmodic, and were soon complicated by Coburg's retreat over the Meuse With this event the offensive of the Allies against the French Revolution came to an inglorious end Poland now occupied the thoughts of European statesmen, and Austria began to draw her forces on to the east England stopped the payment of subsidies and Prussia made the Peace of Basle on April 5, 1795 On the Spanish frontier the French were successful in almost every encounter, and Spain, too, made peace. Only the eternal enemies, France and Austria, were left face to face on the Rhine, and elsewhere of all the Allies, Sardinia alone (*see* below under ITALIAN CAMPAIGNS) continued the struggle in a half-hearted fashion The operations of 1795 on the Rhine present no feature of the revolutionary wars that other and more interesting campaigns fail to show Austria had two armies on foot under the general command of Clerfayt, one on the upper Rhine, the other south of the Main, while Mainz was held by an army of imperial contingents The French, Jourdan on the lower, Pichegru on the upper, Rhine, had as usual superior numbers at their disposal Jourdan combined a demonstrative frontal attack on Neuwied with an advance in force via Dusseldorf, reunited his wings beyond the river near Neuwied, and drove back the Austrians in a series of small engagements to the Main, while Pichegru passed at Mannheim and advanced towards the Neckar But ere long both were beaten, Jourdan at Hochst and Pichegru at Mannheim, and the investment of Mainz had to be abandoned. This was followed by the invasion of the Palatinate by Clerfayt and the retreat of Jourdan to the Moselle The position was further compromised by secret negotiations between Pichegru and the enemy for the restoration of the Bourbons The meditated treason came to light early in the following year, and the guilty commander disappeared into the obscure ranks of the royalist secret agents till finally brought to justice in 1804

THE CAMPAIGN OF 1796 IN GERMANY

The wonder of Europe now transferred itself from the drama of the French Revolution to the equally absorbing drama of a great war on the Rhine France's policy was no longer defensive She aimed at invading and "revolutionizing" the monarchies and principalities of old Europe, and to this end the campaign of 1796 was to be the great and conclusive effort The "liberation of the oppressed" had its part in the decision, and the glory of freeing the serf easily merged itself in the glory of defeating the serf's masters But a still more pressing motive for carrying the war into the enemy's country was the fact that France and the lands she had overrun could no longer subsist her armies The Directory frankly told its generals, when they complained that their men were starving and ragged, that they would find plenty of subsistence beyond the Rhine On her part, Austria, no longer fettered by allied contingents nor by the expenses of a far distant campaign, could put forth more strength than on former campaigns, and as war came nearer home and the citizen saw himself threatened by "revolutionizing" and devastating armies, he ceased to hamper or to swindle the troops Thus the duel took place on the grandest scale then known in the history of European armies Apart from the secondary theatre of Italy, the area embraced in the struggle was a vast triangle extending from Düsseldorf to Basle and thence to Ratisbon, and Carnot sketched the outlines in accordance with the scale of the picture He imagined nothing less than the union of the armies of the Rhine and the Riviera before the walls of Vienna

Jourdan and Moreau.—The scheme took shape only gradually. The first advance was made partly in search of food, partly to disengage the Palatinate, which Clerfayt had conquered in 1795. "If you have reason to believe that you would find some supplies on the Lahn, hasten thither with the greater part of your forces," wrote the Directory to Jourdan (Army of the Sambre-and-Meuse, 76,000) on March 29. He was to move at once, before the Austrians could concentrate, pass the Rhine at Düsseldorf and do his utmost to break them up completely A fortnight later Moreau (Army of the Rhine-and-Moselle, 78,000) was ordered to take advantage of Jourdan's move, which would draw off the Austrian forces, to enter the Breisgau and Suabia "You will attack Austria at home, and capture her magazines. You will enter a new country, the resources of which, properly handled, should suffice for the needs of the Army of the Rhine-and-Moselle" Jourdan, therefore, was to take upon himself the destruction of the enemy, Moreau the invasion of south Germany Jourdan crossed at Dusseldorf and reached the Lahn, but the Austrians, now commanded by the archduke Charles, concentrated against him very swiftly and he had to retire over the river Still he enabled Moreau to cross at Strasbourg without much difficulty On hearing of Moreau's progress, the archduke returned to the Neckar country with 20,000 men, leaving Wartensleben with 36,000 to observe Jourdan In later years he admitted himself that his own force, weakened by the usual numerous detachments, was far too small to deal with Moreau, who, he probably thought, would retire after a few manoeuvres

The Archduke's Plan.—But Carnot had indicated a decisive battle as the object Jourdan was instructed, if the archduke turned on Moreau, to follow him up and bring him to action Moreau, too, was not retreating but advancing The two armies, Moreau's and the archduke's, met in a straggling and indecisive battle at Malsch on July 9, and soon afterwards Charles learned that Jourdan had recrossed the Rhine and was driving Wartensleben before him He thereupon retired both armies from the Rhine valley into the interior, hoping that at least the French would detach large forces to besiege the river fortresses Disappointed of this, he determined, in his own words. "to retire both armies step by step without committing himself to a battle, and to seize the first opportunity to unite them so as to throw himself with superior or at least equal strength on one of the two hostile enemies." This is the ever-recurring idea of "interior lines" It was not new, for C Claudius Nero in the Metaurus campaign (207 B C) had given the earliest example, and Frederick the Great had used similar means in similar circumstances, as had Souham at Tourcoing and even Dampierre at Valenciennes. Nor was it differentiated, as were Bonaparte's operations in this same year, by the deliberate use of a small containing force at one point to obtain relative superiority at another The point to be observed is not the expedient, which was dictated by the circumstances, but the courage of the young general, who, unlike Wartensleben and the rest of his generals, unlike, too, Moreau and Jourdan themselves, surmounted difficulties instead of lamenting them On the other side, Carnot, of course, foresaw this possibility He warned the generals not to allow the enemy to "use his forces sometimes against one, sometimes against the other, as he did in the last campaign," and ordered them to go forward respectively into Franconia and into the country of the upper Neckar, with a view to seeking out and defeating the enemy's army But the plan of operations soon grew bolder Jourdan was informed on July 21 that he was not to hesitate to advance to Ratisbon and even to Passau if the disorganization of the enemy admitted it, but in these contingencies he was to detach a force into Bohemia to levy contributions. "We presume that the enemy is too weak to offer a successful resistance and will have united his forces on the Danube, we hope that our two armies will act in unison to rout him completely Each is, in any case, strong enough to attack by itself, and nothing is so pernicious as slowness in war" Evidently the fear that the two Austrian armies would unite against one of their assailants had now given place to something like disdain.

This was due in all probability to the rapidity with which Moreau was driving the archduke before him Wartensleben was similarly falling back before Jourdan. Hitherto an independent leader, he resented the loss of his freedom of action, and beside lamentations opposed a dull passive resistance to all but the most formal orders of the prince. Many weeks passed before this was overcome sufficiently for his leader even to arrange for the contemplated combination, and in these weeks the archduke was being driven back day by day, and the German principalities were falling away one by one as the French advanced and preached the

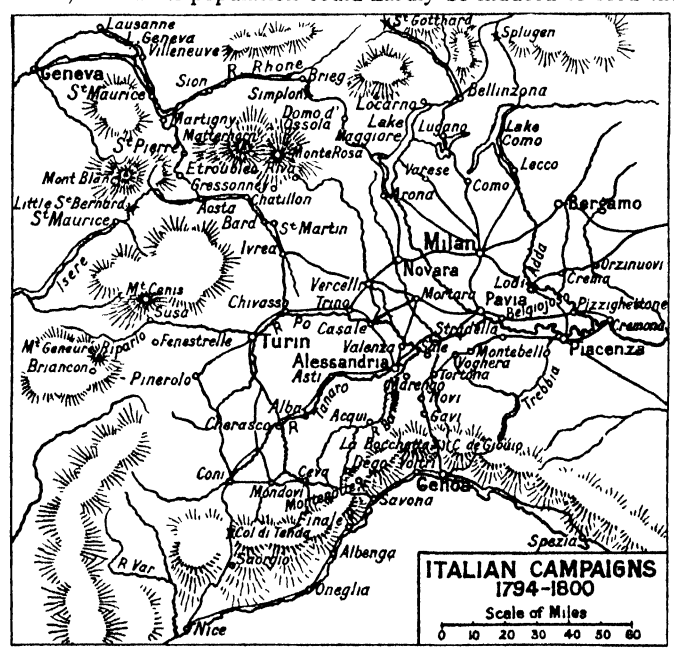
evolutionary formula. But their operating armies had seriously liminished in numbers, Jourdan disposing of not more than 5,000 and Moreau of about 50,000 The archduke had now, owng to the arrival of a few detachments from the Black Forest nd elsewhere, about 34,000 men, Wartensleben almost exactly he same, and the former suddenly turned and fought a long, evere and straggling battle above Neresheim (Aug 11) This lid not, however, give him much respite, and on the 12th he began o retire over the Danube At this date Wartensleben was about Amberg, almost as far away from the other army as he had been n the Rhine, owing to the necessity of retreating round instead f through the neutral principality of Bayreuth (Prussian) Hitherto Charles had intended to unite his armies on the Danube gainst Moreau His later choice of Jourdan's army as the obective of his combination grew out of circumstances and in articular out of the brilliant reconnaissance work of one of Vartensleben's cavalry brigadiers, Nauendorff This general's eports induced the archduke, on the 12th, to begin a concentraion of his own army towards Ingolstadt; the 13th showed that he main columns of the French were swinging away to the east gainst Wartensleben's front and inner flanks, and on the 14th e boldly suggested the idea that decided the campaign, "If your oyal Highness will or can advance 12,000 men against Jourdan's ear, he is lost" When this message arrived at headquarters the rchduke had already issued orders to the same effect Latour, ith 30,000 men, was to keep Moreau occupied—another exedient of the moment, due to the very close pressure of Moreau's dvance, and the failure of the attempt to put him out of action t Neresheim The small remainder of the army, with a few deachments gathered *en route*, in all about 27,000 men, began to ecross the Danube on the 14th, and slowly advanced north on broad front, its leader being now sure that at some point on is line he would encounter the French, whether they were heading or Ratisbon or Amberg Meanwhile, the Directory, still acting n the theory of the archduke's weakness, had ordered Moreau to ombine the operations with those of Bonaparte in Italian Tirol, nd Jourdan to turn both flanks of his immediate opponent, and ius to prevent his joining the archduke, as well as his retreat ito Bohemia And, curiously enough, it was this latter, and not Moreau's move, which suggested to the archduke that his chance ad come The chance was, in fact, one dear to the 18th century eneral, catching his opponent in the act of executing a maoeuvre

Amberg and Würzburg.—The decisive events of the campaign can be described very briefly, the ideas that directed them aving been made clear The long thin line of the archduke rapped itself around Jourdan's right flank near Amberg, while Vartensleben fought him in front The battle (Aug 24) was a eries of engagements between the various columns that met, it as a repetition in fact of Fleurus, without the intensity of ghting spirit that redeems that battle from dullness Success ollowed, not upon bravery or even tactics, but upon the prexisting strategical conditions At the end of the day the French etired, and the next morning the archduke began another wide xtension to his left, hoping to head them off This consumed everal days In the course of it Jourdan attempted to take adantage of his opponent's dissemination to regain the direct road Wurzburg, but the attempt was defeated by an almost forditous combination of forces at the threatened point. More ffective, indeed, than this indirect pursuit was the very active ostility of the peasantry, who had suffered in Jourdan's advance nd retaliated so effectually during his retreat that the army beame thoroughly demoralized, both by want of food and by the rain of incessant sniping Defeated again at Würzburg (*q v*) on ept 3, Jourdan confined his retreat to the Lahn, and finally ithdrew the shattered army over the Rhine In the last engageent on the Lahn the young and brilliant Marceau was mortally ounded. Far away in Bavaria, Moreau had meantime been riving Latour from one line of resistance to another On reeiving the news of Jourdan's reverses, however, he made a rapid nd successful retreat to Strasbourg, evading the prince's army, hich had ascended the Rhine valley to head him off, in the nick of time.

This celebrated campaign raised the reputation of the archduke Charles to the highest point, and deservedly, for he wrested victory from the most desperate circumstances by the skilful and resolute employment of his one advantage But this was only possible because Moreau and Jourdan were content to accept strategical failure without seeking to redress the balance by hard fighting The great question of this campaign is, why did Moreau and Jourdan fail against inferior numbers, when in Italy Bonaparte with a similar army against a similar opponent won victory after victory against equal and superior forces? So far as it is possible to summarize the answer in one phrase, it lies in the fact that though the Directory meant this campaign to be the final word in the Revolutionary War, for the nation at large this final word had been said at Fleurus In default of a cause, however, soldiers will fight for a man, and this brings us by a natural sequence of ideas to the war in Italy.

THE WAR IN ITALY 1793–97

Hitherto we have ignored the operations on the Italian frontier, partly because they were of minor importance and partly because the conditions out of which Bonaparte's first campaign arose can be best considered in connection with that campaign itself It has been mentioned that in 1792 the French overran Savoy and Nice In 1793 the Sardinian army and a small auxiliary corps of Austrians waged a desultory mountain warfare against the Army of the Alps about Briançon and the Army of Italy on the Var That furious offensive on the part of the French, which signalized the year 1793 elsewhere, was made impossible here by the counter-revolution in the cities of the Midi In 1794, when this had been crushed, the intention of the French government was to take the offensive against the Austro-Sardinians The first operation was to be the capture of Oneglia The concentration of large forces in the lower Rhone valley had naturally infringed upon the areas told off for the provisioning of the Armies of the Alps (Kellermann) and of Italy (Dumerbion), indeed, the sullen population could hardly be induced to feed the



troops suppressing the revolt, still less the distant frontier armies. Thus the only source of supply was the Riviera of Genoa: "Our connections with this district are imperilled by the corsairs of Oneglia (a Sardinian town) owing to the cessation of our operations afloat The army is living from hand to mouth," wrote the younger Robespierre in Sept. 1793 Vessels bearing supplies from Genoa could not avoid the corsairs by taking the open sea, for there the British fleet was supreme The Army of Italy began operations in April, and not only was Oneglia captured, but also the Col di Tenda. Napoleon Bonaparte served in these affairs

on the headquarters staff. Meantime the Army of the Alps had possessed itself of the Little St. Bernard and Mont Cenis, and the Republicans were now (May) masters of several routes into Piedmont. But the Alpine roads merely led to fortresses, and both Carnot and Bonaparte—who had by now captivated the younger Robespierre and become the leading spirit in Dumerbion's army—considered that the Army of the Alps should be weakened to the profit of the Army of Italy, and that the time had come to disregard the feeble neutrality of Genoa, and to advance over the Col di Tenda

Bonaparte in 1794.—Bonaparte's first suggestion for a rapid condensation of the French cordon, and an irresistible blow on the centre of the Allies by Tenda-Coni, came to nothing owing to the waste of time in negotiations between the generals and the distant Committee, and meanwhile new factors came into play. The capture of the pass of Argentera by the right wing of the Army of the Alps suggested that the main effort should be made against the barrier fortress of Demonte, but here again Bonaparte proposed a concentration of effort on the primary and economy of force in the secondary objective About the same time, in a memoir on the war in general, he laid down his most celebrated maxim "The principles of war are the same as those of a siege Fire must be concentrated on one point, and as soon as the breach is made, the equilibrium is broken and the rest is nothing." These tactical ideas of concentration and breaking the equilibrium he had already carried into the sphere of policy and strategy on the same lines "Austria is the great enemy; Austria crushed, Germany, Spain, Italy fall of themselves We must not disperse, but concentrate our attack" Bonaparte argued that Austria could be effectively wounded by an offensive against Piedmont, and even more effectively by an ulterior advance from Italian soil into Germany But the younger Robespierre perished with his brother in the *coup d'état* of 9th Thermidor, the advance was suspended, and Bonaparte, amongst other leading spirits of the Army of Italy, was arrested and imprisoned Profiting by this moment, Austria increased her auxiliary corps, and the allied forces moved (in September) towards the Riviera This threat to the French supplies was averted by the expedition of Dego, planned chiefly by Bonaparte, who had been released from prison and was at headquarters, though unemployed

Schérer and Kellermann.—In November 1794, Dumerbion was replaced by Schérer, who was soon transferred to the Spanish frontier, while the plan he left, as limited in scope as in force, was never put into execution, for spring had scarcely arrived when the prospect of renewed revolts in the south of France practically paralysed the army This encouraged the enemy to deliver the blow that had so long been feared Their combined forces, the Sardinians, the Austrian auxiliary corps and the newly arrived Austrian main army, advanced together and forced the French right wing to evacuate Vado and the Genoese littoral But at this juncture the conclusion of peace with Spain released the Pyrenees armies, and Schérer returned to the Army of Italy at the head of reinforcements. He was faced with a difficult situation, but he had the means wherewith to meet it, as Bonaparte promptly pointed out Up to this time, Bonaparte said, the French commanded the mountain crest, and therefore covered Savoy and Nice, and also Oneglia, Loano and Vado, the ports of the Riviera But now that Vado was lost the breach was made. Genoa was cut off, and the south of France was the only remaining resource for the army commissariat. Vado must therefore be retaken and the line reopened to Genoa But Bonaparte's mind ranged beyond the immediate future He calculated that if the French advanced into the interior by the road Savona-Ceva, the Austrians would seek to cover Lombardy, the Piedmontese Turin, and this separation, already morally accomplished, it was to be the French general's task to accentuate in fact. Next, Sardinia having been coerced into peace, the Army of Italy would expel the Austrians from Lombardy and connect its operations with those of the French in South Germany by way of Tirol. The supply question, once the soldiers had gained the rich valley of the Po, would solve itself.

Loano.—This was the essence of the first of four memoranda on this subject prepared by Bonaparte in his Paris office The second indicated the means of coercing Sardinia—first the Austrians were to be driven or scared away towards Alessandria, then the French army would turn sharp to the left, driving the Sardinians eastward and north-eastward through Ceva, and this was to be the signal for the general invasion of Piedmont from all sides In the third paper he framed an elaborate plan for the retaking of Vado, and in the fourth he summarized the contents of the other three. Having thus cleared his own mind as to the conditions and the solution of the problem, he did his best to secure the command for himself The measures recommended by Bonaparte were translated into a formal and detailed order to recapture Vado. To Bonaparte the miserable condition of the Army of Italy was the most urgent incentive to prompt action In Schérer's judgment, however, the army was unfit to take the field, and therefore *ex hypothesi* to attack Vado, without thorough reorganization, and it was only in November that the advance was finally made. It culminated, thanks once more to the resolute Masséna, in the victory of Loano (Nov. 23–24) But Schérer thought more of the destitution of his own army than of the fruits of success, and contented himself with resuming possession of the Riviera Meanwhile the mentor, whose suggestions and personality were equally repugnant to Schérer, had undegone strange vicissitudes of fortune —dismissal from the headquarters staff, expulsion from the list of general officers, and then the "whiff of grapeshot" of 13th Vendémiaire, followed shortly by his marriage with Josephine, and his nomination to command the Army of Italy. These events had neither shaken his cold resolution nor disturbed his balance.

Napoleon in Command.—The Army of Italy spent the winter of 1795–96 as before in the narrow Riviera, while on the one side, just over the mountains, lay the Austro-Sardinians, and on the other, out of range of the coast batteries but ready to pounce on the supply ships, were the British frigates On Bonaparte's left Kellermann, with no more than 18,000, maintained a string of posts between Lake Geneva and the Argentera as before Of the Army of Italy 10,000 watched the Tenda road and 12,000 the coast line. There remained for active operations some 27,000 men, ragged, famished and suffering in every way in spite of their victory of Loano The Sardinian and Austrian auxiliaries (Colli), 25,000 men, lay between Mondovi and Ceva; a force strung out in the Alpine valleys opposed Kellermann; and the main Austrian army (commanded by Beaulieu) in widely extended cantonments between Acqui and Milan, numbered 30,000 field troops Thus the short-lived concentration of all the allied forces for the battle against Schérer had ended in a fresh separation Austria was far more concerned with Poland than with the moribund French question, and committed as few of her troops as possible to this distant and secondary theatre of war. As for Piedmont, "peace" was almost the universal cry, even within the army. All this scarcely affected the regimental spirit and discipline of the Austrian squadrons and battalions, which had now recovered from the defeat of Loano. But they were important factors for the new general-in-chief on the Riviera, and formed the basis of his strategy

Bonaparte's first task was to grasp the reins and to prepare his troops, morally and physically, for active work It was not merely that a young general with many enemies, a political favourite of the moment, had been thrust upon the army The army itself was in a pitiable condition. Whole companies with their officers went plundering in search of mere food, the horses had never received as much as half-rations for a year past, and even the generals were half-starved Thousands of men were barefooted and hundreds were without arms. But in a few days he had secured an almost incredible ascendancy over the sullen, starved, half-clothed army.

"Soldiers," he told them, "you are famished and nearly naked. The government owes you much, but can do nothing for you. Your patience, your courage, do you honour, but give you no glory, no advantage. I will lead you into the most fertile plains of the world There you will find great towns, rich provinces There you will find honour, glory and riches. Soldiers of the Army of Italy, will you be wanting in courage?"

He augmented his army of operations to about 40,000, at the

expense of the coast divisions, and set on foot also two small cavalry divisions, mounted on the half-starved horses that had survived the winter. Then he announced that the army was ready and opened the campaign If the present separation of the Allies continued, he proposed to overwhelm the Sardinians first, before the Austrians could assemble from winter quarters, and then to turn on Beaulieu. If, on the other hand, the Austrians, before he could strike his blow, united with Colli, he proposed to frighten them into separating again by moving on Acqui and Alessandria. Hence Carcare, where the road from Acqui joined the "cannon-road" over the Apennines to Ceva, was the first objective of his march, and from there he could manoeuvre and widen the breach between the allied armies His scattered left wing would assist in the attack on the Sardinians as well as it could—for the immediate attack on the Austrians its co-operation would of course have been out of the question In any case he grudged every week spent in administrative preparation. The delay due to this, as a matter of fact, allowed a new situation to develop Beaulieu was himself the first to move, and he moved towards Genoa instead of towards his Allies The gap between the two allied wings was thereby widened, but it was no longer possible for the French to use it, for their plan of destroying Colli *while Beaulieu was ineffective* had collapsed.

In connection with a plan for a Genoese loan, and to facilitate the movement of supply convoys, a small French force had been pushed forward to Voltri. Bonaparte ordered it back as soon as he arrived at the front, but the alarm was given. The Austrians broke up from winter quarters at once, and rather than lose the food supplies at Voltri, Bonaparte actually reinforced Masséna at that place, and gave him orders to hold on as long as possible, cautioning him only to watch his left rear (Montenotte). But he did not abandon his purpose Starting from the new conditions, he devised other means, as we shall see, for reducing Beaulieu to ineffectiveness The French advance to Voltri had not only spurred Beaulieu into activity, but convinced him that the bulk of the French army lay east of Savona He therefore made Voltri the object of a converging attack, not with the intention of destroying the French army but with that of "cutting its communications with Genoa and expelling it from the only place in the Riviera where there were sufficient ovens to bake its bread" As the Sardinians and auxiliary Austrians were ordered to extend leftwards on Dego to close the gap that Beaulieu's advance on Genoa-Voltri opened up, and the furthest to the right of Beaulieu's own columns had orders to seize Monte Legino, the wings were therefore so far connected that Colli wrote to Beaulieu on this day "the enemy will never dare to place himself between our two armies" The event belied the prediction, and the proposed minor operation against granaries and bakeries became the first act of a decisive campaign

On the night of April 9 the French were grouped as follows: brigades under Garnier and Macquard at the Finestre and Tenda passes, Sérurier's division and Rusca's brigade east of Garessio; Augereau's division about Loano, Meynier's at Finale, Laharpe's at Savona with an outpost on the Monte Legino, and Cervoni's brigade at Voltri. Masséna was in general charge of the last-named units The cavalry was far in rear beyond Loano. Colli's main force was around Coni and Mondovi-Ceva, the latter group connecting with Beaulieu by a detachment under Provera between Millesimo and Carcare Of Beaulieu's army, Argenteau's division, still concentrating to the front in many small bodies, extended over the area Acqui-Dego-Sassello Vukassovich's brigade was equally extended between Ovada and the mountain-crests above Voltri, and Pittoni's division was grouped around Gavi and the Bocchetta, the two last units being destined for the attack on Voltri. Farther to the rear was Sebottendorf's division around Alessandria-Tortona. On the afternoon of the 10th Beaulieu delivered his blow at Voltri, not, as he anticipated, against three-quarters of the French army, but against Cervoni's detachment. This, after a long irregular fight, slipped away in the night to Savona Discovering his mistake next morning, Beaulieu sent back some of his battalions to join Argenteau. But there was no road by which they could do so save the détour through Acqui and Dego, and long before they arrived Argenteau's advance on Monte Legino had forced on the crisis. On the 11th (a day behind time), this general drove in the French outposts, but he soon came on three battalions under Col. Rampon, who threw himself into some old earthworks that lay near, and said to his men, "We must win or die here, my friends." His redoubt and his men stood the trial well, and when day broke on the 12th Bonaparte was ready to deliver his first "Napoleon-stroke."

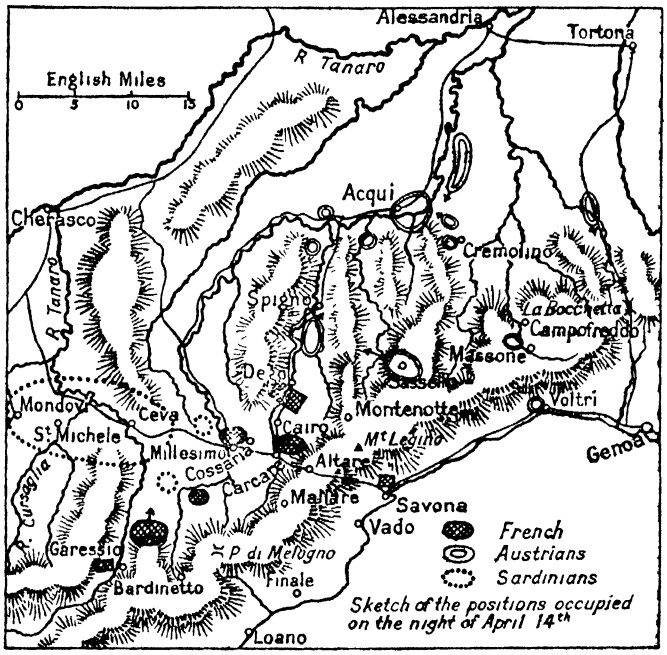
Montenotte.—The principle that guided him in the subsequent operations may be called that of "concentrating a temporary superiority of force at the point of balance" Touch had been gained with the enemy all along the long line between the Tenda and Voltri, and he decided to concentrate swiftly upon the nearest enemy—Argenteau. Augereau's division, or such part of it as could march at once, was ordered to Mallare. Masséna, with 9,000 men, was to send two brigades in the direction of Carcare and Altare, and with the third to swing round Argenteau's right and to head for Montenotte village in his rear. Laharpe with 7,000 (it had become clear that the enemy at Voltri would not pursue their advantage) was to join Rampon, leaving only Cervoni and two battalions in Savona Sérurier and Rusca were to keep the Sardinians in front of them occupied The far-distant brigades of Garnier and Macquard stood fast, but the cavalry drew eastward as quickly as its condition permitted. In rain and mist on the early morning of the 12th the French marched up from all quarters, while Argenteau's men waited in their cold bivouacs for light enough to resume their attack on Monte Legino About nine the mists cleared, and heavy fighting began, but Laharpe held the mountain, and Masséna with his nearest brigade stormed forward against Argenteau's right. A few hours later, seeing Augereau's columns heading for their line of retreat, the Austrians retired, sharply pressed, on Dego The threatened intervention of Provera was checked by Augereau's presence at Carcare.

Montenotte was a brilliant little victory, and one can imagine its effects on the but lately despondent soldiers of the Army of Italy, but only two-thirds of Argenteau's force, and none of the other divisions, had been beaten, and the heaviest fighting was to come Bonaparte, eager to begin at once the subjugation of the Piedmontese (for which purpose he wanted to bring Sérurier and Rusca into play) sent only Laharpe's division and a few details of Masséna's, under the latter, towards Dego These were to protect the main attack from interference by the forces that had been engaged at Montenotte (imagined to be Beaulieu's main body), the said main attack being delivered by Augereau's division, reinforced by most of Masséna's, on the positions held by Provera The latter, only 1,000 strong to Augereau's 9,000, shut himself in the castle of Cossaria, which, imitating Rampon, he defended against a series of furious assaults. Not until the morning of the 14th was his surrender secured, after his ammunition and food had been exhausted

Argenteau also won a day's respite on the 13th, for Laharpe did not join Masséna till late, and nothing took place opposite Dego but a little skirmishing. During the day Bonaparte saw for himself that he had overrated the effects of Montenotte. Beaulieu, on the other hand, underrated them, treating it as a mishap that was more than counterbalanced by his own success in "cutting off the French from Genoa." He began to reconstruct his line on the front Dego-Sassello, trusting to Colli to harry the French until the Voltri troops had finished their détour through Acqui and rejoined Argenteau This, of course, presumed that Argenteau's troops were intact and Colli's able to move, which was not the case with either. Not until the afternoon of the 14th did Beaulieu place a few extra battalions at Argenteau's disposal "to be used only in case of extreme necessity," and order Vukassovich from the region of Sassello to "make a diversion" against the French right with *two* battalions.

Dego.—Thus Argenteau, already shaken, was exposed to destruction. On the 14th, after Provera's surrender, Masséna and Laharpe, reinforced until they had nearly a two-to-one superiority, stormed Dego and killed or captured 3,000 of Argenteau's 5,500 men, the remnant retreating in disorder to Acqui. But nothing was done towards the accomplishment of the purpose of

destroying Colli on that day, save that Sérurier and Rusca began to close in to meet the main body between Ceva and Millesimo Moreover, the victory at Dego had produced its usual results on the wild fighting swarms of the Republicans, who threw themselves like hungry wolves on the little town, without pursuing the beaten enemy or even placing a single outpost on the Acqui road In this state, during the early hours of the 15th, Vukassovich's



brigade,[1] marching up from Sassello, surprised them, and they broke and fled in an instant The whole morning had to be spent in rallying them at Cairo, and Bonaparte had for the second time to postpone his union with Sérurier and Rusca, who meanwhile, isolated from one another and from the main army, were groping forward in the mountains A fresh assault on Dego was ordered, and after very severe fighting, Masséna and Laharpe succeeded late in the evening in retaking it Vukassovich lost heavily, but retired steadily and in order on Spigno The killed and wounded numbered probably about 1,000 French and 1,500 Austrians, out of considerably less than 10,000 engaged on each side—a loss which contrasted very forcibly with those suffered in other battles of the Revolutionary Wars, and by teaching the Army of Italy to bear punishment, imbued it with self-confidence. But again success bred disorder, and there was a second orgy in the houses and streets of Dego which went on till late in the morning and paralysed the whole army.

This was perhaps the crisis of the campaign Even now it was not certain that the Austrians had been definitively pushed aside, while it was quite clear that Beaulieu's main body was intact and Colli was still more an unknown quantity But Bonaparte's intention remained the same, to attack the Piedmontese as quickly and as heavily as possible, Beaulieu being held in check by a containing force under Masséna and Laharpe. The remainder of the army, counting in now Rusca and Sérurier, was to move westward towards Ceva. This disposition, while it illustrates the Napoleonic principle of delivering a heavy blow on the selected target and warding off interference at other points, shows also the difficulty of rightly apportioning the available means between the offensive mass and the defensive system, for, as it turned out, Beaulieu was already sufficiently scared, and thought of nothing but self-defence on the line Acqui-Ovada-Bocchetta, while the French offensive mass was very weak compared with Colli's unbeaten and now fairly concentrated army about Ceva.

On the afternoon of the 16th the real avalanche was begun by Augereau's division, reinforced by other troops. Rusca joined Augereau towards evening, and Sérurier approached Ceva from the south Colli's object was now to spin out time, and having repulsed a weak attack by Augereau, and feeling able to repeat these tactics on each successive spur of the Apennines, he retired in the night to a new position behind the Cursaglia On the 17th, reassured by the absence of fighting on the Dego side, and by the news that no enemy remained at Sassello, Bonaparte released Masséna from Dego, leaving only Laharpe there, and brought him over towards the right of the main body, which thus on the evening of the 17th formed a long straggling line on both sides of Ceva, Sérurier on the left, échelonned forward, Augereau, Joubert and Rusca in the centre, and Masséna, partly as support, partly as flank guard, on Augereau's right rear Sérurier had been bidden to extend well out and to strive to get contact with Masséna, *i.e.*, to encircle the enemy The line of supply, as an extra guarantee against interference, was changed from that of Savona-Carcare to that of Loano-Bardinetto When this was accomplished, four clear days could be reckoned with certainty in which to deal with Colli

The latter, still expecting the Austrians to advance to his assistance, had established his corps (not more than 12,000 muskets in all) in the immensely strong positions of the Cursaglia Opposite this position the French arrived, after many delays due to the weariness of the troops, on the 19th A day of irregular fighting followed, everywhere to the advantage of the defenders Bonaparte, fighting against time, ordered a fresh attack on the 20th, and only desisted when it became evident that the army was exhausted, and, in particular, when Sérurier reported frankly that without bread the soldiers would not march The delay thus imposed, however, enabled him to clear the "cannon-road" of all vehicles, and to bring up the Dego detachment to replace Masséna in the valley of the western Bormida, the latter coming in to the main army Twenty-four thousand men, for the first time with a due proportion of cavalry and artillery, were now disposed along Colli's front and beyond his right flank Colli, outnumbered by two to one, and threatened with envelopment, decided once more to retreat, and the Republicans occupied the Cursaglia lines on the morning of the 21st without firing a shot But Colli halted again at Vico, half-way to Mondovi, and while he was in this unfavourable situation the pursuers came on with true Republican swiftness, lapped round his flanks and crushed him A few days later (April 27), the armistice of Cherasco put an end to the campaign before the Austrians moved a single battalion to his assistance.

The Napoleon Touch.—The interest of the campaign lies in the "Napoleon touch" that differentiated it from other Revolutionary campaigns Revolutionary energy was common to the Army of Italy and to the Army of the North Why, therefore, when the war dragged on from one campaign to another in the great plains of the Meuse and Rhine countries, did Bonaparte bring about so swift a decision in these cramped valleys? The answer is to be found partly in the exigencies of the supply service, but still more in Bonaparte's own personality and the strategy born of it. Action of some sort was the plain alternative to starvation He would have no quarter-rations on the Riviera, but plenty and to spare beyond the mountains Strategical conditions and "new French" methods of war did not save Bonaparte in the two crises—the Dego rout and the sullen halt of the army at San Michele—but the personality which made the soldiers, on the way to Montenotte, march barefoot past a wagon-load of new boots Later critics evolved from his success the theory of "interior lines," but actually the method was in many respects old What, therefore, in the theory or its application was the product of Bonaparte's own genius and will? A comparison with Souham's campaign of Tourcoing will enable us to answer this question To begin with, Souham found himself midway between Coburg and Clerfayt almost by accident, and his utilization of the advantages of his position was an expedient for the given case. Bonaparte, however, placed himself *deliberately* in an analogous situation at Carcare and Cairo. Then he swiftly "concentrated fire, made the breach, and broke the equilibrium" at the spot where the interests and forces of the two allies converged and diverged

[1] Vukassovich had received Beaulieu's order to demonstrate with two battalions, and also appeals for help from Argenteau He therefore brought most of his troops with him

Relative Superiority.—Another guiding idea was that of "relative superiority." Whereas Souham had been in superior force (90,000 against 70,000), Bonaparte (40,000 against 50,000) was not, and yet the Army of Italy was always placed in a position of relative superiority (at first about 3 to 2 and ultimately 2 to 1) to the immediate antagonist. "The essence of strategy," said Bonaparte in 1797, "is, with a weaker army, always to have more force at the crucial point than the enemy But this art is taught neither by books nor by practice; it is a matter of tact" In this he expressed the result of his victories on his own mind rather than a preconceived formula which produced those victories But the idea, though undefined, and the method of practice, though imperfectly worked out, were in his mind from the first As soon as he had made the breach, though preparing to throw all available forces against Colli, he posted Masséna and Laharpe at Dego to guard, not like Vandamme on the Lys against a real and pressing enemy, but against a *possibility*, and he only diminished the strength and altered the position of this protective detachment in proportion as the Austrian danger dwindled Later in his career he defined this system as "having all possible strength at the decisive point," and "being nowhere vulnerable," and the art of reconciling these two requirements, in each case as it arose, was always the principal secret of his generalship At first his precautions (judged by events and not by the probabilities of the moment) were excessive, and the offensive mass small But the point is that such a system, however rough its first model, had been imagined and put into practice

The first phase of the campaign satisfactorily settled, Bonaparte was free to turn his attention to the "arch-enemy" to whom he was now considerably superior in numbers (35,000 to 25,000) The day after the signature of the armistice of Cherasco he began preparing for a new advance and also for the rôle of arbiter of the destinies of Italy Beaulieu had fallen back into Lombardy, and now bordered the Po right and left of Valenza. To achieve further progress, Bonaparte had first to cross that river, and the point and method of crossing was the immediate problem, a problem the more difficult as he had no bridge train and could only make use of such existing bridges as he could seize intact. If he crossed above Valenza he would be confronted by one river-line after another Milan was his objective, and Tortona-Piacenza his indirect route thither. To give himself every chance he had stipulated with the Piedmontese authorities for the right of passing at Valenza, and he had the satisfaction of seeing Beaulieu fall into the trap and concentrate opposite that part of the river The French meantime had moved to the region Alessandria-Tortona. Thence on May 6 Bonaparte set out for a forced march on Piacenza, and that night the advanced guard was 30m. on the way, at Castel San Giovanni, and Laharpe's and the cavalry divisions at Stradella, 10m behind them Augereau was at Broni, Masséna at Salo and Sérurier near Valenza, the whole forming a rapidly extending fan, 50m from point to point If the Piacenza detachment succeeded in crossing, the army was to follow rapidly in its track. If, on the other hand, Beaulieu fell back to oppose the advanced guard, the Valenza divisions would take advantage of his absence to cross there. In either case, be it observed, the Austrians were to be *evaded*, not brought to action. On the 7th, the advanced guard under Dallemagne crossed at Piacenza,[1] and, hearing of this, Bonaparte ordered every division except Sérurier's thither with all possible speed In the exultation of the moment he mocked at Beaulieu's incapacity, but the old Austrian was already on the alert This game of manoeuvres he understood; already one of his divisions had arrived in close proximity to Dallemagne and the others were marching eastward by all available roads But the mobility of the French enabled them to pass the river before the Austrians (who had actually started a day in advance of them) put in an appearance, and afterwards to be in superior numbers at each point of contact. The culmination Bonaparte himself indicated as the turning-point of his life. "Vendémiaire and even Montenotte did not make me think myself a superior being. It was after Lodi that the idea came to me . . . that first kindled the spark of boundless ambition"

Lodi.—Abandoning his original idea of giving battle, Beaulieu retired to the Adda, and most of his troops were safely beyond it before the French arrived near Lodi, but he felt it necessary to leave a strong rearguard on the river opposite that place to cover the reassembly of his columns after their scattered march On the afternoon of May 10, Bonaparte, with Dallemagne, Masséna and Augereau, came up and seized the town But 200yds of open ground had to be passed from the town gate to the bridge, and the bridge itself was another 250yds in length A few hundred yards beyond it stood the Austrians, 9,000 strong with 14 guns Bonaparte brought up all his guns to prevent the enemy from destroying the bridge. Then sending all his cavalry to turn the enemy's right by a ford above the town, he waited two hours, employing the time in cannonading the Austrian lines, resting his advanced infantry and closing up Masséna's and Augereau's divisions Finally he gave the order to Dallemagne's 4,000 grenadiers, who were drawn up under cover of the town wall, to rush the bridge As the column, not more than 30 men broad, made its appearance, it was met by the concentrated fire of the Austrian guns, and half way across the bridge it checked, but Bonaparte himself and Masséna rushed forward, the courage of the soldiers revived, and, while some jumped off the bridge and scrambled forward in the shallow water, the remainder stormed on, passed through the guns and drove back the infantry This was, in bare outline, the astounding passage of the bridge of Lodi It was not till after the battle that Bonaparte realized that only a rearguard was in front of him When he launched his 4,000 grenadiers he thought that on the other side there were four or five times that number of the enemy No wonder, then, that after the event he recognized in himself the flash of genius, the courage to risk everything, and the "tact" which, independent of and indeed contrary to all reasoned calculations, told him that the moment had come for "breaking the equilibrium" Lodi was a tactical success in the highest sense, in that the principles of his tactics rested on psychology—on the "sublime" part of the art of war as Saxe had called it long ago The spirit produced the form, and Lodi was the prototype of the Napoleonic battle—contact, manoeuvre, preparation and finally the well-timed, massed and unhesitating assault The failure to reap the strategical fruits mattered little Many months elapsed before this bold assertion of superiority ceased to decide the battles of France and Austria

Milan.—Next day he set off in pursuit of Beaulieu, postponing his occupation of the Milanese, but the Austrians were now out of reach, and during the next few days the French divisions were installed at various points in the area Pavia-Milan-Pizzighetone, facing outwards in all dangerous directions, with a central reserve at Milan Thus secured, Bonaparte turned his attention to political and military administration This took the form of exacting from the neighbouring princes money, supplies and objects of art, and the once famished Army of Italy revelled in its opportunity Now, however, the Directory, suspicious of the too successful and too sanguine young general, ordered him to turn over the command in Upper Italy to Kellermann, and to take an expeditionary corps himself into the heart of the peninsula, there to preach the Republic and the overthrow of princes Bonaparte absolutely refused, and offered his resignation In the end (partly by bribery) he prevailed, but the incident reawakened his desire to close with Beaulieu. This indeed he could now do with a free hand, since not only had the Milanese been effectively occupied, but also the treaty with Sardinia had been ratified But no sooner had he resumed the advance than it was interrupted by a rising of the peasantry in his rear. The exactions of the French had in a few days generated sparks of discontent which it was easy for the priests and the nobles to fan into open flames. Milan and Pavia as well as the countryside broke into insurrection, and at the latter place the mob forced the French commandant to surrender. Bonaparte acted swiftly and ruthlessly. Bringing back a small portion of the army with him, he

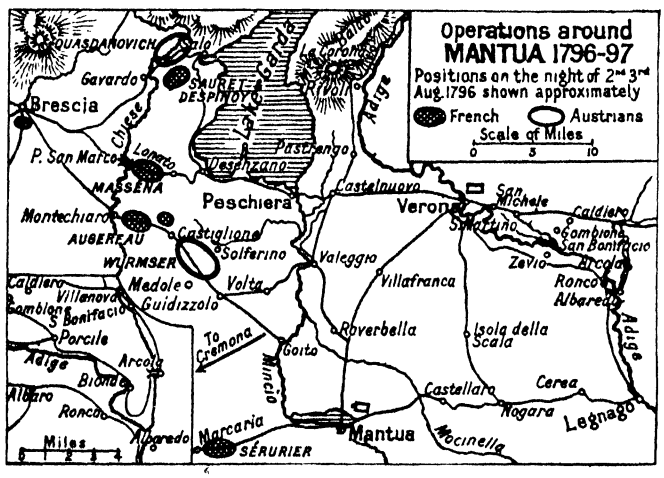
[1] On entering the territory of the duke of Parma, Bonaparte imposed, besides other contributions, the surrender of 20 famous pictures, and thus began a practice which for many years enriched the Louvre and only ceased with the capture of Paris in 1814.

punished Milan on the 25th, sacked and burned Binasco on the 26th, and on the evening of the latter day, while his cavalry swept the open country, he broke his way into Pavia with 1,500 men and beat down all resistance. Then he advanced to the banks of the Mincio, where the remainder of the Italian campaign was fought out, both sides contemptuously disregarding Venetian neutrality. It centred on the fortress of Mantua, which Beaulieu, too weak to keep the field, and dislodged from the Mincio in the action of Borghetto (May 30), strongly garrisoned before retiring into Tirol. Beaulieu was soon afterwards replaced by Wurmser who brought reinforcements from Germany.

At this point, mindful of the narrow escape he had had of losing his command, Bonaparte thought it well to begin the resettlement of Italy. The scheme for co-operating with Moreau on the Danube was indefinitely postponed, and the Army of Italy (now reinforced from the Army of the Alps) was again disposed in a protective "zone of manoeuvre," with a strong central reserve. Against Mantua no siege artillery was available till the Austrians in the citadel of Milan capitulated, and thus not till July 18 was the first parallel begun. Almost at the same moment Wurmser began his advance from Trent with 55,000 men to relieve Mantua.

Siege of Mantua.—The protective system on which his attack would fall in the first instance was now as follows. Augereau (6,000) about Legnago, Despinoy (8,000) south-east of Verona, Masséna (13,000) at Verona and Peschiera, Sauret (4,500) at Salo and Gavardo. Sérurier (12,000) was besieging Mantua, and the only central reserve was the cavalry (2,000) under Kilmaine. The main road to Milan passed by Brescia. Sauret's brigade, therefore, was practically a detached post on the line of communication, and on the main defensive front less than 30,000 men were disposed at various points between La Corona and Legnago (30m. apart), and at a distance of 15 to 20m. from Mantua. The strength of such a disposition depended on the fighting power and handiness of the troops, who in each case would be called upon to act as a rearguard to gain time. The lie of the country scarcely permitted a closer grouping, unless Bonaparte fell back on the old-time device of a "circumvallation," and shut himself up in a ring of earthworks round Mantua —and this was impossible for want of supplies.

As Wurmser's attack procedure has received almost universal condemnation, in justice it may be pointed out that the object of the expedition was not to win a battle by falling on the disunited French with a well-concentrated army, but to overpower



one, any one, of the corps covering the siege, and to press straight forward to the relief of Mantua. New ideas and new forces, undiscernible to a man of 72 years of age, obliterated his achievement by surpassing it; but such as it was—a limited use of force for a limited object—the venture undeniably succeeded.

The Austrians formed three corps, one (Quasdanovich, 18,000 men) marching round the west side of the lake of Garda, the second (under Wurmser, about 30,000) moving directly down the Adige, and the third (Davidovich, 6,000) making a détour by the Brenta valley and heading for Verona by Vicenza. On the 29th Quasdanovich attacked Sauret at Salo, drove him towards Desenzano, and pushed on to Gavardo and thence into Brescia. Wurmser expelled Masséna's advanced guard from La Corona, and captured in succession the Monte Baldo and Rivoli posts. The Brenta column approached Verona with little or no fighting. News of this column led Bonaparte early in the day to close up Despinoy, Masséna and Kilmaine at Castelnuovo, and to order Augereau from Legnago to advance on Montebello (19m. east of Verona) against Davidovich's left rear. But after these orders had been despatched came the news of Sauret's defeat, and this moment was one of the most anxious in Bonaparte's career. He could not make up his mind to give up the siege of Mantua, but he hurried Augereau back to the Mincio, and sent order after order to the officers on the lines of communication to send all convoys by the Cremona instead of by the Brescia road. More, he wrote to Sérurier a despatch which included the words "perhaps we shall recover ourselves . . but I must take serious measures for a retreat." On the 30th he wrote. "The enemy have broken through our line in three places . . and . . captured Brescia. You see that our communications with Milan and Verona are cut." Early reports that day enabled him to "place" the main body of the enemy opposite Masséna, and this at least helped to make his course less doubtful. Augereau was ordered to hold the line of the Molinella, in case Davidovich's attack, the least-known factor, should after all prove to be serious; Masséna to hold Wurmser at Castelnuovo as long as he could. Sauret and Despinoy were concentrated at Desenzano with orders on the 31st to clear the main line of retreat and to recapture Brescia. On the Austrian side Quasdanovich wheeled inwards, his right finally resting on Montechiaro and his left on Salo, and Wurmser drove back Masséna to the west side of the Mincio. Davidovich made a slight advance.

In the late evening Bonaparte held a council of war at Roverbella. The proceedings of this council are unknown, but it at any rate enabled Bonaparte to see clearly and to act. Hitherto he had been covering the siege of Mantua with various detachments, the defeat of any one of which might be fatal to the enterprise. Thus, when he had lost his main line of retreat, he could assemble no more than 8,000 men at Desenzano to win it back. Now, however, he made up his mind that the siege could not be continued, and bitter as was the decision, it gave him freedom. At this moment of crisis the instincts of the great captain came into play, and showed the way to a victory that would more than counterbalance the now inevitable failure. Sérurier was ordered to spike the 140 siege guns which had been so welcome a few days before, and, after sending part of his force to Augereau, to establish himself with the rest at Marcaria on the Cremona road. The field forces were to be used on interior lines. On the 31st Sauret, Despinoy, Augereau and Kilmaine advanced westward against Quasdanovich. The first two found the Austrians at Salo and Lonato and drove them back, while with Augereau and the cavalry Bonaparte himself made a forced march on Brescia, never halting night or day till he reached the town and recovered his depots. Meantime Masséna had gradually drawn in towards Lonato, Sérurier had retired (night of July 31) from before Mantua, and Wurmser's advanced guard triumphantly entered the fortress (Aug. 1).

Lonato and Castiglione.—The Austrian general now formed the plan of crushing Bonaparte between Quasdanovich and his own main body. But meantime Quasdanovich had evacuated Brescia under the threat of Bonaparte's advance and was now fighting a long irregular action with Despinoy and Sauret about Gavardo and Salo, and Bonaparte, having missed his expected target, had brought Augereau by another severe march back to Montechiaro. Masséna was now assembled between Lonato and Ponte San Marco. Wurmser's main body, weakened by the detachment sent to Mantua, crossed the Mincio about Valeggio and Goito on the 2nd, and penetrated as far as Castiglione, whence Masséna's rearguard was expelled. But a renewed advance of Quasdanovich, ordered by Wurmser, which drove Sauret and Despinoy back on Brescia and Lonato, in the end only placed a strong detachment of the Austrians within striking distance of

Masséna, who on the 3rd attacked and destroyed it, while at the same time Augereau recaptured Castiglione from Wurmser On the 4th Sauret and Despinoy pressed back Quasdanovich beyond Salo and Gavardo, and Masséna annihilated an isolated column which tried to break its way through to Wurmser Wurmser, thinking rightly or wrongly that he could not now retire to the Mincio without a battle, drew up his whole force, close on 30,000 men, in the plain between Solferino and Medole The finale may be described in very few words Bonaparte, convinced that no more was to be feared from Quasdanovich, called in Despinoy's division to the main body and sent orders to Sérurier, then far distant on the Cremona road, to march against the left flank of the Austrians On the 5th the battle of Castiglione (*q v*) was fought Closely contested in the first hours of the frontal attack till Sérurier's arrival decided the day, it ended in the retreat of the Austrians over the Mincio and into Tirol, whence they had come

Thus the new way had failed to keep back Wurmser, and the old had failed to crush Bonaparte In former wars a commander threatened as Bonaparte was would have fallen back at once to the Adda, abandoning the siege in such good time that he would have been able to bring off his siege artillery Instead of this Bonaparte hesitated long enough to lose it, which, according to accepted canons, was a waste, and held his ground, which was, by the same rules, sheer madness But revolutionary discipline was not firm enough to stand a retreat Once it turned back, the army would have streamed away to Milan and perhaps to the Alps (*cf.* 1799) As to the manner of this fighting, even the principle of "relative superiority" failed him so long as he was endeavouring to cover the siege and again when his chief care was to protect his new line of retreat and to clear his old In this period, viz, up to his return from Brescia on Aug 2, the only "mass" he collected delivered a blow in the air, while the covering detachments had to fight hard for bare existence Once released from its trammels, the Napoleonic principle had fair play He stood between Wurmser and Quasdanovich, ready to fight either or both The latter was crushed, thanks to local superiority and the resolute leading of Massena, but at Castiglione Wurmser actually outnumbered his opponent till the last of Bonaparte's precautionary dispositions had been given up, and Sérurier brought back from the "alternative line of retreat" to the battlefield The moral is, again, that it was not the mere fact of being on interior lines that gave Bonaparte the victory, but his "tact," his fine appreciation of the chances in his favour, measured in terms of time, space, attacking force and containing power All these factors were greatly influenced by the ground, which favoured the swarms and columns of the French and deprived the brilliant Austrian cavalry of its power to act But of far greater importance was the mobility that Bonaparte's personal force imparted to the French. Bonaparte himself rode five horses to death in three days, and Augereau's division marched from Roverbella to Brescia and back to Montechiaro, a total distance of nearly 50m, in about 36 hours This indeed was the foundation of his "relative superiority," for every hour saved in the time of marching meant more freedom to destroy one corps before the rest could overwhelm the covering detachments and come to its assistance

By the end of the second week in August the blockade of Mantua had been resumed, without siege guns. But still under the impression of a great victory gained, Bonaparte was planning a long forward stride He thought that by advancing past Mantua directly on Trieste and thence onwards to the Semmering he could impose a peace on the emperor The Directory, however, which had by now focussed its attention on the German campaign, ordered him to pass through Tirol and to co-operate with Moreau, and this plan, Bonaparte, though protesting against an Alpine venture being made so late in the year, prepared to execute. Wurmser was thought to have posted his main body near Trent, and to have detached one division to Bassano "to cover Trieste." The French advanced northward on the 2nd, in three disconnected columns which successfully combined and drove the enemy before them to Trent There, however, they missed their target. Wurmser had already drawn over the bulk of his army (22,000) into the Val Sugana, whence with the Bassano division as his advanced guard, he intended once more to relieve Mantua, while Davidovich with 13,000 (excluding detachments) was to hold Tirol against any attempt of Bonaparte to join forces with Moreau.

Thus Austria was preparing to hazard a second (as in the event she hazarded a third and a fourth) highly trained and expensive professional army in the struggle for the preservation of a fortress, and we must conclude that there were weighty reasons which actuated so notoriously cautious a body as the Council of War in making this unconditional venture While Mantua stood, Bonaparte, for all his energy and sanguineness, could not press forward into Friuli and Carniola, and immunity from a Republican visitation was above all else important for the Vienna statesmen, governing as they did more or less discontented and heterogeneous populations that had not felt the pressure of war for a century and more If we neglect pure theory, and regard strategy as the handmaiden of statesmanship—which fundamentally it is—we cannot condemn the Vienna authorities unless it be first proved that they grossly exaggerated the possible results of Bonaparte's threatened irruption

Bassano.—When Masséna entered Trent on the morning of Sept. 5, Bonaparte became aware that the force in his front was a mere detachment, and news soon came in that Wurmser was in the Val Sugana about Primolano and at Bassano This move he supposed to be intended to cover Trieste He therefore informed the Directory that he could not proceed with the Tirol scheme, and spent one more day in driving Davidovich well away from Trent Then leaving Vaubois to watch him, Bonaparte marched Augereau and Masséna, with a rapidity he scarcely ever surpassed, into the Val Sugana Wurmser's rearguard was attacked and defeated again and again, and Wurmser himself felt compelled to stand and fight, in the hope of checking the pursuit before reaching the plains Half his army had already reached Montebello on the Verona road, and with the rear half he posted himself at Bassano, where on the 8th he was defeated with heavy losses Then began a strategic pursuit or general chase, and in this Bonaparte at first directed the pursuers so as to cut off Wurmser from Trieste, not fron Mantua Late on the 9th, Bonaparte realized that his opponent was heading for Mantua via Legnago and despite the fresh cast his net closed so rapidly that Wurmser barely succeeded in reaching Mantua on the 12th, with all the columns of the French, weary as most of them were, converging in hot pursuit After an attempt to keep the open field, defeated in a general action on the 15th, the relieving force was merged in the garrison, now some 28,000 in all So ended the episode of Bassano, the most brilliant feature of which was the marching power of the French infantry. Between the 5th and the 11th, besides fighting three actions, Masséna had marched 100m and Augereau 114

Alvintzi was now appointed to command a new army of relief Practically the whole of the fresh forces available were in Carniola, the military frontier, etc, while Davidovich was still in Tirol Alvintzi's intention was to assemble his new army (29,000) in Friuli, and to move on Bassano Meantime, Davidovich (18,000) was to capture Trent, and the two columns were to connect by the Val Sugana All being well, Alvintzi and Davidovich, still separate, were then to converge on the Adige between Verona and Legnago Wurmser was to co-operate by vigorous sorties. At this time Bonaparte's protective system was as follows. Kilmaine (9,000) investing Mantua, Vaubois (10,000) at Trent, and Masséna (9,000) at Bassano and Treviso, Augereau (9,000) and Macquard (3,000) at Verona and Villafranca constituting, for the first time in these operations, important mobile reserves. Hearing of Alvintzi's approach in good time, he meant first to drive back Davidovich, then with Augereau, Masséna, Macquard and 3,000 of Vaubois's force to fall upon Alvintzi who, he calculated, would at this stage have reached Bassano, and finally to send back a large force through the Val Sugana to attack Davidovich. This plan miscarried.

By Nov. 7 Davidovich had forced Vaubois back to Rivoli, and Alvintzi pressed forward within 5m. of Vicenza. Bonaparte watched carefully for an opportunity to strike out, and on the 8th

massed his troops closely around the central part of Verona. On the 9th, to give himself air, he ordered Masséna to join Vaubois, and to drive back Davidovich at all costs. But before this order was executed, reports came in that Davidovich had suspended his advance. The 10th and 11th were spent by both sides in relative inaction, the French waiting on events and opportunities, the Austrians resting after their prolonged exertions. Then on the afternoon of the 11th, being informed that Alvintzi was approaching, Bonaparte decided to attack him. On the 12th Alvintzi's advanced guard was assailed at Caldiero. But the troops in rear came up rapidly, and by 4 P.M. the French were defeated all along the line and in retreat on Verona. Bonaparte's situation was now indeed precarious. He was on "interior lines" it is true, but he had neither the force nor the space necessary for the delivery of rapid radial blows. Alvintzi was in superior numbers, as Caldiero had proved, and at any moment Davidovich, who had twice Vaubois' force, might advance to the attack of Rivoli. The reserves had proved insufficient, and Kilmaine had to be called up from Mantua, which was thus for the third time freed from the blockaders. Bonaparte chose a daring move on the enemy's rear in preference to the hazards of a retreat, though it was not until the evening of the 14th that he actually issued the fateful order.

The Austrians, too, had selected the 15th as the date of their final advance on Verona, Davidovich from the north, Alvintzi via Zevio from the south. But Bonaparte was no longer there; leaving Vaubois to hold Davidovich as best he might, he had collected the rest of his small army between Albaro and Ronco. His plan seems to have been to cross the Adige well in rear of the Austrians, to march north and establish himself on the Verona-Vicenza highway, where he could supply himself from their convoys. The troops passed the Adige in three columns near Ronco and Albaredo, and marched forward along the dikes, with deep marshes and pools on either hand. If Bonaparte's intention was to reach the dry open ground of San Bonifacio in rear of the Austrians, it was not realized, for the Austrian army, instead of being at the gates of Verona, was still between Caldiero and San Bonifacio, heading, as we know, for Zevio. Thus Alvintzi was able, easily and swiftly, to wheel to the south.

Arcola.—The battle of Arcola almost defies description. The first day passed in a series of resultless encounters between the heads of the columns as they met on the dikes. In the evening Bonaparte withdrew over the Adige, expecting every moment to be summoned to Vaubois' aid. But Davidovich remained inactive, and on the 16th the French again crossed the river. Masséna from Ronco advanced on Porcile, driving the Austrians along the causeway thither, but on the side of Arcola, Alvintzi had deployed a considerable part of his forces on the edge of the marshes, within musket shot of the causeway by which Bonaparte and Augereau had to pass, along the Austrian front, to reach the bridge of Arcola. In these circumstances the second day's battle was more murderous and no more decisive than the first, and again the French retreated to Ronco. But Davidovich again stood still, and with extraordinary resolution, Bonaparte ordered a third assault for the 17th, trying a fresh tactical move. Masséna again advanced on Porcile, Robert's brigade on Arcola, but the rest, under Augereau, were to pass the Alpone near its confluence with the Adige, and joining various small bodies which passed the main stream lower down, to storm forward on dry ground to Arcola. The Austrians, however, themselves advanced from Arcola, overwhelmed Robert's brigade on the causeway and almost reached Ronco. This was perhaps the crisis of the battle, for Augereau's force was now on the other side of the stream, and Masséna, with his back to the new danger, was approaching Porcile. But the fire of a deployed regiment stopped the head of the Austrian column; Masséna, turning about, cut into its flank on the dike; and Augereau, gathering force, was approaching Arcola from the south. The bridge and the village were evacuated soon afterwards, and Masséna and Augereau began to extend in the plain beyond. But the Austrians still sullenly resisted. It was at this moment that Bonaparte secured victory by a mere ruse, but a ruse which would have been unprofitable and ridiculous had it not been based on his fine sense of the moral conditions. Both sides were nearly fought out, and he sent a few trumpeters to the rear of the Austrian army to sound the charge. They did so, and in a few minutes the Austrians were streaming back to San Bonifacio. This ended the drama of Arcola, which more than any other episode of these wars, perhaps of any wars in modern history, centres on the personality of the hero. It is said that the French fought without spirit on the first day, and yet on the second and third Bonaparte had so thoroughly imbued them with his own will to conquer that in the end they prevailed over an enemy nearly twice their own strength.

The climax was reached just in time, for on the 17th Vaubois was completely defeated at Rivoli and withdrew to Peschiera, leaving the Verona and Mantua roads completely open to Davidovich. But on the 19th Bonaparte turned upon him, and combining the forces of Vaubois, Masséna and Augereau against him, drove him back to Trent. Meantime Alvintzi returned from Vicenza to San Bonifacio and Caldiero (Nov. 21), and Bonaparte at once stopped the pursuit of Davidovich. On the return of the French main body to Verona, Alvintzi finally withdrew, Wurmser, who had emerged from Mantua on the 23rd, was driven in again, and this epilogue of the great struggle came to a feeble end because neither side was now capable of prolonging the crisis. In Jan. 1797 Alvintzi renewed his advance with all the forces that could be assembled for a last attempt to save Mantua. At this time 8,000 men under Sérurier blockaded Mantua. Masséna (9,000) was at Verona, Joubert (Vaubois' successor) at Rivoli with 10,000, Augereau at Legnago with 9,000. In reserve were Rey's division (4,000) between Brescia and Montechiaro, and Victor's brigade at Goito and Castelnuovo. On the other side Alvintzi's location was the reverse of that in the previous campaign, for while he had 9,000 men under Provera at Padua, 6,000 under Bayalič at Bassano, he himself with 28,000 men stood in the Tirol about Trent. This time he intended to make his principal effort on the Rivoli side. Provera was to capture Legnago on Jan. 9, and Bayalič Verona on the 12th, while the main army was to deliver its blow against the Rivoli position on the 13th.

Rivoli.—The first marches of this scheme were duly carried out, and several days elapsed before Bonaparte was able to discern the direction of the real attack. Augereau fell back, skirmishing a little, as Provera's and Bayalič's advance developed. On the 11th, when the latter was nearing Verona, Alvintzi's leading troops appeared in front of the Rivoli position. On the 12th Bayalič, weakened by sending reinforcements to Alvintzi, made an unsuccessful attack on Verona, Provera, farther south, remaining inactive. On the 13th, Bonaparte, still in doubt, launched Masséna's division against Bayalič, who was driven back to San Bonifacio; but at the same time definite news came from Joubert that Alvintzi's main army was in front of La Corona. From this point begins the decisive, though by no means the most intense or dramatic, struggle of the campaign. Once he felt sure of the situation Bonaparte acted promptly. Joubert was ordered to hold on to Rivoli at all costs. Rey was brought up by a forced march to Castelnuovo, where Victor joined him, and ahead of them both Masséna was hurried on to Rivoli. Bonaparte himself joined Joubert on the night of the 13th. There he saw the watch-fires of the enemy in a semicircle around him, for Alvintzi, thinking that he had only to deal with one division, had begun a widespread enveloping attack. The horns of this attack were as yet so far distant that Bonaparte, instead of extending on an equal front, only spread out a few regiments to gain an hour or two and to keep the ground for Masséna and Rey, and on the morning of Jan. 14, with 10,000 men in hand against 26,000, he fell upon the central columns of the enemy as they advanced up the steep broken slopes of the foreground. The fighting was severe, but Bonaparte had the advantage. Masséna arrived at 9 A.M., and a little later the column of Quasdanovich, which had moved along the Adige and was now attempting to gain a foothold on the plateau in rear of Joubert, was crushed by the converging fire of Joubert's right brigade and by Masséna's guns, their rout being completed by the charge of a handful of cavalry under Lasalle. The right horn of Alvintzi's attack, when at last it swung in upon Bonaparte's rear, was caught between Masséna and the advancing troops of Rey and annihilated, and even before this the dispirited Austrians were in

full retreat A last alarm, caused by the appearance of a French infantry regiment in their rear (this had crossed the lake in boats from Salo), completed their demoralization, and though less than 2,000 had been killed and wounded, some 12,000 Austrian prisoners were left in the hands of the victors Rivoli was indeed a moral triumph After the ordeal of Arcola, the victory of the French was a foregone conclusion at each point of contact. Bonaparte refrained from striking so long as his information was incomplete, but he knew now from experience that his covering detachment, if well led, could not only hold its own without assistance until it had gained the necessary information, but could still give the rest of the army time to act upon it Then, when the centre of gravity had been ascertained, the French divisions hurried thither, caught the enemy in the act of manoeuvring and broke them up And if that confidence in success which made all this possible needs a special illustration, it may be found in Bonaparte sending Murat's regiment over the lake to place a mere 2,000 bayonets across the line of retreat of a whole army Alvintzi's manoeuvre was faulty neither strategically in the first instance, nor tactically as regards the project of enveloping Joubert on the 14th It failed because, apart from Bonaparte's genius, Joubert and his men were better soldiers than their Austrian opponents, and because a French division could move twice as fast as an Austrian division, and from these two factors a new form of war was evolved, the essence of which was that, for a given time and in a given area, a small force of the French should engage and hold a much larger force of the enemy

The remaining operations can be very briefly summarized Provera, still advancing on Mantua, joined hands there with Wurmser, and for a time held Sérurier at a disadvantage But hearing of this, Bonaparte sent back Masséna from the field of Rivoli, and that general, with Augereau and Sérurier, not only forced Wurmser to retire again into the fortress, but compelled Provera to lay down his arms And on Feb 2, 1797, Mantua, and with it what was left of Wurmser's army, surrendered The campaign of 1797, which ended the war of the First Coalition, was the brilliant sequel of these hard-won victories Austria had decided to save Mantua at all costs, and had lost her armies in the attempt, a loss which was not compensated by the "strategic" victories of the archduke Thus the Republican "visitation" of Carinthia and Carniola was one swift march—politically glorious, if dangerous from a purely military standpoint—of Bonaparte's army to the Semmering The archduke, who was called thither from Germany, could do no more than fight a few rearguard actions and make threats against Bonaparte's rear, which the latter, with his usual "tact," ignored

On the Rhine, as in 1795 and 1796, the armies of the Sambre-and-Meuse (Hoche) and the Rhine-and-Moselle (Moreau) were opposed by the armies of the Lower Rhine (Werneck) and of the Upper Rhine (Latour) Moreau crossed the river near Strasbourg and fought a series of minor actions Hoche, like his predecessors, crossed at Dusseldorf and Neuwied and fought his way to the Lahn, where for the last time in the history of these wars, there was an irregular widespread battle But Hoche, in this his last campaign, displayed the brilliant energy of his first, and delivered the "series of incessant blows" that Carnot had urged upon Jourdan the year before Werneck was driven with ever-increasing losses from the lower Lahn to Wetzlar and Giessen Thence, pressed hard by the French left wing under Championnet, he retired on the Nidda, only to find that Hoche's right had swung completely round him Nothing but the news of the armistice of Leoben saved him from envelopment and surrender This general armistice was signed by Bonaparte, on his own authority and to the intense chagrin of the Directory and of Hoche, on April 18, and was the basis of the peace of Campo Formio.

BONAPARTE IN EGYPT

Within the scope of this article, yet far more important from its political and personal than from its general military interest, comes the expedition of Bonaparte to Egypt and its sequel (*See* also EGYPT *History;* NAPOLEON, etc) Bonaparte left Toulon on May 19, 1798, at the same time as his army (40,000 strong in 400 transports) embarked secretly at various ports. Nelson's fleet was evaded, and, capturing Malta *en route,* the armada reached the coast of Egypt on July 1. The Republicans stormed Alexandria on the 2nd Between Embabeh and Gizeh, on the left bank of the Nile, 60,000 Mamelukes were easily dispersed on the 21st (battle of the Pyramids), the French for the most part marching and fighting in the chequer of infantry squares that afterwards became the classical formation for desert warfare While his lieutenants pursued the more important groups of the enemy, Bonaparte entered Cairo in triumph, and proceeded to organize Egypt as a French protectorate Meantime Nelson, though too late to head off the expedition, had annihilated the squadron of Admiral Brueys This blow severed the army from the home country, and destroyed all hope of reinforcements But to eject the French already in Egypt, military invasion of that country was necessary The first attempts at this were made in September by the Turks as overlords of Egypt. Bonaparte—after suppressing a revolt in Cairo—marched into Syria to meet them, and captured El Arish and Jaffa; at the latter place the prisoners, whom he could afford neither to feed, to release, nor to guard, were shot by his order But he was brought to a standstill (March 17–May 20) before the half-defensible fortifications of Acre, held by a Turkish garrison and animated by the leadership of Sir Sidney Smith (*q v*) In May, though meantime a Turkish relieving army had been severely beaten in the battle of Mount Tabor (April 16, 1799), Bonaparte gave up his enterprise and returned to Egypt, where he won a last victory in annihilating at Aboukir, with 6,000 of his own men, a Turkish army 18,000 strong that had landed there (July 25, 1799) With this tactical success to set against the Syrian reverses, he handed over the command to Kléber and returned to France (Aug 22) to ride the storm in a new *coup d'état,* the "18th Brumaire " Kléber, attacked by the English and Turks, concluded the convention of El Arish (Jan. 27, 1800), whereby he secured free transport for the army back to France But this convention was disavowed by the British Government, and Kléber prepared to hold his ground On March 20, 1800, he thoroughly defeated the Turkish army at Heliopolis and recovered Cairo, and French influence was once more in the ascendant in Egypt, when its director was murdered by a fanatic on June 14, the day of Marengo Kléber's successor, the incompetent Menou, fell an easy victim to the British expeditionary force under Sir Ralph Abercromby in 1801 The British forced their way ashore at Aboukir on March 8 On the 21st Abercromby won a decisive battle, and himself fell in the hour of victory. (*See* ALEXANDRIA. *Battle of 1801*) His successor, Gen Hely Hutchinson, slowly followed up this advantage, and received the surrender of Cairo in July and of Alexandria in August, the débris of the French army being given free passage back to France Meantime a mixed force of British and native troops from India, under Sir David Baird, had landed at Kosseir and marched across the desert to Cairo

THE WAR OF THE SECOND COALITION

In the autumn of 1798, while Bonaparte's Egyptian expedition was in progress, and the Directory was endeavouring at home to reduce the importance and the predominance of the army and its leaders, the Powers of Europe once more allied themselves, not now against the principles of the Republic, but against the Treaty of Campo Formio Russia, Austria, England, Turkey, Portugal, Naples and the pope formed the Second Coalition The war began with an advance into the Roman States by a worthless and ill-behaved Neapolitan army (commanded, much against his will, by Mack), which the French troops under Championnet destroyed with ease Championnet then revolutionized Naples After this unimportant prelude the curtain rose on a general European war. The Directory, which now had at its command neither numbers nor enthusiasm, prepared as best it could to meet the storm Four armies, numbering only 160,000, were set on foot, in Holland (Brune, 24,000); on the Upper Rhine (Jourdan, 46,000); in Switzerland, which had been occupied in 1798 (Masséna, 30,000); and in Upper Italy (Schérer, 60,000). In addition there was Championnet's army, now commanded by Macdonald, in southern Italy. All these forces the Directory ordered, in Jan. and Feb. 1799, to assume the offensive.

Stokach.—Jourdan, in the Constance and Schaffhausen region, had only 40,000 men against the Archduke Charles's 80,000, and was soon brought to a standstill and driven back on Stokach. The archduke had won these preliminary successes with seven-eighths of his army acting as one concentrated mass. But as he had only encountered a portion of Jourdan's army, he became uneasy as to his flanks, checked his bold advance, and ordered a reconnaissance in force. This practically extended his army while Jourdan was closing his, and thus the French began the battle of Stokach (March 25) in superior numbers, and it was not until late in the day that the archduke brought up sufficient strength (60,000) to win a victory. This was a battle of the "strategic" type, a widespread straggling combat in which each side took 15 hours to inflict a loss of 12% on the other, and which ended in Jourdan accepting defeat and drawing off, unpursued by the magnificent Austrian cavalry, though they counted five times as many sabres as the French.

The French secondary army in Switzerland was in the hands of the bold and active Masséna The forces of both sides in the Alpine region were, from a military point of view, mere flank guards to the main armies on the Rhine and the Adige But unrest, amounting to civil war, among the Swiss and Grison peoples tempted both Governments to give these flank guards considerable strength

Masséna in Switzerland.—The Austrians in the Vorarlberg and Grisons were under Hotze, who had 13,000 men at Bregenz, and 7,000 commanded by Auffenberg around Chur, with, between them, 5,000 men at Feldkirch and a post of 1,000 in the strong position of the Luziensteig near Mayenfeld Masséna's available force was about 20,000, and he used almost the whole of it against Auffenberg The Rhine was crossed by his principal column near Mayenfeld, and the Luziensteig stormed (March 6), while a second column from the Zurich side descended upon Disentis and captured its defenders In three days Auffenberg's division was broken up, Oudinot meanwhile holding off Hotze by a hard-fought combat at Feldkirch (March 7) But a second attack on Feldkirch made on the 23rd by Masséna was repulsed and the advance of his left wing came to a standstill Behind Auffenberg and Hotze was Bellegarde in Tirol with some 47,000 men Most of these were stationed north of Innsbruck and Landeck, probably as a sort of strategic reserve to the archduke The rest, with the assistance of the Tirolese themselves, were to ward off irruptions from Italy Here the French offensive was entrusted to two columns, one from Masséna's command under Lecourbe, the other from the Army of Italy under Dessolle Simultaneously with Masséna, Lecourbe marched from Bellinzona with 10,000 men, by the San Bernardino pass into the Splugen valley, and thence over the Julier pass into the upper Engadine. A small Austrian force under Loudon attacked him near Zernetz, but was after three days of rapid manoeuvres and bold tactics driven back to Martinsbruck, with considerable losses. But ere long the country people flew to arms, and Lecourbe found himself between two fires, the levies occupying Zernetz and Loudon's regulars Martinsbrück. But though he had only some 5,000 of his original force left, he was not disconcerted, and by driving back the levies into the high valleys whence they had come, and constantly threatening Loudon, he was able to maintain himself and to wait for Dessolles The latter, moving up the Valtelline, fought his way to the Stelvio pass, but beyond it the defile of Tauffers (south-west of Glurns), was entrenched by Loudon, who thus occupied a position midway between the two French columns, while his irregulars beset all the passes and ways giving access to the Vintschgau and the lower Engadine In this situation the French should have been destroyed in detail But as usual their speed and dash gave them the advantage in every manoeuvre and at every point of contact.

Operations in Tirol.—On the 25th Lecourbe and Dessolles attacked Loudon at Nauders in the Engadine and Tauffers in the Vintschgau respectively. At Nauders the French passed round the flanks of the defence by scrambling along the high mountain crests adjacent, while at Tauffers, the assailants, only 4,500 strong, descended into a deep ravine, debouched unnoticed in the Austrians' rear, and captured 6,000 men and 16 guns. The Austrian leader with a couple of companies made his way through Glurns to Nauders, and there, finding himself headed off by Lecourbe, he took to the mountains. His corps, like Auffenberg's, was annihilated This ended the French general offensive. Jourdan had been defeated by the archduke and forced or induced to retire over the Rhine Masséna was at a standstill before the strong position of Feldkirch, and the Austrians of Hotze were still massed at Bregenz, but the Grisons were revolutionized, two strong bodies of Austrians numbering in all about 20,000 men had been destroyed, and Lecourbe and Dessolles had advanced far into Tirol A pause followed The Austrians in the mountains needed time to concentrate and to recover from their astonishment. The archduke fell ill, and the Vienna war council forbade his army to advance lest Tirol should be "uncovered," though Bellegarde and Hotze still disposed of numbers equal to those of Masséna and Lecourbe Masséna succeeded Jourdan in general command on the French side and promptly collected all available forces of both armies in the hilly non-Alpine country between Basle, Zurich and Schaffhausen, thereby directly barring the roads into France (Berne-Neuchâtel-Pontarlier and Basle-Besançon) which the Austrians appeared to desire to conquer. The protection of Alsace and the Vosges was left to the fortresses. There was no suggestion, it would appear, that the Rhine between Basle and Schaffhausen was a flank position sufficient of itself to bar Alsace to the enemy

It is now time to turn to events in Italy, where the Coalition intended its principal effort At the beginning of March the French had 80,000 men in Upper Italy and some 35,000 in the heart of the Peninsula, the latter engaged chiefly in supporting newly-founded republics Of the former, 53,000 formed the field army on the Mincio under Schérer. The Austrians, commanded by Kray, numbered in all 84,000, but detachments reduced this figure to 67,000, of whom, moreover, 15,000 had not yet arrived when operations began They were to be joined by a Russian contingent under the celebrated Suvórov, who was to command the whole on arrival, and whose extraordinary personality gives the campaign its special interest. Kray himself was a resolute soldier, and when the French, obeying the general order to advance, crossed the Adige, he defeated them in a severely fought battle at Magnano near Verona (March 5) The war, however, was undertaken not to annihilate, but to evict the French, and, probably under orders from Vienna, Kray allowed the beaten enemy to depart

Suvórov.—Suvórov appeared with 17,000 Russians on April 4 His first step was to set Russian officers to teach the Austrian troops—whose feelings can be imagined—how to attack with the bayonet, his next to order the whole army forward. The Allies broke camp on April 17, 18 and 19, and on the 20th, after a forced march of close on 30m , they passed the Chiese Brescia had a French garrison, but Suvórov soon cowed it into surrender by threats of a massacre, which no one doubted that he would carry into execution At the same time, dissatisfied with the marching of the Austrian infantry, he sent the following characteristic reproof to their commander: "The march was in the service of the Kaiser. Fair weather is for my lady's chamber, for dandies, for sluggards. He who dares to cavil against his high duty is, as an egoist, instantly to vacate his command. Whoever is in bad health can stay behind The so-called reasoners do no army any good . . ." One day later, under this unrelenting pressure, the advanced posts of the Allies reached Cremona and the main body the Oglio The pace became slower in the following days, as many bridges had to be made, and meanwhile Moreau, Schérer's successor, prepared with a mere 20,000 men to defend the Adda On the 26th he was attacked all along the line. The moral supremacy had passed over to the Allies. Melas, under Suvórov's stern orders, flung his battalions, regardless of losses, against the strong position of Cassano. The story of 1796 repeated itself with the rôles reversed. The passage was carried, and the French rearguard under Sérurier was surrounded and captured by an inferior corps of Austrians. The Austrians (the Russians at Lecco were hardly engaged) lost 6,000 men, but they took 7,000 prisoners, and in all Moreau's little army lost half its numbers and retreated in many disconnected bodies to the Ticino, and thence to Alessandria.

Everywhere the Italians turned against the French, mindful of the exactions of their commissaries The strange Cossack cavalry that western Europe had never yet seen entered Milan on April 29, 11 days after passing the Mincio, and next day the city received with enthusiasm the old field-marshal, whose exploits against the Turks had long invested him with a halo of romance and legend Here, for the moment, Suvórov's offensive culminated He desired to pass into Switzerland and to unite his own, the archduke's, Hotze's and Bellegarde's armies in one powerful mass But the emperor would not permit the execution of this scheme until all the fortresses held by the enemy in Upper Italy should have been captured In any case, Macdonald's army in southern Italy, cut off from France by the rapidity of Suvórov's onslaught, and now returning with all speed to join Moreau by force or evasion, had still to be dealt with

Suvórov's mobile army, originally 90,000 strong, had now dwindled, by reason of losses and detachments to sieges, to half that number, and serious differences arose between the Vienna Government and himself If he offended the pride of the Austrian army, he was at least respected as a leader who gave it victories, but in Vienna he was regarded as a madman who had to be kept within bounds But at last, when he was becoming thoroughly exasperated by this treatment, Macdonald came within striking distance and the active campaign recommenced In the second week of June, Moreau, who had retired into the Apennines about Gavi, advanced with the intention of drawing upon himself troops that would otherwise have been employed against Macdonald He succeeded, for Suvórov with his usual rapidity collected 40,000 men at Alessandria, only to learn that Macdonald with 35,000 men was coming up on the Parma road When this news arrived, Macdonald had already engaged an Austrian detachment at Modena and driven it back, and Suvórov found himself between Moreau and Macdonald with barely enough men under his hand to enable him to play the game of "interior lines" But at the crisis the rough energetic warrior who despised "raisonneurs," displayed generalship of the first order, and taking in hand all his scattered detachments, he manoeuvred them in the Napoleonic fashion.

The Trebbia.—On the 14th Macdonald was calculated to be between Modena, Reggio and Carpi, but his destination was uncertain Would he continue to hug the Apennines to join Moreau, or would he strike out northwards against Kray, who with 20,000 men was besieging Mantua? From Alessandria it is four marches to Piacenza and nine to Mantua, while from Reggio these places are four and two marches respectively Piacenza, therefore, was the crucial point if Macdonald continued westward, while in the other case nothing could save Kray but the energetic conduct of Hohenzollern's detachment, which was posted near Reggio. This, however, was soon forced over the Po, and Ott, advancing from Cremona to join it, found himself sharply pressed in turn The field-marshal had hoped that Ott and Hohenzollern together would be able to win him time to assemble at Parma, where he could bring on a battle whichever way the French took But on receipt of Ott's report he was convinced that Macdonald had chosen the western route and ordering Ott to delay the French as long as possible by stubborn rearguard actions and to put a garrison into Piacenza under a general who was to hold out "on peril of his life and honour," he collected what forces were ready to move and hurried towards Piacenza, the rest being left to watch Moreau. He arrived just in time When after three forced marches the main body (only 26,000 strong) reached Castel San Giovanni, Ott had been driven out of Piacenza, but the two joined forces safely Both Suvórov and Macdonald spent the 17th in closing up and deploying for battle The respective forces were Allies, barely 25,000, French, 35,000 Suvórov believed the enemy to be only 26,000 strong, and chiefly raw Italian regiments, but his temperament would not have allowed him to stand still even had he known his inferiority. He had already issued one of his peculiar battle-orders, which began with the words. "The hostile army will be taken prisoners" and continued with directions to the Cossacks to spare the surrendered enemy But Macdonald was too full of energy, and believed still that he could annihilate Ott before Suvórov's arrival. Thus the battle of the Trebbia (June 17–19) was fought by both sides in the spirit of the offensive It was one of the most severe struggles in the Republican wars, and it ended in Macdonald's retreat with a loss of 15,000 men—probably 6,000 in the battle and 9,000 killed and prisoners when and after the equilibrium was broken—for Suvórov, unlike other generals, had the necessary surplus of energy, after all the demands made upon him by a great battle, to order and to direct an effective pursuit The Allies lost about 6,000 Macdonald retreated to Modena, harassed by the peasantry, and finally recrossed the Apennines and made his way to Genoa The battle of the Trebbia is one of the most clearly defined examples in military history of the result of moral force—it was a matter not merely of energetic leading *on* the battlefield, but far more of educating the troops beforehand to meet the strain, of ingraining in the soldier the determination to win at all costs

To return now to the Alpine region, where the French offensive had culminated at the end of March Their defeated left was behind the Rhine in the northern part of Switzerland, the half-victorious centre athwart the Rhine between Mayenfeld and Chur, and their wholly victorious right far within Tirol between Glurns, Nauders and Landeck But neither the centre nor the right could maintain itself The forward impulse given by Suvórov spread along the whole Austrian front from left to right Dessolles' column (now under Loison) was forced back to Chiavenna Bellegarde drove Lecourbe from position to position towards the Rhine during April There Lecourbe added to the remnant of his expeditionary column the outlying bodies of Masséna's right wing, but even so he had only 8,000 men against Bellegarde's 17,000, and he was now exposed to the attack of Hotze's 25,000 as well The Luziensteig fell to Hotze and Chur to Bellegarde, but the defenders managed to escape from the converging Austrian columns into the valley of the Reuss Having thus reconquered all the lost ground and forced the French into the interior of Switzerland, Bellegarde and Hotze parted company, the former marching with the greater part of his forces to join Suvórov, the latter moving to his right to reinforce the archduke. Only a chain of posts was left in the Rhine valley between Disentis and Feldkirch The archduke's operations now recommenced

Charles and Hotze stood, about May 15, at opposite ends of the lake of Constance The two together numbered about 88,000 men, but both had sent away numerous detachments to the flanks, and the main bodies dwindled to 35,000 for the archduke, and 20,000 for Hotze Masséna, with 45,000 men in all, retired slowly from the Rhine to the Thur Pressed by the combined forces he continued to yield ground until at last he halted in the position he had prepared for defence at Zurich He had only 25,000 men in hand, owing to detachments, to cover his right and his left These 25,000 occupied an entrenched position 5m in length, against which the Austrians, detaching as usual many posts to protect their flanks and rear, deployed only 42,000 men, of whom 8,000 were sent on a wide turning movement and 8,000 held in reserve 4m. in rear of the battlefield. Thus the frontal attack was made with forces not much greater than those of the defence and it failed accordingly (June 4) But Masséna, fearing perhaps to strain the loyalty of the Swiss to their French-made constitution by exposing their town to assault and sack, retired on the 5th to the valley of the Aar between Baden and Lucerne The archduke did not seek to press Masséna, and for two months operations were at a standstill

Döttingen.—Ere mid-August, Lecourbe, who formed a loose right wing of the French army in the Reuss valley, was reinforced to a strength of 25,000 men, and pounced upon the extended left wing of the enemy, which had stretched itself, to keep pace with Suvórov, as far westward as the St. Gothard. The movement began on the 14th, and in two days the Austrians were driven back from the St. Gothard and the Furka to the line of the Linth, with the loss of 8,000 men and many guns. At the same time an attempt to take advantage of Masséna's momentary weakness by forcing the Aar at Döttingen near its mouth failed completely (Aug 16–17) This was the end of the archduke's campaign in Switzerland Though he would have preferred to continue it, the Vienna Government desired him to return to Germany. An Anglo-Russian

expedition was about to land in Holland,[1] and the French were assembling fresh forces on the Rhine, and, with the double object of preventing an invasion of South Germany and of inducing the French to augment their forces in Alsace at the expense of those in Holland, the archduke left affairs in Switzerland to Hotze and a fresh Russian force under Korsákov, and marched away to the Black Forest. His new campaign never rose above the level of a war of posts and manoeuvres about Mannheim and Philippsburg

Suvórov's last exploit in Italy coincided in time, but in no other respect, with the skirmish at Dottingen. Returning swiftly from the battlefield of the Trebbia, he began to drive back Moreau to the Riviera At this point Joubert succeeded to the command on the French side, and against the advice of his generals, gave battle Equally against the advice of his own subordinates, Suvórov accepted it, and won his last great victory at Novi on Aug 13, Joubert being killed, and only a third of his army making good its retreat This was followed by another rapid march against a new French "Army of the Alps" which had entered Italy by way of the Mt Cenis But immediately after this he left all further operations in Italy to Melas, and himself, with the Russians and an Austrian corps, marched away for the St. Gothard to combine operations against Masséna with Hotze and Korsákov. It was with a heavy heart that he left the scene of his battles, in which the force of his personality had carried the old-fashioned "linear" armies for the last time to complete victory He had himself urged an advance into France, but the Vienna Government had been unwilling, for their interest was concentrated on Italy The Tsar Paul I., annoyed with the Austrians, ordered Suvórov to bring back the Russian army, through Switzerland and thence to South Germany The archduke had already left Switzerland, and was committed to a resultless warfare in the high mountains, with an army which was a mere detachment and in the hope of co-operating with two other detachments far away on the other side of Switzerland

In loyalty to the formal order of his sovereign Suvórov prepared to carry out his instructions Masséna's command (77,000 men) was distributed, at the beginning of September, along an enormous S, from the Simplon through the St. Gothard and Glarus, and along the Linth, the Zuricher See and the Limmat to Basle Opposite the lower point of this S, Suvórov (28,000 men) was about to advance Hotze's corps (25,000 Austrians), extending from Utznach by Chur to Disentis, formed a thin line roughly parallel to the lower curve of the S, Korsákov's Russians (30,000) were opposite the centre at Zurich, while Nauendorff with a small Austrian corps at Waldshut faced the extreme upper point Thus the only completely safe way in which Suvórov could reach the Zurich region was by skirting the lower curve of the S, under protection of Hotze But this détour would be long and painful, and the ardent old man preferred to cross the mountains once for all at the St Gothard, and to follow the valley of the Reuss to Altdorf and Schwyz—*ie*, to strike vertically upward to the centre of the S—and to force his way through the French cordon to Zurich, and if events, so far as concerned his own corps, belied his optimism, they at any rate justified his choice of the shortest route. For, aware of the danger gathering in his rear, Masséna gathered up all his forces within reach towards his centre, leaving Lecourbe to defend the St. Gothard and the Reuss valley and Soult on the Linth. On Sept 24 he forced the passage of the Limmat at Dietikon On the 25th, in the second battle of Zürich, he completely routed Korsákov, who lost 8,000 killed and wounded, large numbers of prisoners and 100 guns. All along the line the Allies fell back, one corps after another, at the moment when Suvórov was approaching the foot of the St Gothard

Suvórov in the Alps.—On the 21st his headquarters were at Bellinzona, where he made the final preparations. Expecting to be four days *en route* before he could reach the nearest friendly magazine, he took his supply trains with him, which inevitably augmented the difficulties of the expedition. On the 24th Airolo was taken, but when the far greater task of storming the pass presented itself before them, even the stolid Russians were terrified, and only the passionate protests of the old man, who reproached his "children" with deserting their father in his extremity, induced them to face the danger. At last after 12 hours' fighting the summit was reached The same evening Suvórov pushed on to Hospenthal, while a flanking column from Disentis made its way towards Amsteg over the Crispalt Lecourbe was threatened in rear and pressed in front, and his engineers, to hold off the Disentis column, had broken the Devil's bridge Discovering this, he left the road, threw his guns into the river and made his way by fords and water-meadows to Goschenen, where by a furious attack he cleared the Disentis troops off his line of retreat. His rearguard meantime held the ruined Devil's bridge This point and the tunnel leading to it, called the Urner Loch, the Russians attempted to force, with the most terrible losses, battalion after battalion crowding into the tunnel and pushing the foremost ranks into the chasm left by the broken bridge But at last a ford was discovered and the bridge, cleared by a turning movement, was repaired More broken bridges lay beyond, but at last Suvórov joined the Disentis column near Goschenen When Altdorf was reached, however, Suvórov found not only Lecourbe in a threatening position, but an entire absence of boats on the Lake of the Four Cantons. It was impossible (in those days the Axenstrasse did not exist) to take an army along the precipitous eastern shore; and thus, passing through one trial after another, each more severe than the last, the Russians, men and horses and pack animals in an interminable single file, ventured on the path leading over the Kinzig pass into the Muotta Thal The passage lasted three days, the leading troops losing men and horses over the precipices, the rearguard from the fire of the enemy, now in pursuit And at last, on arrival in the Muotta Thal, Suvórov received definite information that Korsákov's army was no longer in existence Yet even so it was long before he could make up his mind to retreat, and the pursuers gathered on all sides Fighting, sometimes severe, and never altogether ceasing, went on day after day as the Allied column, now reduced to 15,000 men, struggled on over one pass after another, but at last it reached Ilanz on the Vorder Rhine (Oct 8) The Archduke Charles meanwhile had, on hearing of the disaster of Zurich, brought over a corps from the Neckar, and for some time negotiations were made for a fresh combined operation against Masséna But these came to nothing, for the archduke and Suvórov could not agree, either as to their own relations or as to the plan to be pursued Practically, Suvórov's retreat from Altdorf to Ilanz closed the campaign It was his last active service, and formed a gloomy but grand climax to the career of the greatest soldier who ever wore the Russian uniform

MARENGO AND HOHENLINDEN

The disasters of 1799 sealed the fate of the Directory, and placed Bonaparte, who returned from Egypt with the prestige of a recent victory, in his natural place as civil and military head of France In the course of the campaign the field strength of the French had been gradually augmented, and in spite of losses now numbered 227,000 at the front These were divided into the army of Batavia, Brune (25,000), the army of the Rhine, Moreau (146,000), the army of Italy, Masséna (56,000), and, in addition, there were some 100,000 in garrisons and depots in France Most of these field armies were in a miserable condition owing to the losses and fatigues of the last campaign The treasury was empty and credit exhausted, and worse still—for spirit and enthusiasm, as in 1794, would have remedied material deficiencies—the conscripts obtained under Jourdan's law of 1798 came to their regiments most unwillingly. Most of them, indeed, deserted on their way to join the colours A large draft sent to the Army of Italy arrived with 310 men instead of 10,250, and after a few such experiences, the First Consul decided that the untrained men were to be assembled in the fortresses of the interior and afterwards sent to the active battalions in numerous small drafts, which they could more easily assimilate. Besides accomplishing the immense task of reorganizing existing forces, he created new

[1] For this expedition, which was repulsed by Brune in the battle of Castricum, *see* Fortescue's *History of the British Army*, vol. iv, and Sachot's *Brune en Hollande*

ones, including the Consular Guard, and carried out at this moment of crisis two such far-reaching reforms as the replacement of the civilian drivers of the artillery by soldiers, and of the hired teams by horses belonging to the State, and the permanent grouping of divisions in army corps

The Army of Reserve.—As early as Jan 25, 1800, the First Consul provided for the assembly of all available forces in the interior in an "Army of Reserve." He reserved to himself the command of this army,[1] which gradually came into being as the pacification of Vendée and the return of some of Brune's troops from Holland set free the necessary nucleus troops The conscription law was stringently reinforced, and impassioned calls were made for volunteers (the latter, be it said, did not produce 500 useful men) The district of Dijon, partly as being central with respect to the Rhine and Italian armies, partly as being convenient for supply purposes, was selected as the zone of assembly As for the process of assembling it, we can scarcely imagine one which required more accurate and detailed staff work —correspondence with the district commanders, with the adjutant-generals of the various armies, and orders to the civil authorities on the lines of march, to the troops themselves and to the arsenals and magazines No one but Bonaparte, even aided by a Berthier, could have achieved so great a task in six weeks, and the great captain, himself doing the work that nowadays is apportioned amongst a crowd of administrative staff officers, still found time to administer France's affairs at home and abroad, and to think out a general plan of campaign that embraced Moreau's, Masséna's and his own armies

The Army of the Rhine, by far the strongest and best equipped, lay on the upper Rhine. The small and worn-out Army of Italy was watching the Alps and the Apennines from Mt Blanc to Genoa Between them Switzerland, secured by the victory of Zurich, offered a starting-point for a turning movement on either side—this year the advantage of the flank position was recognized and acted upon The Army of Reserve was assembling around Dijon, within 200m of either theatre of war The general plan was that the Army of Reserve should march through Switzerland to close on the right wing of the Army of the Rhine Thus supported to whatever degree might prove to be necessary, Moreau was to force the passage of the Rhine about Schaffhausen, to push back the Austrians rapidly beyond the Lech, and then, if they took the offensive in turn, to hold them in check for 10 or 12 days During this period of guaranteed freedom the decisive movement was to be made—a swoop along an immense arc on to the rear of the Austrians who had penned Masséna into the north-west corner of Italy The Army of Reserve, augmented by one large corps of the Army of the Rhine, was to descend by the Splugen (alternatively by the St Gothard and even by Tirol) into the plains of Lombardy. Magazines were to be established at Zürich and Lucerne (not at Chur, lest the plan should become obvious from the beginning), and all likely routes reconnoitred in advance. The Army of Italy was at first to maintain a strict defensive, and then to fix the Austrians until the entry of the reserve army into Italy was assured

But Moreau was tardy in moving, and at the beginning of April the enemy took the offensive against Masséna On the 8th Melas's right wing dislodged the French from the Mt Cenis, and most of the troops that had then reached Dijon were shifted southward to be ready for emergencies By the 25th Berthier reported that Masséna was seriously attacked and that he might have to be supported by the shortest route, *i.e.*, the more westerly passes. Bonaparte's resolution was already taken He waited no longer for Moreau (who, indeed, so far from volunteering assistance, actually demanded it for himself). Convinced from the paucity of news that Masséna's army was closely pressed and probably severed from France, and feeling also that the Austrians were deeply committed to their struggle with the Army of Italy, he told Berthier to march with 40,000 men at once by way of the St. Bernard unless otherwise advised. Berthier protested that he had only 25,000 effectives, and the equipment and armament were still far from complete—as indeed they remained to the end —but the troops marched, though their very means of existence were precarious from the time of leaving Geneva to the time of reaching Milan, for nothing could extort supplies and money from the sullen Swiss

Bonaparte's Plan of Campaign.—At the beginning of May the First Consul learned of the serious plight of the Army of Italy. Masséna with his right wing was shut up in Genoa, Suchet with the left wing driven back to the Var Meanwhile Moreau had won a preliminary victory at Stokach, and the Army of Reserve had begun its movement to Geneva With these data the plan of campaign took a clear shape at last—Masséna to resist as long as possible; Suchet to resume the offensive, if he could do so, towards Turin; the Army of Reserve to pass the Alps and to debouch into Piedmont by Aosta and Ivrea, the Army of the Rhine to send a strong force into Italy by the St Gothard Bonaparte left Paris on May 6 Gradually, and with immense efforts, Berthier's leading troops were passed over the snow-clad St Bernard, drawing their artillery on sledges, on the 15th and succeeding days. Driving away small posts of the Austrian army, the advance guard entered Aosta on the 16th—and the alarm was given. Melas, committed as he was to his Riviera campaign, began to look to his right rear, but he was far from suspecting the seriousness of his opponent's purpose. Infinitely more dangerous for the French than the small detachment that Melas opposed to them, or even the actual crossing of the pass, was the unexpected stopping power of the little fort of Bard The advanced guard of the French appeared before it on the 19th, and after three wasted days the infantry managed to find a difficult mountain by-way and to pass round the obstacle Ivrea was occupied on the 23rd, and Bonaparte hoped to assemble the whole army there by the 27th But except for a few guns that with infinite precautions were smuggled one by one through the streets of Bard, the whole of the artillery, as well as a detachment to besiege the fort, had to be left behind Bard surrendered on June 2, having delayed the infantry of the French army for four days and the artillery for a fortnight

The military situation in the last week of May, as it presented itself to Bonaparte, at Ivrea, was this. The Army of Italy under Masséna was closely besieged in Genoa, where provisions were running short and the population hostile But Masséna was no ordinary general, and Bonaparte knew that while Masséna lived the garrison would resist to the last extremity Suchet was defending Nice and the Var by vigorous minor operations The Army of Reserve, the centre of which had reached at Ivrea the edge of the Italian plains, consisted of four weak army corps under Victor, Duhesme, Lannes and Murat There were still to be added to this small army of 34,000 effectives, Turreau's division, which had passed over the Mt Cenis and was aproaching Turin, Moncey's corps of the Army of the Rhine, which had at last been extorted from Moreau and was due to pass the St Gothard before the end of May, Chabran's division left to besiege Bard, and a small force under Béthencourt, which was to cross the Simplon and to descend by Arona (this place proved in the event a second Bard and immobilized Béthencourt until after the decisive battle). Thus it was only the simplest part of Bonaparte's task to concentrate half his army at Ivrea, and he had yet to bring in the rest The problem was to reconcile the necessity for time which he wanted to ensure the maximum force being brought over the Alps, with the necessity for haste, in view of the impending fall of Genoa As early as May 14 he had informed Moncey that from Ivrea the Army of Reserve would move on Milan On May 25 he ordered Lannes (advanced guard) to push out on the Turin road, "in order to deceive the enemy and to obtain news of Turreau," and Duhesme's and Murat's corps to proceed along the Milan road.

The March to Milan.—Very few of Bonaparte's acts of generalship have been more criticized than this resolution to march on Milan, which abandoned Genoa to its fate and gave Melas a week's leisure to assemble his scattered forces. But to hasten to Genoa would, in Bonaparte's eyes, have been playing the enemy's

[1] He afterwards appointed Berthier to command the Army of Reserve, but himself accompanied it and directed it, using Berthier as chief of staff.

game, for they would have concentrated at Alessandria, facing west "in their natural position." The course which he took gave his army the enemy's depôts at Milan, of which it unquestionably stood in sore need, and the reinforcement of Moncey's 15,000 men from the Rhine, while at the same time Moncey's route offered an "assured line of retreat" by the Simplon and the St. Gothard. Above all, it provided him with a "natural position" across Melas's rear—that strategic barrage which seems to have been the initial objective of most of his manoeuvres against the enemy's rear For such a position, offering natural obstacles, afforded him a secure pivot from which to prepare a warm embrace for the enemy, whose natural tendency, when cut off from their line of retreat and supply, was to turn and flow back, often in driblets, towards him Once possessed of Milan, Bonaparte says, he could have engaged Melas with a light heart and with confidence in the greatest possible results of a victory, whether the Austrians sought to force their way back to the east by the right or the left bank of the Po. Thus, we are justified in assuming that his object was not the relief of Genoa, but the most thorough defeat of Melas's field army, to which end, putting all sentiment aside, he treated the hard-pressed Masséna as a "containing force" to keep Melas occupied during the strategical deployment of the Army of Reserve In the beginning he had told Masséna that he would "disengage" him, even if he had to go as far east as Trent to find a way into Italy. From the first, then, no direct relief was intended, and when, on hearing bad news from the Riviera, he altered his route to the more westerly passes, it was because he felt that Masséna's containing power was almost exhausted, and that the passage and reassembly of the reserve army must be brought about in the minimum time and by the shortest way It was a *pis aller* forced upon him by Moreau's delay and Masséna's extremity, and from the moment at which he arrived at Milan he did, as a fact, abandon it altogether in favour of the St Gothard

Bonaparte's immediate purpose, then, was to reassemble the Army of Reserve in a secure zone of manoeuvre about Milan. This was carried out in the first days of June. Lannes at Chivasso stood ready to ward off a flank attack until the main army had filed past on the Vercelli road, then leaving a small force to combine with Turreau (whose column had not been able to advance into the plain) in demonstrations towards Turin, he moved off, still acting as right flank guard to the army, in the direction of Pavia. On the morning of June 2 Murat occupied Milan, and in the evening the headquarters entered the great city, the Austrian detachment under Vukassovich (the flying right wing of Melas's general cordon system in Piedmont) retiring to the Adda. Duhesme's corps forced that river at Lodi, and pressed on with orders to organize Crema and if possible Orzinovi as temporary fortresses. Lannes reached Pavia, where, as at Milan, immense stores of food, equipment and warlike stores were seized Bonaparte was now safe in his "natural" position and barred one of the two main lines of retreat open to the Austrians. But his ambitions went farther, and he intended to cross the Po and to establish himself on the other likewise, thus establishing across the plain a complete barrage between Melas and Mantua. Here his end outranged his means, as we shall see But he gave himself every chance that rapidity could afford him, and the moment that a "zone of manoeuvre" had been secured between the Ticino and the Oglio, he pushed on his main body—or rather what was left after the protective system had been provided for—to the Po.

The Movements of Melas.—At this point the action of the enemy began to make itself felt. Melas had not gained the successes that he had expected in Piedmont and on the Riviera, thanks to Masséna's obstinacy and to Suchet's brilliant defence of the Var. These operations had led him very far afield, and the protection of his over-long line of communications had caused him to weaken his large army by throwing off many detachments to watch the Alpine valleys on his right rear He was further handicapped by the necessity of supporting Ott before Genoa and Elsnitz on the Var, and hearing of Lannes' bold advance on Chivasso and of the presence of a French column with artillery (Turreau) west of Turin, he assumed that the latter represented the main body of the Army of Reserve—in so far indeed as he believed in the existence of that army at all. Next, when Lannes moved away towards Pavia, Melas thought for a moment that fate had delivered his enemy into his hands, and began to collect such troops as were at hand at Turin with a view to cutting off the retreat of the French on Ivrea while Vukassovich held them in front. It was only when news came of Moncey's arrival in Italy and of Vukassovich's fighting retreat on Brescia that the magnitude and purpose of the French column that had penetrated by Ivrea became evident. Melas promptly decided to give up his western enterprises, and to concentrate at Alessandria, preparatory to breaking his way through the network of small columns—as the disseminated Army of Reserve still appeared to be—which threatened to bar his retreat. But orders circulated so slowly that he had to wait in Turin till June 8 for Elsnitz, whose retreat was, moreover, sharply followed up and made exceedingly costly by the enterprising Suchet. Ott, too, in spite of orders to give up the siege of Genoa at once and to march with all speed to hold the Alessandria-Piacenza road, waited two days to secure the prize, and agreed (June 4) to allow Masséna's army to go free and to join Suchet. And lastly, the cavalry of O'Reilly, sent on ahead from Alessandria to the Stradella defile, reached that point only to encounter the French The barrage was complete, and it remained for Melas to break it with the mass that he was assembling, with all these misfortunes and delays, about Alessandria His chances of doing so were anything but desperate.

On June 5 Murat had moved on Piacenza, and stormed the bridge-head there Duhesme pushed out on Crema and Orzinovi and also towards Pizzighetone. Moncey's leading regiments approached Milan, and Berthier thereupon sent on Victor's corps to support Murat and Lannes. Meantime the half-abandoned line of operations, Ivrea-Vercelli, was briskly attacked by the Austrians, who had still detachments on the side of Turin On the 6th Lannes from Pavia, crossing the Po, encountered and defeated O'Reilly, and barred the Alessandria-Parma main road. Opposite Piacenza, Murat had to spend the day in gathering material for his passage, as the pontoon bridge had been cut by the retreating garrison of the bridge-head. Meantime the last divisions of the Army of Reserve (two of Moncey's excepted) were hurried towards Lannes' point of passage, as Murat had not yet secured Piacenza On the 7th, while Duhesme continued to push back Vukassovich and seized Cremona, Murat at last captured Piacenza, finding there immense magazines. Meantime the army, division by division, passed over slowly, owing to a sudden flood, near Belgiojoso, and Lannes' advanced guard was ordered to open communication with Murat along the main road Stradella-Piacenza. "Moments are precious," said the First Consul. He was aware that Elsnitz was retreating before Suchet, that Melas had left Turin for Alessandria, and that heavy forces of the enemy were at or east of Tortona He knew, too, that Murat had been engaged with certain regiments recently before Genoa and (wrongly) assumed O'Reilly's column to have come from the same quarter Whether this meant the deliverance or the surrender of Genoa he did not yet know, but it was certain that Masséna's pinning action was over, and that Melas was gathering up his forces to recover his communications Hence Bonaparte's great object was concentration. "Twenty thousand men at Stradella," in his own words, was the goal of his efforts, and with the accomplishment of this purpose the campaign enters on a new phase.

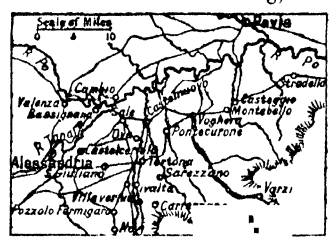
Bonaparte's Dispositions.—The army now being disseminated between the Alps, the Apennines, the Ticino and the Chiese, it was of vital importance to connect up the various parts into a well-balanced system. Duhesme was still absent at Cremona. Lechi was far away in the Brescia country, Béthencourt detained at Arona Moncey with about 15,000 men had to cover an area of 40m. square around Milan, which constituted the original zone of manoeuvre, and if Melas chose to break through the flimsy cordon of outposts on this side (the risk of which was the motive for detaching Moncey at all) instead of at the Stradella, it would take Moncey two days to concentrate his force on any battlefield within the area named, and even then he would be outnumbered

by two to one. As for the main body at the Stradella, its position was wisely chosen, for the ground was too cramped for the deployment of the superior force that Melas might bring up, but the strategy that set before itself as an object 20,000 men at the decisive point out of 50,000 available was, to say the least, hazardous. In truth, here, in contrast to his later campaigns, he had not the material to cement his strategic barrage. It is, however, clear from a letter to Carnot that Bonaparte counted greatly upon the union of Masséna and Suchet, with 18,000 men, to press Melas against the Army of Reserve. Another questionable feature was the order to Lannes to send forward his advanced guard, and to attack whatever enemy he met with on the road to Voghera. Bonaparte, in fact, calculated that Melas could not assemble 20,000 men at Alessandria before June 12. Acting on this order Lannes fought the battle of Montebello on the 9th This was a very severe running fight, in which the French drove the Austrians from several successive positions, and it culminated in a savage fight at close quarters about Montebello itself The singular feature of the battle is the disproportion between the losses on either side—French, 500 out of 12,000 engaged, Austrians, 2,100 killed and wounded and 2,100 prisoners out of 14,000. These figures are most conclusive evidence of the intensity of the French military spirit in those days, and also give a likely explanation of Bonaparte's apparent rashness in pushing Lannes forward. If, without endangering the bait, he could draw Melas towards the Stradella, he could thereby curtail the undue extent of his strategic barrage

Meanwhile, Bonaparte had issued orders for the main body to stand fast, and for the detachments to take up their definitive covering positions Duhesme's corps was directed, from its eastern foray, to Piacenza, to join the main body Moncey was to provide for the defence of the Ticino line, Lechi to form a "flying camp" in the region of Orzinovi-Brescia and Cremona, and another mixed brigade was to control the Austrians in Pizzighetone and in the citadel of Piacenza On the other side of the Po, between Piacenza and Montebello, was the main body (Lannes, Murat and part of Victor's and Duhesme's corps), and a flank guard was stationed near Pavia, with orders to keep on the right of the army as it advanced (this is the first hint of an intention to go westward) and to fall back fighting should Melas come on by the left bank

For a new idea, and doubt, had begun to form in his mind. Still believing that Melas would attack him on the Stradella side, and hastening his preparations to meet this, he began to allow for the contingency of Melas giving up his attempt to re-establish his normal line of communication, and retiring instead on Genoa, which was now in his hands and could be provisioned and reinforced by sea On the 10th Bonaparte ordered reserve ammunition to be sent from Pavia, giving Serravalle, which is south of Novi, as its probable destination. Such reports as were available indicated no important movements whatever which happened to be true, but could hardly appear so to the French headquarters On the 11th, though he thereby forfeited the reinforcements coming up from Duhesme's corps at Cremona, Bonaparte ordered the main body to advance to the Scrivia Lapoype's division (the right flank guard) was called to the south bank of the Po, and the zone around Milan was stripped so bare of troops that there was no escort for the prisoners taken at Montebello. The crisis was at hand, and influenced by the reports collected by Lapoype as to the quietude of the Austrians towards Valenza and Casale, Bonaparte and Berthier strained every nerve to bring up more men to the Voghera side in the hope of preventing the prey from slipping away to Genoa

But Moncey, Duhesme, Lechi and Chabran were at a distance —and these represented almost exactly half of Berthier's command (30,000 out of 58,000), and even the concentration of 28,000 men on the Scrivia had only been obtained by practically giving up the "barrage" on the left bank of the Po. Even now (the 12th) the enemy showed nothing but a rearguard, and the old questions reappeared in a new and acute form. Was Melas still in Alessandria? Was he marching on Valenza and Casale to cross the Po, or to Acqui against Suchet, or to Genoa to base himself on the British fleet? As to the first, why had he given up his chances of fighting on one of the few cavalry battlegrounds in north Italy—the plain of Marengo—as he could not stay in Alessandria for any definite time? The second question had been answered in the negative by Lapoype, but his latest information was 36 hours old. As for the other questions, no answer whatever was forthcoming, and the only course open was to postpone decisive measures and to send forward the cavalry, supported by infantry, to gain information.



MAP SHOWING THE AREA ASSOCIATED WITH NAPOLEON'S ADVANCE AGAINST MELAS, JUNE 12–13, 1800

Marengo.—On the 13th, therefore, Murat, Lannes and Victor advanced into the plain of Marengo, traversed it without difficulty and carrying the villages held by the Austrian rearguard, established themselves for the night within a mile of the fortress But meanwhile Bonaparte had taken a step that was fraught with the gravest consequences He had, as we know, no intention of forcing on a decision until his reconnaissance produced the information on which to base it, and he had therefore kept back three divisions under Desaix at Pontecurone But as the day wore on without incident, he began to fear that the reconnaissance would be profitless, and unwilling to give Melas any further start, he sent out these divisions right and left to find and to hold the enemy, whichever way the latter had gone At noon Desaix with one division was despatched southward to Rivalta to head off Melas from Genoa, and at 9 A M on the 14th, on the strength of a report, false as it turned out, that the Austrian rearguard had broken the bridges of the Bormida, Lapoype was sent back over the Po to hold the Austrians should they be advancing from Valenza towards the Ticino Thus there remained in hand only 23,000 men when at last in the forenoon of the 14th the whole of Melas's army, 45,000 strong, moved out of Alessandria, not southward nor northward, but due west into the plain of Marengo (*q v*) The extraordinary battle that followed is described elsewhere The outline of it is simple enough The Austrians advanced slowly and in the face of the most resolute opposition, until their attack had gathered weight, and at last they were carrying all before them, when Desaix returned from beyond Rivalta and initiated a series of counterstrokes These were brilliantly successful, and gave the French not only local victory but the supreme self-confidence that, coupled with their strategic position, enabled them to extort next day from Melas an agreement to evacuate all Lombardy as far as the Mincio And though in this way the chief prize, Melas's army, escaped after all, Marengo was the birthday of the First Empire

One more blow, however, was required before the Second Coalition collapsed, and it was delivered by Moreau We have seen that he had crossed the upper Rhine and defeated Kray at Stokach This was followed by other partial victories, and Kray then retired to Ulm, where he reassembled his forces, hitherto scattered in a long weak line from the Neckar to Schaffhausen Moreau continued his advance, extending his forces up to and over the Danube below Ulm, and winning several combats of which the most important was that of Höchstädt, fought on the famous battlegrounds of 1703 and 1704, and memorable for the death of La Tour d'Auvergne, the "First Grenadier of France" (June 19). Finding himself in danger of envelopment, Kray now retired, swiftly and skilfully, across the front of the advancing French, and reached Ingolstadt in safety. Thence he retreated over the Inn, Moreau following him to the edge of that river, and an armistice put an end for the moment to further operations.

This not resulting in a treaty of peace, the war was resumed both in Italy and in Germany. The Army of Reserve and the Army of Italy, after being fused into one, under Masséna's command, were divided again into a fighting army under Brune, who opposed the Austrians (Bellegarde) on the Mincio, and a political army under Murat, which re-established French influence in the

peninsula. The former, extending on a wide front as usual, won a few strategical successes without tactical victory, the only incidents of which worth recording are the gallant fight of Dupont's division, which had become isolated during a manoeuvre, at Pozzolo on the Mincio (Dec 25) and the descent of a corps under Macdonald from the Grisons by way of the Splugen, an achievement far surpassing Bonaparte's and even Suvórov's exploits, in that it was made after the winter snows had set in.

Hohenlinden.—In Germany the war for a moment reached the sublime Kray had been displaced in command by the young archduke John, who ordered the denunciation of the armistice and a general advance His plan, or that of his advisers, was to cross the lower Inn, out of reach of Moreau's principal mass, and then to swing round the French flank until a complete chain was drawn across their rear But during the development of the manoeuvre, Moreau also moved, and by rapid marching made good the time he had lost in concentrating his over-dispersed forces The weather was appalling, snow and rain succeeding one another until the roads were almost impassable On Dec 2 the Austrians were brought to a standstill, but the inherent mobility of the Revolutionary armies enabled them to surmount all difficulties, and thanks to the respite afforded him by the archduke's halt, Moreau was able to see clearly into the enemy's plans and dispositions On Dec 3, while the Austrians in many disconnected columns were struggling through the dark and muddy forest paths about Hohenlinden, Moreau struck the decisive blow. While Ney and Grouchy held fast the head of the Austrian main column at Hohenlinden, Richepanse's corps was directed on its left flank In the forest Richepanse unexpectedly met a subsidiary Austrian column which actually cut his column in two But profiting by the momentary confusion he drew off that part of his forces which had passed beyond the point of contact and continued his march, striking the flank of the archduke's main column, most of which had not succeeded in deploying opposite Ney, at the village of Mattempost First the baggage train and then the artillery park fell into his hands, and lastly he reached the rear of the troops engaged opposite Hohenlinden, whereupon the Austrian main body practically dissolved The rear of Richepanse's corps, after disengaging itself from the Austrian column it had met in the earlier part of the day, arrived at Mattempost in time to head off thousands of fugitives who had escaped from the carnage at Hohenlinden The other columns of the unfortunate army were first checked and then driven back by the French divisions they met, which, moving more swiftly and fighting better in the broken ground and the woods, were able to combine two brigades against one wherever a fight developed On this disastrous day the Austrians lost 20,000 men, 12,000 of them being prisoners, and 90 guns.

Marengo and Hohenlinden decided the war of the Second Coalition as Rivoli had decided that of the first, and the Revolutionary Wars came to an end with the armistice of Steyer (Dec. 25, 1800) and the treaty of Lunéville (Feb. 9, 1801). But only the first act of the great drama was accomplished. After a short respite Europe entered upon the Napoleonic Wars

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(C. F. A., X)

NAVAL OPERATIONS

The sweeping aims of the French Revolutionary government, to obtain for France her so-called natural limits—the Rhine, the Alps, the Pyrenees, and the Ocean—quickly provoked a coalition of many European Powers pledged to resist it Of these powers, England proved the most implacable; and it became the object of the Revolutionary, and still more of the Napoleonic, government to reduce her to submission The intensity of the struggle produced a series of naval campaigns extending over most of the world In the earlier years of the war France was hampered by the excessively democratic spirit which spread amongst her fleets Her crews were often mutinous, and some of her most competent admirals were guillotined, their places being filled by men hastily promoted from very junior ranks—for example, Villaret-Joyeuse was promoted straight from lieutenant to admiral Such drawbacks mattered less in 1792 when operations were confined to giving some assistance to troops operating against Austria in north Italy, and to reducing Naples, but when the First Coalition was completed by the entry of England in Feb., and Spain in March 1793, the naval weakness of the French became manifest This was seen in the operations in the Channel, where they were unable to maintain an effective force for some time It is true that Lord Howe, commanding the British Channel fleet, did not attempt to blockade Brest throughout 1793–94—in this connection, the many calls on the British navy for commerce and colonial protection over the whole world must be remembered—and that this freedom enabled Villaret to cover the safe arrival of a large convoy bringing corn from America in 1794 But he himself—more important than the convoy—was caught by Howe in the process, and severely defeated at the Battle of the Glorious 1st of June, losing seven ships This defeat effectually completed the disorganization of the French, and their engagements in the Channel for the next two years, such as those with Cornwallis and Lord Bridport in 1795, only served to emphasize this ineffectiveness None the less, French successes on land added to the already heavy British commitments at sea Having overrun Holland in 1794, the French compelled her to go to war with England in Jan 1795; and England was thereafter forced to maintain a separate North Sea fleet to guard against invasion from the Texel.

In the meantime operations had been proceeding in various colonial waters and in the Mediterranean. In the former the British had, as early as 1793, seized various French stations in the East Indies, including Pondicherry. In 1793–94 they also achieved some success in the West Indies, capturing Tobago, French San Domingo, Martinique and Guadeloupe, though the last-named was retaken by the Terrorist, Victor Hugues Later in the war St. Lucia and other islands were also taken In 1795, Admiral Elphinstone, afterwards Lord Keith, began operations against the colonial possessions of the unfortunate Dutch, and took from them the Cape of Good Hope and their station at Malacca. The importance of these operations lay not only in the captures made, but in the destruction of French sea-borne commerce that they involved.

Lord Hood was given the British command in the Mediterranean and, with 21 ships, directed his energies to the reduction of Toulon, in which he was joined by Spanish and Neapolitan squadrons. The extreme dissension between the Jacobins and Girondists helped him to secure the surrender of the city and its great arsenal; but after the Jacobin triumph, lack of troops forced him to relinquish his hold Over 30 French ships, including 13 of the line, were destroyed before the withdrawal; but, owing to the lukewarm support of the Spanish, a sufficient number were left intact to form, later, the nucleus of a Mediterranean fleet Sev-

eral thousands of the inhabitants were also taken off to escape the ferocious vengeance which was wreaked by the victorious Jacobins on their less fortunate countrymen left behind From 1794–96 the British were mainly occupied in reducing Corsica and trying to help the Austrians in north Italy. Hood's successor, Hotham, failed to deal effectively with the Toulon squadron, though he was twice in action with it in 1795, on each occasion the French escaped serious damage, losing only three ships Fortune, in the shape of the wind, assisted them; but Nelson held the opinion that Hotham's lack of energy did so too Jervis, afterwards Lord St. Vincent, relieved Hotham at the end of 1795, and imparted a livelier spirit to the fleet, but in the following year Spain, who had made peace in 1795, re-entered the war on the French side. This gave England another long piece of coast-line to watch and forced her temporarily to withdraw from the Mediterranean

From 1796 onwards French movements at sea became somewhat more purposeful, and in December they tried to strike at England by the time-honoured method of invading Ireland; but, though the expedition was allowed to sail from Brest, and some of the ships reached Bantry Bay, bad weather caused its failure, and the fleet returned in fragments to Brest The year 1797 saw England standing alone against France and further embarrassed by the great naval mutinies at Spithead and the Nore, in which the sailors expressed their dissatisfaction with a state of affairs now admitted to have been disgraceful None the less the gloom was relieved by the light of two great victories at sea, as a result of which Pitt was enabled to reopen negotiations for the formation of another coalition In Feb Jervis with 15 sail of the line encountered 27 Spaniards off Cape St Vincent and, relying on Spanish inefficiency to counteract their advantage in numbers, attacked them and took four prizes. In Oct , Admiral Duncan in command of the North Sea fleet of 16 ships caught the Dutch at sea off Camperdown, also 16 strong They tried to lure him on to the shoals, but he accepted the risk, chased them and piercing their line in two places took nine prizes.

In 1798, another, and slightly more successful, attempt was made to invade Ireland General Humbert with 1,100 troops was actually landed, but, after some initial success, was compelled to surrender, while other forces were captured before they landed But the most important movements were in the Mediterranean Austria was willing to join a second coalition, but insisted on making the re-entry of the British into the Mediterranean a condition Jervis, therefore, was ordered either to re-enter the Mediterranean himself, or, if he felt it necessary to continue the blockade of Cadiz, to detach a force thither. He replied that Nelson had already been detached to inquire into the nature of reported activities in Toulon, and he reinforced him with ten ships The reported activities were the preparations for Napoleon's expedition to Egypt. the origin of which lay chiefly in his desire to keep himself in the public eye. The force succeeded in sailing from Toulon, covered by a fleet of 13 battleships commanded by Admiral Brueys, and in reaching Alexandria, where Napoleon was landed, but Nelson, discovering their whereabouts after a long search, came upon Brueys anchored in Aboukir Bay and destroyed his entire fleet with the exception of two battleships and two frigates, all of which were accounted for later This placed Napoleon in a most awkward position He advanced some distance, but was repulsed before Acre by Commodore Sir Sydney Smith, who had landed with Napoleon's own guns, taken at sea The French tried to relieve his position, and Admiral Bruix succeeded in bringing the Brest fleet to the Mediterranean; but he did not venture far to the East and ultimately returned to Brest without having been brought to action Napoleon came home as a fugitive, leaving his army to the mercy of the British, who followed up their victory at the Nile, and made further successes possible, by the capture of Minorca (1798) and Malta (1800). Some measure of success was also achieved in the autumn of 1799 by a combined Russian and British expedition, which proposed to attack the French army of occupation in Holland: Admiral Mitchell forced the entrance to the Texel and obtained the surrender of the Dutch fleet—the Dutch sailors showing little inclination to fight on behalf of their French conquerors. From the military standpoint, however, the affair was not so successful.

By this time Napoleon had become First Consul, and was responsible for the formation of the Armed Neutrality of the Northern Powers which brought about the last great expedition of the war. The Scandinavian Powers, Russia and Prussia pledged themselves to resist the right of search of the British, who were dependent for the very existence of their fleet on supplies of timber and hemp from the Baltic The Neutrality had to be broken, and in March 1801, a fleet of 18 ships under Sir Hyde Parker, with Nelson as second-in-command, sailed to the Baltic for the purpose It was decided that an attempt should first be made to detach Denmark from her allies, peaceably or forcibly. Peaceable methods failing, it became necessary to attack the Danish fleet that was anchored along the sea-front of Copenhagen, protected by shoals Parker thought approach to it impossible; but Nelson with 12 ships solved the problem, smashed the Danish fleet, and the Armed Neutrality with it By this time peace was near. The English people were sick of the war, while Napoleon needed a truce for the consolidation of his position and the preparation of new schemes. Consequently the Peace of Amiens ended the Revolutionary War in 1802, a peace that was to be the truce Napoleon intended, rather than anything more lasting

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FRENCH WEST AFRICA. French West Africa comprises an area of about 4,665,000 sq km , or eight times that of France, one-half that of Europe, and one-sixth of that of Africa It extends from Senegal to the Gulf of Guinea, and from the Atlantic to Lake Chad It is bounded on the north by Rio-de-Oro, by the territories of South Algeria and by Italian Libya, on the east by French equatorial Africa, on the south by Nigeria, and on the west by the Atlantic There are certain foreign enclaves Gambia, Portuguese Guinea, Sierra Leone, Liberia, the Gold Coast and Togoland (the latter is partly under French and partly under British mandate). In addition to the districts of the Sahara which form part of it, French West Africa comprises the districts through which the Niger flows in the great bend which it makes towards Timbuctoo, and the coast districts of Senegambia and Guinea, which include the four colonies of Senegal, French Guinea, the Ivory Coast and Dahomey

Geology.—Geologically, French West Africa consists of gneisses and crystalline schists. There also occur at various points granites, old volcanic rocks, porphyries and diorites, old sedimentary deposits, schists and Silurian quartzites Above these old folded formations are horizontal strata of non-fossiliferous sandstones which cover immense areas. Secondary and tertiary marine formations (Cretaceous and Eocene) are met with in Senegambia and extend as far as Lake Chad. The quaternary and recent deposits include alluvial deposits, dunes and laterites, and ferruginous red clays which are often found in strata of great thickness and are the result of the decomposition of rocks *in situ* under the influence of the intertropical climate.

The country is in the form of a plateau, broken up by two systems of fractures, one running south-west and north-east, and the other at right angles, north-west and south-east The heights are domes of granite or diorite, which are remains of older chains of mountains now worn away, and the cliffs in which the plateau ends. The most mountainous regions are Futa Jallon (height 700–1,500 metres), which runs parallel to the coast for a distance of about 700 km., Mount Nimba (1,600 metres) on the frontier of Liberia and the Ivory Coast, and the Atacora chain (700–800 metres) in Dahomey. In the districts of the Sahara which are attached to French West Africa there are three principal mountain regions: the Adrar of Mauretania (500 metres), the Adrar of Ifoghas (1,000 metres) and the Aïr (1,700 metres).

The coast is straight and sandy from Cape Blanco to Cape Verde, which shelters the port of Dakar; after this it is cut up by estuaries, especially between Cape Verde and the island of Sherbro. After Cape Palmas the coast line runs from west to east and is bordered by an almost uninterrupted series of lagoons.

Rivers.—The Niger (*see* NIGER), the third longest river of Africa (4,200 km.) and the second in volume of water (minimum of 30,000 cu m at the mouth) is the main artery of French West Africa. It rises at an altitude of 860 metres, not far from the frontier of Sierra Leone, and at first flows from south-west to north-east, and then takes a great bend which brings it into the Sahara in the neighbourhood of Timbuctoo. After Burem it turns in a north-west to south-east direction, and finally runs into the Gulf of Guinea In its upper reaches, from its source to Kulikoro, it receives tributaries from the right, particularly the Tankisso In the middle reaches, from Kulikoro to Say, it receives its chief tributary, the Bagoe or Bani, and spreads out into a sort of wide inland delta, a great area subject to flooding, which in the rainy season is 140 kilometres wide at Mopti, and narrows in again after Tosaye and Burem. The lower part of the river, from Say to the sea, belongs to British Nigeria, it is separated from the middle reaches by the Bussa rapids The upper course of the Niger is subject to summer floods between June and September, the floods arrive gradually and late in the Timbuctoo district, where the maximum is not reached until January The middle reaches of the Niger are of great importance from the point of view of navigation, which is possible over a distance of 1,300 km , from Kulikoro to Ansongo, as well as for irrigation, the Niger has been called "the French Nile" The most important of the coast rivers is the Senegal (1,700 km), formed by the junction of the Bakhoy, with its tributary the Baule, and the Bafing, it is navigable up to Kayes in the wet season (Aug 15 to Oct 1) and up to Podor in the dry season The Casamance, the Cavally, the Sassandra, the Bandama, the Comoe, the Volta and the Ueme should also be mentioned

Climate.—North of the eighth parallel of latitude the year is divided into two seasons, the rainy and the dry season; the latter is longer the nearer we approach the Sahara On the banks of the Senegal the north-east trade wind blows for eight months, and the moist south-west wind only for four months, in French Guinea the contrary is the case Saint-Louis has a rainfall of 423 mm per annum, Dakar 514, Sedhiu 1,532, and Konakry 4,431. The highest temperatures occur at the end of the dry season, in April and May, and in northern Sudan, near the Sahara, whence blows the harmattan, a wind resembling the sirocco which raises a red dust South of the eighth parallel there are two rainy seasons separated by a short dry season; in Dahomey the rains last from March to July and from September to December; Grand-Bassam has an annual rainfall of 1,077 mm , and Porto-Novo of 1,259 In the district enclosed by the bend of the Niger there is less rain than on the coast, the average is from 600 to 1,200 mm ; at Timbuctoo the tropical rains, which only last for three months (June to August) only give a rainfall of 229 mm

From the point of view of vegetation, a distinction may be drawn between the Saharan zone (rainfall of less than 20 cm.), the Sahelian zone (rainfall of less than 60 cm.), which is a region of steppes in which grow dum palms and narrow-leaved acacias, the Sudanese zone (rainfall of 60 cm. to 1 50 metres), a country of savannas with forest belts, which is the principal agricultural region, and the Guinea zone (rainfall of over 1·50 metres) which is occupied by the great forest, attaining a width of 300 km at Cape Palmas, and the characteristic feature of which is the oil palm (*Elaeis guineensis*) In this district there are no real mountains, and the various zones of vegetation shade gradually off into one another.

Population.—There is no racial unity among the populations of French West Africa; they differ in physique, physiognomy, manners and dialect, and they are of very mixed stock. They have spread mainly in two directions, towards the south and towards the west. Some of them are not connected with the negro races; these include the Saharans, Moors and Tuaregs, and the Fulbé or Peuhl, who, with their reddish-brown colouring and only slightly woolly hair, appear to be of Ethiopian or Hamitic, or possibly of Semitic stock. Among the strictly negro populations, a distinction may be made between those of the region enclosed by the bend of the Niger and of Senegal on the one hand, and those of the Gulf of Guinea on the other. The former include the great group of the Mandé, which extends over the whole of the plateau within the bend of the Niger north of the great forest; it is subdivided into a number of tribes, including the Malinké or Mandingo, the Soninké, the Bambara and the Susu; then there are the Wolof of Senegal, the Tukulor of Segu, the Sonrhaï (Songhai) of the district of Gao, the Mossi of Haute Volta, and the Senufo of the upper Ivory Coast The coast negroes are generally shorter than the Sudanese, their heads are not so long and their colour is lighter. Of this type are the Agni, the Dahomi, the Kru, etc. In the forest region there dwell small groups of inhabitants of an exceedingly primitive type, they appear to be related to the Pygmies or Negrillos

The religion of the Sudanese tribes is animism, or belief in the omnipotence of spirits. About one-half of the population is Mussulman, in name at any rate, for the negro manages to reconcile Islam with his ancient superstitions, and it is only the populations in the neighbourhood of the Sahara which have really been profoundly affected by Mohammedanism The Guinea tribes, as well as the Mossi, have for the most part remained animists

The population of French West Africa is estimated at 12 million, this represents a very low degree of density The most thickly populated districts have 8–10 inhabitants per km , but the average is not more than 3–4, and in many places the density of population is as low as 1 per km or less The country has been depopulated by internecine warfare in the region enclosed by the bend of the Niger, and by the slave trade on the Guinea coast The rate of increase is slow, mainly owing to the enormous infantile mortality, which reaches a figure of 45 per 100

French West Africa, the capital of which is Dakar (34,000 inhabitants, including 3,000 Europeans), includes eight colonies administered by lieutenant-governors who are subordinate to the Governor-general The colonies are Senegal, French Guinea, the Ivory Coast, Dahomey, the French Sudan, Haute-Volta, Mauretania and Niger. There are four coast colonies, Senegal, French Guinea, the Ivory Coast and Dahomey, two inland colonies occupying the region enclosed in the bend of the Niger, the French Sudan and Haute-Volta, and two Saharan districts, Mauretania and Niger. The number of inhabitants according to the census is 34,000 in the autonomous territory of Dakar, 1,318,000 in Senegal (chief town St. Louis, 18,000 inhabitants), 2,096,000 in French Guinea (chief town Konakry, 9,000 inhabitants), 1,725,000 in the Ivory Coast (chief town Bingerville, 1,000 inhabitants), 980,000 in Dahomey (chief town Porto-Novo, 22,000 inhabitants), 2,635,000 in the French Sudan (chief town Bamako, 16,000 inhabitants), 3,240,000 in Haute-Volta (chief town Wagadugu, 5,000 inhabitants), 289,000 in Mauretania (the lieutenant-governor resides in St Louis) and 1,219,000 in the Niger colony (chief town Zinder, 6,000 inhabitants)

History.—The French have been established on the west coast of Africa since very early times, but if we except a few attempts at colonisation such as that of André Brue at the end of the seventeenth century their only object, until the middle of the nineteenth century, was to carry on the slave trade, in this respect their practice was similar to that of other European states A new era was inaugurated by Faidherbe, who, in 1854, conceived the scheme of linking up the upper Senegal with the Upper Niger. From 1876 onwards the coast settlements were considerably extended into the hinterland by a series of campaigns and missions, and at the same time the possessions of other European Powers in the same region were reduced to the state of enclaves by a number of conventions. The most important events were the campaigns of the Upper Niger (1876–90), which resulted in the destruction of the old native kingdoms, the Binger mission to the Ivory Coast (1887–90), the campaigns of Dahomey (1889–94), the occupation of Timbuctoo (1894) and the Franco-British Conventions of 1890 and 1898. By about 1900 the period of expansion may be regarded as over, and the period of organization and development begun.

French West Africa was constituted in 1895 by the grouping of the various territories of which it is composed under one Governor-general Endeavours have been made to encourage the development of the colonies which make up French West Africa as parts of a united whole, under a single government which looks after their common interests while leaving them a large measure of autonomy.

Production.—Until recent years, French West Africa chiefly produced jungle products, such as gum, rubber and ivory Gum produced from the dried resin of various kinds of acacia, is the principal product of Mauretania. Rubber, which is obtained from trees and creepers, was for some years of considerable importance in French West Africa, which in 1910 produced 8,000 tons out of a total world production of 70,000 tons; but rubber collected from wild trees and vines can with difficulty compete with Asiatic cultivated rubber, and in 1925 the rubber production of French West Africa was only 2,000 tons out of a world total of 488,000 tons. On the other hand the exploitation of ordinary timber and precious woods has been considerably developed in the Ivory Coast, where there are 120,000 sq km of virgin forest. The production in 1905 was 13,000 cu m , it is now 100,000 cu m. and will no doubt soon reach 200,000 cu m

The colonies of French West Africa have now entered upon an agricultural era, and their development in recent years has been remarkable. The European inhabitants are few in number—about 12,000—and the progress of cultivation depends mainly on the natives, among whom agricultural work is as a rule held in high esteem This applies both to the cultivation of food crops and of crops for export The principal foodstuffs grown are millet, rice and maize. Cattle breeding is carried on to a considerable extent in the northern part of the country, in the relatively dry districts There are 100,000 horses, 8 million head of cattle, and 5 million sheep The Europeans are making efforts to improve the quality of the wool produced

Vegetable oils are among the most important products of French West Africa The ground nut is the principal source of the prosperity of Senegal, where it has been cultivated since about 1890; the production is 400,000 tons The Ivory Coast and Dahomey produce principally palm oil and palm kernels, the production of the latter is 35,000 tons out of a world total of 100,000 tons, and of the latter 100,000 tons out of a world production of 300,000 tons

The European inhabitants are specially anxious to develop the cultivation of cotton, both with and without irrigation The whole of the Sudan appears to be suitable for this crop with the exception of the excessively dry districts near the Sahara and the excessively wet districts near the coast. The most suitable parts of the country seem to be the middle basin of the Niger for cultivation by means of irrigation, and Haute-Volta for cultivation without irrigation For cotton cultivation there might be three zones: in the north, Egyptian cotton cultivated with irrigation; further south, American cotton cultivated without irrigation; further south again, improved native cotton cultivated without irrigation. It will however be necessary to find a solution for a number of problems connected with agricultural methods, labour and communications, and a considerable time must elapse before this work is completed It will be necessary to establish ginning stations, to arrange for the transport of the cotton after ginning, to improve the native cotton, to introduce American cotton, and to provide a supply of water for irrigation purposes Up to the present the amount of cotton exported has not exceeded 3,000 tons (15,000 bales)

In French Guinea there appears to be a great future for the export of fruit, including pineapples and above all bananas There are cocoa and coffee plantations in the Ivory Coast as well as in Dahomey.

Gold is found in alluvial deposits in Senegal (the Bambuk and Brue deposits) and in veins in the Ivory Coast (Bule, Indenie), but its exploitation is not of great importance. The native industries, which produce leather and cotton goods, are interesting but of little economic importance; they are more highly developed among the Mandé of the interior than among the populations of the coast, because the latter for many years have been able to obtain the clothing and other objects which they require from the European trading stores. There is a great deal of internal trading and certain tribes are specially active in this respect. The principal objects of commerce are salt, kola nuts and European trade goods.

Transport.—The middle course of the Niger and the lower course of the Senegal constitute navigable waterways which, while not without importance, are not completely satisfactory; and the opening up of the African continent to civilization is only possible by means of railways. The four colonies of Senegal, French Guinea, the Ivory Coast and Dahomey are served by four railway lines, which it is proposed to link up later by a transversal line in the neighbourhood of Wagadugu or Bobo-Diulasso They represent, as it were, four artificial outlets for the Niger. (1) From the line Dakar-St Louis, constructed in 1886, there branches the line Thiès-Kayes (667 km), prolonged by the line Kayes-Kulikoro (550 km), which brings the middle Niger within two days' reach of Dakar and a week of Bordeaux (2) In French Guinea the line Konakry-Kankan (662 km) (3) In the Ivory Coast the line Abidjan-Niangbo (453 km.), which is being extended to Wagadugu and Mossi (4) In Dahomey, the lines Kotouou-Savé (261 km.) and Porto-Novo-Pobé (80 km), which have a number of branch lines French West Africa has in all over 3,000 km. of railways in operation, 10,000 km. of roads and tracks, and over 20,000 km of telegraph lines. Dakar is the finest port on the west coast of Africa, and handled 900,000 tons of goods in 1928. The other ports are. in Mauretania, Port-Etienne, in Senegal, St Louis, Rufisque and Kaolack, in French Guinea, Konakry; in the Ivory Coast there are wharfs at Grand-Bassam and Vridy; in Dahomey, a wharf at Kotonu.

French West Africa is served by a large number of French and foreign shipping lines (Chargeurs Réunis, Fraissinet, Cyprien Fabre, Maurel et Prom, Devès et Chaumet, Linea Italiana, Elder Dempster, Woermann, Compagnie belge du Congo, etc) Its main shipping connections are with Bordeaux and Marseilles Submarine cables run to St Louis, Dakar, Konakry and Kotonu There are 16 wireless stations, of which the most important are those of Dakar and Bamako.

Trade.—Trade has increased very rapidly, rising from 40 millions in 1890 to 156 in 1914, 227 in 1915, 1,242 in 1920 and 2,014 in 1925 Leaving north Africa out of account, French West Africa is at present the second French colony in commercial importance, coming immediately after Indo-China One-half of its trade is with France, and the next countries are Great Britain, the United States and the Netherlands The principal imports are unbleached, printed and dyed fabrics, rice, salt, sugar, metal goods, coal, cutlery, hardware and perfumery Oil-bearing products, ground-nuts and palm, represent 87% of the exports Timber, maize, rubber and cattle come next in importance. Cotton (6,000 tons) and cocoa (6,000 tons) are likely to be of great importance in the future, but do not as yet form a prominent feature of the trade statistics. French West Africa is a country of growing prosperity, and seems likely to develop into a second Brazil.

FRENEAU, PHILIP MORIN (1752–1832), American poet, patriot, editor and sea-captain, son of a New York wine merchant of French-Huguenot descent, was born on Jan. 2, 1752 Graduating in 1771 from Princeton, then a hotbed of "Whiggism," he won fame by 1775 as a satirist of the Tories His admirable *Beauties of Santa Cruz, The Jamaica Funeral* and *The House of Night* (the first American romantic poem in the manner of Poe) were produced during his sojourn in Santa Cruz and the Bermudas from 1775 to 1778. He was captured by the British during the American Revolution and his experience (1780) in a prison ship called forth one of his most mordant satires. After some minor editorships and a few years in the Atlantic coast trade, Freneau became clerk of foreign languages for the secretary of State, Jefferson, and at the same time (1791–93) he exerted his greatest political influence as independent editor of *The National Gazette* Opposed to Fenno's *Gazette of the United States*—the organ of Hamilton and the Federalists—Freneau as "the leading editor in America" attacked growing ceremonial, aristocratic, centralizing

tendencies and disseminated the doctrines of liberty, fraternity and equality upheld by Jefferson, Paine and Rousseau. As Jefferson said, Freneau's paper "saved our Constitution, which was fast galloping into monarchy." After more minor editorships and several years on the sea, Freneau retired in 1807 to his plantation-like estate, "Mount Pleasant," near Middletown Point, N.J., where he lived until his death on Dec. 18, 1832. Originally published in newspapers, his poems appeared in five editions during his lifetime—in 1786, 1788, 1795, 1809 and 1815.

Freneau is remembered as the greatest American poet before Bryant, by virtue of *The Wild Honeysuckle;* as the "poet of the revolution" who heartened the soldiers in the darkest days of the war; and as a powerful advocate, in a crucial period, of Jeffersonian democracy and French political philosophy.

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FRENSSEN, GUSTAV (1863–), German author, was born at Barlt on Oct 19, 1863, and educated at the universities of Tübingen, Berlin and Kiel. He took orders, and from 1892 to 1902 was pastor at Hemme; but he had already for some years been known as a writer of novels, and in 1902, a year after his unexampled success with *Jörn Uhl* (1901), he gave up his pastorate and devoted all his time to literature. His work in fiction includes *Die Sandgrafin* (1896, 3rd ed, 1902); *Die drei Getreuen* (1898), *Hilligenlei* (1905); *Peter Moor's Fahrt nach Süd-West* (1906); *Klaus Hinrich Baas* (1909), and *Die Brüder* (1918). He also published sermons (*Dorfpredigten*, 1899–1902), and two plays, *Das Heimatsfest* (1903) and *Sonke Erichsen* (1912).

Frenssen gives a realistic and vivid description of the peasantry and the countryside in north Germany, and is perhaps the most powerful of the school of writers of the *Heimatkunst, i.e.,* literature of special regions. *Jörn Uhl* showed an exact and detailed local knowledge, though the dialogue is more literary than pure realism demands. Its great popularity was due partly to this and to the power of the story, and partly to the many subsidiary and propagandist elements introduced into it

See H. M Elster, *Gustav Frenssen, sein Leben und sein Schaffen* (1912); also studies by E Muesebeck (1908) and T Rehtwisch (1902); and *Gustav Frenssen, Hilligenlei als Kunstwerk und als Tendenzschrift* (1906).

FRENTANI, one of the ancient Samnite tribes which formed an independent community on the east coast of Italy. They entered the Roman alliance after their capital, Frentrum, was taken by the Romans in 305 or 304 B C (Livy ix. 16.45). This town either changed its name or perished some time after the middle of the 3rd century B C., when it was issuing coins of its own with an Oscan legend The town Larinum, which belonged to the same people (Pliny, *Nat. Hist.* iii. 103), became latinized before 200 B.C, as its coins of that epoch bear a legend—LARINOR(VM)—which cannot reasonably be treated as anything but Latin. Several Oscan inscriptions survive from the neighbourhood of Vasto (anc. *Histonium*), which was in the Frentane area

On the forms of the name, and for further details *see* R S Conway, *Italic Dialects* (1897), p 206 ff and p. 212. for the coins, *id* No. 195–196.

FREPPEL, CHARLES ÉMILE (1827–1891), French bishop and politician, was born at Oberehnheim (Obernai), Alsace, on June 1, 1827. He was consecrated bishop of Angers in 1870. In 1880 he was elected deputy for Brest. Being the only priest in the Chamber of Deputies since the death of Dupanloup, he became the chief parliamentary champion of the Church. On all ecclesiastical affairs Freppel voted with the Royalist and Catholic party, yet on questions in which French colonial prestige was involved, such as the expedition to Tunis, Tong-King, Madagascar, he supported the government He died at Angers on Dec 12, 1891.

Freppel's chief works are: *Les Pères apostoliques et leur époque* (1859); *Les Apologistes chrétiens au IIe siècle* (2 vols., 1860); *Saint Irénée et l'éloquence chrétienne dans la Gaule aux deux premiers siècles* (1861); *Tertullien* (2 vols., 1863); *Examen critique de la Vie de Jésus de M. Renan* (1863), *Saint Cyprien et l'Église d'Afrique* (1864); *Clément d' Alexandrie* (1865), *Origène* (2 vols, 1867)

See E. Cornut, *Mgr Freppel* (1893) and A. Pavie, *Mgr Freppel* (1906).

FREQUENCY is used in science generally to denote the number of variations which occur in unit time. In medicine (*q.v*) the frequency of the pulse. In light (*q.v.*) it denotes the number of cycles executed by the electromagnetic vector per second In sound (*q.v*) the number of variations in pressure per second at a point as sound passes that point

FREQUENCY CHANGER, a device which delivers alternating current into an output circuit of a radio receiving set at a frequency (*q.v*), which differs from the frequency of the input or supply circuit

FRERE, SIR HENRY BARTLE EDWARD, 1ST BART., cr 1876 (1815–1884), British administrator, born at Clydach in Brecknockshire on March 29, 1815, was the son of Edward Frere, and a nephew of J H Frere, of *Anti-Jacobin* and *Aristophanes* fame After leaving Haileybury, Bartle Frere was appointed a writer in the Bombay civil service in 1834, and in 1835 assistant collector at Poona In 1842 he became private secretary to Sir George Arthur, governor of Bombay. In 1844 he became political resident at the court of the raja of Satara, administering the province, on the raja's death in 1848, even after its formal annexation in 1849 In 1850 he was appointed chief commissioner of Sind, where he established municipal buildings and made many other improvements.

On his return to India from leave in 1857 Frere learnt at Karachi of the mutiny He sent his only European regiment to secure the strong fortress of Multan against the rebels, and sent further detachments to aid Sir John Lawrence in the Punjab. For his services he received the thanks of both houses of parliament and was made K C B In 1862 he was appointed governor of Bombay, where he effected great improvements, including the inauguration of the university buildings He established the Deccan college at Poona, and a college for instructing natives in civil engineering The prosperity, due to the American Civil War, which rendered these developments possible, resulted in a speculative mania, leading eventually to the disastrous failure of the Bombay bank, for which Frere incurred severe and not wholly undeserved censure In 1867 he returned to England and was made a member of the Indian council In 1872 he was sent by the foreign office to negotiate a treaty with the sultan, Seyyid Burghash, at Zanzibar, for the suppression of the slave traffic In 1875 he accompanied the prince of Wales to Egypt and India

But the greatest service that Frere undertook on behalf of his country was to be attempted not in Asia, but in Africa. He landed at Cape Town as high commissioner of South Africa on March 31, 1877. He had been chosen by Lord Carnarvon in the previous October as the statesman most capable of carrying his scheme of confederation into effect, and within two years it was hoped that he would be the first governor of the South African Dominion He went out in harmony with the aims and enthusiasm of his chief, "hoping to crown by one great constructive effort the work of a bright and noble life" In this hope he was disappointed. The first year of his rule was marked by a Kaffir war on the one hand and by a rupture with the Cape (Molteno-Merriman) ministry on the other The Transkei Kaffirs were subjugated early in 1878 by General Thesiger (the 2nd Lord Chelmsford) and a small force of regular and colonial troops The constitutional difficulty was solved by Frere dismissing his obstructive cabinet and entrusting the formation of a ministry to Gordon Sprigg. Frere emerged successfully from a year of crisis, but the advantage was more than counterbalanced by the resignation of Carnarvon early in 1878, at a time when Frere required the steadiest and most unflinching support He was convinced that there was a widespread insurgent spirit pervading the natives, which had its focus and strength in the celibate military organization of Cetywayo Frere told the colonial office that this organization must be broken up, if necessary, by force. The colonial office appeared to agree, but when Frere sent, in Dec 1878, an ultimatum to Cetywayo, the home Government abruptly discovered that a native war in South

Africa was inopportune and raised difficulties about reinforcements. Having entrusted to Lord Chelmsford the enforcement of the British demands, Frere's immediate responsibility ceased. On Jan 11, 1879 the British troops crossed the Tugela, and 14 days later the disaster of Isandhlwana was reported; and Frere, attacked and censured in the House of Commons, was but feebly defended by the Government Lord Beaconsfield, it appears, supported Frere; the majority of the cabinet were inclined to recall him. He was censured, but begged to stay on.

The Zulu trouble and the disaffection that was brewing in the Transvaal reacted upon each other in the most disastrous manner Frere had had no part in the actual annexation of the Transvaal, which was announced by Sir Theophilus Shepstone a few days after the high commissioner's arrival at Cape Town. The delay in giving the country a constitution afforded a pretext for agitation to the malcontent Boers, a rapidly increasing minority, while the reverse at Isandhlwana had lowered British prestige. Owing to the Kaffir and Zulu wars Frere had hitherto been unable to give his undivided attention to the state of things in the Transvaal, which he visited in 1879. A large camp, numbering 4,000 disaffected Boers, had been formed near Pretoria, and they were terrorizing the country Frere visited them unarmed and practically alone On the condition that the Boers disperse, Frere undertook to present their complaints to the British Government, and to urge the fulfilment of the promises that had been made to them They parted with mutual good feeling, and the Boers did eventually disperse—on the very day upon which Frere received the telegram announcing the Government's censure But bad news met him on his return to Capetown—on June 1, 1879, the prince imperial had met his death in Zululand—and a few hours later Frere heard that the Government of the Transvaal and Natal, together with the high commissionership in the eastern part of South Africa, had been transferred from him to Sir Garnet Wolseley

When Gladstone's ministry came into office in the spring of 1880, Lord Kimberley had no intention of recalling Frere. In June, however, a section of the Liberal party memorialized Gladstone to remove him, and the prime minister weakly complied (Aug 1, 1880). Upon his return Frere replied to the charges relating to his conduct respecting Afghanistan as well as South Africa, previously preferred in Gladstone's Midlothian speeches, and was preparing a fuller vindication when he died at Wimbledon from the effects of a severe chill on May 29, 1884. He was buried in St Paul's, and in 1888 a statue of Frere upon the Thames embankment was unveiled by the prince of Wales. Frere edited the works of his uncle, Hookham Frere, and the popular story-book, *Old Deccan Days,* written by his daughter, Mary Frere. He was three times president of the Royal Asiatic Society.

His *Life and Correspondence,* by John Martineau, was published in 1895. For the South African anti-confederation view, *see* P A Molteno's *Life and Times of Sir John Charles Molteno* (2 vols., 1900) *See* W B. Worsfold, *Sir Bartle Frere* (1923) *See* also *Correspondence respecting the Affairs of South Africa,* H M.S O. (C 2220 1878), and *Further Correspondence* (C. 2222. 1879), in *Accounts and Papers* (11) vol 52 (1878–79); also the article SOUTH AFRICA: *History.*

FRERE, JOHN HOOKHAM (1769–1846), English diplomat and author, was born in London He was educated at Eton, where he met Canning, and at Caius college, Cambridge. He entered public service in the Foreign Office under Lord Grenville, and sat from 1796 to 1802 as M P. for the close borough of West Looe in Cornwall. He and Canning were ardent supporters of Pitt, and contributors to the *Anti-Jacobin.* On Canning's removal to the Board of Trade in 1799 he succeeded him as under-secretary of State; in Oct. 1800 he was appointed envoy extraordinary and plenipotentiary to Lisbon; and in Sept. 1802 he was transferred to Madrid, where he remained for two years. He was made a member of the privy council in 1805; in 1807 he was appointed plenipotentiary at Berlin, but the mission was abandoned, and Frere was again sent to Spain in 1808 as plenipotentiary to the Central Junta. The condition of Spain rendered his position a very responsible and difficult one. When Napoleon began to advance on Madrid Frere wholeheartedly advised Sir John Moore not to retreat. After Corunna public opinion accused him of having endangered the army, and he was recalled.

Thus ended Frere's public life. In 1816 he married Elizabeth Jemima, dowager countess of Erroll, and in 1820, on account of her failing health, he went with her to the Mediterranean. There he finally settled in Malta, where he lived the rest of his life. He died at the Pietà Valetta on Jan. 7, 1846. Frere's literary reputation now rests entirely upon his spirited verse translations of Aristophanes, which remain in many ways unrivalled. The translations of *The Acharnians, The Knights, The Birds,* and *The Frogs* were privately printed, and were first brought into general notice by Sir G. Cornewall Lewis in the *Classical Museum* for 1847.

Frere's complete works were published in 1871, with a memoir by his nephews, W. E. and Sir Bartle Frere, and reached a second edition in 1874. *See* also Gabrielle Festing, *J. H. Frere and his Friends* (1899).

FRÈRE-ORBAN, HUBERT JOSEPH WALTHER (1812–1896), Belgian statesman, was born at Liége on April 24, 1812 After studying law in Paris, he practised as a barrister at Liége, took a prominent part in the Liberal movement, and in June 1847 was returned to the Chamber as member for Liége He was minister of public works in the Rogier cabinet, and from 1848 to 1852 was minister of finance. He founded the Banque Nationale and the Caisse d'Épargne, abolished the newspaper tax, reduced the postage, and modified the customs duties as a preliminary to a decided free-trade policy To facilitate the negotiations for a new commercial treaty, he conceded to France a law of copyright, which proved highly unpopular in Belgium, and he resigned office, soon followed by the rest of the cabinet His work *La Mainmorte et la charité* (1854–1857), published under the pseudonym of "Jean van Damme," helped his party back to power in 1857, when he again became minister of finance. He now embodied his free-trade principles in commercial treaties with England and France, and abolished the *octroi* duties and the tolls on the national roads He resigned in 1861 on the gold question, but soon resumed office, and in 1868 succeeded Rogier as prime minister In 1869 he defeated the attempt of France to gain control of the Luxemburg railways. Defeated in 1870, he returned to office in 1878 as president of the council and foreign minister He provoked the bitter opposition of the Clerical party by his law of 1879 establishing secular primary education, and in 1880 broke off diplomatic relations with the Vatican. Frère-Orban, while rejecting the Radical proposal of universal suffrage, conceded an extension of the franchise (1883); but the hostility of the Radicals, and the discontent caused by a financial crisis, overthrew the government at the elections of 1884 Frère-Orban continued to lead the Liberal opposition till 1894, when he failed to secure re-election. He died at Brussels on Jan 2, 1896

See F. Hymans, *Frère-Orban* (2 vols. 1906–10).

FRÉRET, NICOLAS (1688–1749), French scholar, was born in Paris. His father was *procureur* to the parlement of Paris, and destined him to the profession of the law His first tutors were the historian Charles Rollin and Father Desmolets (1677–1760). He was hardly 26 years of age when he was admitted as pupil to the Academy of Inscriptions. One of the first memoirs which he read was *Sur l'origine des Francs* (1714). He maintained that the Franks were a league of South German tribes and not, according to the legend then almost universally received, a nation of free men deriving from Greece or Troy, who had kept their civilization intact in the heart of a barbarous country. These sensible views excited great indignation in the Abbé Vertot, who denounced Fréret to the Government as a libeller of the monarchy. A *lettre de cachet* was issued, and Fréret was sent to the Bastille. From the time of his liberation in March 1715 his life was uneventful. In Jan. 1716 he was received associate of the Academy of Inscriptions, and in Dec. 1742 he was made perpetual secretary. The list of his memoirs, many of them posthumous, occupies four columns of the *Nouvelle Biographie générale.* They treat of history, chronology, geography, mythology and religion. He was one of the first scholars of Europe to undertake the study of the Chinese language; and in this he was engaged at the time of his committal to the Bastille. He died in Paris on March 8, 1749.

FRESCO PAINTING



BY COURTESY OF (1, 2, 3, 5, 6, 7, 8) THE METROPOLITAN MUSEUM OF ART, NEW YORK, (4) SIR ARTHUR EVANS, PHOTOGRAPHS, (9) ALINARI, (10) ANDERSON, (11) EWING GALLOWAY, (12) BONNEY

FRESCO PAINTING OF VARIOUS PERIODS

1 Ancient Egyptian fresco of geese, from the tomb of Ra'hotep at Medum, 4th dynasty (2900–2750 B C) From a facsimile 2 Fresco of partridges from the walls of the Caravanserai at Knossos, Crete (*c* 1600 B C) From a water-colour copy 3 Fragment from an Egyptian ceiling decoration painted on mud plaster, in the Palace of Amenhotep III at Thebes, 18th dynasty (*c* 1400 B C) 4 Saffron gatherer Cretan fresco from the Palace of Minos at Knossos, middle Minoan, about 1800 B C 5 Woman carrying a casket Cretan fresco of the late Minoan period (1350–1100 B C), found at Tiryns, Greece. 6 Roman fresco decoration, a candelabrum surmounted by panel with Egyptian scene Found in a villa at Boscotrecase, near Pompeii Probably 1st century A D 7 Roman fresco from Boscoreale, near Pompeii, 1st century A D 8 St Christopher, by Antonio del Pollaiuolo (1429–98), Florentine School, Italian Renaissance 9. Detail from the "Procession of the Magi" by Benozzo Gozzoli (1420–97), a fresco decoration, brilliant in colour and crowded with figures, which lines the walls of the Medici Chapel in the Riccardi Palace, Florence 10 Detail from "The School of Athens" by Raphael (1483–1520), one of the frescoes in the "Stanze of Raphael" in the Vatican The figures shown represent Plato and Aristotle 11 Section of the ceiling of the Sistine Chapel in the Vatican, by Michelangelo (1475–1564) The ceiling frescoes are a series of Biblical scenes, which together form a symmetrical pattern Figures of sibyls and prophets fill the spaces in the vaulting and between the central panels 12 Ceiling decoration in fresco, by Paul Baudoin, contemporary French

The best account of his works is "Examen critique des ouvrages composés par Fréret" in C. A. Walckenaer's *Recueil des notices*, etc. (1841–50). *See* also Quérard, *France littéraire*.

FRERICHS, FRIEDRICH THEODOR (1819–1885), German pathologist, became professor of pathology at Göttingen (1848), at Kiel (1850), at Breslau (1852) and Berlin (1859). He developed scientific clinical teaching in Germany. He discovered leucin and tyrosin in the urine in cases of acute yellow atrophy of the liver (1855), made pathological studies of cirrhosis of the liver and of pernicious malarial fever, and published works on Bright's disease (1851) and diseases of the liver (1858)

FRÉRON, ÉLIE CATHERINE (1719–1776), French critic and controversialist, is now remembered solely for his attacks on Voltaire and the Encyclopaedists, and by the retaliation they provoked on the part of Voltaire, who, besides attacking him in epigrams, and even incidentally in some of his tragedies, directed against him a virulent satire, *Le Pauvre diable*, and made him the principal personage in a comedy *L'Ecossaise*, in which the journal of Fréron is designated *L'Ane littéraire* A further attack on Fréron entitled *Anecdotes sur Fréron* . (1760), published anonymously, is generally attributed to Voltaire.

Fréron was the author of *Ode sur la bataille de Fontenoy* (1745); *Histoire de Marie Stuart* (1742, 2 vols.), and *Histoire de l'empire d'Allemagne*, (1771, 8 vols). *See* Ch. Nisard, *Les Ennemis de Voltaire* (1853), Ch Monselet, *Fréron, ou l'illustre critique* (1864), *Fréron, sa vie, souvenirs*, etc (1876), F Cornois, *Élie Fréron* (1922)

FRÉRON, LOUIS MARIE STANISLAS (1765–1802), French revolutionist, son of the preceding, was born at Paris on Aug 17, 1765 On the death of his father his name was attached to *L'Année littéraire*, which was continued till 1790 and edited successively by the abbés G M Royou and J L Geoffroy On the outbreak of the revolution Fréron, who was a schoolfellow of Robespierre and Camille Desmoulins, established the violent journal *L'Orateur du peuple*. With Barras in 1793 he repressed the opposition to the Convention at Marseilles and Toulon, but both afterwards joined the Thermidoriens, and Fréron became the leader of the *jeunesse dorée* and of the Thermidorian reaction He brought about the accusation of Fouquier-Tinville and of J. B Carrier, the deportation of B Barère and the arrest of the last *Montagnards* His paper became the official journal of the reactionists He went in 1799 as commissioner to Santo Domingo and died there in 1802 He wrote *Mémoire historique sur la réaction royale et sur les malheurs du midi* (1796).

FRESCO (Ital. for *cool*, "fresh"), a term introduced into English, both generally (as in such phrases as *al fresco*, "in the fresh air"), and more especially as a technical term for mural painting on plaster In the latter sense the Italians distinguished painting *a secco* (when the plaster had been allowed to dry) from *a fresco* (when it was newly laid and still wet). The nature and history of fresco-painting is dealt with in the article PAINTING

FRESCOBALDI, GIROLAMO (1583–1644), Italian organist and composer, was born in Ferrara He studied under the cathedral organist Luzzasco Luzzaschi, and owed his first reputation to his beautiful voice. He was organist at St. Peter's in Rome from 1608 to 1628. According to Baini no fewer than 30,000 people flocked to St. Peter's on his first appearance there. In 1628 he went to live in Florence, becoming organist to Duke Ferdinand II. Political troubles drove him back to Rome in 1633, and he was again organist at St Peter's until March 1643. He died on March 2, 1644, being buried at Rome in the Church of the Twelve Apostles. Frescobaldi was perhaps the greatest organist of the 17th century, and his method was handed down by his pupil Froberger. His compositions show the consummate art of the early Italian school, and his works for the organ more especially are full of the finest devices of fugal treatment. He also wrote numerous vocal compositions, such as canzone, motets, hymns, etc., a collection of madrigals for five voices (Antwerp, 1608) being among the earliest of his published works.

FRESCO PAINTING. Painting in fresco is here defined as painting on wet lime plaster with pigments mixed with water or water and lime. As the water evaporates, the setting of the lime binds the pigment to the plaster, and the subsequent conversion of the lime into carbonate of lime by the action of the carbonic acid gas in the air completes the binding of the pigment. This method of painting is very old—the wall paintings in the palace of Knossos are examples of genuine fresco painting.

The Egyptians, Greeks and Romans were familiar with the use of egg, gum arabic, size and wax as media for painting, and there has been a big controversy as to how the Pompeian frescoes were painted. Vitruvius gives a detailed account of the preparation of the plaster—a method that was obtained by the Romans from Greek practice. The Roman plaster was several inches thick, and beginning with sand, lime and broken brick, the final coats were made of lime and marble dust—the lime having been prepared by prolonged treatment with water, pounding and mixing. The marble dust, lime mortar was beaten and trowelled until a highly polished surface was obtained. The evidence from Vitruvius' account is on the whole, in favour of the pigments mixed with water being laid on the wet plaster. It has, however, been pointed out by Prof. Berger that this description may apply only to the ground colouring and not to the final painting, which he believes was done with a wax emulsion Walls were certainly treated with wax driven in by heat, in Roman times Vitruvius describes the process, and there are other references in Pliny and elsewhere. The most recent conclusions are in favour of the process having been genuine fresco. The description of mediaeval fresco painting given by Theophilus and the Mount Athos manuscript are of a method of painting by wetting the already dry plaster and painting with pigments mixed with water and a little lime

In the 15th century, Italian painters distinguished between *fresco secco*—the pigments being mixed with egg as a medium, and *buon fresco*—the pigments being mixed with water and laid on the fresh wet plaster The complete design for the fresco was drawn or pounced from a cartoon on the dry plaster. Over this was laid each day a thin coat of wet plaster of sufficient area for one day's work, and the pigments ground in water laid on this wet surface At the end of the day, the plaster not painted upon was cut away, and the joins of the plaster can be seen on the walls to-day.

The proportions of lime to sand should be according to Cennino Cennini (*see* trans. by C J Herringham, 1899), one of lime to two of sand. It is essential that the quick lime slaked to a lime putty should be given months or even years to mature. The pigments must be fast to lime and light For white, either lime or Bianco Sangiovanni prepared by making slaked lime into little cakes and exposing them to the air for some months should be used. For the rest, the earth pigments—red and yellow ochres, terra verte, umber, raw and burnt sienna, black and the permanent greens and blues, such as oxide of chromium, viridian, cobalt green, cobalt blue and cerulean blue should be used.

Italians before the invention of smalt were confined to azurite which is turned green by lime in time and the precious real ultramarine They probably, therefore, laid on the blues mixed with egg

BIBLIOGRAPHY —There is an extensive literature on the subject of wall painting; among the most important are. *The Book of the Art of Cennino Cennini* (trans. C J. Herringham, 1899); *Vasari on Technique* (trans L. S Maclehose, 1907), M. P. Merrifields, *The Art of Fresco Painting* (1846) For modern practice *see* J. Ward, *Fresco Painting* (1909); A. P. Laurie, *The Painter's Methods and Materials* (1926). (A. P. L.)

FRESENIUS, KARL REMIGIUS (1818–1897), German chemist, was born at Frankfort-on-Main on Dec 28, 1818. He studied at Bonn and at Giessen, where he acted as assistant in Liebig's laboratory, and in 1843 became assistant professor. In 1845 he was appointed to the chair of chemistry, physics and technology at the Wiesbaden Agricultural Institution, and in 1848 he became the first director of the chemical laboratory which the Nassau government established there Fresenius occupied himself almost exclusively with analytical chemistry, and the fullness and accuracy of his text-books on that subject (of which that on qualitative analysis first appeared in 1841 and that on quantitative in 1846) soon rendered them standard works. Many of his original papers were published in the *Zeitschrift für analytische*

Chemie, which he founded in 1862 and continued to edit till his death. He died suddenly at Wiesbaden on June 11, 1897.

FRESHWATER, a watering place in the Isle of Wight, England, 11¾ m. W. by S of Newport by rail. Pop. (1921) 3,439. It is a scattered township lying on the peninsula west of the river Yar at the western extremity of the island. Freshwater Bay is separated from Alum bay on the west by the promontory between, with the group of detached rocks jutting from the sea known as the Needles, which are marked by a lighthouse The cliffs are magnificent, rising 400–500 feet Farringford house in the parish was the home of Alfred, Lord Tennyson, who is commemorated by a tablet in All Saints' church and by a great cross on High Down overlooking Freshwater Bay. There are golf links on the downs

FRESNEL, AUGUSTIN JEAN (1788–1827), French physicist, was born at Broglie, Normandy, on May 10, 1788 He was educated at the *École Centrale* in Caen, the *École Polytechnique,* and finally went to the *École des Ponts et Chaussées.* He served as an engineer in several departments, but lost his appointment in 1814 because he opposed Napoleon's return from Elba On the second restoration he obtained a post as engineer in Paris His researches in optics appear to have been begun about 1814, when he prepared a paper on the aberration of light (*q v*), which, however, was not published Fresnel's work on interference did a great deal to establish the wave theory of light (*See* LIGHT. *The Age of Fresnel*), and various devices for producing interference fringes bear his name. He applied mathematical analysis to his work and removed a number of objections to the wave theory With D. F. J Arago he studied the laws of the interference of polarized rays Circularly polarized light he obtained by means of a rhomb of glass, known as "Fresnel's rhomb" He was a pioneer in the use of compound lenses instead of mirrors for lighthouses He was a member of the Académie des Sciences, and a foreign member of the Royal Society He died at Ville-d'Avray, near Paris, on July 14, 1827

He was a member of the Académie des Sciences and the Royal Society, but his labours in the cause of optical science received during his lifetime only scant public recognition, and some of his papers were not printed by the Académie till many years after his decease But, as he wrote to Thomas Young, the English scientist, in him "that sensibility, or that vanity, which people call love of glory" had been blasted "All the compliments," he says, "that I have received from Arago, Laplace and Biot never gave me so much pleasure as the discovery of a theoretic truth, or the confirmation of a calculation by experiment"

See A Duleau "Notice sur Fresnel" in *Revue Encyclopédique* (vol xxxix., 1828); D F. G Arago, *Oeuvres completes,* vol i. (17 vols., 1854–62), G. Peacock, *Miscellaneous works of Thomas Young,* vol. i. (3 vols., 1855)

FRESNILLO, a town of the state of Zacatecas, Mexico, 37m N.W of the city of Zacatecas. Pop. (1921) 27,496. It stands on a fertile plain between the Santa Cruz and Zacatecas ranges, about 7,700ft above sea-level, has a temperate climate, and is surrounded by an agricultural district producing Indian corn and wheat. It is a clean, well-built town, whose chief distinction is its school of mines founded in 1853 Fresnillo has large amalgam works for the reduction of silver ores Its silver mines, situated in the neighbouring Proaño hill, were discovered in 1569, and were for a time among the most productive in Mexico. There is a station near on the Mexican Central railway

FRESNO, a city of California, U S A., in the heart of the San Joaquin valley, at the geographical centre of the State; the county seat of Fresno county It is on Federal highway 99; is served by the Santa Fe and the Southern Pacific railways; has a municipal airport of 296ac. and is on one of the main air-mail routes. The population was 12,470 in 1900; 45,086 in 1920; and in 1927 was estimated by the Census bureau at 62,200. Local estimates for the metropolitan area in 1928 were over 82,000 Fresno is surrounded by irrigated lands of great fertility, where grains, hay, alfalfa and fruits (especially raisin-grapes, figs, peaches and apricots) are grown in vast quantities. Summer temperatures are high, rising at times to 115°, but the humidity is low and the nights are cool; the normal annual mean temperature is 63°. The dominant manufacturing industry is the drying and packing of fruits. The packing plant of the Sun-Maid Raisin Growers (a great co-operative association) is said to be the largest of its kind in the world. There are also large flour and lumber mills, machine shops and foundries, creameries, potteries, brickworks and soap factories. In 1925 the output of the manufacturing establishments in the city was valued at $34,762,024. The oil wells of the county in 1925 produced 7,774,000 barrels Fresno is the trading and shipping centre of a large area Bank debits to individual accounts in 1926 amounted to $484,921,000 The assessed valuation of property was $46,914,099 The newspapers include three in Armenian and one in Japanese At Kearney park is an experimental irrigated farm of the University of California. The Fresno State college (established 1911), together with the Junior college (1910) under its administration, has a registration of over 2,000 Its summer session is held at Huntington lake in the Sierra Nevada in the eastern part of the county, at an elevation of 7,000ft Fresno was laid out and incorporated in 1872, when the railroad came through the county. It was chartered as a city in 1885 The irrigation project was started in 1872

FRESNOY, CHARLES ALPHONSE DU (1611–1665), French painter and writer on art, was born in Paris He learned the rudiments of design under Perrier and Vouet At the age of 21 he went to Rome, and there studied Raphael and the antique He went in 1633 to Venice, and in 1656 returned to France He died at Villiers le Bel, near Paris His Latin poem, *De arte graphica,* written during his Italian sojourn, was translated into several languages.

FRET, properly, to devour, hence to gnaw, used of the slow corroding action of chemicals, water, etc., and thus, figuratively, to chafe or irritate Possibly connected with this word, in the sense of rubbing, is the use of "fret" for a bar on the fingerboard of a banjo, guitar or similar instruments to mark the fingering In decorative art and architecture, the word means any one of several types of running or repeated ornament consisting of lengths of straight lines or narrow bands, usually connected and at right angles to each other in T, L or square-cornered G shapes, so arranged that the spaces between the lines or bands are approximately equal to the width of the bands Occasionally the system is arranged so that the lines intersect or interlace, as in the common "swastika (*q v*) fret" As the fret is one of the simplest and most natural decorative forms that can be produced in textiles, it is one of the most widely spread and is found alike from early times in all the continents. Thus it is a favourite decoration for the ceilings of Egyptian tombs from the fourth dynasty on, in later examples combined with rosettes, scarabs and the lotus into patterns of great richness In America, it is found in early Peruvian textiles, it is frequent in sculpture and architecture in the Maya and Aztec remains in Central America and Mexico, and it is one of the most universal of pottery decorations among the plains Indians. It was highly developed by both Chinese and Japanese for textiles as well as for architectural ornament; it occurs not only as a band but as a complicated all-over pattern, sometimes with acute and obtuse angles instead of the more usual right angles But its most important development was that by the Greeks (hence the common name "Greek fret"), who used it not only for pottery, but painted on architectural members, such as the abaci of capitals, and later carved it. Like so many Greek motives it was widely used by the Romans particularly in Syria (*e.g*, the *propylaea* at Damascus and the great temple at Baalbek) and occurs in Byzantine and Romanesque work.

"Fret-work" has a wider significance and is often used of any small scale repeated ornament in which geometrical forms occur especially if in low relief or pierced (T. F H)

FREUD, SIGMUND (1856–), founder of psychoanalysis, was born, of Jewish extraction, at Freiberg in Moravia on May 6, 1856 Since the age of four he has always lived in Vienna He felt no inclination towards medical work, being more interested in purely scientific research. Influenced by Goethe's essay *Die Natur,* however, he embarked on a medical curriculum. In his preliminary studies he was chiefly interested in botany and

chemistry He worked from 1876 to 1882 in the physiological laboratory under Brucke and later in the Institute for Cerebral Anatomy under Meynert. The concurrent medical studies progressed slowly and he qualified only in 1881. Financial considerations compelled him to renounce his research work and he decided to become a clinical neurologist. In 1884 a Viennese physician, Dr. Breuer, related to him an extraordinary experience in which symptoms of hysteria were cured by getting the patient to recollect in a state of hypnosis the circumstances of their origin and to express the emotions accompanying this This "cathartic" method of treatment was the starting-point of what later became psycho-analysis. In 1885 Freud went to Paris to study for over a year under the great neurologist Charcot, whose moral support strengthened his determination in the then revolutionary step of investigating hysteria from a psychological point of view. Just before this he had been made a Docent in Neuropathology for his pathological and clinical investigations His psychological studies, however, met with immediate disapproval on the part of his colleagues. In the next few years he published important works in neurology, particularly on aphasia and the cerebral paralyses of children

His interest in clinical psychology continued during these years, and in 1893 he persuaded Breuer to publish his remarkable case and to collaborate with him in a book called *Studien uber Hysterie* (1895) In 1894 the partnership dissolved and soon afterwards Freud took the decisive step of replacing hypnotism as a means of resuscitating buried memories by the method of "free association," which is the kernel of the psycho-analytic method This led him to make important discoveries concerning the structure and nature of the various psychoneuroses and to extend these discoveries to the normal mind The three most fundamental of these were (1) the existence of the unconscious and the dynamic influence of this on consciousness, (2) the fact that the splitting of the mind into layers is due to an intrapsychical conflict between various sets of forces, to one of which he gave the name of "repression"; and (3) the existence and importance of infantile sexuality He came to see in the unconscious conflicts over the young child's sexual attitude toward its parents, which together with the accompanying jealousy and hostility he refers to as the "Oedipus conflict," not only the central factor in the neuroses, but a fundamental contribution to the formation of character in general The particular mechanisms he had found in the neuroses he demonstrated in detail in many other spheres, such as wit, dreams, literary products, art, mythology and religion (*See* PSYCHO-ANALYSIS)

For ten years Freud worked alone at psycho-analysis About 1906 he was joined by a number of colleagues, Adler, Brill, Ferenczi, Ernest Jones, Jung, Sadger, Stekel and others, who met in 1908 at the first International Congress of Psycho-Analysis, since then a biennial institution A couple of years later an International Association was founded, which now has branches in most countries of the world (the British one dates from 1913) and which maintains three official organs devoted to the subject The influence of Freud's work, however, has extended far beyond the special activities of the 200 specialists in the subject It has met with keen opposition, which he ascribes to the powerful resistance always operating against the recognition of the unconscious mind. Nevertheless it is recognized that he has given a powerful impetus to psychology in general and that in time this will probably affect many other fields of mental activity On his 70th birthday Freud was the recipient of congratulations from learned societies in various parts of the world and was accorded the freedom of the city of Vienna (E. J)

BIBLIOGRAPHY —A complete edition of Freud's writings (including an autobiography) has been published by the Internationaler Psychoanalytischer Verlag under the title of *Gesammelte Schriften.* His writings have also been published in English, chiefly by the Institute of Psycho-Analysis, (London; this also publishes the *International Journal of Psycho-Analysis,* in which full information of current work can be obtained.

FREUDENSTADT, a town of Germany, in the republic of Württemberg, on the right bank of the Murg, 40 m. S.W. from Stuttgart by rail. Pop. (1925) 9,785. It has some small manufactures of cloth, furniture, knives, nails and glass, and is a health resort It was founded in 1599 by Protestant refugees from Salzburg

FREUND, WILHELM (1806–1894), German philologist and lexicographer, was born at Kempen in the grand duchy of Posen on Jan. 27, 1806 From 1855–70 he was director of the Jewish school at Gleiwitz in Silesia, and he died at Breslau on June 4, 1894 Freund took an important part in the movement for the emancipation of his Prussian coreligionists, and the *Judengesetz* of 1847 was in great measure the result of his efforts The work by which he is best known is his *Worterbuch der lateinischen Sprache* (1834–45), practically the basis of all Latin-English dictionaries.

FREUNDLICH, EMMY (1878–), Austrian politician, was born at Aussig, Czechoslovakia in 1878 She married in 1889, and with her husband began to work among the textile workers of Moravia. There, from 1900–1911, she was the leader of the Socialist women's organization, and one of the managing board of the local co-operative society In 1911 she went to Vienna, and from that date began her assiduous and regular work for co-operation; she insisted on the importance of the representation of women on every co-operative society's management. Frau Freundlich became a member of the central committee of the Austrian Co-operatives, a member of the board of the wholesale society, and of the central committee, and in 1927 of the Executive Committee of the International Co-operative Alliance She entered the Austrian parliament in 1919, and was closely associated with Dr Renner during his premiership. From 1919 onwards, she represented the consumers on the Austrian food ministry, and sat on the municipal council of Vienna, from 1919–1921.

In 1926 she was invited by the League of Nations to sit on the preparatory committee for the World Economic Conference; she was a member of that conference (1927), and of the enlarged Advisory Economic Committee appointed to promote the decisions of the conference

FREWEN, ACCEPTED (1588–1664), archbishop of York, was born at Northiam, in Sussex, and educated at Magdalen College, Oxford. As chaplain to Sir John Digby, ambassador in Spain, he preached at Madrid a sermon which pleased Prince Charles, afterwards Charles I , who, on his accession, appointed Frewen one of his chaplains In 1625 he became canon of Canterbury and vice-president of Magdalen College, and in the following year was elected president. He was vice-chancellor of the university in 1628 and 1629, and again in 1638 and 1639 It was mainly by his instrumentality that the university plate was sent to the king at York in 1642. Two years later he was consecrated bishop of Lichfield and Coventry, and resigned his presidentship Parliament declared his estates forfeited for treason in 1652, and Cromwell afterwards set a price on his head. He escaped to France, and at the Restoration was consecrated archbishop of York. In 1661 he acted as chairman of the Savoy conference

FREY, ADOLF (1855–1920), Swiss poet, literary historian and critic, son of Jacob Frey, was born at Aarau on Feb. 18, 1855, and died at Zurich on Feb 12, 1920 He became professor of German literature, first at Aarau and then at Zurich His chief claim to attention is his keen and profound interpretation of Swiss literature and art, as shown in his book on *Schweizer Dichter* (1919), and in his monographs on *Albert von Haller* (1879) *Gottfried Keller* (enlarged edition, 1893), *C. F. Meyer* (1900), *Böcklin* (1903), *Koller* (1906), *Welti* (1908), *Hodler* (1922) and others. He wrote also two vigorous historical novels, *Die Jungfer von Wattenwil* (1912) and *Bernhard Hirzel* (1918). A final selection of his best *Poems* was issued in 1922. His lyrics are graceful, and his dialect poems were especially popular. His dramas (*e.g., Erni Winkelried,* 1893) are less important

See C. F. Wiegand, *Das Adolf Frey Buch* (1920); L. Frey, *Adolf Frey: sein Leben und Schassen* (1923).

FREY, son of Njord, one of the chief deities in the northern pantheon and the national god of the Swedes. He is the god of fruitfulness, the giver of sunshine and rain His sister Freyia, the most prominent goddess in northern mythology, shares his characteristics. (*See* TEUTONIC PEOPLES, *ad fin*)

FREYCINET, CHARLES LOUIS DE SAULCES DE (1828–1923), French statesman, was born at Foix on Nov. 14, 1828. He was educated at the École Polytechnique, and entered the government service as a mining engineer. In 1858 he was appointed traffic manager to the Compagnie de chemins de fer du Midi, and in 1862 returned to the engineering service (in which he attained in 1886 the rank of inspector-general) He was sent on a number of special missions, among which, one to England, on which he wrote a *Mémoire sur le travail des femmes et des enfants dans les manufactures de l'Angleterre* (1867). On the establishment of the Third Republic in Sept 1870, he offered his services to Gambetta, was appointed prefect of the department of Tarn-et-Garronne, and in October became chief of the military cabinet. It was mainly his powers of organization that enabled Gambetta to raise army after army to oppose the invading Germans. In 1871 he published a defence of his administration under the title of *La Guerre en province pendant le siège de Paris.* He entered the Senate in 1876 as a follower of Gambetta, and in Dec 1877 became minister of public works in the Dufaure cabinet He carried a scheme for the guadual acquisition of the railways by the state and the construction of new lines at a cost of three milliards, and for the development of the canal system at a further cost of one milliard He retained his post in the ministry of Waddington, whom he succeeded in Dec. 1879 as president of the council and minister for foreign affairs He passed an amnesty for the Communards, but in attempting to steer a middle course on the question of the religious associations, lost the support of Gambetta, and resigned in Sept 1880 In Jan 1882 he again became president of the council and minister for foreign affairs His ministry resigned on the rejection of his plan to occupy the Isthmus of Suez He returned to office in April 1885 as foreign minister in the Brisson cabinet, and retained that post when, in Jan 1886, he succeeded to the premiership He came into power with an ambitious programme of internal reform; but except that he settled the question of the exiled pretenders, his successes were won chiefly in the sphere of colonial extension His ministry fell on Dec 3, 1886.

In April 1888 he became minister of war in the Floquet cabinet —the first civilian since 1848 to hold that office His services to France in this capacity were the crowning achievement of his life He held his office without a break for five years through as many successive administrations—those of Floquet and Tirard, his own fourth ministry (March 1890–Feb. 1892), and the Loubet and Ribot ministries He introduced the three-years' service and established a general staff, a supreme council of war, and the army commands He failed to clear himself entirely of complicity in the Panama scandals, and in Jan 1893 resigned the ministry of war In Nov 1898 he once more became minister of war in the Dupuy cabinet, but resigned office May 6, 1899 He published, besides the works already mentioned, *Traité de mécanique rationnelle* (1858); *De l'analyse infinitésimale* (1860, revised ed , 1881); *Des pentes économiques en chemin de fer* (1861); *Emploi des eaux d'égaut en agriculture* (1869); *Principes de l'assainissement des villes* and *Traité d'assainissement industriel* (1870); *Essai sur la philosophie des sciences* (1896); *La Question d'Égypte* (1905); besides some remarkable "Pensées" contributed to the *Contemporain* under the pseudonym of "Alceste." In 1882 he was elected a member of the Academy of Sciences, and in 1890 to the French Academy in succession to Émile Augier. He died on May 14, 1923 in Paris

FREYCINET, LOUIS CLAUDE DESAULSES DE (1779–1842), French navigator, was born at Montélimar, Drôme In 1793 he entered the French navy After taking part in several engagements against the British, he joined in 1800, along with his brother Louis Henri Freycinet (1777–1840), who afterwards rose to the rank of admiral, the expedition sent out under Capt. Baudin in the "Naturaliste" and "Géographe" to explore the south and south-west coasts of Australia. Much of the ground already gone over by Flinders was revisited, and new names imposed by this expedition. In 1805 he returned to Paris, and prepared the maps and plans of the expedition; he also completed the narrative entitled *Voyage de découverts aux terres australes* (1807–16). In 1817 he commanded the "Uranie," in which Arago and others went to Rio de Janeiro, to take a series of scientific observations For three years Freycinet cruised about, visiting Australia, the Marianne, Sandwich and other Pacific Islands, South America, and other places, and, notwithstanding the loss of the "Uranie" on the Falkland islands during the return voyage, returned to France with fine collections in all departments of natural history, and with voluminous notes and drawings The results of this voyage were published under Freycinet's supervision as *Voyage autour du monde sur les corvettes "l'Urane" et "la Physicienne"* (1824–44). Freycinet was one of the founders of the Paris Geographical Society. (See *La Géographie* 41 (1924), pp 265–273)

FREYIA, the sister of Frey (*q v*)

FREYLINGHAUSEN, JOHANN ANASTASIUS (1670–1739), German theologian and poet, was born on Dec 2, 1670, at Gandersheim, and studied theology at Jena, Erfurt and Halle, where, in 1727, he succeeded A H Francke as superintendent of the Paedagogium and of the orphan asylum, and as head pastor of St Ulrich's church Freylinghausen was one of the most gifted of the poets of German Pietism, and has left important editions of hymnals, which were published in 1704 and in 1714 They were reprinted in W Schirck's *Geistliche Sanger* (pt 2, 1855), and some were translated by C Winkworth, *Lyra Germanica* (1868)

See Herzog, *Realencyklopadie.*

FREYTAG, GEORG WILHELM (1788–1861), German philologist, was born at Luneburg on Sept 19, 1788 He studied Arabic, Persian and Turkish under De Sacy at Paris In 1819 he became professor of oriental languages at Bonn He died on Nov 16, 1861 He edited two volumes of Arabic songs (*Hamasae carmina,* 1828–52) and three of Arabic proverbs (*Arabum proverbia,* 1838–43); and prepared the *Lexicon Arabico-latinum* (Halle, 1830–37, abridged ed , 1837)

FREYTAG, GUSTAV (1816–1895), German novelist, was born at Kreuzburg, in Silesia, on July 13, 1816 He studied philology at Breslau and Berlin, and in 1838 took the degree with a remarkable dissertation, *De initus poeseos scenicae apud Germanos* In 1839 he settled at Breslau, as *Privatdocent* in German language and literature His comedy *Die Brautfahrt, oder Kunz von der Rosen* (1844), had some success, but he made his name by his comedy *Die Journalisten* (1853), one of the best German comedies of the 19th century, the subject of which was drawn from his own experience In 1847 he edited, with Julian Schmidt, *Die Grenzboten,* a weekly journal which, founded in 1841, now became the leading organ of German and Austrian liberalism Freytag helped to conduct it until 1861, and again from 1867 till 1870, when for a short time he edited a new periodical, *Im neuen Reich.* His fame became universal with the publication in 1855 of his novel of the counting house, *Soll und Haben,* which was translated into almost all the languages of Europe It was certainly the best German novel of its day, impressive by its sturdy but unexaggerated realism Its main purpose is the recommendation of the German middle class as the soundest element in the nation His powerful advocacy of the hegemony of Prussia in his *Grenzboten* gained him the friendship of the duke of Saxe-Coburg-Gotha, whose neighbour he had become on acquiring the estate of Siebleden near Gotha At the duke's request Freytag was attached to the staff of the crown prince of Prussia in the campaign of 1870, and was present at the battles of Wörth and Sedan Before this he had published another novel, *Die verlorene Handschrift* (1864), a description of Leipzig society, in which he endeavoured to do for German university life what in *Soll und Haben* he had done for commercial life. His *Bilder aus der deutschen Vergangenheit,* a popular account of the history and manners of the Germans, has been compared to Green's *Short History of the English People.* In 1872 he began a work with a similar patriotic purpose, *Die Ahnen,* a series of historical romances in which he unfolds the history of a German family from the earliest times to the middle of the 19th century. His other works include an autobiography (*Erinnerungen aus meinem Leben,* 1887); *Gesammelte Aufsätze,* chiefly reprinted from the *Grenzboten*

(1888); *Der Kronprinz und die deutsche Kaiserkrone; Erinnerungsblatter* (1889). He died at Wiesbaden on April 30, 1895.

Freytag's *Gesammelte Werke* were published in 22 vols at Leipzig (1886–89). His *Vermischte Aufsatze* have been edited by E Elster (2 vols, Leipzig, 1901–03). On Freytag's life *see*, besides his autobiography mentioned above, the lives by C. Alberti (Leipzig, 1890) and F. Seiler (Leipzig, 1898). *See* also *Flugenschriften-sammlung G Freytag* (1925), published by the city library of Frankfort-on-Main; and A. Kohut, *Gustav Freytag als Patriot und Politiker* (1916).

FRIAR, the English generic name for members of the mendicant religious orders (from Lat *frater* through Fr *frère*) Formerly it was the title given to individual members of these orders, as Friar Laurence (in *Romeo and Juliet*), but this is not now common In England the chief orders of friars were distinguished by the colour of their habit thus the Franciscans or Minors were the Grey Friars, the Dominicans or Preachers were the Black Friars (from their black mantle over a white habit), and the Carmelites were the White Friars (from their white mantle over a brown habit). these, together with the Austin Friars or Hermits, formed the four great mendicant orders—Chaucer's "alle the ordres foure" Detailed information on these orders and on their position in England is given in separate articles The difference between friars and monks is explained in article MONASTICISM

See Fr Cuthbert, *The Friars and how they came to England,* pp. 11–32 (1903), also F. A Gasquet, *English Monastic Life,* pp 234–249 (1904), where special information on all the English friars is conveniently brought together

FRIAR-BIRD, the name given to several Australian birds of the honey-eater family from their ruff of feathers on the head, and sober plumage The best-known species is *Tropidorhynchus corniculatus,* also known as Pimlico and Four o'Clock, imitations of its loud cry Friar-birds are bold and noisy, haunting trees in small flocks The forms inhabiting some of the Malay islands are mimicked by orioles (*see* Wallace, *Malay Archipelago;* also HONEY-EATER, ORIOLE, MIMICRY)

FRIARS' BALSAM. An ancient and valuable medicament of which the essential constituent is benzoic acid It is used largely for inhalation in cases of septic as well as inflammatory conditions of the respiratory tract *See* BENZOIC ACID

FRIBOURG (Ger *Freiburg*), one of the Swiss Cantons, in the western portion of the country, taking its name from the town around which the various districts that compose it gradually gathered Its area is 644 sq m, of which 568 sq m are classed as "productive" It is a hilly region, the highest summits (of which the Vanil Noir, 7,858 ft, is the loftiest) rising in the Gruyère district at its south-eastern extremity, the best known being probably the Moléson (6,582 ft) and the Berra (5 653 ft) But it is the heart of pastoral Switzerland and is famed for its cheese and cattle It is watered by the Sarine or Saane river (with its tributaries the Singine or Sense and the Glâne) that flows through the canton from north to south, and traverses its capital town The upper course of the Broye (like the Sarine, a tributary of the Aar) and that of the Veveyse (flowing to the Lake of Geneva) are in the southern portion of the canton. A small portion of lakes Neuchâtel and Morat belongs to the canton, wherein is the Lac Noir or Schwarzsee There are sulphur springs near the lake, and at Montbarry and Bonn. The main line from Lausanne to Bern past Fribourg runs through the Canton with important branch lines in all directions Pop. (1920) 143,055; 1925 estimate, 147,000; most of whom are Roman Catholics The canton is on the linguistic frontier in Switzerland, the line of division running nearly due north and south through it, and even through its capital. The German-speaking inhabitants are found chiefly in the north-western (Morat region) and north-eastern (Singine valley) portions, as well as in the upper valley of the Jogne or Jaun in the south-east Besides the capital, Fribourg (*q.v*) the only villages of importance are Bulle, Châtel St Denis, Morat (*q.v*) or Murten, Romont and Estavayer le Lac or Stäffis am See.

The canton is pre-eminently a pastoral and agricultural region, tobacco, cheese and timber being its chief products. Its industries include watch-making (Semsales), paper-making (Marly) and chocolate manufacturing It forms part of the diocese of Lausanne and Geneva, the bishop living since 1663 at Fribourg. It is a stronghold of Roman Catholicism with monasteries and nunneries, such as those of the Carthusian monks at Valsainte, and the Cistercian nuns at La Fille Dieu and at Maigrauge

FRIBOURG [Ger *Freiburg*], the capital of the Swiss canton of that name. It is built almost entirely on the left bank of the Sarine, the oldest bit (the Bourg) being just above the river bank, flanked by the Neuveville and Auge quarters, these with the Planche quarter on the right bank of the river forming the *Ville Basse.* On the steep ground to the west of the Bourg is the Quartier des Places, beyond which, to the west and south-west, is the still newer Pérolles quarter, with the railway station and university, all these (with the Bourg) constituting the *Ville Haute* In 1921 the population of the town was 20,064, of whom 18,024 were Roman Catholics and 95 Jews, while 12,831 were French-speaking and 6,921 German-speaking, these last being mainly in the Ville Basse Founded as a German town, French became the official language during the 14th and 15th centuries, but when it joined the Swiss Confederation in 1481 German influence came to the fore, and German was the official language from 1483 to 1798 From 1798 to 1814, and again from 1830 onwards, French prevailed, as at present. Fribourg is on the main line from Berne (20 m) to Lausanne (41 m)

The town was founded in 1157 by Berchthold IV, duke of Zahringen The spot was chosen for purposes of military defence, and was situated in the *Uechtland* or waste land between Alamannian and Burgundian territory. The oldest existing charter of the town dates from 1249 In 1218, the lands passed to Anna, the sister of the last duke and wife of Count Ulrich of Kyburg The line became extinct in 1264. Their heiress married Eberhard, count of Habsburg-Laufenburg, who sold Fribourg in 1277 to his cousin Rudolf, the head of the house of Habsburg The town had to struggle for its existence against Berne and the count of Savoy, between 1448 and 1452 Abandoned by the Habsburgs, and desirous of escaping from the increasing power of Berne, Fribourg in 1452 finally submitted to the count of Savoy In the 15th century Fribourg exported much leather and cloth to France, Italy and Venice When Yolande, dowager duchess of Savoy, entered into an alliance with Charles the Bold, duke of Burgundy, Fribourg joined Berne, and helped to gain the victories of Grandson and of Morat (1476).

In 1477 the town was finally freed from the rule of Savoy, while in 1481 (with Soleure) it became a member of the Swiss Confederation In 1475 the town had taken Illens and Arconciel from Savoy, and in 1536 won from Vaud much territory, including Romont, Rue, Châtel St. Denis, Estavayer, St Aubin, as well as Vuissens and Surpierre, which still form outlying portions (physically within the canton of Vaud) of its territory, while in 1537 it took Bulle from the bishop of Lausanne. In 1502–04 the lordship of Bellegarde or Jaun was bought, while in 1555 it acquired (jointly with Berne) the lands of the last count of the Gruyère, and thus obtained the rich district of that name. From 1475 it ruled (with Berne) the bailiwicks of Morat, Grandson, Orbe and Echallens, just taken from Savoy, but in 1798 Morat was incorporated with (finally annexed in 1814) the canton of Fribourg, the other bailiwicks being then given to the canton of Léman (later of Vaud) From the 16th century the democratic government gave place to an oligarchy which continued till the French occupation of 1798

From 1803 (Act of Mediation) to 1814, Fribourg was one of the 19 cantons of the Swiss Confederation. But, on the fall of the new régime, in 1814, the old patrician rule was partly restored. In 1831 the Radicals secured a more liberal constitution. In 1846 Fribourg joined the *Sonderbund* and, in 1847, had to surrender to the Federal troops The Radicals came back to power. In 1857 the Conservatives secured the adoption of a new cantonal constitution, and have since maintained their power

The principal building in the town is the collegiate church of St. Nicholas, of which the nave dates from the 13th–14th centuries, while the choir was rebuilt in the 17th century. It has a lofty bell-tower (15th century) The town hall dates from the 16th century. In the Lycée is the Cantonal museum of fine arts.

On the Pérolles plateau is the International Catholic university founded in 1889. A dam built to the north of the town forms a sheet of water known as the Lac de Pérolles. This is part of a hydro-electric scheme.

FRICK, HENRY CLAY (1849–1919), American manufacturer and philanthropist, was born at West Overton (Pa.), on June 17, 1849 He early became interested in the coke business. In 1871 he organized the firm of Frick and Co , which ultimately acquired large coal deposits and ran 12,000 coke ovens He was chairman of the board of Carnegie Bros , from 1889 to 1892, and in 1892, during the Homestead strike, was shot and stabbed by Alexander Berkman, an anarchist He was a director of the Pennsylvania, the Santa Fé and other railways, and of the U S Steel Corporation. He died in New York, Dec 2, 1919

He left to the city of Pittsburgh land for a park, together with an endowment His New York mansion, with its collection of paintings, bronzes and enamels, he bequeathed with an endowment to the city on the death of his wife Among the various objects are the Fragonard panels, Bellini's "St. Francis in the Desert," Velasquez' "Philip IV.," Van Dyck's "Paola Adorno," Rembrandt's "Portrait of Himself," Gainsborough's "The Mall," and "The Hon Anna Duncan" It includes also fine examples of Titian, Vermeer, Frans Hals, Ruysdael, Cuyp, Rubens, El Greco, Goya, Sir Thomas Lawrence, Millet, Raeburn, Reynolds, Romney and Turner. He divided his residuary estate, estimated at $50,000,000, between various hospitals and educational and charitable institutions

FRICTION is the resistance offered to the motion of one portion of matter upon another It is due partly to the molecular attraction between the surfaces and partly to the nature and condition of those surfaces It is in the nature of a force which acts between the surfaces in contact and resists their sliding or rolling upon each other. This force, termed the force of friction (F), is independent, in a solid body, of the area of the surfaces in contact and the speed of the motion (unless it be very small) of the two bodies It is proportional, however, to the force with which the surfaces are pressed together, that is, it is that force times some factor which is always less than unity This factor is called the coefficient of friction and is designated by μ or f Thus if a 100 lb iron block (pressing the surfaces together with a force P) slides along a horizontally placed iron plate when a force of 20 lb (F) is exerted against it, the ratio between the weight of the block and the force required to move it is the *coefficient of friction* (μ)

$$\mu = \frac{F}{P} = \frac{20}{100} = 0.2$$

If the block of iron is placed upon the iron plate, one end of which is raised until the weight of the block will just overcome its tendency to slide, then the angle of the plate to the horizontal is called the *angle of repose,* which is generally denoted by θ. In the case of the iron block on the iron plate (θ) will be between 14° and 8° depending upon the roughness of the surfaces The force which is required to overcome the friction of starting a body so that it will slide along another surface is called the friction of rest or *static friction* This always is greater than the force necessary to keep it sliding in uniform motion, which is called the friction of motion or *kinetic friction*

All surfaces are more or less rough, even those which are well machined and polished show, under the microscope, small projections and depressions When any surfaces have been at rest for some time static friction is always increased This is because two dry surfaces left under pressure embed themselves, the one in the other, more and more thoroughly as time passes, until with the exclusion of air, in some instances adhesion occurs With lubricated surfaces that have been at rest for some time, and when the lubricant has been pressed out, a somewhat similar action occurs. As a result the starting effort is always much greater than the running effort; starting effort may even approximate the values for *solid friction,* which is the term used to denote friction when there has been no lubrication After the surfaces have been forced into motion, the lubricant is drawn between them and the force necessary to drive the part rapidly decreases as the lubricant begins to produce a film. When a perfect film is maintained between the surfaces they are then held apart and are without contact The condition then follows the laws of *fluid friction* covering the movement of particles of liquids in contact with each other or with other bodies. This can be likened to the effect of a boat going through the water, giving motion to various strata or films of water. (*See* VISCOSITY.) The film in contact with the boat travels at about the speed of the boat, but every succeeding film or layer has less motion, the outside layer being then in contact with still water. The frictional resistance between the films is very great as the speed of the boat increases.

The laws of *fluid friction* as given by Thurston are. Frictional resistance is, (1) independent of the pressure between the masses in contact; (2) directly proportional to the area of rubbing surface; (3) proportional to the square of the relative velocity at moderate and high speeds; and to the velocity, nearly, at low speeds; (4) independent of the nature of the surfaces of the solid against which the stream may flow, but dependent to an extent upon the degree of roughness; (5) proportional to the density of the fluid and related in some way to its viscosity

The following table (Thomsen) of approximate values for the coefficient of friction shows coefficient of friction with various conditions:—

Condition of surfaces	Coefficient of friction	
	Range	Average value
Unlubricated or poorly lubricated surfaces	0.1 to 0.4	0.160
Semi-lubricated surfaces	0.01 to 0.10	0.030
Perfectly lubricated surfaces	0.002 to 0.01	0.006
Ball bearings, in rolling contact	0.001 to 0.003	0.002
Roller bearings, in rolling contact	0.002 to 0.007	0.005

In the latest studies of the behaviour of bearings and lubricants it has been pointed out by Bernard (*Industrial and Engineering Chemistry,* April 1924) that the main variables influencing the lubrication of a given bearing of normal design and construction are the ratio $z\frac{n}{p}$ where z is the viscosity of the lubricant, n is the speed of rotation of the journal, and p is the pressure on the bearing When speeds are high and loads are light viscosity is the only property of the lubricant which influences friction With low speeds and heavy loads friction is largely effected by the ability of the lubricant to adhere to the bearing surfaces and resist rupture (*See* also BEARINGS; LUBRICATION AND LUBRICANTS) (W. F P)

FRIDAY, the sixth day of the week, corresponding to the Roman *Dies Veneris,* the French *Vendredi* The ill-luck associated with the day arose from its connection with the Crucifixion By the Western and Eastern Churches Fridays, except when Christmas falls on that day, have ever been observed as days of fast The day on which the Passion of Christ is commemorated is known as Good Friday (*q v*)

FRIDOLIN or **FRIDOLD, SAINT** (*fl* 6th century), Irish missionary, is first mentioned by the monk Balther, at the beginning of the 11th century, as belonging to a noble Irish family, and as having been the first missionary from Ireland to work among the Alamanni on the upper Rhine, where he founded many monasteries Some historians regard Balther's account as pure invention.

FRIEDBERG, the name of two towns in Germany.

1. A small town in Upper Bavaria, with an old castle, known mainly as the scene of Moreau's victory over the Austrians in 1796. Pop. (1925) 4,190.

2. FRIEDBERG IN DER WETTERAU, in the republic of Hesse, on the Usa, 14 m. N. of Frankfort-on-Main by rail Pop (1925) 11,048. Friedberg is of Roman origin, but is first mentioned as a town in the 11th century. In 1211 it became a free imperial city, in 1349 was pledged to the counts of Schwarzburg, and subsequently often changed hands, eventually in 1802 passing to

Hesse-Darmstadt It is still surrounded by old walls and towers, and contains many mediaeval buildings, of which the Gothic town church and the old castle are noteworthy. It has manufactures of sugar, leather and photographic paper

FRIEDEL, CHARLES (1832–99), French chemist and mineralogist, was born at Strasbourg on March 12, 1832 In 1854 he entered C A. Wurtz's laboratory, and in 1856 was appointed conservator of the mineralogical collections at the École des Mines In 1871 he began to lecture at the École Normale, and in 1876 he became professor of mineralogy at the Sorbonne, but on the death of Wurtz in 1884 he exchanged that position for the chair of organic chemistry. He died at Montauban on April 20, 1899 Friedel worked both in mineralogy and organic chemistry He collaborated from 1879 to 1887 with Émile Edmond Sarasin (1843–90), on the formation of minerals by artificial means. In 1893, as the result of an attempt to make diamond by the action of sulphur on highly carburetted cast iron at 450°–500° C he obtained a black powder too small in quantity to be analysed but hard enough to scratch corundum He also devoted much attention to the pyroelectric phenomena of crystals, to the determination of crystallographic constants, and to the study of the ketones and aldehydes. In 1862 he prepared iso-propyl alcohol, and in 1863, with J M Crafts (1839–1917), he obtained various organic compounds of silicon A few years later further work, with A Ladenburg, on silicon yielded silicochloroform and led to a demonstration of the close analogy existing between silicon and carbon. In 1871, with R D da Silva he synthesized glycerin, starting from propylene In 1877, with Crafts, he described the valuable method for synthesizing benzene homologues, generally known as the "Friedel and Crafts reaction", it was based on an accidental observation of the action of metallic aluminium on amyl chloride The method consists in bringing together a hydrocarbon and an organic chloride in presence of aluminium chloride, when the residues of the two compounds unite to form a more complex body. Friedel was associated with Wurtz in editing the latter's *Dictionnaire de chimie,* and undertook the supervision of the supplements issued after 1884 He was the chief founder of the *Revue générale de chimie* in 1899 His publications include a *Notice sur la vie et les travaux de Wurtz* (1885), *Cours de chimie organique* (1887) and *Cours de minéralogie* (1893)

See memorial lecture by J M Crafts, printed in the *Journal of the London Chemical Society* (1900).

FRIEDJUNG, HEINRICH (1851–1920), Austrian historian, was born at Roštín, Moravia, of Jewish parents. Friedjung spent much of his career in political journalism, he was a pronounced German nationalist, and the chief author of the nationalist *Unser Programme* of 1885 At the same time he devoted himself to historical research, especially over the period 1848–66, which he covered brilliantly and exhaustively in the three works *Oesterreich von 1849–60* (1908–12); *Der Krimkrieg und die oesterreichische Politik* (1907); and *Der Kampf um die Vorherrschaft in Deutschland* (10th ed, 1917). His other chief works are the volume *Historische Aufsatze* (1919) and the monumental review of modern times *Das Zeitalter des Imperialismus* (1919–22), which was finished by Prof. A F Pribram after Friedjung's death.

Friedjung was a conscientious and an attractive historian, whose works cover all aspects of life during the period with which they deal The point of view expressed in them is, however, pronouncedly liberal, patriotic and anti-Catholic, and shows little sympathy for the Slav and Magyar nationalist movements in the Dual Monarchy. His last excursion into politics was most unlucky, and undeservedly clouded his name; on March 24, 1909, when the conflict between Austria-Hungary and Serbia over the annexation of Bosnia-Herzegovina was at its height, he published an article in the *Neue Freie Presse,* accusing the Serbo-Croat politicians in the Monarchy of treasonable practices with the Government of Serbia, and violently attacking conditions in Serbia. Fifty-two deputies of the Croato-Serb coalition and their leader Supilo separately, sued Friedjung for libel. It was disclosed that Friedjung had received the documents on which his article was based from the Austro-Hungarian Foreign Office, that he had accepted them in good faith but after most insufficient scrutiny and that some at least were blatant forgeries. The affair ended at last in a compromise, but not until it had assumed the proportions of a European *cause célèbre.* Friedjung died in Vienna July 14, 1920

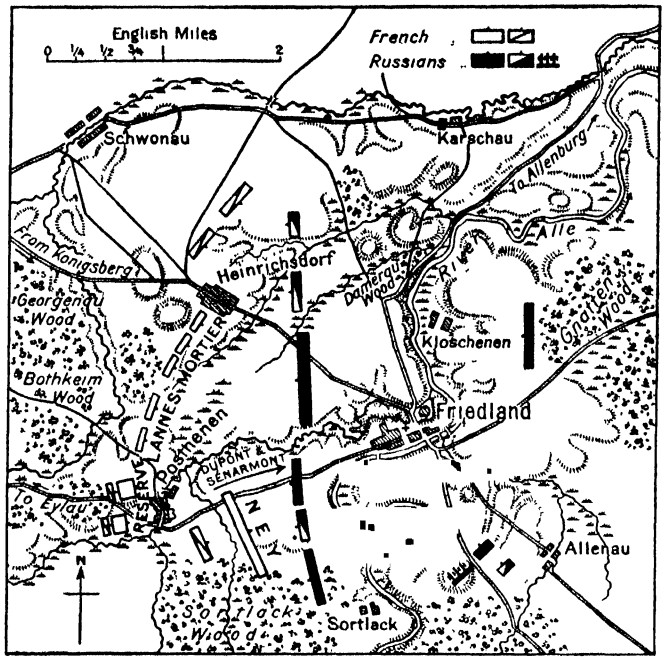
See Dr. R W. Seton-Watson, *The Southern Slav Question and the Habsburg Monarchy* (1911).

FRIEDLAND (AUSTRIA). *see* FRYDLANT

FRIEDLAND, the name of seven towns in Germany The most important is that in the republic of Mecklenburg-Strelitz, on the Muhlenteich, 35 m N E of Strelitz by rail. Pop (1925) 7,550 It possesses a Gothic church and has manufactures of iron, machinery, starch and sugar Friedland was founded in 1244 by the margraves John and Otto III of Brandenburg

FRIEDLAND, a town of Prussia, on the Alle, 27 m. S E of Konigsberg, famous as the scene of the battle fought between the French under Napoleon and the Russians commanded by General Bennigsen, on June 14, 1807 (*see* NAPOLEONIC CAMPAIGNS) The Russians had on the 13th driven the French cavalry outposts from Friedland to the westward, and Bennigsen's main body began to occupy the town in the night The army of Napoleon was set in motion for Friedland, but it was still dispersed on its various march routes, and the first stage of the engagement was thus, as usual, a pure "encounter-battle" The corps of Marshal Lannes as "general advanced guard" was first engaged, in the Sortlack Wood and in front of Posthenen (2 30–3 A.M on the 14th) Both sides now used their cavalry freely to cover the formation of lines of battle, and a race between the rival squadrons for the possession of Heinrichsdorf resulted in favour of the French under Grouchy Lannes in the meantime was fighting hard to hold Bennigsen, for Napoleon feared that the Russians meant to evade him again Actually, by 6 A.M. Bennigsen had nearly 50,000 men across the river and forming up west of Friedland His infantry, in two lines, with artillery, extended between the Heinrichsdorf-Friedland road and the upper bends of the river Beyond the right of the infantry, cavalry and Cossacks extended the line to the wood northeast of Heinrichsdorf, and small bodies of Cossacks penetrated even to Schwonau The left wing also had some cavalry and, beyond the Alle, batteries were brought into action to cover it A heavy and indecisive fire-fight raged in the Sortlack Wood between the Russian skirmishers and some of Lannes's troops. The head of Mortier's (French and Polish) corps appeared at Heinrichsdorf and the Cossacks were driven out of Schwonau Lannes held his own, and by noon, when Napoleon arrived, 40,000 French troops were on the scene of action His orders were brief Ney's corps was to take the line between Posthenen and the Sortlack Wood, Lannes closing on his left, to form the centre, Mortier at Heinrichsdorf the left wing. Victor and the Guard were placed in reserve behind Posthenen Cavalry masses were collected at Heinrichsdorf The main attack was to be delivered against the Russian left, which Napoleon saw at once to be cramped in the narrow tongue of land between the river and the Posthenen mill-stream Three cavalry divisions were added to the general reserve The course of the previous operations had been such that both armies had still large detachments out towards Konigsberg. The afternoon was spent by the emperor in forming up the newly arrived masses, the deployment being covered by an artillery bombardment. At 5 o'clock all was ready, and Ney, preceded by a heavy artillery fire, rapidly carried the Sortlack Wood The attack was pushed on toward the Alle One of Ney's divisions (Marchand) drove part of the Russian left into the river at Sortlack A furious charge of cavalry against Marchand's left was repulsed by the dragoon division of Latour-Maubourg Soon the Russians were huddled together in the bends of the Alle, an easy target for the guns of Ney and of the reserve Ney's attack indeed came eventually to a standstill; Bennigsen's reserve cavalry charged with great effect and drove him back in disorder. As at Eylau, the approach of night seemed to preclude a decisive success, but in June and on firm ground the old mobility of the French reasserted its value The infantry division of Dupont advanced rapidly from Posthenen, the cavalry divisions drove back the Russian squadrons into the now congested masses

of foot on the river bank, and finally the artillery general Sénarmont advanced a mass of guns to case-shot range. It was the first example of the terrible artillery preparations of modern warfare, and the Russian defence collapsed in a few minutes Ney's exhausted infantry were able to pursue the broken regiments of Bennigsen's left into the streets of Friedland Lannes and Mortier had all this time held the Russian centre and right on its ground,



PLAN OF THE BATTLE OF FRIEDLAND, JUNE 14TH, 1807

and their artillery had inflicted severe losses When Friedland itself was seen to be on fire, the two marshals launched their infantry attack Fresh French troops approached the battlefield Dupont distinguished himself for the second time by fording the mill-stream and assailing the left flank of the Russian centre This offered a stubborn resistance, but the French steadily forced the line backwards, and the battle was soon over The losses incurred by the Russians in retreating over the river at Friedland were very heavy, many soldiers being drowned Farther north the still unbroken troops of the right wing drew off by the Allenburg road; the French cavalry of the left wing, though ordered to pursue, remaining, for some reason, inactive The losses of the victors were reckoned at 12,100 out of 86,000, or 14%, those of the Russians at 10,000 out of 46,000, or 21% (Berndt, *Zahl im Kriege*)

FRIEDMANN, MEIR (1831–1908), Hungarian Jewish scholar, was born at Kraszna on July 10, 1831. His editions of the Midrash are the standard texts His chief editions were the *Sifra* (1864), the *Mekhilta* (1870), *Pesiqla Rabbathi* (1880) At the time of his death he was editing the *Sifra*. Friedmann, while inspired with regard for tradition, dealt with the Rabbinic texts on modern scientific methods, and rendered conspicuous service to the critical investigation of the Midrash and to the history of early homilies.

FRIEDRICH, CASPAR DAVID (1774–1840), German landscape painter and engraver, born at Greifswald on Sept 5, 1774 He studied under Dr J. G. Quistorp, the university drawing master of his native town, and from 1794 to 1798 at the Academy of Copenhagen He then settled at Dresden, where he was a member of an artistic and literary circle of friends, which included Runge, Tieck and Novalis His drawings in sepia, executed in his neat early style, won Goethe's approval and a prize from a Weimar art society in 1805 His first important oil painting, dated 1807, was an altarpiece for the castle of Graf Thun in Teschen, representing a "Crucifix in Mountain Scenery." Other notable works were the "Graveyard in Snow" (1810), "Alpine Scenery" (1828), now in the National Gallery, Berlin; "Two Men Contemplating the Moon" (1819), in Dresden; and "Rest in a Hayfield" (1835) In 1824 he was made professor of the Dresden academy. He died on May 7, 1840, at Dresden. For a long time his work was neglected and forgotten; but recently his memory has been revived. His influence made itself felt in the work of his pupils and friends, K G. Carus, G. Kersting, K. F Lessing, F Olivier, E. Öhme, the Norwegian J. C Dahl and others

FRIEDRICH KRUPP AKTIENGESELLSCHAFT, an industrial company founded at Essen in 1811 Alfred Krupp (*q v*) (1812–1887) supplied his steel in the shape of rolls, coining dies, weldless tyres for railway vehicles, etc, etc At an early date, iron and coal mines were acquired. The excellent quality of his steel brought him the highest award, the Council Medal, at the Great Exhibition of London (1851), where he exhibited a homogeneous solid cast steel ingot weighing over 2 tons His son started the manufacture of armour plates and in this connection acquired the Gruson Works at Magdeburg in 1895 and the Germania Shipbuilding Yard at Kiel in 1902 In 1896 he began the erection of what was to become one of the largest blast furnace plants in Europe, situated at Rheinhausen near Duisburg In 1903, the Krupp firm was converted into a Joint Stock Company, the shares of which are all owned by the Krupp family The basic activities of the undertaking are the manufacture and working of high-grade and special steels The company also owns coal and iron mines, blast furnaces, a shipbuilding yard, and engineering works where locomotives and waggons, motor vehicles and a great variety of other machinery are built

A community of interests has been entered into with the Westphalian Wire Works at Hamm and the Coal Mining Company Ver Constantin der Grosse at Bochum The administration of numerous other interests held by the Krupp firm in various other concerns is vested in the A G fur Unternehmungen der Eisen— und Stahlindustrie in Berlin On the 1st of July 1928, the Company had in its employ a total of 71,500 officials and workmen

See *Krupp 1812–1912* (Essen, 1912), W Berdrow, *Friedrich Krupp, der Grunder der Gussstahlfabrik, in Briefen und Dokumenten* (Berlin, 1915), W Berdrow, *Alfred Krupp* (Berlin, 1926) (A Gol)

FRIEDRICHRODA, a summer resort in the republic of Thuringia, Germany, at the north foot of the Thuringian Forest, 13 m by rail S W from Gotha Pop (1925) 7,394 In the immediate neighbourhood are the ruins of the Benedictine monastery founded in 1085, and now incorporated in a hunting seat The town manufactures a variety of electric lamps, furniture and machinery

FRIEDRICHSDORF, a town of Germany, in the Prussian province of Hesse-Nassau, on the southern slope of the Taunus range, 3 m N E from Homburg Pop (1925) 1,683 It manufactures hats, leather and biscuits It was founded in 1687 by Huguenot refugees

FRIEDRICHSHAFEN, a town of Germany, in the republic of Wurttemberg, on the east shore of Lake Constance, at the junction of railways to Bretten and Lindau Pop (1925) 11,289 It consists of the former imperial town of Buchhorn and the monastery and village of Hofen Buchhorn is mentioned (as Buachihorn or Puchihorn) in documents of 837 and in the 12th century passed through the hands of the Welfs to the Hohenstaufen In 1275 it was made a free imperial city by King Rudolph I. In 1802 it was assigned to Bavaria, and in 1810 to Württemberg The monastery of Hofen was founded in 1050 as a convent of Benedictine nuns, but was changed in 1420 into a provostship of monks, was suppressed in 1802, and in 1805 came to Wurttemberg King Frederick I, who caused the harbour to be made, amalgamated Buchhorn and Hofen under the new name of Friedrichshafen. The principal building is the palace, formerly the residence of the provosts of Hofen, and here are also the natural history and antiquarian collections of the Lake Constance Association. Zeppelins are built here and in 1924 the L Z 126 flew from here to America and back. Its other industries include motor cars and tanning.

FRIEDRICHSRUH, a village in the Prussian province of Schleswig-Holstein, 15 m. S E. of Hamburg It gives its name to the country seat of the Bismarck family, the park of which

forms a portion of the Sachsenwald. Close by stands the mausoleum of Prince Otto von Bismarck.

FRIENDLY SOCIETIES. A friendly society is a mutual association the chief purpose of which is to provide its members with money allowances during incapacity for work resulting from sickness or infirmity and to make a provision for the immediate necessities arising on the death of a member or his wife This definition is not exhaustive since there exist a considerable number of societies (some of them very large) the objects of which are principally restricted to the insurance of small sums at death These bodies customarily use the words "friendly society" in their title and are registered in Great Britain under the Friendly Societies Act To that extent they come within the scope of the present article but the great majority of them are, in fact, engaged in the business of industrial assurance and are fully described under that heading Their methods of operation and their subjection to the statute by which industrial assurance is regulated (Industrial Assurance Act, 1923) distinguish them from the ordinary friendly society, and no further reference will be made to them in dealing with this subject.

The functions of most of the British friendly societies have undergone some change since 1912 when they became associated with the administration of national health insurance The present article deals wholly with the position and activities of the societies as instruments of voluntary insurance, but in order to appreciate the scope of the societies' work it should be understood that a friendly society may be an "approved society" under the National Health Insurance Act and at the same time may be a wholly voluntary institution conducting its operations in this aspect under the sanction of the Friendly Societies Act or (if it is unregistered) of common law, without oversight by the government departments to which it is responsible so far as concerns its functions in regard to health insurance If a society is so constituted it has separate codes of rules for each side of its business; in the usual case a majority of the members will be insured in respect of both voluntary and statutory benefits, but some will be insured for the "State" benefits only, while others will be insured on the voluntary side alone, these latter consisting partly of tradesmen and others not employed within the meaning of the National Health Insurance Act and partly of members who come within the act but have effected their insurances under it elsewhere

The Friendly Societies Act, 1896, as amended by the Act of 1908 defines a friendly society as a society "for the purpose of providing by voluntary subscriptions of the members thereof, with or without the aid of donations, for

"(*a*) The relief or maintenance of the members, their husbands, wives, children, fathers, mothers, brothers or sisters, nephews or nieces, or wards being orphans, during sickness or other infirmity, whether bodily or mental, in old age (which shall mean any age after 50) or in widowhood, or for the relief or maintenance of the orphan children of members during minority; or

"(*b*) Insuring money to be paid on the birth of a member's child or on the death of a member, or for the funeral expenses of the husband, wife, or child of a member, or of the widow of a deceased member, or, as respects persons of the Jewish persuasion, for the payment of a sum of money during the period of confined mourning; or

"(*c*) The relief or maintenance of the members when on travel in search of employment, or when in distressed circumstances, or in case of shipwreck, or loss or damage of or to boats or nets; or

"(*d*) The endowment of members or nominees of members at any age; or

"(*e*) The insurance against fire, to any amount not exceeding £15, of the tools or implements of the trade or calling of the members; or

"(*f*) Guaranteeing the performance of their duties by officers and servants of the society or any branch thereof "

The great majority of the societies limit their operations to the objects comprised in (*a*) and (*b*) although in conformity with the ideals by which they are actuated many of them are empowered by their rules to relieve cases of distress So far as benefits under (*a*) include annuities the act prohibits a total insurance of more than £52 a year Similarly insurance on life, whether through one or more societies may not exceed £300, exclusive of bonus

HISTORY AND DEVELOPMENT

It may be conjectured that the English friendly societies are tenuously linked with the mediaeval gilds, the numerous objects of which included most of the purposes which the modern friendly society serves Very few societies have survived from an earlier period than the 18th century, but there is ample evidence that towards the end of that century the system was widely established It was, for example, sufficiently important to receive a considerable amount of attention in Sir F M Eden's *The State of the Poor* published in 1797, while the same author issued in 1801 his *Observations on Friendly Societies for Maintenance of the Industrious Classes During Sickness, Infirmity, Old Age and Other Exigencies* in which he referred to returns he had obtained in respect of some 5,117 societies enrolled under the Act of 1793 (the first statute relating to friendly societies) and came to the conclusion that the total number of societies in existence was about 7,200. It is also on record that between 1793 and 1828 some 20,000 rules of societies—many of which no doubt had but a brief existence—were enrolled among the records of the courts of quarter sessions under the act just mentioned The financial arrangements of these early societies were primitive, and failures were evidently sufficiently numerous to receive the attention of parliament The appendix to the later editions of Dr Price's *Observations on Reversionary Payments, etc*, contains a complete set of rates of contribution "prepared at the request of a committee of the House of Commons," apparently before 1789, and "intended to form the foundation of a plan for enabling the labouring poor to provide support for themselves in sickness and old age " The author's conception of the nature of a sickness risk was sound but in the absence of data his assumptions were of necessity hypothetical His scheme was, however, so complete as to include an elaborate table of sums payable on the removal of a contributor from one parish to another, in order to enable him to remain in insurance at his original rate of contribution. This latter feature is of special interest as ante-dating by over 120 years the supposedly novel provisions of the National Insurance Act of 1911 in regard to "transfer values" for insured persons who change their society.

It is an interesting fact that 54 societies established before 1800 were on the English register at the end of 1927 and that 22 such societies were on the Scottish register at the end of 1924 Three of the English societies, two of them of Huguenot origin, date respectively to 1703, 1708 and 1712, a society of still earlier formation (1687) having disappeared but a few years ago. The Scottish registrations include even older cases. The date of the earliest society—the Incorporation of Carters in Leith—is given as 1555, and two other societies are stated as founded respectively in 1634 and 1670.

While the purely local societies were multiplying in the early years of the 19th century two other movements were developing. One of these, that of the societies of the "county" type, was promoted by the rural gentry and clergy, and was distinguished by the correctness of the financial principles adopted and by the completeness of the administrative machinery set up on a county basis with devolution of details to parish agencies. The whole cost of management was frequently met from funds contributed by the patrons in whom control was vested, and insurance of a substantial character was thus brought within the means of the rural population in various parts of the country A few societies of this class, *e g*, the Hampshire friendly society, have achieved considerable success but the county societies never obtained a position commensurate with their merits as insurance institutions and their place in the friendly society world is now quite inconsiderable. The other movement, that of the "Orders," was destined to transform the character of the whole friendly society system. In

speaking of these bodies it will be useful to employ this (their own) designation of orders, rather than the cumbrous description of "societies having branches" by which they are identified in the Friendly Societies Act. The first of the orders to take definite form was the "Independent Order of Oddfellows, Manchester Unity" which, established in Manchester in or about the year 1810, spread rapidly through the industrial districts of the North of England and eventually extended its "lodges" throughout the whole country. Modestly imitating the ritual and symbolism of Freemasonry, its professions of secrecy, with signs and passwords, no less than its charitable designs, made a strong appeal to the social instincts of the tradesman and the better-paid artisan. At the outset its financial arrangements were entirely devoid of any scientific basis, but this came later with the gradual realization by its leaders that insurance and not benevolence was the real foundation of its operations. In the course of time the tide of emigration carried the society to the United States, to Canada, to Australia, to New Zealand, to South Africa and elsewhere overseas. The place which the society has achieved in the provident institutions of the British people is indicated by the fact that in 1926 its lodges in Great Britain numbered 4,000 with an adult membership of about 750,000 and funds (including centralized accounts) amounting to nearly £20,000,000.

The Ancient Order of Foresters was the next important organization to rise from local obscurity. Also basing themselves on a mixture of ritual and benevolence, its "courts" began to spread from Leeds in 1834. In this case, again, numerical progress was long conspicuous but was unaccompanied by perception of the need of a sound insurance basis and in recent years essential reforms have, in consequence, proved a heavy handicap to progress. Much, however, has been accomplished and the returns for 1926 showed an adult membership in Great Britain and Ireland of nearly 600,000 distributed over 3,438 branches (courts) with funds of £11,650,000.

Other societies of the order type sprang up in the 19th century, and have established themselves with varying degrees of success. The membership, in most cases, is small in relation to that of the two great societies named above, and distinctive features are only to be found in the "temperance" group in which an undertaking of total abstinence is required as a condition of membership. The larger societies of this group are the Independent Order of Rechabites with approximately 700,000 members (of whom, however, nearly one half are juveniles) distributed over about 3,000 branches, called "tents," and the order of the Sons of Temperance with nearly 1,200 "divisions" and about 250,000 members.

Societies of two other types came into prominence somewhat later. The first is the general society, without a social side, relying for support on its stability as an insurance institution. The most prominent society of this group is the Hearts of Oak Benefit Society which, established in 1840 as an offshoot of a society of the same class still in existence, had attained at the end of 1926 a membership of 425,000 with funds of nearly £9,000,000. The other type is that of the deposit society, the most important body in this group being the National Deposit Friendly Society. Though established so recently as 1868, on a plan which presents a somewhat curious blend of insurance and private saving—both excellent, but certainly divergent modes of thrift—this society numbered over 760,000 members at the end of 1926 with funds of about £6,000,000. Of the total membership, 420,000 were males of ages over 16, this being, substantially, the comparable figure with those of the other societies to which reference has been made. The corresponding number of women was 202,000, a feature of much interest in the constitution of the deposit type of society in view of the failure of the societies of other classes to attract any large body of women in the 30 years or more during which their doors have been widely open to the sex.

Less important than these major developments but worthy, nevertheless, of mention are the "dividing" societies, many of them unregistered, which exist in great numbers in Britain especially in the large towns. These societies provide small benefits, relatively to the contributions, but share out their funds at intervals, generally yearly. If numbers command respect it must in some degree at least, be accorded to these "slate clubs," "sick and annual" societies, "tontines," etc., as they are variously styled in different parts of the country.

Constitution of the Orders.—The orders, which constitute so prominent an element in the friendly society movement, are organized, both financially and administratively, on somewhat elaborate lines. At the base of the system are the local branches which are distributed over the country in somewhat haphazard fashion; in the rural districts one branch of an order will serve several neighbouring villages, while commonly a large town will have a number of branches, some of them clustering round the centre, while others are scattered over the suburbs. These branches are grouped in districts on a geographical basis, there being about 260 such districts in the Manchester Unity of Oddfellows and about 200 in the Ancient Order of Foresters. Above the districts is the central authority of the society, the board of directors in the first of the two large societies and the executive council in the other. As regards legal status the society is entitled to registration under the Friendly Societies Act as a single organization, the primary units (lodges, courts, etc.) and the district being similarly entitled to registration as branches. Under this form of constitution every branch is subject to the rules of the society and though it has its own rules these must comply with the rules of the superior body. All the branch rules are, therefore, to a large extent in common form—and this, no less than the free interchange of views on the best methods of effecting the common purpose, ensures a considerable degree of uniformity in administration throughout the whole organization. The domestic affairs of the primary unit are legally subject to its own committee of management, though in fact the members, in their fortnightly or monthly meetings, are enabled to exercise whatever share they are inclined to take in the general conduct of business. This unit elects its delegates to the district meeting held half yearly or quarterly and the districts appoint their representatives to the annual meeting of the society, which in the case of the larger bodies is a somewhat imposing assemblage, the proceedings of which are largely devoted to the discussion of major questions of internal policy. The tripartite arrangement of lodge (or whatever the name of the primary unit), district and order each with its carefully delimited powers and duties, though appearing somewhat grandiose if the utilitarian purpose of the society only is considered, is in fact well adapted to the purposes to be served. In most cases the primary unit, the lodge or court is directly responsible to the member for all the benefits under his contract, but retains only the liability to provide the sickness benefits, the death benefits being re-assured with the district. The principal function of the central body, in regard to finance, is to aid any local branches which may fall into difficulty. For many years this obligation was never closely defined and amounted in practice to little more than eleemosynary relief. In this respect the conditions have changed considerably in recent years, both the Manchester Unity of Oddfellows and the Ancient Order of Foresters having taken effective steps to secure (under proper contribution arrangements) the fulfilment of the original benefit undertakings of all their branches. The larger society has achieved its purpose by a small charge on the valuation surpluses of the fully solvent lodges, while the Ancient Order of Foresters has adopted the plan of a moderate levy on the contributions of the members generally.

Legislation.—Numerous acts of parliament for the encouragement and regulation of friendly societies were passed in Great Britain between 1793 and 1895 but as practically everything that is of permanent value in these measures (all of which have been repealed) is incorporated in the Friendly Societies Act 1896, it is unnecessary to examine them in any detail. The act is administered by the Friendly Societies Registry Office at the head of which is the chief registrar, who by the statute, must be a barrister of 10 years' standing. In essential matters the Act of 1896 re-enacts the Act of 1875, which was based on the report (issued in 1874) of a royal commission appointed in 1870. The privileges which the act confers are restricted to those societies

which register under it and the conditions which it imposes apply to those societies only. Unregistered friendly societies are subject, of course, to common law, but are neither protected nor controlled by statute, and the Registry Office exercises no functions in regard to them. The privilege of registration under the act has a somewhat wider range than the organizations which are the subject of this article, and includes, for example, working men's clubs and cattle insurance societies

The condition of registration is the adoption of rules providing, *inter alia,* for the following matters —

1 The objects of the society, these must be chosen from amongst the objects specified in the act. 2. The terms of admission of members 3. The conditions under which a member may become entitled to benefit 4 The mode of holding meetings, and the right of voting 5 The manner of making, altering, or rescinding rules. 6. The appointment and removal of trustees, committee of management and other officers 7 If the society is one with branches, provision is to be made for the composition of the central body, and the conditions under which a branch may secede from the society. 8 The investment of the funds 9 The keeping of the the accounts, and audit thereof 10 Annual returns to the registrar 11. The manner in which disputes shall be settled; decisions arrived at in accordance with the rules are binding, are not removable into a court of law, and may be enforced on application by the county court. 12 Provision for the expenses of management 13 Quinquennial valuation

The rules, in fact, set out the conditions of the contract which the members of a friendly society mutually make with each other and of the remedies which the law provides to secure its fulfilment It will be observed that although the society is required to state in its rules what are its benefits and the conditions under which they are payable, no conditions are imposed upon it. There is no compulsion to adopt an actuarially sound table of contributions (except for the insurance of annuities) or to administer the benefits in any particular way The members, as Sir Edward Brabrook says (*Provident Societies and Industrial Welfare,* p 52), "are left entirely to their own discretion as to the soundness of the conditions on which they grant insurances" It may be observed also that while every society is required to submit its financial position to valuation at quinquennial intervals (unless exempted by the registrar on the ground that valuation is inapplicable to its undertakings, *e g ,* a dividing society) there is no compulsion on the members to take steps to rectify any unsoundness which the valuation may reveal The registrar may do (and does) much, through the influence which his position enables him to exercise, to secure the due consideration of valuation results on which action should be taken, but he has no powers save those which in extremity the requisite number of the members may call upon him to exercise

A registered friendly society has certain privileges of which the more important are the following —

1. It can legally hold land and other kinds of property in the names of the trustees 2 Where the property is stock in the funds, it may be transferred from a deceased or absent trustee by order of the chief registrar, without other legal proceedings 3 Other property passes from one trustee to another without conveyance or assignment 4 The trustees can invest the society's money without restriction of amount in a savings-bank, or the Post-office savings-bank 5. They can discharge a mortgage by merely endorsing a receipt upon it, without a reconveyance 6 The trustees are entitled to claim priority over creditors in respect of property of the society 7. Documents of the society are exempt from stamp-duty. 8 Members above sixteen years of age may nominate the recipients of sums not exceeding £100, payable at their death by the society, and the trustees, where a member dies intestate and has made no nomination, may pay to the person who appears to them to be legally entitled, and such payment is a good discharge to the society. 9 Societies can settle disputes in any manner the rules provide, and thus avoid the cost of litigation. 10. Societies are free of income-tax on their interest from investments.

Ordinary Friendly Societies.—The primary benefit is the weekly allowance during sickness, to which is usually added a payment on the death of a member or his wife The sickness benefit insured is generally from 10s. to 20s. a week; the predominating rates are probably 10s and 12s except in and around London where insurances for 18s and 20s. a week are common. Sickness benefit at the full rate is usually payable for 26 or 52 weeks—after which, if incapacity still continues, it is reduced by one-half In many cases there is no further reduction, but under the rules of other societies half pay is limited to the same period as full pay and is succeeded by quarter pay Benefit at the lowest rate is in most cases continued during incapacity, which may extend over many years Difficult problems have been created by the sickness claims of aged members, in regard to whom it is impossible to distinguish between incapacity due to sickness and the infirmity of old age Sickness benefit has, in general, been paid continuously to those beyond work, but the strain of permanent claims has everywhere absorbed a disproportionate part of the resources of the societies and the institution of old age pensions by the State is leading them to a wise limitation of the insurance of sickness benefit to the working ages of life (terminating at 65 or 70) so far as new entrants are concerned. In most cases the contributions are graduated according to age at entry, in accordance with actuarial tables At the age of 18, for instance, a contribution of 5d a week (to which 1d a week must be added for management expenses) will provide a man, according to the rules of one society, with a sickness benefit terminable at the age of 70 of 12s a week for 26 weeks and 6s a week for the remainder of sickness, together with "funeral benefits" of £12 for himself and £6 for his first wife, the corresponding rate (also subject to addition for management expenses) for an entrant aged 27 is 6d. and for one of 35, is 7½d Under the stress of the competition of the "deposit" societies the older organizations have in recent years made a notable departure from their original objects and have put forward schemes combining insurance (on a sound actuarial basis) with personal savings Under this plan the member is free to draw upon his savings account at his option and to withdraw the amount to his credit (less a small deduction) on terminating his membership The amount accumulated is payable in any case on arrival at a stipulated age, generally 65, and is also payable on the death of the member should that occur before he reaches this age.

As an example of this class of benefit, one society offers to a male entrant of 16 years of age (last birthday) for a contribution of 15s a quarter, inclusive of management expenses, a sickness benefit of 20s a week for 26 weeks, followed, if necessary, by 10s a week for a further 26 weeks, and 5s a week for the remainder of illness, and at the age of 65 (when contributions and sickness benefit cease) from his personal account a lump sum of over £210 if he is classed as engaged in an "ordinary" occupation, or of about £130 if his occupation is scheduled as "hazardous" and his sickness risk is, in consequence, above the general average These amounts are subject to possible increase from valuation surplus In the event of a member's death before he reaches the age of 65 the balance of his account is payable, this being made up, if necessary, to a stipulated minimum

Schemes such as this premise that the entrant to a friendly society is prepared to contribute on a considerably higher level than was formerly deemed practicable, and is equally prepared, so far as private savings are concerned, to utilize his friendly society as a principal instrument of thrift.

Deposit Societies.—The societies of the deposit class which, as already shown, have advanced remarkably in public favour during the present century constitute a distinct class. All have the common purpose of combining sickness insurance with personal savings, and all eschew the orthodox methods of accumulation of funds in correspondence with the growth of the liabilities of the insurance side of their undertakings. Under the deposit plan which enjoys the widest popularity the members are in general required to contribute monthly the same amount as they desire to insure for as the daily rate of sickness benefit, a contribution of 2s. a month (24s. a year) thus being paid in respect of a sickness benefit of 12s a week The contribution so paid is

divided between the member's deposit and the "common sick fund" (with which is linked the small "sickness reserve fund"); the governing body fixes the proportions in which the contributions shall be divided, but it is essential to the main purpose of the system that substantial sums shall be placed to the members' deposits and in the particular case under examination the present practice is to carry to them about two-thirds of the contributions The member's share of the expenses of management, with certain smaller sums, is charged upon his deposit to which also is debited a proportion, varying with sex and age, but averaging about one-third, of any sickness benefit which he may claim and of the cost of any medical benefit for which he may have contracted For the other two-thirds of the cost of these benefits (which ordinarily cease at the age of 70) resort is had to the common sick fund A member may draw at any time upon his deposit, which carries interest at a low rate, and subject to safeguarding provisions, may add to it by payments in excess of his normal contributions Any balance standing to his credit at the time of his death is paid to his representatives while if he leaves the society he draws out his deposit, subject to a small fine

The system lends itself to criticism mainly on two grounds, the uncertainty as to the duration of the benefits in the case of the individual and the provision made for the growing liabilities of the "common sick fund" As regards the first of these points, the member is entitled only to full sickness benefit so long as he has a balance in his deposit from which the prescribed proportion of his benefit can be taken There is at all times, therefore, a risk of exhaustion of the right to sickness benefit Any resulting hardship is alleviated by the payment from the common sick fund of "grace pay," *i e*, sickness benefit at a reduced rate, for a limited period after a member's account is exhausted, but no member is allowed to resort to this benefit more than once in five years It was observed by Sir Edward Brabrook (at the time Chief Registrar of Friendly Societies) in his *Provident Societies and Industrial Welfare* (p 68) that under this system "a member who suffers from prolonged sickness may find the relief of the society fail him through the exhaustion of his own bank at a time when he most wants it." The question of the adequacy of the reserves which the deposit societies make for the liabilities of their common funds also gives occasion for reflection There seems every reason to assume that these liabilities are growing and that the system involves the essential elements of a case in which reserves should be controlled on an actuarial basis It does not appear, however, that the guidance of actuaries, in this direction, has yet been sought

In considering the characteristics of the deposit class a distinction must be drawn between the societies whose system may be criticized on the particular grounds just examined and the societies of the "Holloway" group. These latter societies, which are chiefly found (and in considerable strength) in the west of England require a high contribution, relatively to the insurance value of the benefits offered, and increase it as the member passes from age to age between the ages of 30 and 65, when sickness benefit terminates; the object of this novel condition in friendly society finance is to provide, in the absence of specific reserves for sickness benefit, for the growing liability the member brings as his age increases The claims of each year constitute a first charge on the contribution income of the year, and in normal circumstances are wholly met from this source, there being no recourse to the personal account of a member in respect of his own demands for sickness benefit and no such limitation, consequently, on the amount of benefit that he may draw as the alternative system is held to involve The balance of the income of each year, after meeting the sickness claims, is divided among the members, and accumulated for their personal advantage. The contribution is so high, in relation to the insurance element of the scheme, that the prospect of a dividend at the end of the year is in all ordinary circumstances considerable.

The system evidently appeals with success to those who are attracted by a combination of insurance and saving, flavoured by an apparently pleasing uncertainty as to what the "dividend" will be.

Railway Benefit Societies.—The societies in this group, some of which are unregistered, limit their membership to the operative staffs of the railway companies. The benefits frequently include substantial pensions after the age of 65, while in some cases there are retiring allowances on withdrawal; the contributions are largely supplemented by subsidies from the companies No doubt because of the quasi-compulsory character of the membership, the companies have accepted a large measure of responsibility for the financial soundness of the societies and the actuarial valuations have frequently been followed by very substantial grants in the liquidation of deficiencies

Miners' Permanent Relief Societies.—This is a small group, with, however, a membership of some hundreds of thousands, the object of which is to provide allowances including permanent pensions, for miners who are injured at work and pensions to the widows (with children's allowances) of miners whose death is due to occupational accident. With responsibilities difficult of assessment in any case and liable, obviously, to great fluctuations, the financial record of these societies leaves much to be desired They are, nevertheless, of special interest as showing the efforts made by the workman to meet a risk to which he was particularly subject long before it was decided by parliament, in the Workmen's Compensation Acts, that the liability was one which the employer should be called upon to bear

Warehousemen's and Clerks' Societies.—This is a very small but interesting group in which the chief subject of insurance is loss of income whether due to sickness or unemployment The societies of the group originated with the Provident Association of Warehousemen, Travellers and Clerks established for the employees of textile warehouses in the City of London in 1871; the objects being somewhat beyond those which the ordinary friendly society is permitted to adopt, registration has been effected under a section of the act providing for "specially authorized" societies The resources of these societies have been found well in advance of the modest financial design of their benefits and from the substantial surpluses which have accrued, annuities to members in need and other benefits have been added to the original plan

STATISTICS

The report of the chief registrar (Great Britain) for 1925 gives a summary of the returns of the societies from which it appears that the number of returns for the year 1924 received from friendly societies (and branches) of all classes was 21,773, these showing total members of 7,028,671, of whom, however, not more, apparently, than about 5,300,000 were adults insured for sickness benefits The expenditure on sickness during the year was £4,310,806 and in death claims £1,104,923, the funds at the end of the year amounting to £81,767,080 While the figures of membership are impressively large in total, it is necessary to look at their component items, with the related statistics of earlier years, in order to ascertain the trend of popular favour as between the different types of society. Taking first the class of sickness benefit societies, as the registrar styles them, though payments at death are almost invariably provided in addition to sick pay, it is shown that 1,241 returns were received from societies including nearly 1,100,000 members with funds of over £18,000,000 But of this group 25 societies led by the Hearts of Oak benefit society, accounted for a membership of 820,000 and £13,500,000, leaving among 1,216 societies about 270,000 members and funds of about £4,500,000. Substantially these represent the survivors of the class of independent local clubs in which the friendly society system originated The number of societies of this type appears to have fallen by about 1,600 between 1910 and 1916, doubtless as the result of the institution of the system of national health insurance which made it as unnecessary as it was hopeless to prolong the existence of many weak and decaying societies. It is, however, an interesting fact that over 400 societies of this class became branches of the orders. The disappearance of societies of this type continues, and each year sees a further reduction in their number; between 1916 and 1924 considerably over 300 of them were removed from the register. The membership of the orders on December 31, 1924, was well over

3,000,000 and their funds exceeded £40,000,000, the group thus representing nearly one-half of the whole friendly society movement, both in funds and membership. The number of branches making returns was 18,254, the average membership being under 200. So far as numbers are concerned the societies of this type have not made progress in recent years While funds have grown since 1910 by over £12,000,000 the number of branches making returns has fallen by over 2,000, and little increase in the total number of members is observable In contrast, deposit societies, numbering about 100, have achieved continuous and rapid progress Between 1915 and 1924 their membership increased from 600,000 to over 1,000,000 and their funds from £5,300,000 to £12,200,000 Of the varied other types of society on the register mention need only be made of the statistics of the "dividing" societies The membership of this group (which is probably exceeded by that of unregistered societies of the same type) is practically stationary at under half a million The amount of funds in hand—about £500,000—also remains unchanged, in any material degree, from year to year. This is, of course, explained by the leading feature of the constitution of these societies—the yearly "share-out"

Finance.—From the large amount of their funds the friendly societies rank as capitalists of some importance, and much attention is devoted to the subject of investment Although considerable sums are invested in Government stocks, and in loans to local authorities, the favourite security is the mortgage on house property In great numbers of cases advances have been made to members to enable them to purchase their dwellings and in some directions the system of repayment in instalments has been in successful operation for many years The rise in the market value of money since the World War has been quickly appreciated by the friendly societies, and the resulting increase in the rates of interest secured on their funds has been a powerful factor in the financial progress to which reference is made below.

It was inevitable from the circumstances in which the friendly societies originated and developed that they should long have lain under the imputation of financial unsoundness The very fact that they were conducting insurance business, for which an actuarial basis was essential to security, was but tardily recognized, and it was not until the middle of the 19th century was approaching that tables of an authoritative character were compiled to show the rates of sickness and of mortality to which their members were subject at successive ages These tables provided the means of framing fairly reliable estimates of the financial position of the societies, but it was not until the Friendly Societies Act of 1875 enforced them that such estimates—in the form of quinquennial valuations—were generally obtained, and many years had to elapse, and a vast amount of propaganda to be undertaken, before the results of early and long-continued insufficiency in financial arrangements could be overcome Improvement has been accelerated in recent years by the increase in the rate of interest obtainable on investments and by the decline in sickness claims which set in during the World War and continued for several years afterwards. Valuations (which are not required from deposit and dividing societies) were received in the five years ending Dec. 31, 1925, from 15,122 societies and branches, and these showed surpluses to the amount of nearly £8,000,000 and deficiencies of rather less than £6,500,000 It is thus evident that while much remains to be done before all the friendly societies of Great Britain are solvent—and for some among them the task may be too great—there is conclusive evidence of soundness, and promise of the enlargement of the contractual benefits, over a great part of the field

The data providing the rates of sickness and mortality on which valuation tables are based were formerly obtained from returns supplied by the friendly societies, in compliance with a statutory requirement, at quinquennial intervals covering the period between 1836 and 1880. The first returns so received, relating to the period 1836–40, were analysed by a distinguished actuary (Neison) who himself published the results of his observations and the returns for 1846–50 were dissected, unfortunately on such a theoretical basis as to render the results of little value for practical purposes, by an actuary in the public service. An analysis of the returns for the period 1856–80 was made by the actuary to the registry of friendly societies, but unfortunately his report was not available till 1896, by which time the greater part of the data brought under review had become out of date The Manchester Unity of Oddfellows taking advantage of the requirement to render quinquennial returns had on three occasions analysed its own experience, the latest of the resulting tabulations, that of the period 1866–70, being generally accepted for many years as the authoritative standard of sickness experience A similar course was followed by the Ancient Order of Foresters with the quinquennial returns of its branches for the period 1871–75 These societies thus supplied themselves—and the world—with the only authentic bases of valuation that existed for the half century during which the movement was making its greatest progress The government report of 1896 indicated that according to the latest data of which it treated—that of the years 1876–80—the sickness liabilities of friendly societies had risen seriously The societies were thus placed in a difficulty, for even this experience was nearly 20 years old at the time the report was published Parliament had in 1882 abolished the quinquennial returns (under advice, presumably, that sickness was more or less static and that a sufficient volume of facts as to its incidence had been collected) and no information as to current conditions was available, either to modify or to confirm the disquieting results which the last official report brought out In these circumstances the Manchester Unity of Oddfellows decided on independent action and again collected the experience of its branches, the years selected being 1893–97 The data so obtained, for the assemblage and analysis of which (Sir) Alfred Watson (then one of the actuaries to the society) was responsible, extended over 3,000,000 years of life and included 7,000,000 weeks of sickness It represented by far the largest body of friendly society records ever brought together, and the report exhibiting its results was issued in 1903 No other investigation of the kind has subsequently been made and the tables obtained from this experience are therefore still in general use as the standard of sickness risks; in this connection they supplied the financial basis of the National Health Insurance Act The importance to the industrial classes of an adequate provision against the risk of sickness is illustrated by the statistics of this experience from which the following figures are extracted —

Age	Percentage of members at the age claiming sickness benefit in a year	Average duration of sickness in the year per member claiming benefit	Average duration of sickness in the year, computed over all members at the age
		Weeks	*Weeks*
20 and under 25	24 5	3·7	·9
30 ,, ,, 35	23 6	4 5	1·1
40 ,, ,, 45	25 5	6 2	1·6
50 ,, ,, 55	29 5	9 3	2·7
60 ,, ,, 65	39 8	15 8	6·3
70 ,, ,, 75	60 6	28 7	17·4
80 ,, ,, 85	85 1	37 9	32 3

It will be seen that while till the age of 50 has been passed there is no material increase in the proportion of members requiring sickness benefit in a year, the average duration of incapacity increases steadily as age advances. Permanent invalidity accounts for much of the weight of sickness at the higher ages but disregarding incapacity beyond a duration of 26 weeks (at which, for the purpose of illustration, a dividing line may be drawn) it is an arresting fact that at the important ages 60–65, where the workman in the normal case must still rely for his maintenance upon his labour, the Manchester Unity experience suggests that about 33% of the insured will have occasion to claim sickness benefit in the course of a year and this for an average period of seven weeks. Partial statistics of Health Insurance afford some indication that in the early years after the war the percentage of claimants at these ages fell to about 25 (the average duration of seven weeks remaining stable), but there is reason to think that this improvement has not been fully maintained. Whichever fig-

ures be taken, it is evident that sickness insurance on a reliable basis is essential to the security of the wage-earner and those dependent upon him

War-time Adaptations.—Interesting measures were taken by the friendly societies to adapt themselves to the conditions created by the World War About 25% of the members went to the colours, and universal measures were taken to relieve them of contributions for the duration of their service In some cases this was done by levying the civilian members, in other cases the relief was given at the cost of the general funds The insurance of sickness benefit was unnecessary for serving men and was generally suspended, the contributions being correspondingly reduced The strain on the civilian members of paying even the reduced contributions of their brethren in the services was, however, considerable, as indicated by the fact that the levies imposed on its members by the largest society reached a total of £475,000

The death benefit insurances of friendly society members with the forces were maintained in full effect, and the resulting charge upon the societies is estimated to have been about £1,500,000 On this subject a special problem arose The proportion of the membership of the orders on active service was unevenly distributed, and for the protection of the branches that were most affected measures of "pooling" were devised Cognate steps were taken by the creation of a temporary affiliation for this single purpose, of many of the small societies of the dividing type These plans achieved their purpose and no case is known of the collapse of a friendly society under the financial stress of war claims

BRITISH DOMINIONS AND OTHER COUNTRIES

As indicated earlier, the tide of emigration carried the friendly society system overseas at an early period in the history of the orders and a number of the pioneer branches which members of the two great bodies established in Australia, South Africa and New York in the decade 1840–50 are still in existence and apparently flourishing The subsequent development of the connections of the orders beyond Great Britain has been considerable and branches are to be found in most parts of the Empire, in the United States and in other countries, especially of the American continent The Manchester Unity of Oddfellows claims more than 1,500 lodges outside the British Isles, of which over 1,200 are in Australasia, and the Ancient Order of Foresters presents an even wider geographical distribution of its 900 courts abroad It is, however, to be observed that the link between the parent bodies and their branches overseas is simply one of fraternal association The jurisdiction of the central body of a British order can have no wider scope than that of the Friendly Societies Act of Great Britain, and although (somewhat exceptionally in British legislation) including the Isle of Man and the Channel Islands, it extends no further, the branches, so called, of the orders established elsewhere being subject in all respects to the laws of their own States, and possessing, independently of any association with societies in the mother country, such powers of self-government as those laws confer upon them.

Australia.—The friendly societies of Australia include a total membership of about 580,000, in over 5,000 societies and branches, with funds of £11,500,000 The benefits are of the same type as those of the British societies but are more substantial, the usual rate of full sick pay being 20s or 21s. a week. Their sickness "experience" as actuarially analysed in the various States is distinctly more favourable than that of the British bodies, a feature which in some degree at least may be attributed to the differences between the economic conditions of old and new countries The legislation governing the societies was based upon the British act, but for a considerable period has departed widely from the principle of freedom from State control which underlies that act, a policy of close official supervision and intervention having been definitely adopted Each of the six States of Australia has its own registrar of friendly societies and in the three largest States registration is compulsory. The rates of contribution must receive official sanction, the valuations are made by State officers, either under compulsion (as in New South Wales) or under the inducement of a low scale of fees (Victoria), control is exercised over the distribution of surpluses which valuations disclose, and where deficiency is discovered rectification of the position is, in effect, compulsory. In some of the States, also, the responsible government officer is vested with extensive powers of inspection and of examination of books. Where, as in South Australia, a measure of freedom in regard to finance is left with the societies, the official charged with their oversight is endowed with such powers of comment in his reports as in the long run must amount (as Parliament evidently contemplated) to a very effective form of government pressure Another interesting development, and one which differentiates the system even more strikingly from its English parent, is that of the State subsidy. This is found in New South Wales where a "subvention" has been granted by Parliament to all societies that choose to apply for it, and, naturally, is almost universal The subvention takes the form of a grant of part of the cost of benefits and is very substantial in the case of members of ages over 65 (women 60); the amount distributed under the heading of State subvention between 1908 (when the system came into operation) and 1925 is officially stated as over £500,000, the amount for the latest year being nearly £55,000 It does not appear, however, that public control is more complete in the State in which it is accompanied by a subsidy than it is elsewhere, and it is to be inferred, in consequence, that control has the support of public opinion as a matter of principle

New Zealand.—In New Zealand the Friendly Societies' Act is also administered by a registrar, whose last report shows a membership of over 94,000 with funds amounting to the remarkable relative total of three and one-third million pounds The number of separately registered bodies is nearly 1,000 including 900 branches of which 235 lodges of the Manchester Unity of Oddfellows represent the largest group In this dominion, also, the registrar is responsible for the valuations, and his report shows that in many cases there is a very considerable surplus of assets over liabilities

Other Countries.—The description already given of the war-time adaptations of the British friendly societies requires reference to the corresponding action in the dominions It will be sufficient in this connection to mention the records as to the State of Victoria The societies paid the contributions of enlisted members during their absence from Australia at a cost of about £152,000; sickness and mortality benefits of such members amounted to about £286,000, and certain societies received over £46,000 in reimbursement of benefits which had been reinsured with the Government under one of the acts included in the war legislation of the State

The friendly societies of South Africa, although in some cases of considerable age, are not numerically strong They have a membership of about 43,000, largely in bodies of the order type Legislation in regard to these societies is not elaborate So far as Canada is concerned, it is quite sufficient to say that, while the order system has been widely extended, its development has proceeded rather on ceremonial and "fraternal" lines, with certain endowment benefits, than in the direction followed by the British friendly society system

Europe.—Institutions bearing a close analogy to the English friendly society are to be found in various European countries, although in no case have they developed along quite the same lines in regard to legislation, or with the same attitude towards financial considerations In France the system appears to be one of considerable antiquity and it was doubtless on the model of the societies existing among the Protestant communities of that country that the component societies of an interesting group established in East London by Huguenot refugees between 1687 and 1750 were founded. It would appear that, in general, greater importance is attached on the continent than in Great Britain to benefits "in kind," *e.g.*, medical, hospital, dental treatment, etc., and especially to the inclusion of the dependants of the insured in the scope of these benefits.

France.—The number of societies of adults which submit returns is about 16,500 and the total of insured persons exceeds two and three-quarter millions. Revenue in 1923 was about 32f

a head and expenditure on benefits about 22f. These items are nearly double the corresponding amounts of 1913, an increase doubtless due to the depreciation of the currency. The French societies fall into three categories, "independent" (corresponding with the English unregistered societies), "approved" and societies "recognized" as of public utility The two latter groups are subject to a law of 1898 which in various respects is similar to the Friendly Societies Act, but provides for a greater degree of State supervision, especially in the case of the "recognized" societies There is no requirement of actuarial valuation except in the case of approved societies providing pensions in old age. Approved and recognized societies are entitled to Exchequer grants dependent on the nature of the benefits assured.

Belgium.—Sickness insurance is transacted by nearly 4,000 societies with 1,100,000 contributors and an equal number of dependants, and invalidity insurance (covering, broadly, permanent sickness as distinct from temporary incapacity) by 127 societies, or funds, with a membership of 800,000. The Belgian societies were originally confined to workers in particular trades but were later reorganized on a territorial basis The societies are of two categories, independent and approved The latter must comply with certain regulations and are subject to some degree of control; they may be aided by grants from the central government or from the local authorities Pensions in old age and death benefits in excess of 300f may not be assured directly by approved societies. In respect of these benefits the societies may act as agents of the State pension and assurance funds The liability of the societies is in general limited to sickness insurance, the invalidity funds consisting of federations of approved societies In principle, but not entirely in practice, it would appear, the State grants are reserved for these federations. There are no statutory provisions as to valuation

Denmark.—There appear to be about 1,650 societies; the membership is reported as about 1,500,000. The societies are self-governing, but receive grants-in-aid from public funds, through the administration of which the Government is able to exercise control and guidance. The system is so fully developed that the rules of the societies make provision for the transference of members, presumably on migration, from one society to another Expenditure on benefits in kind, largely incurred, no doubt, in respect of dependants, is between three and four times the sum spent on cash benefits

Sweden.—There are about 1,300 societies with nearly 900,000 contributors. Unlike, apparently, the neighbouring country of Denmark expenditure on cash benefits predominates, little being spent on treatment benefits It is complained that many of the societies are financially weak, and that there is a lack of co-operation between them.

Switzerland.—The number of societies is given as about 1,000 and membership 1,160,000, of whom, however, over 200,000 are children of school age. Expenditure is about equally divided between "cash" and "treatment" benefits The operations of the societies appear to be, financially, of considerable magnitude, the "revenue" in 1925 averaging nearly 36f. a member and the payments in benefits over 30f.

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THE UNITED STATES

In America the term "fraternal insurance" covers the activities of those bodies included in England under the head of "Friendly Societies." The forms of organization cover a wide range, from societies like the Improved Order of Red Men, formed in 1771, to what might be called "intramural" benefit groups formed within industrial concerns like the New York Telephone Company The Associated Employees of Bureaus of Buildings of the Borough of Brooklyn, organized in 1907, with 200 members, indicates the specialized grouping which such bodies may take. Again, organization may centre around racial interests, as in the case of the Bavarian National Association of North America, with the object of providing "mutual insurance to relieve the families of deceased members." Not all fraternal bodies embrace insurance activities, as for example the Freemasons. But all such bodies do provide machinery of some kind for the relief of distress "homes" for the aged and orphans, hospitals, funds for the relief of indigence and employment services represent their more common activities

The tendency among fraternal insurance organizations is toward standard commercial insurance. State laws have in some cases pointed the way, but the volume of business made such a change necessary Originally no legal reserve was carried, members being assessed an amount required to cover current mortality. It was soon found that the average age of the member grew with the age of the order. In several instances societies were discontinued owing to the increased mortality; those that survived followed usually one of two plans. raised their premium rates, or else lowered the benefit schedules The stronger bodies, too, were able to build up their membership in sufficient volume to relieve the pressure of the growing mortality hazard. Taking a lesson from this experience organizations began to adopt the reserve plan, with such modifications as adapt it to fraternal association needs, together with the use of more or less standard mortality tables The adoption of these more scientific ideas, with the lower management costs and writing of business, as compared with these factors in commercial insurance, has placed fraternal bodies upon a sound economic basis

The total business written by these groups in 1928 exceeded $11.000,000,000, representing over 225 bodies The societies are in a healthy condition, and new business is being written at the rate of approximately $1,000,000,000 annually. Among the leading strictly "friendly societies" in point of members are the Fraternal Order of Eagles, with a membership of 520,000, Woodmen of the World, 500,000; Royal Arcanum, 123,500; Ancient Order of Oddfellows, Knights of the Maccabees, Order of Owls, Fraternal Aid Union; American Order Sons of St. George; Ancient Order of Hibernians; National Union Assurance Society; Fraternal Aid Union.

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FRIENDS, SOCIETY OF, the name adopted by a body of Christians, who, in law and general usage, are commonly called QUAKERS. Though small in number, the Society occupies a position of singular interest To the student of ecclesiastical history it is remarkable as exhibiting a form of Christianity widely divergent from the prevalent types, being a religious fellowship which has no formulated creed demanding definite subscription, and no liturgy, priesthood or outward sacrament, and which gives to women an equal place with men in church organization The student of English constitutional history will observe the success with which Friends have, by the mere force of passive resistance, obtained, from the legislature and the courts, indulgence for all their scruples and a legal recognition of their customs In American history they occupy an important place because of the very prominent part which they played in the colonization of New Jersey and Pennsylvania.

The history of Quakerism in England may be divided into three periods —(1) from the first preaching of George Fox in 1647 to the Toleration Act 1689; (2) from 1689 to the evangelical movement in 1835; (3) from 1835 to the present time.

George Fox: Period 1647–1689.—George Fox (1624–1691), the son of a weaver of Drayton-in-the-Clay (now called Fenny Drayton) in Leicestershire, was the founder of the Society He

began his public ministry in 1647, but there is no evidence to show that he set out to form a separate religious body Impressed by the formalism and deadness of contemporary Christianity (of which there is much evidence in the confessions of the Puritan writers themselves) he emphasized the importance of repentance and personal striving after the truth When, however, his preaching attracted followers, a community began to be formed, and traces of organization and discipline may be noted in very early times Fox and his fellow-preachers spoke whenever opportunity offered,—sometimes in churches (declining, for the most part, to occupy the pulpit), sometimes in barns, sometimes at market crosses The insistence on an inward spiritual experience was the great contribution made by Friends to the religious life of the time, and to thousands it came as a new revelation There is evidence to show that the arrangement for this "publishing of Truth" rested mainly with Fox, and that the expenses of it and of the foreign missions were borne out of a common fund Margaret Fell (1614–1702), wife of Thomas Fell (1598–1658), vice-chancellor of the duchy of Lancaster, and afterwards of George Fox, opened her house, Swarthmore Hall near Ulverston, to these preachers and probably contributed largely to this fund

Their insistence on the personal aspect of religious experience made it impossible for Friends to countenance the setting apart of any man or building for the purpose of divine worship to the exclusion of all others The operation of the Spirit was in no way limited to time, or individual or place The great stress which they laid upon this aspect of Christian truth caused them to be charged with unbelief in the current orthodox views as to the inspiration of the Scriptures, and the person and work of Christ, a charge which they always denied Contrary to the Puritan teaching of the time, they insisted on the possibility, in this life, of complete victory over sin Such teaching necessarily brought Fox and his friends into conflict with all the religious bodies of England, and they were continually engaged in strife with the Presbyterians, Independents, Baptists, Episcopalians and the wilder sectaries Although there was little or no stress laid on either the joys or the terrors of a future life, the movement was not infrequently accompanied by most of those physical symptoms which usually go with vehement appeals to the conscience and emotions of a rude multitude It was owing to these physical manifestations that the name "Quaker" was either first given or was regarded as appropriate when given for another reason (*see* Fox's *Journal* concerning Justice Bennet at Derby in 1650 and Barclay's *Apology*, Prop II, § 8) The early Friends definitely asserted that those who did not know quaking and trembling were strangers to the experience of Moses, David and other saints

The activity of the early Friends was not confined to England or even to the British Isles Fox and others travelled in America and the West India Islands, another reached Jerusalem and preached against the superstition of the monks, Mary Fisher (*fl* 1652–1697), "a religious maiden," visited Smyrna, the Morea and the court of Mohammed IV at Adrianople, Alexander Parker (1628–1689) went to Africa, others made their way to Rome, two women were imprisoned by the Inquisition at Malta, two men passed into Austria and Hungary, and William Penn, George Fox and several others preached in Holland and Germany

It was only gradually that the Quaker community clothed itself with an organization The beginning of this appears to be due to William Dewsbury (1621–1688) and George Fox; it was not until 1666 that a complete system of church organization was definitely established The introduction of an ordered system and discipline was naturally viewed with some suspicion by people taught to believe that the inward light of each man was the only true guide for his conduct, there was determined opposition, and a number of secessions took place

Persecutions.—During the whole time between their rise and the passing of the Toleration Act in 1689 the Quakers were the subject of almost continuous persecution, which they endured with extraordinary patience and fortitude They insisted on the duty of meeting openly in time of persecution, declining to hold secret assemblies for worship as other Noncomformists were doing They were liable not only to the dangers in which all dissenters from the established church were involved, but to special misunderstanding, slander, and persecution because of their refusal to take an oath After the Restoration, one of the most common causes of imprisonment was the practice adopted by judges and magistrates of tendering to Friends (particularly when no other charge could be proved against them) the oaths of supremacy and allegiance. The story is vividly told in W. C Braithwaite's essay "The Penal Laws affecting early Friends in England," in *The First Publishers of Truth* The Toleration Act of 1689 put an end to the persecution of Quakers (along with other dissenters) for non-attendance at church But for many years after this they were liable to imprisonment for non-payment of tithes, and, together with other Dissenters, they remained under various civil disabilities, the gradual removal of which is part of the general history of England

Period 1689-1835.—From the beginning of the 18th century the zeal of the Quaker body abated Although many "general" and other meetings were held in different parts of the country for the purpose of setting forth Quakerism, the notion that the whole Christian church would be absorbed in it, and that the Quakers were, in fact, the church, gave place to the conception that they were "a peculiar people" to whom, more than to others, had been given an understanding of the will of God The Quakerism of this period was largely of a traditional kind; it dwelt with increasing emphasis on the peculiarities of its dress and language, it rested much upon discipline, which developed and hardened into rigorous forms, and the correction or exclusion of its members occupied more attention than did the winning of converts

Excluded from political and municipal life by the laws which required either the taking of an oath or joining in the Lord's Supper according to the rites of the Established Church, excluding themselves not only from the frivolous pursuits of pleasure, but from music and art in general, attaining no high average level of literary culture (though producing some men of eminence in science and medicine), the Quakers occupied themselves mainly with trade, the business of their Society, the calls of philanthropy, and the foundation of schools

Period From 1835.—During the 18th century the doctrine of the Inward Light acquired such exclusive prominence as to bring about a tendency to disparage, or, at least, to neglect, the written word (the Scriptures) as being "outward" and non-essential In the early part of the 19th century an American Friend, Elias Hicks, pressed this doctrine to its furthest limits, and, in doing so, he laid stress on "Christ within" in such a way as practically to take little account of the person and work of the "outward," *i e*, the historic Christ The result was a separation of the Society in America into two divisions which persist to the present day (*see* section below, United States) This led to a countermovement in England, known as the Beacon Controversy, from the name of a warning publication issued by Isaac Crewdson of Manchester in 1835, advocating views of a pronounced "evangelical" type Much controversy ensued, and a certain number of Friends departed from the parent stock, most of them joining one or other of the orthodox evangelical churches. They left behind them, however, many influential members, who may be described as a middle party, and who strove to give a more "evangelical" tone to Quaker doctrine Joseph John Gurney of Norwich, a brother of Elizabeth Fry, by means of his high social position and his various writings (some published before 1835), was the most prominent actor in this movement the effects of which were felt throughout the 19th century. Other causes have been at work modifying the Quaker society The repeal of the Test Act, the admission of Quakers to Parliament in consequence of their being allowed to affirm instead of taking the oath (1832, when Joseph Pease was elected for South Durham), the establishment of the University of London, and, more recently, the opening of the universities of Oxford and Cambridge to Nonconformists, have all had their effect upon the body. It has abandoned its peculiarities of dress and language, as well as its hostility to music and art, and it has cultivated a wider taste in literature. In fact, the number of men, either Quakers or of Quaker origin and proclivities, who occupy positions of influence in English life is large in

proportion to the small body with which they are connected

Public Worship.—There is not now the sharp distinction which formerly existed between Friends and other non-sacerdotal evangelical bodies, these have, in theory at least, largely accepted the spiritual message of Quakerism By their special insistence on the fact of immediate communion between God and man, Friends have been led into those views and practices which still mark them off from their fellow-Christians It is rather in their emphasis on this thought of Divine communion, in their insistence on its reasonable consequences (as it seems to them), that Friends constitute a separate community The appointment of one man to preach, to the exclusion of others, is regarded as a limitation of the work of the Spirit and an undue concentration of that responsibility which ought to be shared by a wider circle For the same reason they refuse to occupy the time of worship with an arranged programme of vocal service; they meet in silence, desiring that the service of the meeting shall depend on spiritual guidance Thus it is left to any man or woman to offer vocal prayer, to read the Scriptures, or to utter such exhortation or teaching as may seem to be called for Of late years, in certain of their meetings on Sunday evening, it has become customary for part of the time to be occupied with set addresses for the purpose of instructing the members of the congregation, or of conveying the Quaker message to others who may be present, all their meetings for worship being freely open to the public Occasionally hymns are sung, very rarely as part of any arrangement, but almost always upon the request of some individual for a particular hymn appropriate to the need of the congregation The periods of silence are regarded as times of worship equally with those occupied with vocal service, inasmuch as Friends hold that robustness of spiritual life is best promoted by earnest striving on the part of each one to know the will of God for himself, and to be drawn into Christian fellowship with the other worshippers The idea which ought to underlie a Friends' meeting is thus set forth by Robert Barclay. "When I came into the silent assemblies of God's people, I felt a secret power among them, which touched my heart, and as I gave way unto it, I found the evil weakening in me and the good raised up" (*Apology*, xi 7) In many places Friends have felt the need of bringing spiritual help to those who are unable to profit by the somewhat severe discipline of their ordinary manner of worship To meet this need they hold (chiefly on Sunday evenings) meetings which are not professedly "Friends' meetings for worship," but which are services conducted on lines similar to those of other religious bodies, with, in some cases, a portion of time set apart for silent worship, and freedom for any one of the congregation to utter words of exhortation or prayer

From the beginning Friends have not practised the outward ordinances of Baptism and the Lord's Supper, even in a non-sacerdotal spirit They attach, however, supreme value to the realities of which the observances are reminders or types. Their testimony is not *primarily* against these outward observances, their disuse of them is due to a sense of the danger of substituting the shadow for the reality They hold that every event in life may be turned into a sacrament, a means of grace

Ministers.—When the ministry of any man or woman has been found to be helpful to the congregation, the Monthly Meeting (*see* below) may, after solemn consideration, record the fact that it believes the individual to have a divine call to the ministry, and that it encourages him or her to be faithful to the gift. Such ministers are said to be "acknowledged" or "recorded", they are emphatically *not* appointed to preach, and the fact of their acknowledgment is not regarded as conferring any special status upon them. The various Monthly Meetings appoint Elders, or some body of Friends, to give advice of encouragement or restraint as may be needed, and, generally, to take the ministry under their care. With regard to the ministry of women, Friends hold that there is no evidence that the gifts of prophecy and teaching are confined to one sex.

Doctrine.—With regard to the fundamental doctrines of Christianity, the belief of the Society of Friends does not essentially differ from that of other Christian bodies At the same time their avoidance of exact definition embodied in a rigid creed, together with their disuse of the outward ordinances of Baptism and the Supper, has laid them open to considerable misunderstanding As will have been seen, they hold an exalted view of the divinity and work of Christ as the Word become flesh and the Saviour of the world; but they have always shrunk from rigid Trinitarian *definitions* They believe that the same Spirit who gave forth the Scriptures still guides men to a right understanding of them "You profess the Holy Scriptures: but what do you witness and experience? What interest have you in them? Can you set to your seal that they are true by the work of the same spirit in you that gave them forth in the holy ancients?" (William Penn, *A Summons or Call to Christendom*) This doctrine has enabled Friends to face fearlessly the conclusions of modern criticism, and has contributed to a largely increased interest in Bible study During the past few years a new movement has been started in the shape of lecture schools, lasting for longer or shorter periods, for the purpose of studying Biblical, ecclesiastical and social subjects In 1903 there was established at Woodbrooke, an estate at Selly Oak on the outskirts of Birmingham, a permanent settlement for men and women, for the study of these questions on modern lines The outward beginning of this movement was the Manchester Conference of 1895, a turning-point in Quaker history Speaking generally, it may be noted that the Society includes various shades of opinion, from that known as "evangelical," with a certain hesitation in receiving modern thought, to the more "advanced" position which finds greater freedom to consider and adopt new suggestions of scientific, religious or other thinkers The differences, however, are seldom pressed, and rarely become acute Apart from points of doctrine which can be more or less definitely stated (not always with unanimity) Quakerism is an *atmosphere*, a manner of life, a method of approaching questions, a habit and attitude of mind They have always held that war is contrary to the spirit and precepts of the Gospel; and that the attempts to enforce truth-speaking by means of an oath, in courts of law and elsewhere, tend to create a double standard of truth

Periodic "Meetings."—The present organization of the Quaker church is essentially democratic; every person born of Quaker parents is a member, and, together with those who have been admitted on their own request, is entitled to take part in the business assemblies of any meeting of which he or she is a member The Society is organized as a series of subordinated meetings which recall to the mind the Presbyterian model The "Preparative Meeting" usually consists of a single congregation; next in order comes the "Monthly Meeting," the executive body, usually embracing several Preparative Meetings called together, as its name indicates, monthly (in some cases less often), then the "Quarterly Meeting," embracing several Monthly Meetings, and lastly the "Yearly Meeting," embracing the whole of Great Britain (but not Ireland) After several yearly or "general" meetings had been held in different places at irregular intervals as need arose, the first of an uninterrupted series met in 1668 From that date until 1904 it was held in London. In 1905 it met in Leeds, and in 1908 in Birmingham Its official title is "London Yearly Meeting" It is the legislative body of Friends in Great Britain It considers questions of policy, and some of its sittings are conferences for the consideration of reports on religious, philanthropic, educational and social work which is carried on Its sessions occupy a week in May of each year Representatives are sent from each inferior to each superior meeting, but they have no precedence over others, and all Friends may attend any meeting and take part in any of which they are members. Formerly the system was double, the men and women meeting separately for their own appointed business Of late years the meetings have been, for the most part, held jointly, with equal liberty for all men and women to state their opinions, and to serve on all committees and other appointments The mode of conducting these meetings is noteworthy A secretary or "clerk," as he is called, acts as chairman or president; there are no formal resolutions; and there is no voting or applause. The clerk ascertains what he considers to be the judgment of the assembly, and records it in a minute The permanent standing committee of the Society is known as the "Meeting for Sufferings" (established in 1675), which took its rise in the days when the per-

secution of many Friends demanded the Christian care and material help of those who were able to give it It is composed of representatives (men and women) sent by the quarterly meetings, and of all recorded Ministers and Elders Its work is not confined to the interests of Friends, it is sensitive to the call of oppression and distress (*e g*, a famine) in all parts of the world, it frequently raises large sums of money to alleviate the same, and intervenes, often successfully, and mostly without publicity, with those in authority who have the power to bring about an amelioration.

The offices known to the Quaker body are (1) that of *minister*, (2) of *elder*, whose duty it is "to encourage and help young ministers, and advise others as they, in the wisdom of God, see occasion"; (3) of *overseer*, to whom is especially entrusted that duty of Christian care for and interest in one another which Quakers recognize as obligatory in all the members of a church In most Monthly Meetings the care of the poor is committed to the overseers who hold, from time to time, meetings separate from the general assemblies of the members

A genuine vein of *philanthropy* has always existed in the Quaker body In nothing has this been more conspicuous than in the matter of slavery George Fox and William Penn laboured to secure the religious teaching of slaves As early as 1676 the assembly of Barbados passed "An Act to prevent the people called Quakers from bringing negroes to their meetings" On the attitude of Friends in America toward slavery, *see* PENN, WILLIAM It was in 1783 that the first petition to the House of Commons for the abolition of the slave trade and slavery went up from the Quakers, and in the long agitation which ensued the Society took a prominent part In 1798 Joseph Lancaster, himself a Friend, opened his first school for the education of the poor, and the cause of unsectarian religious education found in the Quakers steady support They also took an active part in Sir Samuel Romilly's efforts to ameliorate the penal code, in prison reform, with which the name of Elizabeth Fry (a Friend) is especially connected, and in the efforts to ameliorate the condition of lunatics in England (the Friends' Retreat at York, founded in 1792, was the earliest example in England of kindly treatment of the insane) It is noteworthy that Quaker efforts for the education of the poor and philanthropy in general, though they have always been Christian in character, have not been undertaken primarily for the purpose of bringing proselytes within the body, and have not done so to any great extent

By means of the *Adult Schools*, Friends have been able to exercise a religious influence beyond the borders of their own Society The movement began in Birmingham in 1845, in an attempt to help the loungers at street corners, reading and writing were the chief inducements offered. The schools are unsectarian in character and mainly democratic in government the aim is to draw out what is best in men and to induce them to act for the help of their fellows Whilst the work is essentially religious in character, a well-equipped school also caters for the social, intellectual and physical parts of a man's nature. Bible teaching is the central part of the school session: the lessons are mainly concerned with life's practical problems The spirit of brotherliness which prevails is largely the secret of the success of the movement At the end of 1909 there were in connection with the "National Council of Adult-School Associations" 1818 "schools" for men with a membership of about 113,789, and 402 for women with a membership of about 27,000. The movement, which is no longer exclusively under the control of Friends, is rapidly becoming one of the chief means of bringing about a religious fellowship among a class which the organized churches have largely failed to reach The effect of the work upon the Society itself may be summarized thus some addition to membership, the creation of a sphere of usefulness for the younger and more active members; a general stirring of interest in social question (*See* J. W. Rowntree and H. B Binns, *A History of the Adult School Movement*. The organ of the movement is *One and All*, published monthly. *See* also *The Adult School Year Book*.)

A strong interest in *Sunday schools* for children preceded the Adult School movement The earliest schools which are still existing were formed at Bristol, for boys in 1810 and for girls in the following year Several isolated efforts were made earlier than this; it is evident that there was a school at Lothersdale near Skipton in 1800 "for the preservation of the youth of both sexes, and for their instruction in useful learning"; and another at Nottingham. Even earlier still were the Sunday and day schools in Rossendale, Lancashire, dating from 1793 A "provisional committee" of members of the Society of Friends was formed in 1865 to deal with offers of *service in foreign lands* In 1868 this developed into the Friends' Foreign Mission Association, which now undertakes Missionary work in India (begun 1866), Madagascar (1867), Syria (1869), China (1886), Ceylon (1896) At the end of 1927 the Society consisted of 19,147 members and 380 places of worship in Great Britain, and in Ireland 2,195 members and 26 places of worship The central offices for Great Britain are at the Friends' House, Euston Road, London; and for Ireland, 6, Eustace Street, Dublin

BIBLIOGRAPHY —The writings of the early Friends are very numerous the most noteworthy are the *Journals* of George Fox and of Thomas Ellwood, both autobiographies, the *Apology for True Christian Divinity* and other works of Robert Barclay, and the works of Penn and Penington Early in the 18th century William Sewel, a Dutch Quaker, wrote a history of the Society and published an English translation; modern (small) histories have been written by T Edmund Harvey (*The Rise of the Quakers*) and by Mrs Emmott (*The Story of Quakerism*) *The Sufferings of the Quakers* by Joseph Besse (1753) gives a detailed account of the persecution of the early Friends in England and America An excellent portraiture of early Quakerism is given in William Tanner's *Lectures on Friends in Bristol and Somersetshire The Book of Discipline* in its successive printed editions from 1783 to 1906 contains the working rules of the organization, and also a compilation of testimonies borne by the Society at different periods, to important points of Christian truth, and often called forth by the special circumstances of the time *The Inner Life of the Religious Societies of the Commonwealth* (London, 1876) by Robert Barclay, a descendant of the Apologist, contains much curious information about the Quakers *See* also "Quaker" in the index to Masson's *Life of Milton* Joseph Smith's *Descriptive Catalogue of Friends' Books* (London, 1867) gives the information which its title promises, the same author has also published a catalogue of works hostile to Quakerism For an exposition of Quakerism on its spiritual side many of the poems by Whittier may be referred to, also *Quaker Strongholds* and *Light Arising* by Caroline E Stephen, *The Society of Friends, its Faith and Practice*, and other works by John Stephenson Rowntree, *A Dynamic Faith* and other works by Rufus M Jones, *Authority and the Light Within* and other works by Edw Grubb, and the series of "Swarthmore Lectures" as well as the histories above mentioned Much valuable information will be found in *John Stephenson Rowntree: His Life and Work* (1908) The history of the modern forward movement may be studied in *Essays and Addresses* by John Wilhelm Rowntree, and in *Present Day Papers* edited by him. The social life of the 18th century and the first half of the 19th is portrayed in *Records of a Quaker Family, the Richardsons of Cleveland*, by Mrs Boyce, and *The Diaries of Edward Pease, the Father of English Railways*, edited by Sir A E. Pease Other works which may usefully be consulted are the Journals of John Woolman, Stephen Grellet and Elizabeth Fry, also *The First Publishers of Truth*, a reprint of contemporary accounts of the rise of Quakerism in various districts Among the periodicals issued (not officially) in connection with the Quaker body are *The Friend* (weekly), *The British Friend* (monthly), *The Friends' Quarterly Examiner, Journal of the Friends' Historical Society*. Officially issued *The Book of Meetings* and *The Friends' Year Book* On the history of Quakerism in America, *see* R M Jones (and others), *The Quakers in the American Colonies* (1911), Sharpless, *The History of Quaker Government in Pennsylvania* (1898); J. Bowden, *History of the Society of Friends in America* (1850–54), S Janney, *History of Friends* (1859–67); A C and R H. Thomas, *A History of Friends in America* (1905) For recent studies of the whole subject *see* W C. Braithwaite, *The Beginnings of Quakerism* (1912) and J W Graham, *The Faith of a Quaker* (with bibliography, 1920), and for convenient introductions, *see* R. M Jones, *The Faith and Practice of the Quakers* (1927), and W C Braithwaite, article "Friends, Society of," in Hastings, *Encyclopaedia of Religion and Ethics* (X.)

THE UNITED STATES

The Colonial Period.—Between 1656 and 1658 Quaker missionaries arrived in Massachusetts Bay, Rhode Island, New Amsterdam, Maryland and Virginia, where they made converts and established meetings The visit of George Fox to America in 1672 gave fresh impetus to the movement. By 1700 the Friends had acquired New Jersey and Delaware, founded Pennsylvania, were politically powerful in Rhode Island, North Carolina and Maryland, had organized meetings in all the Colonies except Con-

necticut and South Carolina and had established six yearly meetings.

Friends were persecuted in all the non-Quaker Colonies except Rhode Island In New England and Virginia this was primarily due to their religious nonconformity Four Friends were hanged on Boston Common in 1661 and one died in Virginia as the result of flogging and subsequent neglect in prison Their refusal to pay tithes, take oaths or render military service brought on them fines and civil disabilities in most of the Colonies Pennsylvania Colony (*q v*) was founded by William Penn in 1682 as a "holy experiment" in the application of Quaker ideals to the State, but the Friends were not able to give their principles a full expression in Pennsylvania, because the Crown imposed limitations on the Colony's policy The later settlers were hostile to the Quaker ideals, and at the outbreak of the French and Indian War the Friends voluntarily gave up control of the Government. They used their influence to keep peace with the Indians and to protect them from fraud and debauchery They worked for popular education, peace, temperance and democracy and championed effectively the cause of religious liberty Chiefly through the patient work of John Woolman the Society had cleared itself of slavery, without a war or division, before 1800.

By the end of the colonial period Friends had retired from public life generally, and during the next century, chiefly on account of the neglect of higher education and the prevailing quietism, the society declined in numbers and in influence But they pioneered in prison reform, the care of the insane, and the anti-slavery movement.

Migrations.—Between 1725 and 1775 there were considerable migrations of the Quaker population from New England, Pennsylvania and New Jersey southward into North and South Carolina Toward the end of the 18th century large numbers of southern Friends, finding it difficult to live in a slave-holding society after freeing their own slaves, emigrated to the free territories of Ohio and Indiana.

Divisions.—In 1827–28 came the great disruption of the society, due to the clashing of new forces which made themselves felt after the Revolutionary War Elias Hicks (*q v*), alarmed at the intolerant spirit and new methods of the newly felt Evangelical influences, became the champion of the older quietism In the effort to rationalize and defend the sufficiency of the doctrine of the Inner Light, he built a theology of his own. The opposition of the city elders to his views made him the champion of the democratic opposition to their authority, particularly on the part of the country Friends The result was a division in five of the yearly meetings. The resulting groups, usually, but not officially, called Orthodox and Liberal (Hicksite), were about equal in numbers, but since the westward migrations were mainly from the undivided yearly meetings of Virginia and North Carolina, which sided with the Orthodox, the latter have since greatly outstripped the Liberals in numbers.

The Liberal yearly meetings never adopted the theology of Elias Hicks, their position being that theology is not the essence of Christianity but a matter of individual opinion. There are seven Liberal yearly meetings with a total membership (1927) of 16,576, of whom 10,425 belong to the Philadelphia Yearly Meeting and 400 are residents of Canada In 1902 they united in the Friends General Conference, which meets biennially but has no legislative authority. Through standing committees it carries on First-day schools, philanthropic labour, education, the advancement of Friends' principles, young Friends and foreign service The central offices are in Philadelphia, where they publish *The Friends Intelligencer.*

Among the Orthodox Friends the Evangelical tendencies developed most readily in the new western yearly meetings, and they were powerfully stimulated by the visit of Joseph John Gurney, a prominent English Friend, in 1836. He laid emphasis on the authority of the Scriptures, favoured Bible study and Bible schools and gave an impetus to higher education. The opposition of John Wilbur of New England to his work led finally to small separations in New England and Ohio. The resulting groups are called unofficially, Orthodox (Gurneyite or Progressive) and Conservative (Wilburite). After the Civil War a great revival movement began among Progressive Friends The leaders introduced innovations in methods and in theological expression. In consequence, there were small conservative separations in Iowa, Kansas, Western, and Canada yearly meetings (1877–84) and later in North Carolina (1905) These seven Conservative yearly meetings "recognize" one another and have an estimated membership of 2,600 of whom about 1,000 belong to the Ohio Yearly Meeting

Reorganization.—Among the Progressive (Orthodox, Gurneyite) Friends the Evangelical emphasis on the outward authority of the Bible and other influences produced a movement toward the practice of water baptism, especially in the Ohio Yearly Meeting To consider this tendency a conference of the Orthodox Yearly Meetings in America and Great Britain was held at Richmond, Ind, in 1887. It issued a "Declaration of Faith" which reaffirmed the historic position of the society in regard to the outward ordinances and restated its doctrinal position in mildly evangelical terms The Great Revival occasioned marked changes in the Progressive yearly meetings. The peculiarities of dress and speech have been abandoned almost entirely Music was introduced into the public worship, which now conforms closely to the general type of "low church" Protestantism, without, however, using a fixed liturgy or abandoning the theory of Spirit-led worship. Pastors are generally employed to preach.

In 1902 a uniform discipline was adopted which set up a Five Years Meeting with legislative powers, to which all the Orthodox Yearly Meetings belong except Ohio, Oregon and Philadelphia. The work of this body is carried on through the following boards: finance, foreign missions, home missions, peace association, prohibition and public morals, religious education, publication, education and young Friends' activities It is also represented on the American Friends Service committee. The executive committee is composed of the chairmen or of representatives appointed by the boards. The central offices are in Richmond, Ind, where the official organ, *The American Friend,* is published. The Five Years Meeting is a member of the Federal Council of the Churches of Christ in America The total membership (1927) of the Five Years Meeting was 80,663.

Together with the Oregon Yearly Meeting the Five Years Meeting had (1926) mission stations in Mexico, Jamaica, Cuba, Palestine, east Africa and west China with 43 missionaries, 375 native helpers and 6,295 members Ohio has stations in China and India; Philadelphia in Japan, and California in Central America and Alaska.

Education and Philanthropy.—The Quaker pioneers usually established elementary schools and academies in their communities, which had a marked influence in shaping the public school systems in North Carolina, Ohio, Indiana and Kansas In the eastern yearly meetings Friends of both the larger branches still maintain both elementary and high schools. There are several Quaker colleges

In 1869, at the request of President Grant, Friends of both branches began to take charge of many of the Indian agencies This work was finished in 1885, but missions and schools for the Indians are still maintained in Oklahoma and a school at Tunessasa, N Y., is under the care of the Philadelphia Yearly Meeting (Orthodox). Friends were active in the work of the Freedmen's Bureau after the Civil War and have contributed much to negro education. In 1917 Friends of all branches united in forming the American Friends Service Committee, with headquarters in Philadelphia, for relief and reconstruction work in the war-torn world. In co-operation with British Friends it helped in the restoration of the devastated districts in northern France, Poland and Serbia; provided hospitals in France and Russia and orphanage-schools for the children of war victims in Serbia, Poland and Syria. It co-operated with the American Relief Administration in feeding the Russian peasants in the Volga basin and supervised the feeding of two million underfed German children. It assisted the Greek refugees, the earthquake victims in Japan and the families of starving miners in West Virginia It maintains, in conjunction with British Friends, goodwill centres in Paris, Geneva, Berlin, Vienna, Warsaw, Moscow and Salonika to promote international

understanding and co-operation and to aid oppressed minorities in Europe. In recent years there has been a great increase in co-operation and unity between the different branches of Friends In 1920 they joined in the All-Friends conference held in London to review the Quaker peace testimony in the light of the experiences of the World War A joint young Friends' conference is held each summer in the Middle West (E RL)

FRIES, ELIAS MAGNUS (1794–1878), Swedish botanist, was born at Femsjo, Småland, on Aug 15, 1794 He studied at Lund, where in 1814 he was elected *Dozent* of botany and in 1824 professor In 1834 he became professor of practical economy at Uppsala, and in 1851 professor of botany He died on Feb 8, 1878

Fries was an authority on the Cryptogamia He wrote *Novitiae florae Sueciae* (1814), *Flora Hollandica* (1817); *Systema mycologicum* (1821–29) and many other works

FRIES, JAKOB FRIEDRICH (1773–1843), German philosopher, was born at Barby, Saxony, on Aug 23, 1773 Having studied at Niesky, Leipzig and Jena, in 1806 he became professor of philosophy and elementary mathematics at Heidelberg His philosophical position with regard to his contemporaries is set forth in *Reinhold, Fichte und Schelling* (1803, reprinted 1824 as *Polemische Schriften*), *System der Philosophie als evidente Wissenschaft* (1804) and *Wissen, Glaube und Ahnung* (1805) His important *Neue oder anthropologische Kritik der Vernunft* (3 vols 1807) attempted to give a new foundation of psychological analysis to the critical theory of Kant In 1811 appeared his *System der Logik* and five years later, he accepted the chair of theoretical philosophy at Jena In politics he was a strong Liberal and Unionist, and did much to inspire the organization of the *Burschenschaft* In 1816 he published *Vom deutschen Bund und deutscher Staatsverfassung*, and his influence gave a powerful impetus to the agitation which in 1819 led to the issue of the Carlsbad Decrees by the representatives of the German governments He was condemned by the Mainz Commission and the grand-duke of Weimar was compelled to deprive him of his professorship In 1824 he was recalled to Jena as professor of mathematics and physics, and in 1838, the right of lecturing on philosophy was restored to him He died at Jena on Aug 10, 1843

The most important works of his Jena professorate are the *Handbuch der praktischen Philosophie* (1817–32), *Handbuch der psychischen Anthropologie* (1820), *Die mathematische Naturphilosophie* (1822), *System der Metaphysik* (1824, *Die Geschichte der Philosophie* (1837–40) In philosophy Fries attempted to reconcile the criticism of Kant and Jacobi's philosophy of belief

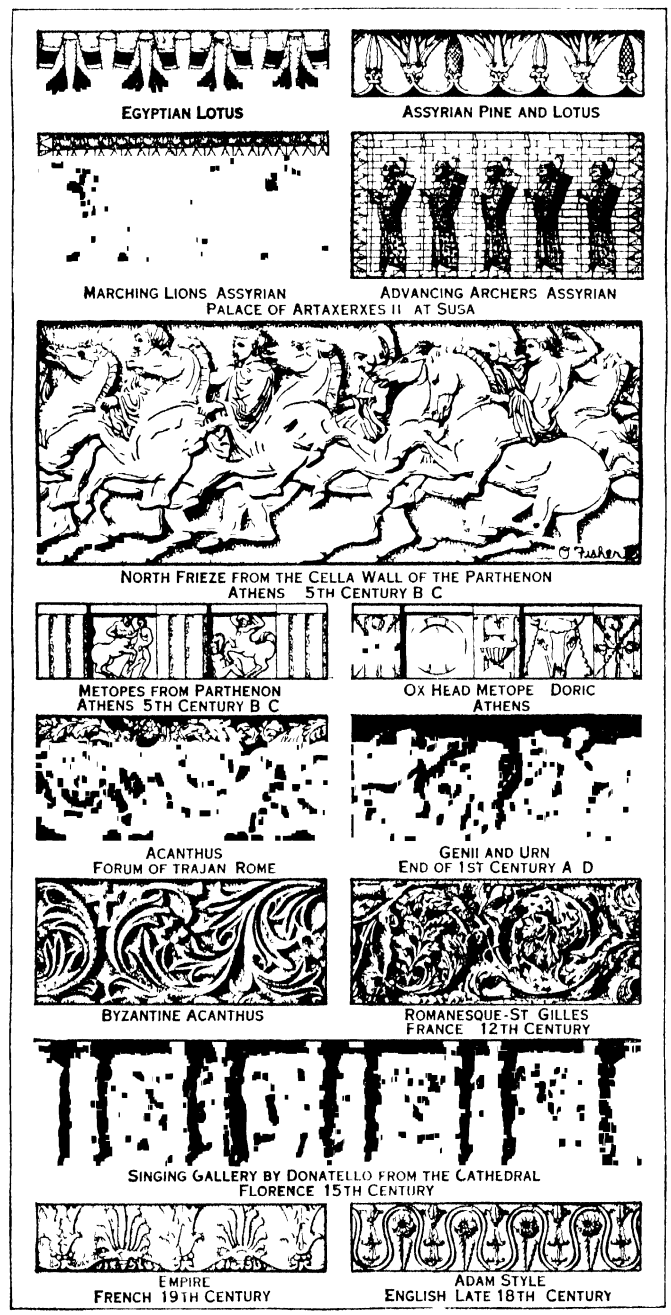
See E L Henke, *J F Fries* (1867), C Grapengiesser, *J F Fries, ein Gedenkblatt* and *Kant's "Kritik der Vernunft" und deren Fortbildung durch J F Fries* (1882), H Strasosky, *J F Fries als Kritiker der Kantischen Erkenntnistheorie* (1891), G Weiss *Fries' Lehre v der Ahnung in Asthetik, Religion u Ethik* (Gottingen, 1912), G Hessenberg, *Abhandlungen der Fries'schen Schule* 4 vols, 1906

FRIESLAND or **VRIESLAND,** a province of Holland, bounded south-west, west and north by the Zuider Zee and the North sea, east by Groningen and Drente, and south-east by Overijsel It also includes the islands of Ameland and Schiermonnikoog (*see* FRISIAN ISLANDS) Area, 1,248 sq m, pop (1926), 401,388 The soil of Friesland falls naturally into three divisions consisting of sandy clay in the north and north-west, of a median belt of low-fen between the south-west and north-east, and of a comparatively small area of high-fen in the south-east The clay and low-fen furnish good meadow-land for the world-famed breed of Frisian cattle, noted especially for butter production Horse-breeding is also practised In the high-fen district peat-digging is still important but cultivation remains difficult Droughts are specially serious in the absence of flowing rivers, and this difficulty interferes seriously with milk production at times The water system is entirely canalized, and there is a vast network of canals, waterways and lakes in the whole north and west The principal lakes are Tjeuke Meer, Sloter Meer, De Fluessen and Sneeker Meer The tidal range being small on the north coast, the Waterstaat (*see* NETHERLANDS) provides for the largest removal of superfluous surface water into the Lauwerszee. The drainage problem has always been a peculiarly difficult one.

The population of the province is evenly distributed in small villages The principal centres are Leeuwarden, Sneek, Bolsward, Franeker, Dokkum, and Heerenveen With the exception of Franeker and Heerenveen all these towns originally arose on the inlet which has become the Zuider Zee The seaport towns are more or less decayed, they include Stavoren, Hindeloopen, Workum, Harlingen and Makkum, the increased draught of modern vessels is largely responsible for this

For history *see* FRISIANS

FRIESY, EMILE OTHON (1879–) French painter, born at Le Havre He was a pupil at the École des Beaux-Arts and of L Bonnat, but came under the influence of Cézanne and Matisse He is one of the leaders of the French Post-Impressionism His paintings of landscapes, with views of harbours and villages in Normandy are summary stylistic arrangements, full of life and vigour

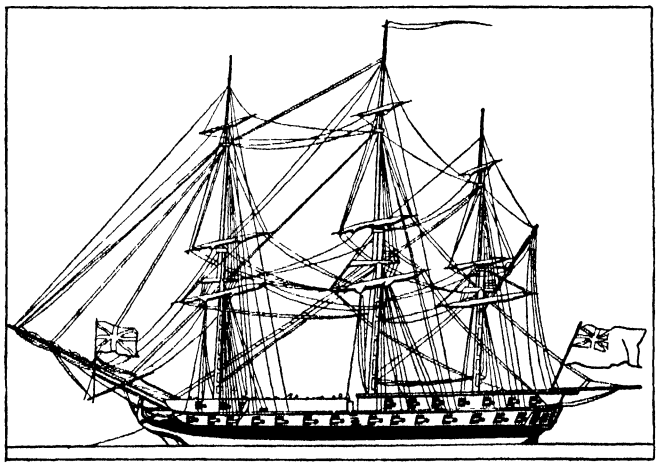


EGYPTIAN LOTUS, ASSYRIAN PINE AND LOTUS, FROM HAMLIN 'A HISTORY ORNAMENT BY COURTESY OF THE CENTURY CO , MARCHING LIONS ADVANCING ARCHERS BY COURTESY OF THE METROPOLITAN MUSEUM OF ART

FRIEZE, in architecture, the middle of the three divisions of a classic entablature above the architrave and below the cornice (*see* ORDER); also any long, narrow, horizontal panel or band used for decorative purposes The frieze probably developed from the necessity of carrying the cross beams of a ceiling upon the tops of the architrave beams, but below the cornice eaves; the stone triglyphs (*q v*) of the Doric frieze are reminiscent of the beam ends of a primitive wood construction In the Ionic, Corinthian and Composite orders the frieze has no architectural membering, but is frequently richly ornamented In Greek work this ornamentation consists of figures, as in the treasury of the Cnidians at Delphi (early 5th century B C) or the monument of Lysicrates at Athens (310 B C), in Roman and Renaissance work of anthemions, acanthus foliage or garlands, as in the temple of Vesta at Tivoli (*c* 80 B C) and the Maison Carrée at Nîmes (early 1st century A D) In late Roman work and many Renaissance examples the profile of the frieze is a convex curve, and is known as a *pulvinated* frieze

The most famous of all decorative friezes is undoubtedly that carved on the top of the outer wall of the cella of the Parthenon, just under the ceiling of the portico This frieze, 40 in high and 525 ft long, bearing a representation of the ritual procession of the Pan-athenaic festival, is characterized by superb rhythmic design and faultless execution; sculptured probably from the designs and under the supervision of Pheidias it is a perfect expression of Greek sculpture of the middle of the 5th century B C and one of the most praise-worthy examples of architectural sculpture of all time

FRIGATE, originally a small swift, undecked vessel, propelled by oars or sails, in use on the Mediterranean The word is thus used of the large open boats, without guns, used for war purposes by the Portuguese in the East Indies during the 16th and 17th centuries The French first applied the term to a particular type of ships of war during the second quarter of the 18th century The Seven Years' War (1756–1763) marked the definite adoption of



FROM "THE KING S SHIPS," BY COURTESY OF COMMANDER H S LECKY, R N

THREE-MASTED FRIGATE, THE "CRUISER" OF SAILING-SHIP DAYS
Adopted as a standard class of vessel during the Seven Years War (1756–1763), the frigate was three-masted, full-rigged, and carried from 30 to 50 guns

the "frigate" as a standard class of vessel, coming next to ships of the line, and used for cruising and scouting purposes They were three-masted, fully rigged, fast vessels, with the main armament carried on a single deck, and additional guns on the poop and forecastle. The guns varied from 24 to 50, but between 30 and 40 guns was the usual number carried "Frigate" continued to be used as the name for this type of ship, even after the introduction of steam and of ironclad vessels, but the class is now represented by the cruiser.

FRIGATE-BIRD, the name given by British sailors to a large sea-bird (*Fregata aquila*) and its ally *F. minor*. They form the family *Fregatidae*, allied to the pelicans (q v.). The species differ only in size and geographical distribution, *F. minor* being restricted to the Indian Ocean, while *F. aquila* is found in the tropics all round the world They obtain their food largely by robbing other birds, especially the boobies, of their prey and their speed and dexterity upon the wing are astonishing. Usually solitary, the birds breed in large companies on mangrove trees, a single white egg is laid and the nestlings are clad in white down In the adult, the plumage is dark brown above, and in the males, below also, with a scarlet pouch which is inflated to a large size in courtship, the females are white below

FRIGG, the wife of the god Odin (Woden) in northern mythology, was known also to other Teutonic peoples (O H Ger *Frua*, Langobardic *Frea*); in English her name still survives in Friday (O E *Frigedaeg*) (*See* TEUTONIC PEOPLES, *ad fin*)

FRIGIDARIUM, the cold room, often containing a swimming pool, of the ancient Roman baths (*see* BATHS)

FRIIS, JOHAN (1494–1570), Danish statesman, was born in 1494, and was educated at Odense and at Copenhagen, completing his studies abroad He was one of the first of the magnates to adhere to the Reformation and its promoter King Frederick I (1523–1533) Friis, who made a fortune out of the church lands, succeeded Claus Gjoodsen as imperial chancellor in 1532, and held that dignity till his death He promoted the election of Christian III (1533–1559), but in the course of the "Count's War" he was taken prisoner by Count Christopher, the Catholic candidate for the throne, and forced to do him homage He made his escape to Germany, and then rejoined Christian III He was one of the plenipotentiaries who concluded peace with Lubeck at the congress of Hamburg, and subsequently took part in the national reconstruction necessitated by the Reformation, acting as mediator between the Danish and the German parties who were contesting for supremacy during the earlier years of Christian III Friis was a patron of learning He encouraged Hans Svaning to complete Saxo's history of Denmark, and Anders Vedel to translate Saxo into Danish Under King Frederick II (1559–1588), Friis was well-nigh omnipotent He was largely responsible for the Scandinavian Seven Years' War (1562–70), which did so much to exacerbate the relations between Denmark and Sweden. Friis died on Dec 5, 1570, a few days before the peace of Stettin

FRILLED LIZARD (*Chlamydosaurus kingi*), a tropical Australian lizard, remarkable for the large erectile frill round the neck and for its bipedal mode of progression It is arboreal and insectivorous (*See* LIZARD)

FRIMLEY, an urban district in the Farnham parliamentary by division of Surrey, England, 33¼ m W S W from London by the Southern railway, and 1 m N of Farnborough in Hampshire. Pop. of urban district (1921) 13,676 Its healthy climate, its position in the sandy heath-district of the west of Surrey, and its proximity to Aldershot Camp have contributed to its growth as a residential township To the east the moorland rises in the picturesque elevation of Chobham Ridges, and 3 m. N E is Bagshot, another village which has grown into a residential district, on the heath of the same name extending into Berkshire Bisley Camp, to which in 1890 the meetings of the National Rifle association were removed from Wimbledon, is 4 m east Coniferous trees and rhododendrons are characteristic products of the soil, and large nurseries are devoted to their cultivation.

FRIMONT, JOHANN MARIA PHILIPP, COUNT OF PALOTA, PRINCE OF ANTRODOCCO (1759–1831), Austrian general, entered the Austrian cavalry as a trooper in 1776, won his commission in the War of the Bavarian Succession, and took part in the Turkish wars and in the early campaigns against the French Revolutionary armies in Italy. He served in the Russian campaign of 1812, and in the campaigns of 1813–14 In 1815 he was commander-in-chief of the Austrians in Italy, and his army penetrated France as far as Lyons (July 11). With the army of occupation he remained in France for some years, and in 1819 he commanded at Venice. In 1821 he led the Austrian army which was employed against the Neapolitan rebels, and received from King Ferdinand of Naples the title of prince of Antrodocco and a sum of money, and from his own master the rank of general of cavalry. After this he commanded in North Italy, and repressed many out-

breaks of the Italian patriots. He became president of the Aulic council in 1831, but died a few months later.

FRINGILLIDAE: *see* GROSBEAK; FINCH; BUNTING.

FRIOUL, one of several dialects of the Rhaeto-Romance subdivision of the Italo-Celtic family of speech It is akin to Ladin (*q v.*), the speech most typical of this subdivision and presents many peculiar divergences from its Romance parents

See *Rhaeto-Romance Languages* and R Brandstetter, *Ratoromanische Forschungen* (1905).

FRISCHES HAFF, a lagoon on the Baltic coast of Germany, between Danzig and Konigsberg It is 52 m in length, from 4 to 12 m. broad, 332 sq m in area, and is separated from the Baltic by a narrow spit, the Frische Nehrung This barrier was torn open by a storm in 1510, and the channel thus formed, now dredged out to a depth of 22 ft., affords a navigable passage for vessels Into the Haff flow the Nogat, the Elbing, the Passarge, the Pregel and the Frisching

FRISCHLIN, PHILIPP NIKODEMUS (1547–1590), German philologist and poet, was born on Sept. 22, 1547, at Balingen, Wurttemberg, where his father was parish minister He was educated at Tubingen, where he became (1568) professor of poetry and history. In 1575 for his comedy of *Rebecca,* which he read at Regensburg before the emperor Maximilian II , he was rewarded with the laureateship, and in 1577 he was made a count palatine (*comes palatinus*) or *Pfalzgraf.* In 1582 he had to leave Tubingen, and spent two years teaching at Laibach. Shortly after his return to Tubingen in 1584, he was threatened with a criminal prosecution for immoral conduct, and fled to Frankfurt-on-Main (1587). For 18 months he taught in the Brunswick gymnasium, and he appears also to have resided occasionally at Strasbourg, Marburg and Mainz From Mainz he wrote libellous letters, which led to his arrest in March 1590 He was imprisoned in the fortress of Hohenurach, near Reutlingen, where, on the night of Nov 29, 1590, he was killed by a fall in attempting to let himself down from the window of his cell

In his Latin verse Frischlin often successfully imitated the classical models; his comedies have freshness and vivacity, and his commentaries on the *Georgics* and *Bucolics* of Virgil were important contributions to the scholarship of his time His *Opera poetica* were published 12 times between 1535 and 1636. *See* D. F Strauss, *Leben und Schriften des Dichters und Philologen Frischlin* (1856)

FRISI, PAOLO (1728–1784), Italian mathematician and astronomer, was born at Milan and educated at the Barnabite monastery there and at Padua He made his reputation by his *Disquisitio mathematica in causam physicam figurae et magnitudinis terrae* (1751), and became professor of philosophy in the College of Casale, and subsequently in the Barnabite college of St Alexander at Milan He was professor of mathematics at Pisa (1756–64) and in the palatine schools at Milan (1764–77), where he obtained papal release from ecclesiastical jurisdiction and authority to become a secular priest In 1777 he became director of a school of architecture at Milan He had a European reputation as a consulting authority on hydraulics, and through him lightning-conductors were introduced into Italy

His other works include:—*Saggio della morale filosofia* (Lugano, 1753), *Nova electricitatis theoria* (1755), *Dissertatio de motu diurno terrae* (Pisa, 1758); *Dissertationes variae* (Lucca, 1759, 1761); *Del modo di regolare i fiumi e i torrenti* (Lucca, 1762), *Cosmographia physica et mathematica* (1774, 1775 his chief work); *Dell' architettura, statica e idraulica* (1777); and other treatises.

FRISIAN ISLANDS, a chain of islands, lying from 3 to 20 m. from the mainland, and stretching from the Zuider Zee east and north as far as Jutland, along the coasts of Holland and Germany They are divided into three groups —(1) The West Frisian, (2) the East Frisian, and (3) the North Frisian

The islands mark the outer fringe of the former continental coast-line, and are separated from the mainland by shallows, known as *wadden.* Notwithstanding the protection afforded by sand-dunes and artificial embankments, the Frisian islands are slowly disappearing through marine erosion Many of the Frisian legends and folk-songs deal with submerged villages and hamlets. The German and Dutch governments annually expend large sums for the protection of the islands, and in some cases the erosion on the seaward side is counterbalanced by the accretion of land on the inner side, fine sandy beaches being formed well suited for sea-bathing, which attracts many visitors in summer. The inhabitants support themselves by seafaring, pilotage, grazing of cattle and sheep, fishing and a little agriculture, chiefly potato-growing

West Frisian.—The West Frisian islands belong to the kingdom of the Netherlands, and embrace Texel (71 sq m), Vlieland (19 sq.m), Terschelling (41 sq m), Ameland (23 sq m), Schiermonnikoog (19 sq m), as well as the much smaller islands of Boschplaat and Rottum, which are practically uninhabited. The northern end of Texel is called Eierland, or "island of eggs," in reference to the large number of sea-birds' eggs which are found there It was joined to Texel by a sand-dike in 1629–1630, and is now undistinguishable from the main island Texel was already separated from the mainland in the 8th century, but remained a Frisian province and countship, which once extended as far as Alkmaar in North Holland, until it came into the possession of the counts of Holland

The island of Terschelling once formed a separate lordship, but was sold to Holland As early as the beginning of the 9th century Ameland was a lordship belonging to the Cammingha family, who held immediately of the emperor and in recognition of their independence the Amelanders were in 1369 declared to be neutral in the fighting between Holland and Friesland, while Cromwell made the same declaration in 1654 The castle of the Camminghas in Ballum remained until 1829 This island is joined to the mainland of Friesland by a stone dike built in 1873 to promote the deposit of mud Schiermonnikoog has a village and a lighthouse. Rottum was once the property of the ancient abbey at Rottum, 8 m N of Groningen, of which there are slight remains

East Frisian.—The East Frisian group belongs to Germany and comprises Borkum (12½ sq.m), Memmert, Juist (2¼ sq m), Norderney (5½ sq m), Baltrum, Langeoog (8 sq m), Spiekeroog (4 sq m), and Wangeroog (2 sq m). All these islands are visited for sea-bathing Many have lighthouses and lifeboat stations In the beginning of the 18th century Wangeroog comprised eight times its present area Borkum and Juist are two surviving fragments of the original island of Borkum (computed at 380 sq m), known to Drusus as *Fabaria,* and to Pliny as *Burchana,* which was rent asunder by the sea in 1170 Neuwerk and Scharhörn are situated off the mouth of the Elbe, the former contains some marshland protected by dikes and has two lighthouses and a lifeboat station

North Frisian.—About the year 1250 the area of the North Frisian islands was estimated at 1,065 sq m ; by 1850 this had diminished to only 105 sq m. This group embraces the islands of Nordstrand (17¼ sq m), which up to 1634 formed one larger island with the adjoining Pohnshallig and Nordstrandisch-Moor, Pellworm (16¼ sq m), protected by a circle of dikes and connected by steamer with Husum on the mainland; Amrum (10½ sq m), Fohr (32 sq.m.); Sylt (38 sq.m.); Röm (16 sq m), with several villages, the principal of which is Kirkeby, Fano (21 sq m.), and Heligoland (¼ sq.m.). With the exception of Fanö and Röm which are Danish, these islands belong to Germany. In the North Frisian group there are also several smaller islands called Halligen, rising generally only a few feet above the level of the sea

FRISIANS, a people who in the first century of our era were found by the Romans in occupation of the coast lands stretching from the mouth of the Scheldt to that of the Ems The first historical notices of the Frisians are found in the *Annals* of Tacitus. They (or a portion of them) were rendered tributary by Drusus, and became *socii* of the Roman people, but soon after A.D. 47 the emperor Claudius ordered the withdrawal of all Roman troops to the left bank of the Rhine In 58 the Frisians tried unsuccessfully to appropriate certain districts between the Rhine and the Yssel and in 70 they took part in the campaign of Claudius Civilis Ptolemy states that they inhabited the coast above the Bructeri as far as the Ems. Tacitus speaks of them as adjacent to the Rhine. But there is some reason for believing that the part

of Holland which lies to the west of the Zuider Zee was at first inhabited by a different people, the Canninefates, whose name is perhaps preserved in the name Kennemerland or Kinnehem formerly applied to the same district.

In connection with the movements of the migration period the Frisians are hardly ever mentioned, though some of them are said to have surrendered to the Roman prince Constantius about the year 293. Procopius speaks of the Frisians as one of the nations which inhabited Britain in his day, but we have no evidence from other sources to bear out his statement. In Anglo-Saxon poetry mention is frequently made of a Frisian king named Finn, the son of Folcwalda, who came into conflict with a certain Hnaef, a vassal of the Danish king, Healfdene, about the middle of the 5th century. The incident is obscure, but it is worth noting that Hnaef's chief follower, Hengest, may quite possibly be identical with the founder of the Kentish dynasty. About the year 520 the Frisians are said to have joined the Frankish prince Theodberht in destroying a piratical expedition which had sailed up the Rhine under Chocilaicus (Hygelac), king of the Gotar Towards the close of the century they begin to figure much more prominently in Frankish writings It is probable that the Frisians were to some extent associated with the Angles and Saxons in the invasion of Britain In any case, the Frisian language, by its close resemblance to English, proves an ancient and intimate connection between these peoples

The northward extension of Frankish dominion brought on a collision with the Frisians Under the protection of the Frankish king Dagobert (622–638), the Christian missionaries Amandus (St Amand) and Eligius (St Eloi) attempted the conversion of the southern Frisians, but farther north the building of a church by Dagobert at Trajectum (Utrecht) at once aroused the fierce hostility of the heathen tribesmen of the Zuider Zee Utrecht was attacked and captured, and the church destroyed. Wilfrid bishop of York who visited Frisia in 678 was allowed to preach Christianity by Aldgils, then king Radbod, his successor, who was hostile to Christianity, was beaten by Pippin of Herstal in the battle of Dorstadt (689), and was compelled to cede west Frisia from the Scheldt to the Zuider Zee to the conqueror Although Frankish supremacy over Frisia was not completely established until the time of Charles the Great, it was under Frankish protection that Christianity was established in Frisia by the Englishman Willibrord, between 690 and 739 The see of Utrecht which he founded has remained the chief see of the northern Netherlands from his day to our own, though many Frisians were still heathen when the more famous English missionary Boniface was martyred at Dokkum in Frisia shortly after 750

Charles the Great granted the Frisians important privileges under a code known as the *Lex Frisionum*, based upon the ancient laws of the country In this text three districts are clearly distinguished. west Frisia from the Zwin to the Vlie, middle Frisia from the Vlie to the Lauwers; east Frisia from the Lauwers to the Weser At the treaty of Verdun (843) Frisia became part of Lotharingia; at the treaty of Mersen (870) it was divided between the kingdoms of the East Franks and the West Franks; in 880 the whole country was united to the latter, in 911 it fell under the dominion of Charles the Simple, king of the West Franks, but the districts of East Frisia asserted their independence and for a long time governed themselves after a very simple democratic fashion. The history of West Frisia gradually loses itself in that of the countship of Holland and the see of Utrecht (*see* HOLLAND and UTRECHT).

The influence of the Frisians during the interval between the invasion of Britain and the loss of their independence must have been greater than is generally recognized They were a seafaring people and engaged largely in trade, especially perhaps the slave trade, their chief emporium being Wyk te Duurstede. During the period in question there is considerable archaeological evidence for intercourse between the west coast of Norway and the regions south of the North sea, and it is worth noting that this seems to have come to an end early in the 9th century. Probably it is no mere accident that the first appearance, or rather reappearance, of Scandinavian pirates in the west took place shortly after the overthrow of the Frisians

Besides the Frisians discussed previously, a people called North Frisians inhabited the west coast of Schleswig. In historical times these North Frisians were subjects of the Danish kingdom and not connected in any way with the Frisians of the empire It seems not unlikely that the original settlers were Frisians who had been driven northwards by the Franks in the 8th century. The inhabitants of the neighbouring islands, Sylt, Amrum and Fohr, who speak a kindred dialect, have apparently never regarded themselves as Frisians, and it is the view of many scholars that they are the direct descendants of the ancient Saxons

In 1248 William of Holland, having become emperor, restored to the Frisians in his countship their ancient liberties in reward for the assistance they had rendered him in the siege of Aachen; but in 1254 they revolted, and William lost his life in the contest which ensued After many struggles west Friesland became completely subdued, and was henceforth virtually absorbed in the county of Holland. But the Frieslanders east of the Zuider Zee obstinately resisted repeated attempts to bring them into subjection. In the course of the 14th century the country was in a state of anarchy, which favoured the attempts of the counts of Holland to push their conquests eastward, but the main body of the Frisians was still independent when the countship of Holland passed into the hands of Philip the Good of Burgundy Philip laid claim to the whole country, but the people appealed to the protection of the empire, and Frederick III., in Aug 1457, recognized their direct dependence on the empire The marriage of Maximilian of Austria with the heiress of Burgundy produced a change in the fortunes of that part of Frisia which lies between the Vlie and the Lauwers In 1498 Maximilian reversed the policy of his father Frederick III and gave it to Albert of Saxony, who thoroughly crushed out all resistance In 1523 it passed with all the rest of the provinces of the Netherlands to the emperor Charles, the grandson of Maximilian and Mary of Burgundy.

The part of Frisia which lies to the east of the Lauwers had a divided history The portion which lies between the Lauwers and the Ems after some struggles for independence had, like the rest of the country, to submit itself to Charles It became ultimately the province of the town and district of Groningen (*q v*). The easternmost part between the Ems and the Weser, which had since 1454 been a county was ruled by the descendants of Edzard Cirksena, and was attached to the empire. The last of the Cirksenas, Count Charles Edward, died in 1744 and in default of heirs male the king of Prussia took possession of the county.

The province of Friesland was one of the seven provinces which by the treaty known as the Union of Utrecht bound themselves together to resist the tyranny of Spain. From 1579 to 1795 Friesland remained one of the constituent parts of the republic of the United Provinces, but it always jealously insisted on its sovereign rights, especially against the encroachments of the predominant province of Holland It maintained throughout the whole of the republican period a certain distinctiveness of nationality, which was marked by the preservation of a different dialect and of a separate stadtholder. Count William Lewis of Nassau-Siegen, nephew and son-in-law of William the Silent, was chosen stadtholder, and throughout the 17th and 18th centuries the stadtholdership was held by one of his descendants. Frederick Henry of Orange was stadtholder of six provinces, but not of Friesland, and even during the stadtholderless periods which followed the deaths of William II. and William III. of Orange the Frisians remained stanch to the family of Nassau-Siegen. Finally, by the revolution of 1748 William of Nassau-Siegen, stadtholder of Friesland (who by default of heirs male of the elder line, had become William IV, prince of Orange), was made hereditary stadtholder of all the provinces. His grandson in 1815 took the title of William I, king of the Netherlands The male line of the "Frisian" Nassaus came to an end with the death of King William III. in 1890.

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Bede, *Hist. Eccles* iv. 22, v. 9 f.; Alcuin, *Vita Willebrordi; Groot Placaat en Charterboek van Friesland* (edit Baron, C. F. zu Schwarzenberg, 5 vols., Leeuwarden, 1768–93); T. D Wiarda, *Ost-friesch-tsche Gesch.* (vols i.–ix., Aurich, 1791; vol x, Bremen, 1817), Pirius Winsemius, *Chronique van Vriesland* (Franoker, 1822); J Dirks, *Geschiedkundig onderzoek van den Koophandel der Friezen* (Utrecht, 1846), O. Klopp, *Gesch. Ost-frieslands* (3 vols., Hanover, 1854–58); I Undset, *Aarbeger for nordisk Oldkyndighed* (1880), p. 89 ff. (*cf.* E Mogk in Paul's *Grundriss d germ Philologie* ii. p 623 ff), Hooft van Iddekinge *Friesland en de Friezen in de Middeleeuwen* (Leyden, 1881), A Telting, *Het Oudfriesche Stadrecht* (The Hague, 1882), P J Blok, *Friesland im Mittelalter* (Leer, 1891); E W Selmer, *Sytterfriesische Studien* (*Kristiania*, 1921), P C G. Jensen, *Die nordfriesische Sprache der Wiedingharde* (Halle, 1925)

FRIT-FLY (*Oscinella frit*), a fly extremely destructive to barley crops in northern Europe and North America It is a small, greenish-black insect, the larvae of which live in the grains of the barley, which they destroy. (*See* ENTOMOLOGY, ECONOMIC; DIPTERA)

FRITH (or FRYTH), **JOHN** (*c* 1503–1533), English Reformer and Protestant martyr, was born at Westerham, Kent He was educated at Eton and King's College, Cambridge, where Gardiner, afterwards bishop of Winchester, was his tutor At the invitation of Cardinal Wolsey, after taking his degree he migrated (Dec 1525) to the newly founded college of St Frideswide or Cardinal College (now Christ Church), Oxford. The sympathetic interest which he showed in the Reformation movement in Germany caused him to be suspected as a heretic, and led to his imprisonment for some months Subsequently he appears to have resided chiefly at the newly founded Protestant university of Marburg, where he became acquainted with several scholars and reformers of note, especially Patrick Hamilton (*q v*) Frith's first publications were printed at Marburg His *Disputacyon of Purgatorye,* a treatise in three books, against Rastell, More and Fisher (bishop of Rochester) respectively, was published at the same place in 1531. While at Marburg, Frith also assisted Tyndale, whose acquaintance he had made in England, in his literary labours. In 1532 he ventured back to England Warrants for his arrest were almost immediately issued at the instance of More, then lord chancellor, and he ultimately fell into the hands of the authorities as he was on the point of escaping to Flanders. Frith was examined by the king's order, he was afterwards tried and found guilty of having denied that the doctrines of purgatory and transubtantiation were necessary articles of faith On June 23, 1533 he was handed over to the secular arm, and was burnt at the stake at Smithfield on July 4 During his captivity he wrote a reply to More's letter against his own "lytle treatise", also two tracts entitled *A Mirror or Glass to know thyself,* and *A Mirror or Looking-glass wherein you may behold the Sacrament of Baptism.*

See A à Wood, *Athenae Oxonienses* (ed. P. Bliss, 1813), i p. 74; John Foxe, *Acts and Monuments* (ed G Townshend, 1843–49), v pp 1–16 (also Index), G. Burnet, *Hist. of the Reformation of the Church of England* (ed N Pocock, 1865), i p 273; L Richmond, *The Fathers of the English Church,* i (1807), *Life and Martyrdom of John Frith* (Church of England Tract Society, 1824); Deborah Alcock, *Six Heroic Men* (1906).

FRITH, WILLIAM POWELL (1819–1909), English painter, was born at Aldfield, in Yorkshire, on Jan 9, 1819 In 1835 he entered Henry Sass's school in Bloomsbury, from which he passed to the Royal Academy schools In 1840 his first picture, "Malvolio, cross-gartered before the Countess Olivia," was exhibited at the Royal Academy. He was elected an Associate of the Royal Academy in 1845. His promotion to the rank of Academician followed in 1852, when he was chosen to fill the vacancy caused by Turner's death A succession of large compositions of every-day English life gained for the artist an extraordinary popularity "Life at the Seaside," better known as "Ramsgate Sands," was exhibited in 1854, and was bought by Queen Victoria; "The Derby Day," in 1858; "Claude Duval," in 1860; "The Railway Station," in 1862; "The Marriage of the Prince of Wales," painted for Queen Victoria, in 1865 He also painted a number of portraits His "Derby Day" is in the National Gallery, London Frith died on Nov 2, 1909

See his *Autobiography and Reminiscences* (1887), *Further Reminiscences* (1889).

FRITILLARY (*Fritillaria*), a genus of hardy bulbous plants of the family Liliaceae, containing upwards of 50 species widely distributed in the northern hemisphere. The genus is represented in Great Britain by the fritillary or snakeshead (*F. Meleagris*), which occurs in moist meadows in the southern half of England A much larger plant is the crown imperial (*F. imperialis*), a native of western Asia and well known in gardens. This grows to a height of about 3 ft, the lower part of the stoutish stem being furnished with leaves, while near the top is developed a crown of large pendent flowers surmounted by a tuft of bright green leaves. The flowers are bell-shaped, yellow or red, and in some of the forms double. The plant grows freely in good garden soil, preferring a deep well-drained loam.



THE FRITILLARY OR SNAKESHEAD, A LONG STEMMED FLOWER THAT BLOOMS IN ENGLISH MEADOWS BETWEEN APRIL AND MAY

About 15 species are native to western North America, chiefly California, and mostly with handsome flowers, among which are the white fritillary (*F liliacea*), the yellow fritillary (*F pudica*), mission bells (*F biflora*), brown bells (*F. parviflora*) and the checker-lily (*F lanceolata*)

Fritillary is also the name of several species of butterfly

FRITZLAR, a town in the Prussian province of Hesse-Cassel, on the left bank of the Eder, 16 m SW. from Cassel by rail Pop (1925) 3,888 As early as 732 Boniface, the apostle of Germany, established the church of St Peter and a small Benedictine monastery at Frideslar Among the earlier scholars of the famous monastery school were Sturm, abbot of Fulda, and Megingod, second bishop of Wurzburg Boniface later entrusted the office to Wigbert of Glastonbury, who thus became the first abbot of Fritzlar. In 774 the little settlement was burnt by the Saxons, but soon recovered Soon after 786 it was the seat of the bishopric of Buraburg, founded by Boniface in 741 At the diet of Fritzlar in 919 Henry I. was elected German king Early in the 13th century the village received municipal rights As a principality Fritzlar continued subject to the archbishopric of Mainz till 1802, when it was incorporated with Hesse In 1866 it passed with Hesse-Cassel to Prussia.

FRITZSCHE, OTTO FRIDOLIN (1812–96), German theologian, was born on Sept. 23, 1812, at Dobrilugk, and studied at Halle From 1837 to 1893 he was professor of theology at the University of Zurich, where he died on March 9, 1896

His chief publications were his edition of the Apocrypha of the Old Testament (1871) and his *Kurzgefasstes exegetisches Handbuch zu den Apokryphen des Alten Testamentes* (6 vols, 1851–60) For his other works, including his text editions, *see* Herzog's *Realencyklopädie.*

FRIULI, a district at the head of the Adriatic Sea, partly included in Venetia proper (province of Udine) and partly in Venetia Julia (province of Gorizia) In the north and east Friuli includes portions of the Julian and Carnic Alps, while the south is the alluvial plain of the Isonzo, Tagliamento, and lesser streams which come down in enormous floods after rain or thaw. The inhabitants, known as Furlanians or Friulani, speak a dialect with Celtic elements, one of the Latin dialects (others being those of the Dolomite valleys and of the Engadine). The area of the country is about 3,300 sq m. Silkworms are very largely bred

Friuli derives its name from the Roman town of Forum Iulii, or Foroiulium, the modern Cividale (*q.v*). In the 2nd century B C. the district was subjugated and became part of Gallia Transpadana. During the Roman period, besides Forum Iulii, its principal towns were Concordia and Aquileia The Lombards (6th

century) made it one of their thirty-six duchies, the capital being Forum Iulii or, as they called it, Civitas Austriae. The discovery of the grave of Gisulf (d. 611) at Cividale is an interesting proof of the veracity of Paulus Diaconus' *Historia Langobardorum.* In the 11th century the ducal rights over the greater part of Friuli were bestowed by the emperor Henry IV. on the patriarch of Aquileia; but towards the close of the 14th century the nobles called in the assistance of Venice, which, after defeating the archbishop, secured possession of the country for itself in 1420 The eastern part of Friuli was held by the counts of Gorizia till 1500, when on the failure of their line it was appropriated by Maximilian I., and became the possession of the house of Austria By the peace of Campo Formio in 1797 the Venetian district also came to Austria, and on the formation of the Napoleonic kingdom of Italy in 1805 the department of Passariano was made to include the whole of Venetian and part of Austrian Friuli, and in 1809 the rest was added to the Illyrian provinces. The title of duke of Friuli was borne by Marshal Duroc In 1815 the whole country was recovered by the emperor of Austria, who himself assumed the ducal title and coat of arms In 1866 the Venetian portion was again ceded to Italy by the peace of Prague, and the rest recovered in 1918

See Manzano, *Annali del Friuli* (Udine, 1858–79); and *Compendio di storia friulana* (Udine, 1876); Antonini, *Il Friuli orientale* (Milan, 1865), von Zahn, *Friaulische Studien* (Vienna, 1878); Pirona, *Vocabolario friulino* (Venice, 1869), and L Fracassetti, *La Statistica etnografica del Friuli* (Udine, 1903) *Memorie Storiche Forojulies* (in progress), P S Leicht, *Breve Storia del Friuli* (Udine, 1923)

(T A)

FROBEN [FROBENIUS], **JOANNES** (*c* 1460–1527), German printer and scholar, was born at Hammelburg in Bavaria After completing his university career at Basel, where he made the acquaintance of the famous printer Johannes Auerbach (1443–1513), he established there about 1491 a printing house which had a European reputation for accuracy and for taste. In 1500 he married the daughter of the bookseller Wolfgang Lachner, who entered into partnership with him He was a friend of Erasmus (*q v*), who not only had his own works printed by him, but superintended Frobenius's editions of St Jerome, St Cyprian, Tertullian, Hilary of Poitiers and St Ambrose His *Neues Testament* in Greek (1516) was used by Luther for his translation Frobenius employed Hans Holbein to illuminate his texts It was part of his plan to print editions of the Greek Fathers. He did not, however, live to carry out this project, but it was very creditably executed by his son Jerome and his son-in-law Nikolaus Episcopius Frobenius's work in Basel made that city in the 16th century the leading centre of the German book trade An extant letter of Erasmus gives an epitome of his life.

FROBERGER, JOHANN JACOB (1605–1667), German organist and composer, was born at Halle and died near Montbelliard on May 7, 1667. He was appointed court organist at Vienna in 1637, but did not immediately enter on his functions as he spent the years 1637–41 at Rome studying under the great master Frescobaldi He was in Vienna from 1641 to 1645, and again from 1653 to 1657, when he left the emperor's service After this time he seems to have fallen into extreme poverty, for it is said that Christopher Gibbons offered him the post of organ blower at Westminster Abbey in 1662 Froberger is important as being the link between the 17th century Italian school of organ playing and Buxtehude and others who led on to the Bach school His organ and piano works were collected by G. Adler in *Denkmaler der Tonkunst in Oesterreich* (1903).

See Franz Beier, *Über J. Frobergers Leben und Bedeutung* (1884).

FROBISHER, SIR MARTIN (*c* 1535–1594), English navigator and explorer, was the son of Bernard Frobisher of Altofts, Normanton, Yorkshire. In 1544 he was placed on board a ship sailing to Guinea. By 1565 he is referred to as Captain Frobisher, and in 1571–72 as being in the public service at sea off the coast of Ireland. He married in 1559 As early as 1560 or 1561 Frobisher had resolved to undertake a voyage in search of a north-west passage to Cathay and India, and in 1576, by help of the earl of Warwick, he was put in command of an expedition consisting of two tiny barques, the "Gabriel" and "Michael" He weighed anchor at Blackwall, and set sail on June 7 by way of the Shetland islands The pinnace was lost in a storm and some time afterwards the "Michael" deserted; but on July 28 the "Gabriel" sighted the coast of Labrador Some days later the mouth of Frobisher bay was reached, and a farther advance northwards being prevented by ice and contrary winds, Frobisher determined to sail westward up this passage (which he conceived to be a strait) to see "whether he mighte carrie himself through the same into some open sea on the backe syde" Butcher's island was reached on Aug 18 and some natives then decoyed away five of his men After vainly trying to get them back, Frobisher turned homewards, and reached London on Oct 9

Among the things Frobisher's men brought back was some "black earth," and a rumour arose that this was gold ore The result was great interest in the commercial world, and next year a much more important expedition than the former was fitted out, the queen lending the "Aid" from the royal navy and subscribing £1,000 towards the expenses of the expedition A company of Cathay was established with a charter from the Crown and Frobisher was appointed high admiral of all lands and waters that might be discovered by him. On May 26, 1577, the expedition, consisting besides the "Aid," of the ships "Gabriel" and "Michael" with boats, pinnaces and an aggregate complement of 120 men, including miners, refiners, etc., left Blackwall, and sailing by the north of Scotland reached Hall's island at the mouth of Frobisher bay on July 17. The south side of the bay was taken possession of in the queen's name The time was spent in collecting ore, and very little discovery was achieved The return was begun on Aug 23 and the "Aid" reached Milford Haven on Sept. 23, the "Gabriel" and "Michael," having separated, arrived later at Bristol and Yarmouth

Frobisher was received by the queen at Windsor She still believed in the value of the new territory, and it was resolved to send out a larger expedition, and establish a colony On May 31, 1578, the expedition, consisting in all of 15 vessels, left Harwich, and sailing by the English channel reached the south of Greenland on June 20 On July 2 the foreland of Frobisher bay was sighted, but stormy weather and dangerous ice caused the wreck of the barque "Dennis" and drove the fleet unwittingly up a new (Hudson) strait. After proceeding about 60m up this "mistaken strait," Frobisher turned back, and the fleet at last came to anchor in Frobisher bay. Some attempt was made at founding a settlement, and a large quantity of ore was shipped, but the venture was not a success, and on the last day of August the fleet set out for England, which was reached in the beginning of October In 1585 Frobisher commanded the "Primrose," as vice-admiral to Sir Francis Drake in his expedition to the West Indies, and for his services in the "Triumph," in the dispersion of the Armada, he was knighted He continued to cruise about in the Channel until 1590 when he was sent in command of a small fleet to the coast of Spain In 1591 he married again and settled down in Yorkshire He found, however, little leisure for a country life, and the following year took charge of the fleet fitted out by Sir Walter Raleigh to sail to the Spanish coast, returning with a rich prize. In Nov 1594 he was engaged with a squadron in the siege and relief of Brest, when he received a wound at Fort Crozon, from which he died at Plymouth on Nov 22 His body was taken to London and buried at St. Giles', Cripplegate Though he appears to have been somewhat rough in his bearing, and too strict a disciplinarian to be much loved, Frobisher was undoubtedly one of the most able seamen of his time, and justly takes rank among England's great naval heroes

See Hakluyt's *Voyages;* the Hakluyt Society's *Three Voyages of Frobisher* (vol xxxviii, 1868); F Jones, *Life of Frobisher* (1878); Julian Corbett, *Drake and the Tudor Navy* (1898), *The North-West and North-East Passages, 1576–1611* edited by P F. Alexander (1915)

FROCK, originally a long, loose gown with broad sleeves, worn by members of the religious orders The word is derived from the O Fr. *froc,* of obscure origin The formal stripping off of the frock became part of the ceremony of degradation in the case of a condemned monk; hence the expression "to unfrock." In the middle ages "frock" was also a long loose coat worn by men, or a

coat of mail, and the word survived into the 19th century for a coat with long skirts, the "frock coat." It is now chiefly used in English for a child's or young girl's dress.

FROEBEL, FRIEDRICH WILHELM AUGUST (1782–1852), German educational reformer, was born at Oberweissbach, Thuringia, on April 21, 1782 Like Comenius, with whom he had much in common, he was neglected in his youth until a maternal uncle gave him a home at Stadt-Ilm. He went to the village school, but like many thoughtful boys he passed for a dunce, and was apprenticed to a forester (1797–99)

In the Thuringian forest, Froebel obtained a profound insight into the uniformity and unity of nature's laws No training could have been better suited to his tendency to mysticism, and when he left the forest at 17, he seems to have possessed the main ideas which influenced him all his life He was dominated by the idea of the unity of nature, and longed to study natural sciences to find in them various applications of nature's universal laws To this end, he went to Jena, but his allowance was small, and his university career ended in an imprisonment of nine weeks for a debt of 30 shillings He returned home more intent on what he called "self-completion" than on getting on in a worldly sense. During his various employments, as surveyor, accountant and private secretary, he became more and more conscious that a great task lay before him for the good of humanity While studying architecture in Frankfurt-on-Main, he met the director of a model school, who had caught some of the enthusiasm of Pestalozzi, and who induced him to take a post in his school From 1807 till 1809 Froebel was attached to Pestalozzi's celebrated institution at Yverdon, near Neuchâtel But holding that man and nature, inasmuch as they proceed from the same source, must be governed by the same laws, he longed for more knowledge of natural science than Pestalozzi advocated In 1811 he began to study at Göttingen, whence he proceeded to Berlin But this time his studies were interrupted by the king of Prussia's call "to my people" Though not a Prussian, Froebel was heart and soul a German He enlisted in Lutzow's corps, and went through the campaign of 1813, his experience showing him the value of discipline and united action, how the individual belongs not to himself but to the whole, and how the whole supports the individual

Froebel was rewarded for his patriotism by the friendship of two men whose names will always be associated with his, Langethal and Middendorff These young men were ever afterwards his devoted followers, sacrificing all their prospects to carry out his ideas After the peace of Fontainebleau (May 1814) Froebel returned to Berlin, and became curator of the museum of mineralogy under Weiss Langethal and Middendorff were in Berlin, engaged in tuition Froebel instructed them in his theory, and at length in 1816 resolved to realize his own idea of "the new education" He went to Griesheim, a village on the Ilm, but two years later moved to Keilhau, a Thuringian village which became the Mecca of the new faith

In Keilhau Froebel, Langethal, Middendorff and Barop, a relation of Middendorff's, all married and formed an educational community. The school gradually increased, though for many years its teachers, with Froebel at their head, were short of money and of food After 14 years' experience he determined to start other institutions to work in connection with the parent institution at Keilhau Leaving the Keilhau institution under the direction of Barop, he opened another school at a castle on the Wartensee, Lucerne, offered to him by a friend. But the Catholic clergy resisted what they considered a Protestant invasion, and the experiment on the Wartensee and at Willisau in the same canton, to which the institution was moved in 1833, never had a fair chance

The Swiss Government, however, sent young teachers to Froebel for instruction, and finally Froebel moved to Burgdorf (famous for Pestalozzi's activities there 30 years earlier) to establish a public orphanage and superintend a course for schoolmasters The elementary teachers of the canton were to spend three months every alternate year at Burgdorf, and compare experiences, and receive instruction from distinguished men such as Froebel and Bitzius. In his conferences with these teachers Froebel found that the schools suffered because up to school age the children were entirely neglected. Froebel's conception of harmonious development attached much importance to the earliest years, and his great work on *The Education of Man* (1826) deals chiefly with the child up to the age of seven. His thoughts were occupied with the proper treatment of young children, and in scheming for them a graduated course of exercises, modelled on the games which interested them. Official restraints led him to return to Keilhau, where he opened the first *Kindergarten* or "Garden of Children," in the neighbouring village of Blankenburg (1837) It had to be given up for lack of funds and Froebel carried on his courses first at Keilhau, and from 1848 to 1852 near Liebenstein, in the Thuringian forest, and in the duchy of Meiningen In 1849 he attracted within the circle of his influence a woman of great intellectual power, the baroness von Marenholtz-Bülow, who wrote *Recollections of Friedrich Froebel* (Eng trans 1877), the only lifelike portrait we possess.

In the great year of revolutions (1848) Froebel had hoped to turn to account the general eagerness for improvement, and Middendorff had presented an address on Kindergartens to the German parliament. A nephew of Froebel's, however, Professor Karl Froebel of Zurich, published books which were supposed to teach socialism, and the uncle and nephew were regarded as the united advocates of some new thing Froebel found himself suspected of socialism and irreligion, and in 1851 the education minister, von Raumer, issued an edict forbidding the establishment of schools "after Friedrich and Karl Froebel's principles" in Prussia This was a heavy blow to the old man, who did not long survive the decree He died on June 21, 1852, and was buried at Schweina, a village near Bad-Liebenstein

"All education not founded on religion is unproductive." This conviction followed naturally from Froebel's conception of the unity of all things, a unity due to the original Unity from whom all proceed and in whom all "live, move and have their being" As man and nature have one origin they must be subject to the same laws. Hence Froebel, like Comenius two centuries earlier, looked to the course of nature for the principles of human education As the cultivator creates nothing in the trees and plants, so the educator creates nothing in the children,—he merely superintends the development of inborn faculties Pestalozzi said that the faculties were developed by exercise Froebel added that the function of education was to develop the faculties by arousing *voluntary activity*

The prominence which Froebel gave to action and his doctrine that man is primarily a doer and an originator, learning only through "self-activity," has its importance throughout the entire period of education But it was to the first stage that Froebel paid the greatest attention He held with Rousseau that each age has a completeness of its own, and that the perfection of the later stage rests upon the perfection of the earlier. Impressed with the importance of the first stage, Froebel like Pestalozzi devoted himself to the instruction of mothers But he rejected Pestalozzi's view that the child belonged to the family. Fichte had claimed it for society and the state Froebel who believed that "all progress lay through opposites to their reconciliation," maintained that the child belonged both to the family and to society, and that he should spend some part of the day in a common life and in common employments. Since these assemblies were for children not old enough for schooling, he invented the name *Kindergarten*, garden of children, and desired that the children's employment should be *play* Any occupation in which children delight is play, and Froebel invented a series of employments, which, while they are in this sense play to the children, have nevertheless a distinct educational object, namely, to strengthen their bodies, to exercise their senses, to engage their awakening minds, and through their senses to acquaint them with nature and their fellows; it is especially to guide aright the heart and the affections, and to lead them to the basis of all life, to unity with themselves.

Froebel's works are: *Menschenerziehung* (1826 Eng. trans., 1885), *Pädagogik d. Kindergartens; Kleinere Schriften* and *Mutter- und Koselieder*; collected editions have been edited by Lange (1862) and Seidel (1883) There are English translations of the *Autobiography* (last ed. 1903), of his chief writings on education (1912) and of the *Mother's*

Songs (1895). *See* A. B. Hauschmann, *F. Frobel*, E Shirreff, *Principles of Froebel's System;* H. Barnard, *Papers on Froebel's Kindergarten* (1881); R. H. Quick, *Educational Reformers* (1890), J White, *The Educational Ideas of Froebel* (1905), R D. Chalke, *A Synthesis of Froebel and Herbart* (1912); E. R Murray, *Froebel as a Pioneer in Modern Psychology* (1914); W. H. Kilpatrick, *Froebel's Kindergarten Principles* (1916). (R. H. Q; X.)

FROESCHWILLER, BATTLE OF. The name given by the French to the Battle of Worth (*q v*) in the Franco-German War (*q v*), which is the name commonly adopted, following German practice.

FROG, a name of wide application, strictly for an animal belonging to the family *Ranidae,* but also used of some other families of the order Anura of the class Amphibia (*q v.*).

Frogs proper are typified by the common British species, *Rana temporaria,* the edible frog, *R. esculenta,* and the American bull-frog, *R. catesbiana* The genus *Rana* includes in all about 200 species, distributed over the whole world with the exception of the greater part of South America and Australia. Some of the species are permanently aquatic and have fully webbed toes, others are terrestrial, except during the breeding season, others are adapted for burrowing, by means of the much-enlarged and sharp-edged tubercle at the base of the inner toe, while not a few have the tips of the digits dilated into disks by which they are able to climb on trees. The tree-frogs, *Hylidae,* show in their anatomical structure a close resemblance to the toads, *Bufonidae*

Some frogs grow to a large size. The bull-frog of eastern North America grows to nearly 8 in. from snout to vent, *R. guppyi* of the Solomon Islands to 8½ in and *R goliath,* the South Cameroons to 10 inches Among species belonging to other genera of the family may be mentioned the hairy frog of West Africa, *Trichobatrachus robustus,* some specimens of which have the sides of the body and of the hind limbs covered with long villosities and its ally *Gampsosteonyx batesi,* in which the last phalanx of the fingers and toes is sharp and claw-like and perforates the skin To this family also belongs the arboreal genus *Rhacophorus* of eastern Asia, some species of which are remarkable for the extremely developed webs between the fingers and toes, which are believed to act as a parachute (flying-frog of A R. Wallace), while others have been observed to make aerial nests between leaves overhanging water, a habit which is shared by their near allies, the *Chiromantis* of tropical Africa *Dimorphognathus,* from West Africa, is the unique example of a sexual dimorphism in the dentition, the males being provided with a series of large sharp teeth in the lower jaw, which in the female is edentulous. The curious horned frog of the Solomon Islands, *Ceratobatrachus guentheri,* has teeth in the lower jaw in both sexes, while a few forms, such as *Dendrobates* and *Cardioglossa,* have no teeth at all

FROG-BIT, in botany, the English name for a small rootless plant with floating leaves known botanically as *Hydrocharis Morsus-ranae,* a member of the family *Hydrocharitaceae* The plant has rosettes of roundish floating leaves, and multiplies like the strawberry plant by runners, at the end of which new leaf-rosettes develop. Staminate and pistillate flowers are borne on different plants; they have three small green sepals and three broadly ovate white membranous petals The fruit, which is fleshy, is not found in Great Britain. The plant occurs in ponds and ditches in England and is rare in Ireland.

FROG-MOUTH or **MOREPORK,** an Australian bird (*Podargus cuvieri*), so-called from its cry, resembles the nightjar (*q.v.*) in appearance and habits and belongs to the same order, Coraciiformes. Some 24 species of the *Podargidae* are distributed from Southern India to Australia.

FRÖHLICH, ABRAHAM EMANUEL, a Swiss poet, pastor and professor, was born at Brugg (Feb 1, 1796) and died at Baden (Dec. 1, 1865), both in the canton of Aargau His earliest literary work was in the form of versified apologues (*Fabeln;* 1825), which achieved great popularity for their satirical humour and sound morality. Among his other works were *Hymns,* the ultra-Protestant epics of *Ulrich Zwingli* (1840) and *Ulrich von Hutten* (1845), and *Der Junge Deutsch-Michel* (1846), an attack on the youth of his day. Fröhlich was highly conservative and orthodox in his views

His collected works were issued in 1853, in 5 volumes, with a 6th added in 1861. See *Life* by R. Faesi (1907).

FROHMAN, CHARLES (1860–1915), American theatrical manager, was born at Sandusky, O., on June 17, 1860. At the age of 12 he started to work at night in the office of the *New York Tribune,* attending school by day. In 1874 he began work for the *Daily Graphic.* In 1877 he entered the theatrical business, being for a time associated with his brother Daniel in managing the Madison Square theatre, New York. In 1890 he organized the Charles Frohman Stock Company. On Jan 25, 1893, he opened his Empire theatre, New York. Other New York theatres with which he was at various times connected were the Criterion, Garrick, Knickerbocker, Lyceum and Savoy.

He was an adept in developing talent Among his successful players were Maude Adams, Ethel Barrymore, Julia Marlowe, Billie Burke, William Gillette, and Otis Skinner. He was one of the organizers of the syndicate which for several years controlled the American theatres Beginning in 1897 he presented many plays in London, leasing at different times such houses as the Duke of York's, Globe, Comedy, Vaudeville, and Adelphi He perished when the "Lusitania" was sunk by a German submarine May 7, 1915

FROHSCHAMMER, JAKOB (1821–1893), German theologian and philosopher, was born at Illkofen, near Regensburg, on Jan 6, 1821. He studied theology at Munich and in 1847 became a priest In 1850 he published *Beitrage zur Kirchengeschichte,* which was placed on the Index Expurgatorius, and in 1854, his *Über den Ursprung der menschlichen Seelen,* which maintained that the human soul was not individually created, but was the result of a secondary creative act on the part of the parents, and that soul like body was subject to the laws of heredity. This was supplemented in 1855, the year in which he became professor of philosophy in Munich, by the controversial *Menschenseele und Physiologie.* The *Einleitung in die Philosophie und Grundriss der Metaphysik,* of 1858, assailed the doctrine of Thomas Aquinas, that philosophy was the handmaid of theology. In 1861 appeared *Über die Aufgabe der Naturphilosophie und ihr Verhaltnis zur Naturwissenschaft,* and *Über die Freiheit der Wissenschaft,* in which he declared the independence of science from authority, and reproached the excessive respect for the latter in the Roman Church In 1862 he founded *Athenäum* as organ of Liberal Catholicism, writing for it the first adequate German account of the Darwinian theory of natural selection. Excommunicated in 1871, he replied with *Der Fels Petri in Rom* (1873), *Der Primat Petri und des Papstes* (1875), and *Das Christentum Christi und das Christentum des Papstes* (1876). Of his later philosophical works, the most important are: *Die Phantasie als Grundprincip des Weltprocesses* (1877), *Über die Genesis der Menschheit* (1883), and *Über die Organisation und Cultur der menschlichen Gesellschaft* (1885). He died at Bad Kreuth, Bavaria, on June 14, 1893.

Frohschammer's autobiography was published in A. Hinrichsen's *Deutsche Denker* (1888) *See* also E. Reich, *Weltanschauung und Menschenleben, Betrachtungen uber die Philosophie J. Frohschammers* (1894); B. Munz, *J Frohschammer* (1894) and *Briefe von und uber J Frohschammer* (1897), J. Friedrich, *J. Frohschammer* (1896) and *Systematische und kritische Darstellung der Psychologie J. Frohschammers* (1899); A. Attensperger, *J. Frohschammers philosophisches System* (1899).

FROISSART, JEAN (1338–1410?), French chronicler and raconteur, historian of his own times. His forefathers were *jurés* (aldermen) of the little town of Beaumont, lying near the river Sambre, to the west of the forest of Ardennes His father, who seems to have been a painter of armorial bearings, migrated to Valenciennes. The date generally adopted for his birth is 1338. His native city of Valenciennes was rich in romantic associations Not far from its walls was the western fringe of the great forest of Ardennes, sacred to the memory of Pepin, Charlemagne, Roland and Ogier. Along the banks of the Scheldt stood, one after the other, not then in ruins, but bright with banners, the gleam of armour, and the liveries of the men at arms, castles whose seigneurs, now forgotten, were famous in their day for

many a gallant feat of arms The castle of Valenciennes itself was illustrious in the romance of *Perceforest*. There was born that most glorious and most luckless hero, Baldwin, first emperor of Constantinople. All the splendour of mediaeval life was to be seen in Froissart's native city on the walls of the Salle le Comte glittered—perhaps painted by his father—the arms and scutcheons beneath the banners and helmets of Luxembourg, Hainaut and Avesnes; the streets were crowded with knights and soldiers, priests, artisans and merchants, the churches were rich with stained glass, delicate tracery and precious carving; there were libraries full of richly illuminated manuscripts on which the boy could gaze with delight, every year there was the *fête* of the *puy d'Amour de Valenciennes*, at which he would hear the verses of the competing poets, there were festivals, masques, mummeries and moralities

The moon, he says, rules the first four years of life, Mercury the next ten, Venus follows He was 14 when the last goddess appeared to him in person, as he tells us, after the manner of his time, and informed him that he was to love a lady, "belle, jone, et gente" Meanwhile he was placed in some commercial position which he very soon abandoned, for he had resolved on becoming a learned clerk He then naturally began to make verses, like every other learned clerk, and fell in love He found one day a *damoiselle* reading a book of romances It was the romance of *Cleomades* He remarks the singular beauty of her blue eyes and fair hair, while she reads a page or two, and then—one would almost suspect a reminiscence of Dante—"Adont laissames nous le lire" She was rich and he was poor, she was nobly born and he obscure, it was long before she would accept the devotion, even of the conventional kind, which Froissart offered her

In England.—He was 18 years of age when he left Valenciennes for the court of England, taking with him letters of recommendation from the king of Bohemia and the count of Hainaut to Queen Philippa, niece of the latter He was well received by the queen, always ready to welcome her own countrymen, he wrote ballades and virelays for her and her ladies But after a year he began to pine for another sight of "la très douce, simple, et quoie," whom he loved loyally Good Queen Philippa gave him his *congé* on the condition that he was to return The conclusion of his single love adventure is simply and unaffectedly told in his *Trettie de l'espinette amoureuse*. It was a passion conducted on the well-known lines of conventional love, it ended with calumny and a complete rupture. The *damoiselle* not only scornfully refused to speak to her lover or acknowledge him, but even seized him by the hair and pulled out a handful Nor would she ever be reconciled to him again.

Perhaps to get healed of his sorrow, Froissart began those wanderings in which the best part of his life was to be consumed He first visited Avignon in 1360, and in 1361 he returned to England after an absence of five years. He brought with him as a present to Queen Philippa a book of rhymed chronicles of the wars of his time written by himself The queen now made young Froissart one of her secretaries, and he began to serve her with "beaux dittiés et traités amoureux." She seems to have suggested to him the propriety of travelling in order to get information for more rhymed chronicles It was at her charges that Froissart travelled to Scotland, where he was well received by King David, William of Douglas, and the earls of Fife, Mar, March and others. His travels in Scotland lasted for six months Returning southwards he rode along the whole course of the Roman wall, showing the true spirit of an archaeologist; he thought that Carlisle was Carlyon, King Arthur's capital, he calls Westmorland, where the common people still spoke the ancient British tongue, North Wales; he rode down the banks of the Severn, and returned to London by way of Oxford—"l'escole d'Asque-Suffort" In London Froissart entered the service of King John of France as secretary, and probably acquired at this period that art, in which he has probably never been surpassed, of making people tell him all they knew. He liked the story of a battle from both sides and from many points of view; he wanted the details of every little cavalry skirmish, every capture of a castle, every gallant action and brave deed And he forgot nothing.

At the age of 29, in 1366, Froissart left England for Brussels, where there was a great concourse of minstrels from all parts, from the courts of the kings of Denmark, Navarre and Aragon, from those of the dukes of Lancaster, Bavaria and Brunswick Froissart received a gift of money, as appears from the accounts. "uni Fritsardo, dictori, qui est cum regina Angliae, dicto die, VI. mottones" He then went to Brittany, where he heard from eye-witnesses details of the battles of Cocherel and Auray, the Great Day of the Thirty and the heroism of Jeanne de Montfort. Windsor Herald told him something about Auray, and a French knight, one Antoine de Beaujeu, gave him the details of Cocherel From Brittany he went southwards to Nantes, La Rochelle and Bordeaux, where he arrived a few days before the visit of Richard (afterwards Richard II) He accompanied the Black Prince to Dax, and hoped to go on with him into Spain, but was despatched to England on a mission He next formed part of the expedition which escorted Lionel duke of Clarence to Milan, to marry the daughter of Galeazzo Visconti Chaucer was also one of the prince's suite At the wedding banquet Petrarch was a guest sitting among the princes From Milan Froissart, accepting gratefully a *cotte hardie* with 20 florins of gold, went to Bologna, and met Peter king of Cyprus, from whose follower and minister, Eustache de Conflans, he learned particulars of the king's exploits. He accompanied Peter to Venice, where he left him after receiving a gift of 40 ducats At Rome he learned of the death of his friend King Peter of Cyprus, and of the good Queen Philippa, of whom he writes, in grateful remembrance—

> Propices li soit Diex à l'âme!
> J'en suis bien tenus de pryer
> Et ses larghesces escuver,
> Car elle me fist et créa

Philippa dead, Froissart returned to Flanders and presented himself, with a new book in French, to the duchess of Brabant, from whom he received the sum of 16 francs, given in the accounts as paid *uni Frissardo dictatori* Froissart may also have found a patron in Yolande de Bar, grandmother of King René of Anjou. In any case he received a substantial gift from some one in the shape of the benefice of Lestines, a village near Binche He was placed upon the duke of Brabant's pension list, and was entitled to a yearly grant of grain and wine, with some small sum in money Froissart was not the man to sit down at ease to discharge the duties of parish priest, to say mass, to bury the dead, to marry the villagers and to baptize the young From time to time he repaired to the court of Coudenberg, and became "moult frère et accointé" with the duke of Brabant And then came Gui de Blois, one of King John's hostages in London in the old days He had been fighting in Prussia with the Teutonic knights, and now proposed to settle down for a time in his castle of Beaumont This prince, in emulation of its grandfather, the patron of Jean le Bel, advised Froissart seriously to take in hand the history of his own time

THE CHRONICLE

He began his career by rewriting the work of the chronicler Jean le Bel; Gui de Blois, among others, supplied him with additional information His own notes, taken from information obtained in his travels, gave him more details, and when in 1374 Gui married Marie de Namur, Froissart found in the bride's father, Robert de Namur, one who had himself largely shared in the events which he had to relate He, for instance, is the authority for the story of the siege of Calais and the six burgesses Froissart remained for twelve years at Lestines, or at Beaumont, arranging and writing his chronicles. During this period, too, he composed his *Espinette amoureuse*, and the *Joli Buisson de jonesce*, and his romance of *Méliador*. He also became chaplain to the count of Blois, and obtained a canonry of Chimay After this appointment we hear nothing more of Lestines, which he probably resigned.

In 1386 his travels began again, when he accompanied Gui to his castle at Blois, in order to celebrate the marriage of his son Louis de Dunois with Marie de Berry. He wrote a *pastourelle* in honour of the event. Then he attached himself for a few days to the duke of Berry, from whom he learned certain particulars of current events, and then, becoming aware of what promised to be

the most mighty feat of arms of his time, he hastened to Sluys, where the French were collecting an enormous fleet, and making preparations to repeat the invasion of William the Conqueror But there was no invasion of England In Flanders Froissart met many knights who had fought at Rosebeque, and could tell him of the troubles which in a few years desolated that country, once so prosperous He stayed at Ghent, among those ruined merchants and mechanics, for whom, as one of the same class, he felt a sympathy never extended to English or French, perhaps quite as unfortunate, and he devotes 300 chapters to the Flemish troubles This portion of the chronicle was written at Valenciennes During this residence in his birthplace his verses were crowned at the "puys d'amour" of Valenciennes and Tournay.

This part of his work finished, he determined on making a journey to the south of France in order to learn something new On this occasion he rode first to Blois, on the way he fell in with two knights who told him of the disasters of the English army in Spain, one of them also informed him of the splendid hospitality of Gaston Phoebus, count of Foix, on hearing of which Froissart resolved to seek him out Arrived at Foix he discovered that the count was at Orthez, whither he proceeded in company with a knight named Espaing de Lyon, who, Froissart found, had not only fought, but could describe

The account of those few days' ride with Espaing de Lyon is the most charming, the most graphic, and the most vivid chapter in the whole of Froissart Every turn of the road brings with it the sight of a ruined castle, about which this knight of many memories has a tale or a reminiscence. The whole country teems with fighting stories Froissart never tires of listening nor the good knight of telling. "Sainte Marie!" cries Froissart in mere rapture "How pleasant are your tales, and how much do they profit me while you relate them! And you shall not lose your trouble, for they shall all be set down in memory and remembrance in the history which I am writing" Arrived at length at Orthez, Froissart introduced himself to the count as a chronicler He heard much from the count, and there was a good deal, too, to be learned of people about the court One knight recently returned from the East told about the Genoese occupation of Famagosta, two more had been in the fray of Otterbourne; others had been in the Spanish wars

Leaving Gaston at length, Froissart assisted at the wedding of the old duke of Berry with the youthful Jeanne de Bourbon, and was present at the reception given to Isabeau of Bavaria by the Parisians He then returned to Valenciennes, and sat down to write his fourth book While engaged in the events of the year 1385 he found that his notes taken at Orthez and elsewhere on the affairs of Castile and Portugal were incomplete He hastened to Bruges, where, he felt certain, he should find some one who would help him There was, in fact, at this great commercial centre, a colony of Portuguese From them he learned that a certain Portuguese knight, Dom Juan Fernand Pacheco, was at the moment in Middelburg on the point of starting for Prussia He instantly embarked at Sluys, reached Middelburg in time to catch this knight, introduced himself, and conversed with him uninterruptedly for the space of six days, getting his information on the promise of due acknowledgment During the next two years he seems to have had trouble with his seigneur Gui de Blois, and even to have resigned his chaplaincy He next calls Robert de Namur his seigneur, and dedicates to him, in a general introduction, the whole of his chronicles We then find him at Abbeville, trying to learn all about the negotiations pending between Charles VI and the English He was unsuccessful, either because he could not get at those who knew what was going on, or because the secret was too well kept. He next made his last visit to England, where, after 40 years' absence, he naturally found no one who remembered him. He stayed in England some months, seeking information on all points from his friends Henry Chrystead and Richard Stury, from the dukes of York and Gloucester, and from Robert the Hermit.

On his return to France, he found preparations going on for that unlucky crusade, the end of which he describes in his *Chronicle*. It was headed by the count of Nevers. After him floated many a banner of knights, descendants of the crusaders, who bore the proud titles of duke of Athens, duke of Thebes, sire de Sidon, sire de Jericho They were going to invade the sultan's empire by way of Hungary; they were going to march south, they would reconquer the holy places And presently we read how it all came to nothing, and how the slaughtered knights lay dead outside the city of Nikopoli In almost the concluding words of the *Chronicle* the murder of Richard II of England is described. His death ends the long and crowded *Chronicle*, though the pen of the writer struggles through a few more unfinished sentences

The Man and His Work.—The rest is vague tradition He is said to have died at Chimay in 1410 and to have been buried at the church of St Monegunda It is further said that he died in poverty so great that his relations could not even afford to carve his name upon the headstone of his tomb, not one of his friends, not even Eustache Deschamps, writes a line of regret in remembrance; the greatest historian of his age had a reputation so limited that his death was no more regarded than that of any common monk or obscure priest Among his friends were Guillaume de Machault, Eustache Deschamps and Cuvelier, a follower of Bertrand du Guesclin It is probable that he knew Chaucer, with whom Deschamps maintained a poetical correspondence, there is nothing to show that he ever made the acquaintance of Christine de Pisan The selection of his own poems published by Buchon in 1829 includes the *Dit dou florin;* the *Débat dou cheval et dou levrier*, written during his journey in Scotland, the *Dittie de la flour de la Marguerite;* a *Dittie d'amour* called *L'Orlose amoureus*, in which he compares himself, the imaginary lover, with a clock, the *Espinette amoureuse*, which contains a sketch of his early life, freely and pleasantly drawn, accompanied by rondeaux and virelays; the *Buisson de jonesce*, in which he returns to the recollections of his own youth, and various smaller pieces

There has never been any difference of opinion on the distinctive merits of his *Chronicle* It presents a vivid and faithful drawing of the things done in the 14th century No more graphic account exists of any age No historian has drawn so many and such faithful portraits They are, it is true, portraits of men as they seemed to the writer, not of men as they were Froissart was uncritical, he accepted princes by their appearance Who, for instance, would recognize in his portrait of Gaston Phoebus de Foix the cruel voluptuary, stained with the blood of his own son, which we know him to have been? Froissart, again, had no sense of historical responsibility; he was no judge to enquire into motives and condemn actions, he was simply a chronicler He has been accused by French authors of lacking patriotism Yet it must be remembered that he was neither a Frenchman nor an Englishman, but a Fleming He has been accused of insensibility to suffering Indignation against oppression was not, however, common in the 14th century, why demand of Froissart a quality which is rare enough even in our own time? Yet there are moments when, as in describing the massacre of Limoges, he speaks with tears in his voice.

As regards his personal character, Froissart depicts it himself for us. Such as he was in youth, he tells us, so he remained in more advanced life, rejoicing mightily in dances and carols, in hearing minstrels and poems, inclined to love all those who love dogs and hawks, pricking up his ears at the uncorking of bottles,—"Car au voire prens grand plaisir", pleased with good cheer, gorgeous apparel and joyous society, but no commonplace reveller or greedy voluptuary,—everything in Froissart was ruled by the good manners which he set before all else, and always eager to listen to tales of war and battle. As we have said above, he shows, not only by his success at courts, but also by the whole tone of his writings, that he possessed a singularly winning manner and strong personal character. He lived wholly in the present, and had no thought of the coming changes Born when chivalrous ideas were most widely spread, but the spirit of chivalry itself, as inculcated by the best writers, in its decadence, he is penetrated with the sense of knightly honour, and ascribes to all his heroes alike those qualities which only the ideal knight possessed

The first edition of Froissart's *Chronicle* was published in Paris. It bears no date; the next editions are those of the years 1505, 1514, 1518

and 1520 The edition of Buchon, 1924, was a continuation of one commenced by Dadier The best modern editions are those of Kervyn de Lettenhove (1863–77) and Siméon Luce (1869–88), for bibliography *see* Potthast, *Bibliotheca hist medii aevi*, 1 (1896) An abridgment was made in Latin by Belleforest, and published in 1672 An English translation was made by Bourchier, Lord Berners, and published in London, 1525 *See* the "Tudor Translations" edition of Berners (1901), with introduction by W P Ker, and the "Globe" edition, with introduction by G C Macaulay (1913) The translation by Thomas Johnes was originally published in 1802–05 For Froissart's poems *see* Scheler's text in K de Lettenhove's complete edition, *Méliador* has been edited by Longnon for the Société des Anciens Textes (1895–99) *See* also Madame Darmesteter (Duclaux), *Froissart* (1894) *Froissarts Cronycles*, translated out of the French by Sir John Bourchier, Lord Berners, 7 vol Oxford (1927–28)

FROME, a market town in the Frome parliamentary division of Somersetshire, England, 101¼ m W by S of London by the G W R, at the junction of a branch line to Bristol (24½ m N W by N) Pop of urban district (1921) 10,504 It is unevenly built on high ground above the river Frome and was formerly called Frome (or Froome) Selwood, after the neighbouring forest of Selwood, the country round is richly wooded and picturesque The parish church of St John the Baptist, with its fine tower and spire, was rebuilt about the close of the 14th century, and, though largely restored, has a beautiful chancel, Lady chapel and baptistery The market-hall, museum, school of art, mechanics institute and a free grammar school, founded under Edward VI, may be noted The chief industries are woollen cloth manufactures, brewing and art metal-working, also printing, metal-founding, and the manufacture of silk, tools and cards for wool-dressing Selwood forest was long a favourite haunt of brigands and highwaymen The Saxon occupation of Frome (From) is the earliest of which there is evidence, the settlement being due to the foundation of a monastery by Aldhelm in 705 A witenagemot was held there in 934, so that Frome must already have been a place of some size At the time of the Domesday Survey the manor was owned by King William Local tradition asserts that Frome was a mediaeval borough, and the reeve of Frome is mentioned in documents after the reign of Edward I It was not represented in parliament until given one member by the Reform act of 1832, its separate representation was merged in that of the county in 1885 A charter of Henry VII to Edmund Leversedge, then lord of the manor, granted the right to have two fairs and in the 18th century two others were held An agricultural show and cheese fair is held on the last Wednesday in September The manufacture of woollen cloth has flourished since the 15th century

FROMENTIN, EUGÈNE (1820–1876), French painter, was born at La Rochelle on Oct 24, 1820 He studied under Louis Cabat, the landscape painter Fromentin was one of the earliest pictorial interpreters of Algeria, having been able repeatedly to visit the land and people that suggested the subjects of most of his works Among his more important early works are—"Moisson en Algérie"; "Diffa, reception du Soir", "Chasse à la gazelle" and "Enterrement maure" They are somewhat stiff in design and execution The second period extends till 1859 and includes the following works—"Les Bateleurs nègres", "Le Simoun", and "La Lisière d'oasis" They are grey in tone and were executed under Corot's influence After 1860 Fromentin's colour becomes bright and luminous —"Fauconnier arabe"; "Chasse au héron"; "La curée"; "Centaures et centauresses", here Fromentin was influenced by Eugène Delacroix. In these pictures is given with great truth and refinement the unconscious grandeur of barbarian and animal attitudes and gestures Fromentin's paintings show only one side of a genius that was perhaps even more felicitously expressed in literature, "Dominique," first published in the *Revue des deux mondes* in 1862, and dedicated to George Sand, is remarkable among the fiction of the century for delicate and imaginative observation and for emotional earnestness Fromentin's other literary works are—*Visites artistiques* (1852), *Simples Pèlerinages* (1856); *Un Été dans le Sahara* (1857); *Une Année dans le Sahel* (1858); and *Les Maîtres d'autrefois* (1876) In 1876 he was an unsuccessful candidate for the Academy He died suddenly at La Rochelle on Aug. 27, 1876

See L. Gonse, *Eug Fromentin* (1881)

FROMMEL, GASTON (1862–1906), Swiss theologian, professor of theology in Geneva from 1894 to 1906 An Alsatian by birth, he belonged mainly to French Switzerland He may best be described as continuing the spirit of Vinet (*q v*) amid later mental conditions Like Vinet, he derived his philosophy of religion from a deeply personal experience of the Gospel of Christ as meeting the demands of the moral consciousness, but he developed even further than Vinet the psychological analysis of conscience and the method of verifying every doctrine by direct reference to spiritual experience. Both made much of moral individuality or personality as the criterion of reality, believing that its correlation with Christianity, both historically and philosophically, was most intimate But while Vinet's stress was on the liberty from human authority essential to the moral consciousness, the changed needs of the age caused Frommel to develop rather the aspect of man's dependence on God's spiritual initiative, "the conditional nature of his liberty" "Liberty is not the primary, but the secondary characteristic" of conscience, "before being free, it is the subject of obligation"

Frommel claimed that a deeper analysis carries us beyond the subjectivity of Kant's categorical imperative, since consciousness of obligation was "une expérience imposée sous le mode de l'absolu" By *imposée* (Malan's phrase) he emphasized the priority of man's sense of obligation to his moral consciousness either of self or of God He appealed to the psychology of the subconscious for confirmation of his analysis, insisting on priority to self-conscious thought as a mark of metaphysical objectivity in the case of moral, no less than of physical experience He found in the Christian revelation the same characteristics as belonged to the universal revelation in conscience, viz God's sovereign initiative and his living action in history From this standpoint he argued against a purely psychological type of religion (*agnosticisme religieux*, as he termed it)—a tendency to which he saw even in A Sabatier and the *symbolofidéisme* of the Paris School—as giving up a real faith Like Vinet, Frommel was a man of letters and a penetrating critic of men and systems *see* his *Études litteraires et Morales* (1907)

LITERATURE.—G Godet, *Gaston Frommel* (Neuchâtel, 1906), a sketch, with citation of sources, for a complete edition of his writings see *Oeuvre Systematique* (Neuchâtel, 1910–16), *The Psychology of Christian Faith* (London, Stud Chr. Mov, 1928), a selection in English with introductory study (J V B)

FRONDE, THE, the name given to a civil war in France which lasted from 1648 to 1652, and to its sequel, the war with Spain in 1653–59 The word means a sling, and was applied to this contest from the circumstance that the windows of Cardinal Mazarin's adherents were pelted with stones by the Paris mob Its original object was the redress of grievances, but the movement soon degenerated into a factional contest among the nobles, who sought to reverse the results of Richelieu's work and to overthrow his successor Mazarin In May 1648 a tax levied on judicial officers of the *parlement* of Paris was met by that body, not merely with a refusal to pay, but with a condemnation of earlier financial edicts and even with a demand for the acceptance of a scheme of constitutional reforms framed by a committee of the *parlement* This charter was somewhat influenced by contemporary events in England But there is no real likeness between the two revolutions, the French *parlement* being no more representative of the people than the Inns of Court were in England The political history of the time is dealt with in the article FRANCE *History*, the present article being concerned chiefly with the military operations of what was perhaps the most costly and least necessary civil war in history

The military record of the first or "parliamentary" Fronde is almost blank In Aug 1648, strengthened by the news of Condé's victory at Lens, Mazarin suddenly arrested the leaders of the parlement, whereupon Paris broke into insurrection and barricaded the streets The court, having no army at its immediate disposal, had to release the prisoners and to promise reforms, and fled from Paris on the night of Oct. 22. But the signing of the peace of Westphalia set free Condé's army, and by Jan 1649 it was besieging Paris The peace of Rueil was signed in March, after little blood had been shed The Parisians, though still and always

anti-cardinalist, refused to ask for Spanish aid, as proposed by their princely and noble adherents, and having no prospect of military success without such aid, submitted and received concessions. Thenceforward the Fronde becomes a story of sordid intrigues and half-hearted warfare, losing all trace of its first constitutional phase The leaders were discontented princes and nobles—Monsieur (Gaston of Orléans, the king's uncle), the great Condé and his brother Conti, the duc de Bouillon and his brother Turenne. To these must be added Gaston's daughter, Mademoiselle de Montpensier (La grande Mademoiselle), Condé's sister, Madame de Longueville, Madame de Chevreuse, and the astute intriguer Paul de Gondi, later Cardinal de Retz. The military operations fell into the hands of war-experienced mercenaries, led by two great, and many second-rate, generals, and of nobles to whom war was a polite pastime The feelings of the people at large were enlisted on neither side

This peace of Rueil lasted until the end of 1649 The princes, received at court once more, renewed their intrigues against Mazarin, who, having come to an understanding with Monsieur, Gondi and Madame de Chevreuse, suddenly arrested Condé, Conti and Longueville (Jan 14, 1650). The war which followed this *coup* is called the "Princes' Fronde" This time it was Turenne, before and afterwards the most loyal soldier of his day, who headed the armed rebellion Listening to the promptings of his Egeria, Madame de Longueville, he resolved to rescue her brother, his old comrade of Freiburg and Nördlingen. It was with Spanish assistance that he hoped to do so; and a powerful army of that nation assembled in Artois under the archduke Leopold, governor-general of the Spanish Netherlands But the peasants of the country-side rose against the invaders, the royal army in Champagne was in the capable hands of César de Choiseul, comte du Plessis-Praslin, and the little fortress of Guise successfully resisted the archduke's attack Thereupon, however, Mazarin drew upon Plessis-Praslin's army for reinforcements to be sent to subdue the rebellion in the south, and the royal general had to retire Then, happily for France, the archduke decided that he had spent sufficient of the king of Spain's money and men in the French quarrel The magnificent regular army withdrew into winter quarters, and left Turenne to deliver the princes with a motley host of Frondeurs and Lorrainers Plessis-Praslin by force and bribery secured the surrender of Rethel on Dec 13, 1650, and Turenne, who had advanced to relieve the place, fell back hurriedly But he was a terrible opponent, and Plessis-Praslin and Mazarin himself, who accompanied the army, had many misgivings as to the result of a lost battle The marshal chose nevertheless to force Turenne to a decision, and the battle of Blanc-Champ (near Somme-Py) or Rethel was the consequence Both sides were at a standstill in strong positions, Plessis-Praslin doubtful of the trustworthiness of his cavalry, Turenne too weak to attack, when a dispute for precedence arose between the *Gardes françaises* and the *Picardie* regiment. The royal infantry had to be rearranged in order of regimental seniority, and Turenne, seeing and desiring to profit by the attendant disorder, came out of his stronghold and attacked with the greatest vigour The battle (Dec. 15, 1650) was for a time doubtful, but Turenne's Frondeurs gave way in the end, and his army, as an army, ceased to exist. Turenne himself, undeceived as to the part he was playing in the drama, asked and received the young king's pardon, and meantime the court, with the *maison du roi* and other loyal troops, had subdued the minor risings without difficulty (March–April 1651). Condé, Conti and Longueville were released, a few months of hollow peace followed, and the court returned to Paris Mazarin, an object of hatred to all the princes, had already retired into exile. *"Le temps est un galant homme,"* he remarked, *"laissons le faire!"* and so it proved His absence left the field free for mutual jealousies, and a state of anarchy soon reigned. In December Mazarin returned with a small army, the war began again, and this time Turenne and Condé were pitted against one another. After the first campaign, as we shall see, the civil war ceased, but for several other campaigns the two great soldiers were opposed to one another, Turenne as the defender of France, Condé as a Spanish invader. Their personalities alone give threads of continuity to these seven years of wearisome manoeuvres, sieges and combats, though for a right understanding of the causes which were to produce the standing armies of the age of Louis XIV. and Frederick the Great the military student should search deeply into the material and moral factors that here decided the issue.

The début of the new Frondeurs took place in Guyenne (February–March 1652), while their Spanish ally, the archduke Leopold William, captured various northern fortresses. On the Loire, whither the centre of gravity was soon transferred, the Frondeurs were commanded by intriguers and quarrelsome lords, until Condé's arrival from Guyenne His bold trenchant leadership brought initial success in the action of Bléneau (April 7, 1652), but fresh troops came up to oppose him, and from the skilful dispositions made by his opponents Condé felt the presence of Turenne and broke off the action The royal army did likewise. Condé invited the commander of Turenne's rearguard to supper, chaffed him unmercifully for allowing the prince's men to surprise him in the morning, and by way of farewell remarked to his guest, *"Quel dommage que des braves gens comme nous se coupent la gorge pour un faquin"*—an incident and a remark that thoroughly justify the iron-handed absolutism of Louis XIV. There was no hope for France while tournaments on a large scale and at the public's expense were fashionable amongst the *grands seigneurs* After Bléneau both armies marched to Paris to negotiate with the *parlement*, de Retz and Mlle. de Montpensier, while the archduke took more fortresses in Flanders, and Charles IV, duke of Lorraine, with an army of plundering mercenaries, marched through Champagne to join Condé But Turenne manoeuvred past Condé and planted himself in front of the mercenaries, and their leader, not wishing to expend his men against the old French regiments, consented to depart with a money payment and the promise of two tiny Lorraine fortresses A few more manoeuvres, and the royal army was able to hem in the Frondeurs in the Faubourg St Antoine (July 2, 1652) with their backs to the closed gates of Paris The royalists attacked all along the line and won a signal victory in spite of the knightly prowess of the prince and his great lords, but at the critical moment Gaston's daughter persuaded the Parisians to open the gates and to admit Condé's army. She herself turned the guns of the Bastille on the pursuers. An insurrectional government was organized in the capital and proclaimed Monsieur lieutenant-general of the realm Mazarin, feeling that public opinion was solidly against him, left France again, and the bourgeois of Paris, quarrelling with the princes, permitted the king to enter the city on Oct 21, 1652 Mazarin returned unopposed in Feb 1653.

The Fronde as a civil war was now over The whole country, wearied of anarchy and disgusted with the princes, came to look to the king's party as the party of order and settled government, and thus the Fronde prepared the way for the absolutism of Louis XIV The general war continued in Flanders, Catalonia and Italy wherever a Spanish and a French garrison were face to face, and Condé with the wreck of his army openly and definitely entered the service of the king of Spain. The "Spanish Fronde" was, except for a few outstanding incidents, a dull affair. In 1653 France was so exhausted that neither invaders nor defenders were able to gather supplies to enable them to take the field till July. At one moment, near Péronne, Condé had Turenne at a serious disadvantage, but he could not galvanize the Spanish general Count Fuensaldana, who was more solicitous to preserve his master's soldiers than to establish Condé as mayor of the palace to the king of France, and the armies drew apart again without fighting. In 1654 the principal incident was the siege and relief of Arras. On the night of Aug. 24–25 the lines of circumvallation drawn round that place by the prince were brilliantly stormed by Turenne's army, and Condé won equal credit for his safe withdrawal of the besieging corps under cover of a series of bold cavalry charges, led by himself as usual, sword in hand. In 1655 Turenne captured the fortresses of Landrecies, Condé and St. Ghislain In 1656 Condé revenged himself for Arras by storming Turenne's circumvallation around Valenciennes (July 16), but Turenne drew off his forces in good order. In the campaign of 1657 a body of 6,000 British infantry, sent by Cromwell in pur-

suance of his treaty of alliance with Mazarin, took part. The presence of the English contingent and its very definite purpose of making Dunkirk a new Calais, to be held by England for ever, gave the next campaign a character of certainty and decision which is entirely wanting in the rest of the war. Dunkirk was besieged promptly and in great force, and when Don Juan of Austria and Condé appeared with the relieving army from Furnes, Turenne advanced boldly to meet him The battle of the Dunes (*q v*) fought on June 14, 1658, was the first real trial of strength since the battle of the Faubourg St Antoine, ended in Turenne's victory Here the "red-coats" made their first appearance on a continental battlefield, under the leadership of Sir W. Lockhart, Cromwell's ambassador at Paris, and astonished both armies by the stubborn fierceness of their assaults, for they were the products of a war where passions ran higher and the determination to win rested on deeper foundations than in the *dégringolade* of the feudal spirit in which they now figured Dunkirk fell, as a result of the victory, and flew the St George's cross till Charles .II. sold it to the king of France A last desultory campaign followed in 1659—the 25th year of the Franco-Spanish War—and the peace of the Pyrenees, was signed on Nov 5 On Jan 27, 1660, the prince asked and obtained at Aix the forgiveness of Louis XIV The later careers of Turenne and Condé as the great generals—and obedient subjects—of their sovereign are described in the article DUTCH WARS. (For their earlier careers *see* THIRTY YEARS' WAR)

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FRONTENAC ET PALLUAU, LOUIS DE BUADE, COMTE DE (1620–1698), French-Canadian statesman, governor and lieutenant-general for the French king in *La Nouvelle France* (Canada), son of Henri de Buade, colonel in the regiment of Navarre, was born in the year 1620 Louis de Buade served in 1635 under the prince of Orange in Holland, and fought in many engagements in the Low Countries and in Italy His service seems to have been continuous until the conclusion of the peace of Westphalia in 1648, when he returned to his father's house in Paris and married Anne de la Grange-Trianon, a girl of great beauty, who later became the friend and confidante of Madame de Montpensier. Incompatibility of temper led to a separation, the count retiring to his estate on the Indre, where by an extravagant course of living he became hopelessly involved in debt In 1669, when France sent a contingent to assist the Venetians in the defence of Crete against the Turks, Frontenac was placed in command of the troops on the recommendation of Turenne In this expedition he won military glory; but his fortune was not improved

At this period the affairs of New France claimed the attention of the French Court. Frontenac was appointed to succeed Rémy de Courcelle as governor, and arrived in Quebec on Sept. 12, 1672 It was immediately evident that he proposed to pursue a policy of colonial expansion, and to exercise an independence of action that did not coincide with the views of Louis XIV, or of his minister Colbert. One of the first acts of the governor, by which he sought to establish in Canada the three estates—nobles, clergy and people—met with the disapproval of the French court, and measures were adopted to curb his ambition by increasing the power of the sovereign council and by reviving the office of intendant Frontenac soon became involved in quarrels with the intendant touching questions of precedence, and with those priests who ventured to criticize his proceedings. The church in Canada had been administered for many years by the religious orders; for the see of Quebec had not yet been erected But three years after the arrival of Frontenac a former vicar apostolic, François Xavier de Laval de Montmorenci, returned to Quebec as bishop, with a jurisdiction over the whole of Canada. In him the governor found a vigorous opponent who was determined to render the state subordinate to the church. Frontenac had issued trading licences which permitted the sale of intoxicants. The bishop, supported by the intendant, endeavoured to suppress this trade, and sent an ambassador to France to obtain remedial action The views of the bishop were upheld, and henceforth authority was divided Troubles ensued between the governor and the sovereign council, most of the members of which sided with the one permanent power in the colony—the bishop, while the intrigues of the intendant, Duchesneau, were a constant source of strife At last both governor and intendant were recalled to France in the year 1682.

During Frontenac's first administration many improvements had been made in the country The defences had been strengthened, a fort was built at Cataraqui (now Kingston), Ontario, bearing the governor's name, and conditions of peace had been fairly maintained between the Iroquois on the one hand and the French and their allies, the Ottawas and the Hurons, on the other The recall of the governor was ill-timed The Iroquois were assuming a threatening attitude towards the inhabitants, and Frontenac's successor, La Barre, was quite incapable of leading an army against such cunning foes At the end of a year La Barre was replaced by the marquis de Denonville, a man of ability and courage, who, though he showed some vigour in marching against the western Iroquois tribes, angered rather than intimidated them, and the massacre of Lachine (5th of August, 1689) must be regarded as one of the unhappy results of his administration

The affairs of the colony were now in a critical condition, and Louis XIV. once more sent out Frontenac He arrived in Quebec as governor for the second time on Oct 15, 1689, and confidence was at once restored But on Oct 16, 1690, several New England ships under the command of Sir William Phipps appeared off the Island of Orleans, and an officer was sent ashore to demand the surrender of the fort Frontenac repulsed the enemy and prepared to follow up his advantage by an attack on Boston from the sea, but his resources were inadequate for the undertaking In 1696 Frontenac, now 76 years of age, decided to take the field against the Iroquois On July 6 he left Lachine for the village of the Onondagas, where he arrived a month later In the meantime the Iroquois had abandoned their villages, and as pursuit was impracticable the army commenced its return march on Aug 10 Frontenac died on Nov 28, 1698 at the Château St Louis after a brief illness, deeply mourned by the Canadian people. He was fearless, resourceful and decisive, and triumphed as few men could have done over the difficulties and dangers of a most critical position.

See *Count Frontenac*, by W. D. Le Sueur (Toronto, 1906); *Count Frontenac and New France under Louis XIV*, by Francis Parkman (Boston, 1878); *Le Comte de Frontenac*, by Henri Lorin (Paris, 1895); *Frontenac et ses amis*, by Ernest Myrand (Quebec, 1902)

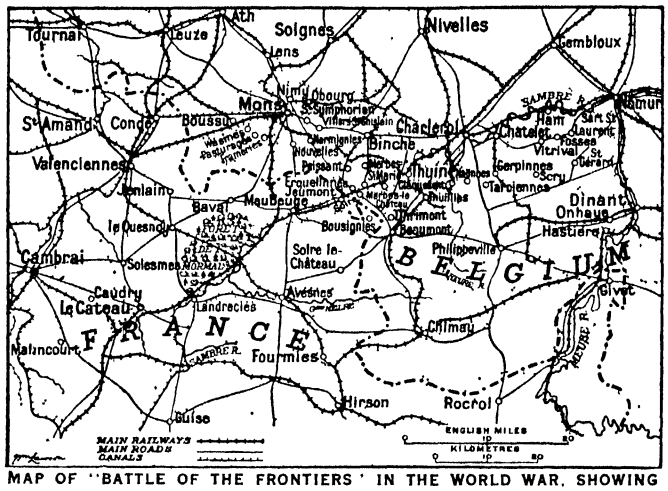
(A. G D)

FRONTIER, BATTLES OF THE. The generic name of "battles of the frontier" covers the whole of the actions fought at the opening of the World War in Aug 1914, on or near the French frontiers For convenience, these are here divided into six sections, each of which deals with a more or less distinct part of the series of operations These are. I Early battles in Upper Alsace, II First battles in Lorraine; III Battle of the Ardennes; IV. Charleroi and Mons; V. Le Cateau; and VI. Guise.

I. EARLY BATTLES IN UPPER ALSACE

It was laid down in the original French plan (*see* WORLD WAR) that the action of their right wing would be much assisted by a preliminary operation in Upper Alsace to be carried out by the VII Corps and 8th Cavalry Division; this force was to advance by Mulhouse on Colmar, so holding fast the hostile forces in that area, besides encouraging the Francophile elements of the population to throw off the German yoke. In accordance with this plan, Gen. Dubail, commanding the I Army on the right of the French line, issued orders on Aug 5 for this operation to commence on

the 7th, and by the evening of the 8th the French had secured Mulhouse and taken up a defensive position around that town, the weak German covering troops falling back before them to the east bank of the Rhine Their success, however, was short-lived; Gen von Heeringen, commanding the German VII Army, was already planning a counter offensive with the XIV and XV Corps, then detraining in the area Colmar-Breisach, and on the 10th the



MAP OF "BATTLE OF THE FRONTIERS" IN THE WORLD WAR, SHOWING MONS, CHARLEROI AND LE CATEAU, WHERE ENGAGEMENTS OCCURRED IN AUGUST 1914

French, heavily attacked by these superior forces, were forced to evacuate Mulhouse and commence a retreat which by the 12th had brought them back to within 10m of Belfort On neither side had the conduct of the operations been a model of skill, but the Germans had at least the satisfaction of having scored the advantage in the first clash of arms

The French high command now decided to entrust the execution of the task in which the VII Corps had so completely failed to a newly formed army of Alsace under Gen Pau, comprising, besides that corps, one additional regular division, and three reserve divisions The concentration of this new army and the preparations for a renewed advance could not be completed before Aug 14, by which date the German VII Army, in expectation of the main French offensive in Lorraine, was concentrating all its forces to the north, leaving in Upper Alsace only three weak brigades of second line troops These were, of course, easily driven back by Pau's army, which by Aug 20 had reoccupied Mulhouse, together with Munster to the north and Altkirch to the south, and had cleared Upper Alsace entirely of the enemy. But the object of holding to their ground important hostile forces and so assisting Dubail's army now engaged in the main offensive had not been achieved; nor could Pau from his present position even cover its right flank effectively It was therefore decided to withdraw him On Aug 20 the short-lived Army of Alsace was dissolved, the troops comprising it being placed under Dubail or despatched to other parts of the front The early French operations in Upper Alsace had been unproductive of either political or military advantage and had absorbed forces which might have found more useful employment elsewhere. (E W. S)

II. FIRST BATTLES IN LORRAINE

The first French plan (General Instruction No. 1 of Aug. 8, 1914) was purely offensive It proposed to seek action with all forces united with the right on the Rhine. The two armies of Lorraine (I and II) were to lead, the I (Gen Dubail) in the direction of Saarburg, after having thrown back the German VII Army towards Strasbourg and Lower Alsace, while an isolated corps would make a diversion to the east of the Vosges. The II. Army (Gen. de Castelnau), covering itself from Metz, was to attack in the direction of Saarbruck, pivoting on Dubail's in the neighbourhood of Étangs. The two left corps were to the west of the Moselle, with a view to their eventual employment in the north.

Disposition of Forces.—In front of Dubail's and De Castelnau's armies the Germans had approximately equal strength (VI. and VII. Armies). They would at first keep to the defensive, acting as a pivot to the huge wheel being made by their centre and right. The rapidity of the invasion of Belgium determined the French to hasten the operations in the east in order to make a diversion On Aug 13 Dubail's army had two corps on the Meurthe (VIII and XIII) Dubail counted besides on the co-operation of the two right corps of De Castelnau's army and on that of the XXI. Corps descending from the Vosges on his right. On Aug 16 the II Cavalry Corps was placed under his orders The final concentration of the complete fighting force, however, could not be complete until the 18th Nevertheless, the XIII and VIII Corps moved on the 14th, and on the 15th entered Cirey and Blamont, pushing back the I Bavarian Corps, which retired toward Saarburg

By the evening of the 17th the two French corps had reached the line Vasperveiller-Aspach-St Georges, and the XXI extended the line toward the Vosges The II Cavalry Corps had orders to go ahead on the 18th towards Saarburg, which was entered after a skirmish The XXI Corps pushed to the north-east as far as Walscheid; the XIII held the heights north and east of Saarburg, the VIII, marching on Heming, seized the passage of the Marne-Rhine Canal and entered Saarburg The II Cavalry Corps bivouacked toward Diane-Capelle, in liaison with De Castelnau's army, which had reached the line Bisping-Château Salins The Germans held entrenched positions on a front of 40m, from the neighbourhood of Dobbenheim to Biberkirch

Dubail's Offensive.—It was decided that Dubail's army should attack with its left north-west of Saarburg, its centre and right standing fast to repulse an eventual counter-attack in the Vosges The II Cavalry Corps was to move on Saar-Union in order to operate south of the Saar On Aug 19 the VIII Corps commenced the attack before dawn, gained the terrain north-west of Saarburg, and repulsed a counter-attack On the 20th it resumed the offensive, but during the morning it became evident that it was incapable of opening a passage for the Cavalry Corps; indeed, it was necessary to bring back a division on the canal with heavy losses In the centre and on the right the French were more fortunate The XXI Corps met no resistance on the 19th, and the XIII had not yet been engaged

On Aug 20, the XXI Corps, attacked by the German XIV Corps, inflicted on it a serious check near Walscheid, the XIII. Corps, coming into line, attacked to the north-east of Saarburg, disengaging the right of the VIII Corps, which held the town till nightfall Dubail's intention was to entrench on the front Kerprich-Soldatenkopf, and to undertake afterwards a methodical advance; but the check to De Castelnau's army led Joffre to direct a retreat in Lorraine On the morning of Aug 21 Dubail's army retired slowly towards Blamont Afterwards it was necessary to accelerate the movement on account of the rapidity of De Castelnau's retreat On the evening of the 23rd, Dubail held a front from Dames-aux-Bois to the Col du Bonhomme His army had suffered heavy losses, the casualties in the VIII. Corps amounting to more than 50%

De Castelnau's Offensive.—The offensive of De Castelnau's army had been still less fortunate On Aug 14 the XVI. and XV Corps moved in the direction of Avricourt, with the bulk of the XX, the remainder covering the front to the north In the evening the army faced to the north-east on the high ground at Gondrexon, the XV Corps alone having been stopped by the enemy at Moncourt On the 15th the advance still suffered a brake by the condition of the XV. Corps, which had suffered heavily, but the XVI and XX. Corps made fair progress The IX. Corps remained on the Grand Couronné east of Nancy and sent out detachments toward the north-east

On Aug 16 the Germans continued their retreat and the French followed rapidly as far as Morhange, north-west of Donnelay. On the 17th the army was to swing round to the north-west toward Delme-Chateau Salins-Dieuze. The XVI Corps progressed without difficulty; the XV occupied Marsal, but could not bring its main body beyond the Seille; the XX. Corps, in possession of Château Salins, reconnoitred toward the north. Rearguard fights

only were expected, but on the 18th the XVI Corps from the early morning met the enemy in strength The German artillery held the XV. Corps in the valley of the Seille and prevented it from occupying Dieuze The XVI. Corps had to fall back on Angviller, and only the XX advanced to the north of Morville-les-Vic and Château Salins In spite of the loss of the IX. Corps, sent to the IV Army on Aug 18, De Castelnau ordered for the 19th the continuation of the offensive in the direction of Loudrefing, Bensdorf and Morhange

Retreat: Aug. 19–20.—From the morning of Aug 19 the XVI. Corps was stopped on the Salines canal, the XV could not pass Zommange and Vergaville; and only the XX. could make a real advance, pushing a brigade as far as Morhange The 68th Reserve Division, which had relieved the IX Corps, insufficiently covered the left of the XX Corps. De Castelnau ordered for Aug 20 a combined attack by the two other corps on the line Cutting–Dommon–Bassing; the XX was to consolidate its positions, ready to march to the north or north-east On the 20th the corps on the right, instead of progressing, was attacked and even thrown back The XX., having attacked and not having improved its position, was stopped by De Castelnau, but the Germans, taking the offensive in turn, threw the left back on Château Salins The right followed this movement on Lidrequin and the 68th Division resumed its position of the previous day At 4 P M. the general ordered a retirement, which began during the night and continued through Aug 21 under the protection of the XX Corps and the 68th Division In spite of the arrival of two new reserve divisions and the II Cavalry Corps, De Castelnau had to retire to the west of the Meurthe, his left to St Nicholas To the north, three divisions held the Grand Couronné

Dubail's Action.—On Aug 23, Dubail's army commenced a three weeks' battle destined to stop the enemy and aid De Castelnau, who was heavily attacked To effect this, it took the offensive on the 24th and 25th, while De Castelnau's army threw back the Germans to the north-east From the 28th to the 31st the Germans held up Dubail's advance, and their VI and VII. Armies even aimed at forcing "the gap of Charmes," in such a manner as to carry out an enveloping movement to the west of the Vosges This action was helped by the French XXI. Corps being despatched to take part in the battle of the Marne

From these circumstances there resulted a series of very confused fights extending over a large front between the Grand Couronné and the Vosges On Sept 6, the German VII. Army, facing Dubail, was broken up, divided between the VI Army, and the main German right wing was then engaged on the Ourcq against Maunoury But Dubail's army was also enfeebled by the removal, westwards also, of the XIII Corps; and at the same time De Castelnau lost the 18th Division and the XV Corps. Clearly both sides had given up the idea of striking seriously in Lorraine After having gloriously held its positions to the east of Nancy and on the Meurthe, De Castelnau's Army was itself to be broken up, to be reconstituted on the left of the French armies in the "race to the sea"

Thus, after checks resulting from an inopportune offensive, Dubail's and De Castelnau's armies had been first able to stop the German progress, then to throw the enemy back to the frontier Moreover, their merit was all the greater as they had been constantly weakened by the withdrawal of their best units During the battle of the Marne they provided the unshakable pivot of the vast movement undertaken by the Allies It was thanks to their efforts that that movement succeeded. But they had paid the price. A single reserve division between Aug 24 and Sept. 12 lost 140 officers and more than 5,000 men

See R Christian-Frogé, *Morhange et les Marsouins en Lorraine* (1916), J. B J Rimbault, *Journal de Campagne d'un officier de ligne* (1916), M. Barrès, *Voyages de Lorraine et d'Artois* (1916), A. Bertrand, *La Victoire de Lorraine: Carnet d'un officier de Dragons* (1917); Y Dubail, *Quatre années de commandement*, vol 1 (1920); A Dubois, *Deux ans de commandement*, vol i (1921). (B. E. P.)

III. BATTLE OF THE ARDENNES

On the outbreak of the World War, the French III., IV. and V. Armies concentrated towards the frontier, west of the Meuse On hearing of the German attack on Liége, Gen. Joffre decided to post the V Army (Gen. Lanrezac) toward the Sambre and to direct the IV. Army, which he had grouped between Vitry-le-Français and Sainte-Menehould, in the region of Stenay. The concentration, which had scarcely begun on Aug. 8, was nearly finished on the 14th Until the commander-in-chief had all his forces at hand, the covering troops were not to be drawn into an important action The German high command had made a similar decision, hence the battle of the Ardennes was the "battle of the two blind men"

French Plan of Attack.—The German plan of operations placed the V. Army between Thionville and Tintigny, the IV between Tintigny and the Meuse de Dinant (the Meuse between Mezières and Namur), the III. Army between Dinant and the Sambre, the II. on the Sambre, and the I in the neighbourhood of Mons. The III Army was still in the Ardennes behind the IV, and the I Army was hastening towards Brussels and Antwerp, when on Aug 22 Joffre decided to attack. It was certainly a strategic success to bring about a battle with all his forces in the Ardennes, while the German III Army was unable to take part in it Joffre had disposed his III and IV Armies in échelon, the left in front, so that he could face the north or east as he wished On Aug 16 he decided to attack towards the north with these two armies massed, while the 7th Cavalry Division reconnoitred towards Thionville, and the 4th and 9th Cavalry Divisions to the north towards the Meuse The result was that in front, and almost everywhere, the Army Corps had only weak and insufficient cavalry for reconnoitring purposes

During the night of Aug 20–1 the whole mass moved forward. The only instructions given by Joffre were "to attack the enemy wherever met" He estimated that the IV Army would have almost nothing in front of it, and yet it was precisely there that the Germans had their IV. and III. Armies, the III being behind the IV The French Lorraine army, which consisted of groups of reserve divisions, was placed under the command of Gen Maunoury with orders to defend the Hauts de Meuse, or eventually, in the event of the advance of the III Army, to besiege Metz and Thionville These reserve divisions were mobilized after the active forces, the men were elderly, they had few officers, and their staffs were inexperienced, so that the III. Army could get little help from them

On the evening of Aug 21, after a long period, during which only patrols had been encountered, the III Army arrived on the line Conz-Lagranville-Tellancourt-Virton At Virton, the left corps tried to get in touch with the right of the IV Army. The line continued by Villers-la-Loue, Geronville, Florenville and the Semoy. The IV Army (De Langle de Cary) was to push on towards the north, while the III. Army was to cover its right against any attack coming from the north or east. Everywhere the advance was made in divisions except one corps, which marched entire on a single road.

On Aug. 22 all the columns started in a fog at a very early hour for a long march with the idea of "attacking the enemy wherever met" To march quickly rather than to take precautions was the order of the day, and almost everywhere the presence of the Germans was only discovered by receiving shell fire In the III Army, the V Corps sent its infantry to the attack without the support of artillery, and it suffered such terrible losses that the leaders became completely unnerved, and Gen Grossetti, chief of the staff, had to intervene to prevent a precipitate retreat In the IV. Army the Colonial Corps exposed a division in column-of-route to the German guns. The XVII. Corps also suffered from a sanguinary surprise. But the most serious danger arose on the right wing of the IV Army, uncovered by the premature check of the IV. Corps at Virton, and on the exposed right wing of the III. Army.

Fortunately, the II. Corps was in a single column, so that the rear division was able to make up for the absence of the IV. Corps. On the right of the III. Army there was a leader, Gen. Hache, who with his heroic division gained the necessary time for the other divisions to fall back. The Germans did not exploit their tactical success but remained practically stationary in their

positions. This battle of the Ardennes taught the French the necessity for co-operation of all arms in the field of battle. On Aug. 23, 24 and 25 the two armies retired slowly without being disturbed.

Lorraine Army Dissolved.—On the morning of Aug 25, the right of the IV. Army retired between the Chiers and the Meuse; the III Army also approached the Meuse facing eastwards Thus the two armies practically became one, and it is regrettable that from this time they were not placed under one leader On the same day, the IV Corps (III. Army) suffered a severe reverse at Marville and they feared they would lose their corps artillery, but the II Corps came to their assistance and convoyed this artillery to Stenay, where they crossed the Meuse This shows how intimate was the co-operation between the two armies It was on Aug 25 also that Joffre decided to reinforce the left of the Allied Armies and to lose ground in order to gain the necessary time for his strategic plans The Lorraine Army was dissolved, one group of divisions was to defend the Hauts-de-Meuse; the 55th and 56th Divisions were entrained for Montdidier. Gen Maunoury had in these two divisions the nucleus of that VI Army which determined the victory of the Marne

On the morning of Aug 26 the entire IV. Army was on the left bank of the Meuse, with cavalry connecting it with the V Army. On its right flank it was in immediate contact with the III Army So much feared was the envelopment of the III Army's right, that a cavalry division was sent to the rear to Dombasle, between Verdun and Clermont, as if an extensive enemy movement was expected to take place south of Verdun. The III. Army took no part in the battle of the Meuse.

Defence of the Meuse.—On Aug 26 the orders ran "From to-morrow the IV Army will fight a decisive battle on the Meuse . . . The corps will make every effort to prevent any attempt of the enemy to cross the river" Generally speaking, this army was some distance from the left bank Its object was to carry out vigorous counter-attacks against German infantry who had passed the river before its artillery could come to its support The Colonial Corps was somewhat driven back by the Germans, who had crossed at Inor and Pouilly, but the arrival of reinforcements from the II Corps soon checked this The struggle was severe on the whole front On the right wing the II Corps had decided successes, three times throwing the Germans back into the river at Cesse and Luzy On the left wing, the success was still more marked There the XI Corps, reinforced by two reserve divisions, gained the battle of La Marfée A German division, making the same mistake as did the French at the battle of the Ardennes, advanced in massed formation without artillery support and was crushed

On the evening of Aug 27, De Langle de Cary gave the following order "At all costs the Germans must be thrown back into the river Meuse." However, Aug 28 was not so active as the previous day, the Germans scarcely attacked at all, and the orders given by Joffre for the coming retirement to the Aisne kept the IV Army to its ground On the 29th the retirement towards the Aisne commenced—the battle of the Meuse was ended The French IV Army had repulsed the German IV. Army—a victory without a to-morrow, but certainly a victory.

Battle of Signy l'Abbaye.—The French V. Army, having been beaten by the German II. Army on Aug 22 and 23, had to retreat, leaving a gap 25m. wide between it and the IV. Army. The Germans of Hausen's III. Army poured into this open space. Gen. Dubois was ordered to fill up this gap and to cover the left of the IV. Army, and was given command of the IX. Corps, composed of the 17th Division, the Moroccan Division, and the 9th Cavalry Division. Two roads led to the region occupied by the Germans at Rethel The road Mezières-Rethel was barred by the 17th Division and the 9th Cavalry Division at Guignicourt, the road from Rocroi to Rethel by the Moroccan Division at Signy l'Abbaye Launois.

On Aug. 28, the 17th Division, hearing the guns from La Marfée, had its attention drawn in that direction. On the same day, at 3 A.M., the advanced posts of the Moroccan Division were attacked by the XII. (Saxon) Corps. At 11 A.M. the Moroccan Division was turned in the west by the enemy, who seized Signy l'Abbaye and so opened up the way to Rethel But the Germans did not exploit their success and allowed themselves to be checked at Novion-Porcien The battle manoeuvres lasted through Aug. 29 and 30 Dubois, by clever movements, brought his forces to the north of Rethel, having thus accomplished his difficult mission. Again German strategy had not made the best use of its superior strength. (V. L. E. C.)

IV. BATTLES OF CHARLEROI AND MONS

The series of encounters between the Allied left and German right wings in southern Belgium during the third week in Aug. 1914 may be sub-divided into the battle of Charleroi, in which the V French Army was attacked and defeated by the German II. and III Armies, and the battle of Mons, subsequent to which the British Expeditionary Force retired southwards before the German I. Army

1. THE PRELUDE TO THE BATTLES

(*a*) **German Movements Prior to the Battles.**—The German plan of campaign in 1914, which in its general lines followed that drawn up some ten years before by Schlieffen, the then chief of the great general staff, involved an advance with a strong right wing through Belgium, so as to turn the fortresses on the French eastern frontier, and with the centre through the Belgian Ardennes and Luxembourg, pivoting on the fortified area Thionville-Metz The three German right wing armies concentrated in the area between the German western frontier with Holland, Belgium and Luxembourg, and the line of the lower Rhine and Moselle from Duisburg to Treves The I Army (Kluck) on the extreme right, comprising four first line corps and two second line corps, assembled to the north-east of Aix-la-Chapelle, the II Army (Bulow) on its left, comprising three first line corps and three second line corps, to the east and south of Aix-la-Chapelle, the III. Army (Hausen), comprising three first line corps and one second line corps, to the east of the line St Vith-Bitburg Two cavalry corps were also allotted to the right wing, together with certain ancillary troops In all, the three armies therefore comprised 20 first line and 12 second line infantry divisions and five cavalry divisions, and their concentration was completed by Aug. 14. The fall of the last forts of Liége early on the 16th having opened the way for their advance, the I and II Armies crossed the Meuse between the Dutch frontier and Huy during the course of the next few days, and came into contact with the main body of the Belgian army deployed behind the line of the Geete between Diest and Tirlemont By the evening of the 20th the Belgians had been forced to seek shelter in Antwerp, the I. Army had occupied Brussels and the country to the south as far as Waterloo, the II. Army on its left continued the line south-eastwards towards the Belgian fortress of Namur, which its two left wing corps were observing; and the III Army east of the Meuse, having made its way through the northern Ardennes, was approaching the line of that river between Namur and Givet At the headquarters of Bulow, who had been placed in general control of the operations of both the I. and II Armies, it was believed that strong French forces (about five corps) were moving forward into the angle between the Sambre and the Meuse, that the British would shortly complete their landing at Boulogne and move thence on Lille, though their arrival in the near future was not to be expected. On the morning of the 20th Bulow received orders from the German Supreme Command that his two armies should co-operate with the III Army in an attack on the French forces west of Namur; the details of the combined attack were left to be mutually arranged between him and Hausen.

(*b*) **French Movements Prior to the Battle of Charleroi.**—The French V. Army, the rôle of which as laid down in plan 17, was to act offensively in conjunction with the IV and III. Armies on its right, to the north of the line Verdun-Metz against the enemy right wing, concentrated on the Franco-Belgian frontier between Longwy and Hirson; it comprised four corps (each of two divisions), two Algerian divisions, and a cavalry corps of

three divisions.

The army commander, Gen Lanrezac, from the first believed that the main strength of the forces opposed to him was to be expected north of the Meuse, and that the projected offensive across that river through the Ardennes would therefore be impracticable; and he took every opportunity of impressing this view on Gen Joffre The latter, on the other hand, adhered to his plan for an offensive across the Meuse into the Ardennes, which he estimated would break in the enemy's centre, nullify any advantage gained by their right wing in Belgium, and even force its withdrawal All he considered necessary was to extend the left wing of Lanrezac's Army to the north towards Namur and place a group of three reserve divisions behind it around Vervins A hostile attack on Dinant on Aug 14 and increasing evidence of the great German strength north of the Meuse finally induced him, while still maintaining his project for an offensive by the III and IV Armies, to move Lanrezac's Army northward to the area Mariembourg-Philippeville, so as to be in a position to meet the danger from the north

Between Aug 16 and 20, therefore, Lanrezac's Army carried out a change of front and a flank march which brought it to a new position south of the Sambre between the western defences of Namur and Thuin, with advanced guards holding the bridges, and one corps (I) facing east along the Meuse between Givet and Namur to guard its right flank Its further action as laid down by Joffre on the 18th was, in conjunction with the British and Belgian armies, either directly to oppose a hostile advance astride the Meuse between Givet and Brussels, or, if the main enemy strength lay south of that river, to act against his right flank in the northern Ardennes On the 20th, however, it became known that the Belgian army was in full retreat on Antwerp, while Sir John French had informed Lanrezac at an interview on the 17th that the British Expeditionary Force would not be ready for action before the 24th As regards the enemy, Lanrezac believed them to have nine or ten corps available for active operations against him north of the Meuse and another two in the angle south-east of Namur His intention was now to close up his army on the 21st and 22nd, establish himself in a defensive position, and cross the Sambre early on the 23rd, and orders to this effect were issued on the evening of the 20th

(*c*) **British Movements Prior to the Battle of Mons.**—The mobilization of the British Expeditionary Force (B E F) was completed by Aug 9 and the transport across the Channel of its four infantry divisions and five cavalry brigades took place without interruption between the 12th and 17th Field Marshal Sir John French, the commander-in-chief, had received instructions to co-operate with the French but as an independent commander only, and to be cautious of exposing his small and precious force to serious danger or losses After a series of conferences with Joffre and Lanrezac, it was agreed that the B E F should take part in Lanrezac's offensive, moving on the left of Lanrezac by Soignies on Nivelles, and as a preliminary should move forward from its concentration area east of the general line Maubeuge-Landrecies-Bohain to a position of assembly about Mons On the evening of the 20th, orders were issued for the advance to begin on the morrow.

2. THE BATTLE OF CHARLEROI

(*a*) **Aug. 21.**—During the 21st the I. German Army continued its south-westerly advance and the III Army closed up to a line a few miles east of the Meuse Bulow's orders for the 21st were that the II. Army on the 21st would continue its advance to the Sambre, but as the III. Army was not yet in position, it was agreed between the two commanders that the combined attack by the two armies against the enemy south-west of Namur should not take place until the 23rd The right wing of the II Army reached the line of the Canal du Centre west of Gosselies, driving back the French cavalry, while the left began operations against the eastern forts of Namur. The centre, however, early in the afternoon came into contact with the right of the French V. Army on the line of the Sambre and forced its way across the river Thus on the evening of the 21st the German II Army secured the crossings both of the Canal du Centre and of the Sambre, and was in position ready to carry out its part in the combined attack arranged with the III. Army for the 23rd.

The French right on this evening had taken up a new defensive position running from Fosse to Marchienne au Pont The left was approaching Thuin, with the cavalry covering its western flank Of the group of three reserve divisions which had detrained around Vervins, one was on its way to relieve the I. Corps, still guarding the army right on the Meuse south of Namur; the other two were moving north and had reached Avesnes In these positions Lanrezac decided to await further hostile attacks on the morrow

(*b*) **Aug. 22.**—Bulow's orders for the 22nd envisaged nothing more than a general closing up of the II Army on the north bank of the Sambre and preparations for an advance across that river on the 23rd, so as to open the passage of the Meuse for the III Army The I Army was directed to close up to a position whence it could support the right of the II Army News which arrived at II Army H Q in the course of the morning, however, caused a radical change of plan, it appeared from this that the French immediately south of the Sambre were chiefly cavalry and that their main forces were no farther north than the line Beaumont-Philippeville Bulow, faced with the alternative of throwing overboard his pre-arranged scheme of co-operation with the I and III Armies, or of losing so apparently favourable a chance of securing the passage of the Sambre at little cost, decided about noon to attack forthwith Orders were accordingly issued to all corps; the III Army was asked also to push forward

The right of the II German Army encountered no very serious opposition, and by the evening, had succeeded in setting foot on the right bank of the river In the centre, however, the struggle was much more severe In the early morning the French right wing launched a series of counter attacks in the hope of regaining the ground lost on the 21st, these met with only partial success, and were finally beaten back with heavy loss A stand was made on the line Fosse-Gerpinnes, where for some hours the fight swayed to and fro without any decided success on either side Finally, however, the Germans succeeded in breaking into the positions held by the French, who were driven back once more to the line St Gerard-Nalinnes, where they reorganized and prepared for a new defence on the morrow Their left wing was not seriously attacked and maintained its positions

For the 22nd, the German III Army had been ordered merely to close up on the east bank of the Meuse, and began preparations for the passage of the river on the morrow During the day news came in to Hausen that the II Army, contrary to its commander's previous arrangement with him, had crossed the Sambre that day and asked urgently for his co-operation by an advance across the Meuse Orders were therefore issued for the III Army to force the passage of the river early on the morrow.

(*c*) **Aug. 23.**—The morning of the 23rd passed without any renewal of fighting on the French V Army front; Bulow was apparently waiting till the effects of the III. Army attack should make themselves felt It was not till afternoon that his centre began to work forward towards Mettet and forced back the French line some little distance by nightfall. Fighting on the left was more serious and sustained; the Germans forced the passage of the Sambre in this sector, and after repeated attacks drove back their opponents some miles to the south On the extreme left the troops of the Reserve Divisions, relieving the cavalry, came into line along the south bank of the Sambre between Merbes le Chateau and Maubeuge.

Despite the progress made by the II Army during the fighting of the last three days, the view of the situation taken at Bülow's headquarters on this evening was gloomy The expected co-operation of the I. Army had failed to materialize, and that of the III Army seemed to have had little effect. The enemy was believed to be in superior force on the army front; he had fought well and might be expected at any time to undertake a general counter-offensive, which the German troops, exhausted by three days' incessant fighting, could hardly hope to resist Nevertheless, the army orders for the 24th laid down a continuance of the

attack.

The III. Army had begun its attack east of the Meuse early in the morning The French positions were strong and well adapted for defence, and their resistance stubborn; but before noon the German left had effected a crossing and observed signs of a hostile retirement, which were attributed to the effect of the II Army's victorious advance In accordance, therefore, with an order from the German Supreme Command, Hausen instructed his left to move on Fumay so as to cut off the hostile retreat to the south. But the task of the army was far from accomplished; its centre met with fierce resistance at Dinant and only got across late in the day, the left, pushing forward to Onhaye, was counter-attacked and driven back by part of the French I. Corps, sent back to restore the threatening situation on this front, while the column sent towards Fumay, by reason of the natural difficulties of the route, failed to reach its objective. Still, the III Army was across the Meuse, and Hausen had ordered it to undertake a pursuit next day in a south-westerly direction, when a staff officer from the II Army arrived bearing an urgent request for his assistance in the form of an advance due west against the flank of the French V Army To this alteration of his plan Hausen consented and issued new orders directing his right wing on Mettet

Meanwhile, Lanrezac, on his side, in view of the threat to his flanks and rear afforded by the fall of Namur, the advance of the III. Army and the defeat of the French in the Ardennes, fearing for his left where the B E F had been engaged all that day, with superior enemy forces, and realizing the state of moral and material exhaustion among his own troops, decided that he had no choice but to retreat Orders were issued that morning for a withdrawal to the line Givet-Philippeville-Merbes-le Chateau, which was carried out on the 24th unmolested by the Germans Their II Army advanced only a few miles to the southward; the right of their III Army, advancing due west, found no enemy before it, and its left column, resuming its advance on Fumay, was unable to cross the Meuse there until the 28th, when it was too late to interfere with the French retirement The battle of Charleroi had thus terminated in a definite German success, the scope and effects of which, however, were so unduly exaggerated in the reports of army and corps commanders, as to assume, quite without warrant, the dimensions of a decisive victory

3. THE BATTLE OF MONS

On Aug 21 the British Expeditionary Force began its advance into the line of battle The cavalry preceded the advance, followed by the II. Corps (Smith-Dorrien) and the I Corps (Haig) in that order Reports from aircraft and cavalry on the 21st and 22nd established the presence of hostile cavalry about Nivelles, and of the main enemy forces between Enghien and Charleroi In rear of the cavalry the British Corps closed up to the line Binche-Mons-Condé canal, the I Corps on the right as far as Villers St. Ghislain, the II. Corps on the left behind the canal line, one cavalry brigade covered the right of the army, while later in the morning the cavalry division fell back from before the front to a new position south-east of Condé in rear of its left Sir John French knew on the evening of the 22nd that the French on his right, after heavy fighting, had been forced back from the line of the Sambre, and that strong enemy forces, reckoned at three or four corps, were approaching his own front, he therefore determined to abandon all idea of an offensive, and to stand for battle next day in the positions then held by his army In view of this, a request from Lanrezac for a British counter-stroke against the flank of the enemy then attacking him could not be complied with, the most that French could promise was that he would hold his ground for at least 24 hours

On the German side the I. Army, on the evening of Aug. 21, received orders from Bülow to be prepared next day to afford direct support to the II Army. To this scheme Kluck saw serious objections in view of the uncertainty as to the whereabouts of the British, and a prolonged discussion took place which resulted in the I. Army commander yielding his point, and agreeing to swing his army on the 22nd more to the south to the line Lessines-Soignies During this day contact was established, as has already been related, with the British cavalry and Kluck now realized that the B E.F. was advancing to join up with the left of the French on the Sambre Once more there arose a divergence of views; Kluck wanted to carry out a wide turning movement to envelop the British left; while Bülow considered he could not dispense with his direct support on the Sambre. Eventually orders were issued for the I Army to advance on the 23rd across the Canal du Centre to the general line north of Maubeuge, north-east of Condé, a movement which was bound to bring them into conflict with the British.

Early on the morning of the 23rd, the latter had taken up their positions for battle—the I Corps on the right facing north-east between the Sambre and the Haine south-east of Mons, the II. Corps and the 19th Infantry Brigade facing north along the line of the Canal du Centre from Mons to just east of Condé (which was held by part of the 84th French Territorial Division), and the Cavalry Division in rear of the II Corps left The whole front was a very long one—about 27 miles; the ground along the line of the canal was enclosed and much built over, but the heights to the south-east of the Haine afforded strong second positions farther in rear About 9 A M the battle opened on the II Corps' right, but it was not till 11 A.M that the action became general all along its front This pause was due to the fact that early in the morning Kluck, alarmed by a false report that strong hostile forces were detraining at Tournai, well out on his right flank, had ordered his army to halt until the situation there was cleared up—which did not occur till about mid-day The German attack at first made little progress and suffered heavy casualties from the effective British fire, but in the early afternoon the right of the British Corps was forced to evacuate Mons and the canal bend north of it, and retire to its second position, while a gap in its centre also caused some temporary anxiety By nightfall it had everywhere fallen or was about to fall back to this new position about 2m south of the canal. Neither the I. Corps on the right nor the 19th Brigade and the French on the extreme left had been seriously attacked during the day, since the German right wing, which was moving on Condé, failed to reach the battlefield, the British losses had been slight and the *moral* was excellent. None the less, Sir John French, on receipt of news from the French G O C and Lanrezac's French army of the situation on his flanks and the greatly superior enemy force available for use against him, realized that he could not continue to hold his position, and issued orders for a retirement next day to a line running east and west through Bavai, with its right covered by the fortress of Maubeuge

This withdrawal, commencing before dawn on the 24th, was successfully executed, though not without local fighting in which the B E F actually suffered more heavily than in the previous day's battle. The I Corps and the right of the II Corps fell back unmolested, but at Frameries and Elouges the centre and left of the II Corps and Cavalry Divisions were hard pressed by the enemy, who succeeded in cutting off and capturing the greater part of one battalion at Elouges after a gallant resistance. Nevertheless, by the morning of the 24th the B.E F. stood, wearied but intact, on the line allotted to it on either side of Bavai. The German I Army, apart from its pressure on the rear guards of the II. Corps, made little attempt to follow up or molest the retirement. Kluck believed the British would stand fast on this day and await his further attack, arrangements for which he had laid down in his orders issued late on the 23rd; it was not till next morning that he realized the true position, and then it was too late to carry out that enveloping movement with his right wing which alone could have enabled him to secure decisive success. In fact, the results of the two days' fighting around Mons were, from the German point of view, disappointing; the retirement of the British before it was mainly attributable to the course of events elsewhere and in particular to the ill-success of the French V. Army farther east, and there was at no time any question of a true tactical victory on the German I. Army front.

General Considerations.—The operations above described

had thus resulted in a serious Allied defeat which laid open the whole northern frontier of France to invasion The weight and velocity of the German offensive had been too great and unexpected for the French counter-measures to be effective in stemming its progress; such a result was only to be expected in view of the fact that on this sector of the front the Germans had a numerical superiority of 11 divisions (28 as against 17) The Allies, moreover, were incompletely concentrated for battle and the arrangements for co-operation between them were by no means satisfactory The V Army moved forward to the Sambre too late to assist the Belgians and too soon to be able to count on British support, and became involved in an encounter battle before it had time to establish itself in a suitable defensive position Moreover, its indifferent tactical handling allowed the Germans to make full use of their superior armament, which took heavy toll of the hasty and ill-prepared attacks in which the French at this period of the war were too prone to indulge The French failure at Charleroi, moreover, nullified the effect of the temporarily successful resistance of the British at Mons against an enemy who had ample additional troops at hand to continue his offensive The immediate retreat of the whole Allied left wing therefore became the only means of escape from a critical situation

Fortunately for the Allies, the Germans on their side failed to reap the full fruits of a success so real that it might well have been made decisive This failure must be attributed to several causes inadequate information, which lead them unduly to disperse their forces prior to and during the battles, defective organization of command, which placed the general control of the operations in the hands of one army commander who was bound to be unduly influenced by events on his own immediate front; and faulty leadership, which indulged in sudden and ill-considered changes of plan, and let slip its chance of completely destroying its weaker adversary It seems that while the Allies were fortunate to escape as lightly as they did, for the Germans Charleroi and Mons were at once a real victory and a lost opportunity

V. BATTLE OF LE CATEAU

In view of the withdrawal of the whole of the French centre and left wing which Sir John French had been informed was to be continued on Aug 28, the British C.-in-C. ordered on the evening of the 24th a further retirement of the B.E.F. from the Bavai area to a position on either side of Le Cateau In order to carry out this movement it was necessary to split the army and send the I Corps to the east and the II Corps and cavalry to the west of the great Mormal forest, which lay right across the line of retreat and through which no practicable roads were believed to exist. The I Corps completed its movement unmolested by the enemy, though not without difficulty and trouble owing to the great heat and the presence of French troops along its allotted route, and went into quarters for the night around Landrecies Here late in the evening a collision took place with German advance guards, which after some confused fighting were beaten off. On the other flank, however, the II Corps and the cavalry, who were joined in the afternoon by the 4th Division, just detrained at Le Cateau, had considerable fighting

The commander of the German I Army, who had expected the British to stand for battle, realized in the early morning that they were in fact retiring, but concluded as the result of an erroneous air report that the direction of their retreat was not south-westwards but eastwards with a view of seeking shelter under the guns of Maubeuge—a course of action which Sir John French had in fact considered, but on recollection of the fate of Bazaine in similar circumstances in 1870, had rejected As a consequence of this inaccurate appreciation of the situation, the I Army column were switched off from their first direction of advance south-westwards towards a new southward direction, and it was not till the afternoon that the error was recognized and the original direction resumed. By that time, as we have seen, the British I Corps had got a good start of their adversaries; but the II Corps and cavalry, partly owing to the passage of the French I Cavalry Corps across their rear to the new position allotted to it on their left, were much delayed in starting their retirement, and the German II. and IV. Corps early got contact with their rear guards; so that the retreat of the British left wing resolved itself into a running fight with a vigorously pursuing enemy The 4th Division, which had just arrived from England and had taken up a position north of Solesmes, effectively assisted the withdrawal, but the bulk of the troops of the II. Corps were unable to reach the positions allotted to them west of Le Cateau until late that night, and some not even till next morning. The 4th Division and the cavalry were in little better position, the former, which was deficient of many essential units, being unable to fall back from Solesmes to its new positions till long after dark, while the cavalry, being scattered on both flanks of the II Corps, were much exhausted

About 9 P.M. Gen Smith-Dorrien, G.O.C. II Corps, received orders from British G.H.Q. that the army was not to stand to fight on its present position next day, as expected, but was to continue its retreat to the area Busigny-Beaurevoir-Le Catelet. He now found himself called on to make a critical decision According to reports from his subordinates, his force could not possibly resume its retreat till well after dawn on the 25th, and as the enemy were, according to information from the cavalry, in force close to his front, to attempt a retirement by daylight and over roads encumbered with transport and refugees would probably lead to a disaster Moreover, the I Corps was believed to be engaged with the enemy, and the II Corps, by falling back, would expose its flank and rear. To continue his retirement next day, as ordered, he therefore considered impossible By standing to fight in conjunction with the 4th Division and the cavalry he might hope to check the hostile advance for a time and utilize the first opportunity to resume his withdrawal before he could be attacked and overwhelmed by greatly superior forces On this latter course, therefore, Smith-Dorrien eventually decided, and in this decision G.H.Q. concurred Accordingly, orders were got out for the British left wing to stand for battle, on the heights south of the Le Cateau-Cambrai high road between Le Cateau and Esnes

The German I Army halted for the night of the 25th–26th on the general front, east and south edges of Mormal forest—Solesmes-Bouchain, and its orders for the morrow were to continue the pursuit south-westward so as to cut off the British line of retreat between Cambrai and St Quentin About 6 A.M. on the 26th, the 4th Division was suddenly attacked by German cavalry and suffered severely before it could effect its withdrawal to its battle position on the line Ligny-Esnes, and there check the German progress Meanwhile, on the opposite flank the 5th Division in and west of Le Cateau were as suddenly assailed and forced back to the heights south-west and west of the town. An attempt to get round its right in the Selle valley was, however, foiled with the help of the cavalry on that flank; and with the assistance of troops sent up from corps reserve the British positions were maintained intact in this part of the field till noon. The 3rd Division in the centre had not been seriously attacked. Before long, however, the situation became serious, one fresh German corps, moving west from about Landrecies, was approaching the field and threatened to envelop the British right, while on the left another which had arrived on the field to support the cavalry, resumed the attack in the sector held by the 4th Division. Under these circumstances Smith-Dorrien, at 1.40 P.M., ordered a general retirement commencing with the right, and as soon as these orders reached the troops, about 3 P.M., the withdrawal commenced On the 5th Division front considerable difficulties were encountered, and some guns had to be abandoned but the bulk of the troops succeeded in getting away. The 3rd Division had no difficulty in effecting their retreat, and the 4th little more, since the attention of the German II. Corps, which, after driving back French Territorial troops through Cambrai, was preparing to fall on the British left, was distracted by the opportune arrival about Crèvecoeur, of the French Cavalry Corps, whose artillery effectively prevented the German attack from developing till the 4th Division had got well away to the south. On the whole front small parties which had not received orders to retire or had

received them too late, fought on till finally overwhelmed, and their stubborn resistance prevented any pursuit of the main bodies by the enemy. Marching far into the night despite its intense exhaustion and great congestion and confusion on the various lines of retirement, Smith-Dorrien's command finally halted in the area between Bohain and Le Catelet. It had lost close on 8,000 men and 38 guns, but was still a fighting force. Its escape from the critical position in which it stood on the morning of the battle may be attributed partly to its adversaries' failure to exploit to the full their great superiority in numbers and means; partly to the invaluable help rendered first by the French Territorials and later by their cavalry corps in securing its exposed left flank throughout the day; but most of all to the fine qualities of its leadership and its own soldierly virtues, which made of Le Cateau an episode more creditable than many a victory

With the conclusion of the battle the crisis through which the B E F had passed since Mons may be said to have ended Its retreat was continued on the 27th and 28th unmolested by the German I Army, which now had to swing westward to deal with a new enemy in the shape of French forces assembling in the Somme valley. The II Corps, 4th Division, and cavalry moved via St. Quentin and Ham behind the line of the Somme and then behind the Oise, where touch was established with the I Corps, which, after a series of rear-guard encounters with the right wing of the German II Army, had successfully effected its retreat by way of Etreux and Guise. Thus, on the 29th, the whole of the B E F stood once more united on the south bank of the Oise between La Fere and Noyon, where it was afforded a short respite to reorganize and refit

VI. THE BATTLE OF GUISE

Between Aug 24 and 27 the French V Army carried out a steady retirement southwards from the area south of the Sambre to south of the Oise, and on the evening of the 26th stood with outposts on the line of that river and the Thon between Aubenton and Guise, and its main bodies farther back The German II Army, which had bought its victory at Charleroi at a heavy price in casualties, had followed it up and had reached on a line from east of Bohain to La Capelle, it was now reduced to four corps, the other two having been sent off to the eastern front, where the situation had become menacing for the Germans. No serious contact had taken place between the adversaries during this period

Meanwhile Joffre, in view of the Allied failure in the frontier battles and the rapid progress of the German right wing, proposed to strengthen his own left wing by the formation of a new VI. Army about and south of Amiens, to check the enemy advance on the general line Laon-La Fere-St Quentin-the Somme, and ultimately assume the offensive with the V., VI and British Armies But the retreat of the B E F. as a result of Le Cateau rendered it necessary in his opinion for some immediate assistance to be given to it if it were to be kept in being as a fighting force, and on the 27th the V. Army received orders for an immediate attack north-westwards towards St. Quentin against the enemy who were following up the British on the west bank of the Oise Accordingly, the French Corps on the 28th closed to their left in preparation for the attack on the 29th, the left wing facing north-west along the Oise between Origny and Mons, the right guard facing north between Guise and Rumigny. The co-operation of the British I. Corps had been asked for and promised by its commander, but Sir John French intervened to forbid this. Meanwhile, Bulow, as before the battle of Charleroi, had come to the conclusion early on the 28th that he had only strong rear guards in front of him south of the Oise. On the 28th, therefore, he pushed his left wing up and over that river between Guise and Étréaupont, while his right was sent off far to the south-westwards beyond St. Quentin towards the upper Somme so as to keep touch with the I. Army and assist it to cut off the retreat of the British. His orders for the 29th dealt mainly with the preparatory measures for the attack on the out-of-date fortress of La Fère, the importance of which seems unduly to have obsessed him; the right wing, however, was to continue its advance south-westwards.

The French advance across the Oise towards St. Quentin thus came as a complete surprise to the Germans; and their right wing, thus menaced on its left flank, was at once checked in its progress and faced hurriedly south-eastwards to meet the unexpected threat At first only part of one corps was available to stave off the advancing French, who got to within 4m. of St. Quentin, while the wide gap between Bulow's wings for a time caused him grave anxiety Eventually the arrival of the remainder of his right wing relieved the German situation in this part of the field; the French having received orders that the attack on St Quentin was not to be pressed, maintained their ground till nightfall, and then fell back east of the Oise

The reason for this order lay in the changed situation on the northern part of the field, where the German left wing, advancing southwards, had driven in the French forward troops opposed to them, and menaced the flank of columns about to cross the Oise about Mt d'Origny. Lanrezac's reserve was thrown in; a general counter-stroke took place which not only put a stop to the enemy's advance, but forced him to give ground; and by nightfall the progress of the German left wing had been definitely checked.

The object of the French counter-offensive having been achieved, Joffre ordered Lanrezac to resume his retreat on the 30th, to the line originally laid down, and this movement, which commenced early in the morning, was safely completed under cover of strong rear guards. The Germans did not attempt to resume their attack during the morning, but their right wing, having called up to its assistance a division of the I Army, advanced in force later in the afternoon across the Oise and established itself on the east bank by nightfall; the left wing also moved forward level with it By this time the French main bodies had got clear away and no pursuit was undertaken; the II Army, which was much exhausted, was ordered a rest day on the 30th, leaving to the I Army the task of following up the retiring enemy by an advance across the Oise south of La Fère In truth the battle of Guise, if a *victoire sans lendemain* for the French, was a bad set-back for the Germans, and in it was to be found a presage of the turn of the tide a week later on the Marne

See French, British and German official *Histories*, also Lord French, *1914*, 2nd ed. (1919); C W. P. v. Bülow, *Mein Bericht zur Marneschlacht* (1919), H. R A v. Kluck, *The March on Paris*, Eng trans. (1920), M. C. L v. Hausen, *Erinnerungen an den Marnefeldzug* (Leipzig, 1920), C L M. Lanrezac, *Le Plan de Campagne Français* (1920), H. J. v. Kuhl, *Die Marnefeldzug* (1921), H L Smith-Dorrien, *Memories of Forty-eight Years' Service* (1925); B. H. Liddell Hart, *Reputations* (1928). (E. W. S.)

FRONTINUS, SEXTUS IULIUS (*c* A D. 40–103), Roman soldier and author In 70 he was city praetor, and five years later succeeded Petilius Cerealis as governor of Britain. He subdued the Silures, and held the other native tribes in check till he was superseded by Agricola (78) In 97 he was appointed superintendent of the aqueducts (*curator aquarum*) at Rome. His chief work is *De aquis urbis Romae*, in two books, containing a history and description of the water-supply of Rome, including the laws relating to its use and maintenance, and other matters of importance in the history of architecture His treatise *De re militari* is lost His *Strategematicon libri iii.* is a collection of examples of military stratagems from Greek and Roman history; a fourth book, the plan and style of which is different from the rest (more stress is laid on the moral aspects of war, *e g*, discipline), is the work of another writer (best edition by G. Gundermann, 1888). Extracts from a treatise on land-surveying ascribed to Frontinus are preserved in Lachmann's *Gromatici veteres* (1848).

A valuable edition of the *De aquis* (text and translation) has been published by C. Herschel (Boston, Mass., 1899; 2nd ed., 1913). It contains illustrations, maps, a photographic reproduction of the only ms (the Monte Cassino), explanatory chapters, and bibliography, in which special reference is made to P de Tissot, *Étude sur la condition des agrimensores* (1879). Editions of the works A. Dederich (1855); Knohn (Leipzig, 1922); the *Strategematica* by R. Scott (1816), *Strategemata* and *De aquis* by C. Bennett (Loeb series, 1925).

FRONTISPIECE, an architectural term for the entrance front of any building, also, more commonly, for a rich decorative

feature of considerable size, sometimes including the entrance door, applied to the principal front of a building Thus the tall niches containing the doors of many Mohammedan buildings (*see* MOHAMMEDAN ARCHITECTURE) are frontispieces In common non-architectural usage the word designates the decorative composition or picture placed at the beginning of a book, usually facing the title page, and forming the first, and often the most important of the book's illustrations

FRONTO, MARCUS CORNELIUS (*c* AD 100–170), Roman grammarian, rhetorician and advocate, was born of an Italian family at Cirta in Numidia He came to Rome in the reign of Hadrian, and soon won fame as an advocate, and amassed a large fortune Antoninus Pius appointed him tutor to his adopted sons Marcus Aurelius and Lucius Verus In 143 he was consul for two months, but declined the proconsulship of Asia on the ground of ill-health His talents were greatly admired by his contemporaries, a number of whom formed themselves into a school called after him Frontoniani, whose avowed object it was to restore the ancient vigour of the Latin language The authors recommended include Ennius, Plautus and Sallust Till 1815 the only extant works ascribed (erroneously) to Fronto were two grammatical treatises, *De nominum verborumque differentus* and *Exempla elocutionum* (the last being really by Arusianus Messius) In that year, however, Angelo Mai discovered in the Ambrosian library at Milan a palimpsest manuscript from St Columba at Bobbio (and, later, some additional sheets of it in the Vatican), on which had been originally written some of Fronto's letters to his royal pupils and their replies These were published at Rome in 1823 The correspondence with Antoninus Pius, Marcus Aurelius and Lucius Verus, shows their character in a very favourable light The collection also contains letters of recommendation to friends, treatises on eloquence, some historical fragments, and literary trifles on such subjects as the praise of smoke and dust, of negligence, and a dissertation on Arion Fronto's style is "a laborious mixture of archaisms, a motley cento," the forerunner of the Latin of Apuleius

The best edition of his works is by S A Naber (1867), with an account of the palimpsest, *see* also G Boissier, "Marc-Aurele et les lettres de F," in *Revue des deux mondes* (April 1868), R Ellis, in *Journal of Philology* (1868) and *Correspondence of Fronto and M Aurelius* (1904), and the full bibliography in the article by Brzoska in the new edition of Pauly's *Realencyklopadie der classischen Altertumswissenschaft*, IV pt 1 (1900) Edition with English translation by Haines (Loeb series, 1919), *see* also M D Brock, *Studies in Fronto and his Age* (Girton Coll Studies V) (1911)—a more favourable view of Fronto's style

FROSINONE, a town of Italy (anc *Frusino*), and the capital of a province 53 m E S E by rail from Rome Pop (1921) town, 5,885, commune, 12,815 The place is picturesquely situated on a hill of 955 ft above sea-level, but contains no buildings of interest It was a Volscian, not a Hernican, town, a part of its territory was taken from it and sold about 306–303 B C by the Roman, later becoming an unimportant colony It was situated a little way above the Via Latina

FROSSARD, CHARLES AUGUSTE (1807–1875), French general, was born on April 26, 1807, and entered the army from the École Polytechnique in 1827, being posted to the engineers Napoleon III made him in 1867 chief of his military household and governor to the prince imperial He was one of the superior military authorities who in this period 1866–1870 foresaw and endeavoured to prepare for the inevitable war with Germany, and at the outbreak of war he was given by Napoleon the choice between a corps command and the post of chief engineer at headquarters He chose the command of the II. corps On Aug 6, 1870 he held the position of Spicheren against the Germans until the arrival of reinforcements for the latter, and the non-appearance of the other French corps compelled him to retire He took part in the battles around Metz, and was involved with his corps in the surrender of Bazaine's army General Frossard published in 1872 a *Rapport sur les opérations du 2 corps* He died at Château-Villain (Haute-Marne) on Aug 25, 1875

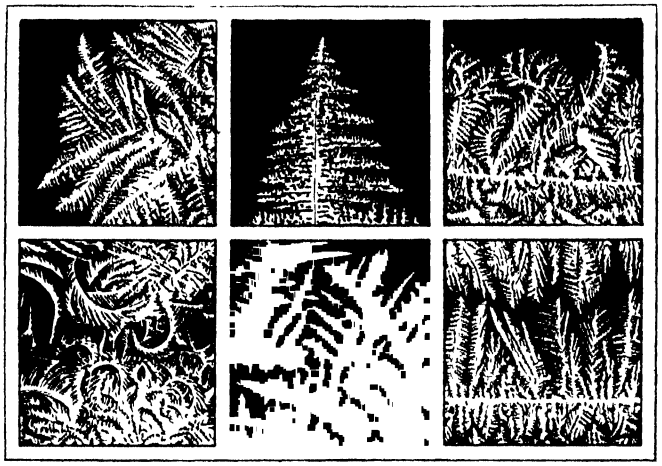
FROST, EDWIN BRANT (1866–), American astronomer, was born in Brattleboro, Vt., on July 14, 1866, and graduated at Dartmouth college in 1886. From 1887 to 1890 he served at Dartmouth as instructor in physics and astronomy and received his M A degree in 1889. The following year he studied in Strassburg, Germany, and in 1891–92 served as volunteer and assistant in astrophysics at the observatory at Potsdam He was assistant professor of astronomy and director of the observatory at Dartmouth, 1892–95, and professor, 1895–1902 In 1898 he became professor of astrophysics at the University of Chicago and astrophysicist at the Yerkes observatory, Williams Bay, Wis, of which in 1905 he was made director He became editor of the *Astrophysics Journal* in 1902 and is also editor of the publications of Yerkes observatory, in which much of his scientific work has been printed His chief contributions have been in the field of stellar spectroscopy, especially the spectrographic determination of velocities of stars He also made researches on sun spots and the thermal radiation of the sun He edited *A Photographic Atlas of Selected Regions of the Milky Way* (1927)

FROST, ROBERT (1875–), American poet, was born in San Francisco (Calif.), March 26, 1875 His father was a New Englander and his mother was born in Edinburgh In 1885 he moved with his parents to Lawrence (Mass), studied in the public schools, and entered Dartmouth college in 1892, remaining there one year In 1897–99 he was a student at Harvard, and from 1905 to 1911 taught English in the Pinkerton academy, Derry (N H), and then for a year taught psychology at the New Hampshire Normal school at Plymouth In 1912 he went to England, where he remained three years and published his first two volumes of verse On his return to America he retired to a farm at Derry and gave much time to active farming During 1916–20 he was professor of English at Amherst college (Mass), a position which he resumed 1923-25 after an interval spent as poet in residence at the University of Michigan Later he became fellow in letters at Michigan His poems portray realistically, yet with a fine reticence, everyday country life in New England, his work as a whole partaking of the dignity and serene beauty of the hills among which much of his life has been passed Some of the work of his first volume had been denied publication for 20 years, and some of the second for ten years He is the author of *A Boy's Will* (London, 1913, New York, 1915), *North of Boston* (London, 1914, New York, 1915), *Mountain Interval* (1916), *A Way Out,* a play (1917), *New Hampshire* (1923) *Selected Poems* appeared in 1923, and "West-running Brook," in 1928, *see* G B Munson, *Robert Frost* (1927), and J C. Squire, *Contemporary American Authors* (1928)

FROST, WILLIAM EDWARD (1810–1877), English painter, was born at Wandsworth, near London, in Sept 1810 In 1839 he obtained the gold medal of the Royal Academy for his picture of "Prometheus bound by Force and Strength" His "Nymph disarming Cupid" was exhibited in 1847, "Una and the Wood-Nymphs" of the same year was bought by the queen This was the time of Frost's highest popularity, which considerably declined after 1850 He died on June 4, 1877

FROST, water in the atmosphere, which is crystallized by freezing upon exposed objects Under the broader and more popular conception of frost, the phenomenon also includes the mechanical effects produced by the freezing of the juices of plants, of the water in the soil, in rocks, etc Frost is a phenomenon most common in the polar regions and during the winter months But frosts of a milder nature are also quite common, during cold, clear nights in spring and autumn, in temperate regions, and sometimes extend over thousands of square miles, doing great damage by freezing the juices of plants, vegetables, etc When frosts of this character occur, hoar-frost crystals collect upon the earth and vegetation. The frost crystals, themselves, however, do no damage. It is the freezing of the juices of plants, etc, that injures them The condition that precedes and favours hoar-frost formation is a cooling of the air near the earth's surface. This may be brought about by seasonal changes in temperature and by radiation of heat from the earth during calm, clear nights Other factors that tend to favour frosts are the cooling of objects by the evaporation of moisture from them, and in mountain regions the descent of cold air into the valleys.

Hoar-frost, like snow, occurs in two distinct states, the crystalline and the granular Hoar-frost is not, as some suppose, frozen dew Granular hoar-frost may properly be termed fog or cloud-frost, as it is produced by the collection and freezing of fog drops upon vegetation, etc It occurs most frequently upon mountain tops, because clouds often enshroud them In zero weather, fog drops form in the air around all open springs and streams, and



SOME OF THE FORMS ASSUMED BY HOAR-FROST ON WINDOW PANES
The designs effected by hoar frost on window panes are varied and very often familiar in outline. That in the upper panel, centre, resembles a balsam fir tree, those to the left and directly below suggest jungle ferns, while there is a lace-like delicacy in the pattern at the extreme lower right

collect and freeze upon near-by objects Hoar-frost of this character is usually of a subcrystalline character, due to colloidal crystallization It occurs during both windy and calm weather Its forms assume columnar, needle-like or fernlike shapes, sometimes of considerable size and great beauty On mountain tops, the cloud-frost crystals often grow outward, mainly in a windward direction, and form lovely fernlike or fluted creations, that impart wondrous beauty to the mountain tops True crystalline hoar-frost crystals, like the crystalline varieties of snow crystals, form direct from the invisible water vapour in the air Winds and clouds, and overhanging objects that shield the earth, retard or prevent frosts of this character in the open Such crystals assume many beautiful and varied forms Like the snow crystals, most of them can be grouped into one of two classes, those that assume columnar forms, and those that assume tabular forms In general, the crystals of these respective classes do not form together on a given night, but one or the other will greatly predominate Columnar shapes usually form the bulk of the hoar-frost crystals during the so-called destructive frosts of spring and autumn The columns are usually hexagonal in form, are hollow, or have cavities projecting downward from their upper ends, and vary more or less in size, slenderness, etc

Tabular hoar-frost crystals are most common to the winter months, and to lower temperatures They form in open branching or in close solid platelike figures, and vary in size, outline, thickness, etc The individual crystals of tabular frost resemble in some degree similar types of tabular snow crystals But unlike them, and as a result of their being forced to grow outward in segmental fashion from some support, they rarely assume the perfect symmetry of many of the snow crystals Copious frosts of this description coat the trees and other objects with glittering hosts of butterflylike or fernlike crystals, giving them a white frosted appearance, and thus convert forested regions into the semblance of fairyland In the winter time, when ice covers pond and river, beautiful clusters or rosettes of fernlike or jewel-like frost collect upon the surface of the ice Among the rarer of the frost forms are those which assume the funnel or cubical form

The most varied and beautiful of all the frost forms, however, occur during zero weather, upon the window-panes of buildings. The more delicate and varied effects are due to a crystallization of the moisture in the air of a room, upon dry glass in cold unheated rooms. The bolder and larger so-called window-frost effects, however, that form in warm moist rooms, are really window-ice crystallization, as they form upon wet window-panes, and crystallize within the thin film of fluid water that often covers such panes Window-frost and window-ice assume a bewildering variety of designs, some of them in the semblance of castles, tropical forest effects, starry firmaments, trees, ferns, corals, stars, etc Some of the designs, as those that form within tiny scratches or strictions in the glass, are repeated from time to time Others have a much more obscure origin The temperature and degree of humidity of the air, the varying thickness of the glass, the dust, etc , on it, the tiny air currents and eddies that flow over it, the presence or absence of other closely lying frost crystals, each doubtless tends to determine or modify the shape, size, and form of the frost crystals forming on windows When considered in its broader aspects, frost plays an important rôle, both beneficent and otherwise, in nature's plan Its destructive effects, when early or late frosts occur and injure crops and vegetation, are well known Various devices are now used to lessen or prevent frost damage, such as tentlike coverings, oil heaters and smudge pans, etc The beneficent services of frost are very important It acts as an erosive agent, in tearing down mountains, and converting rocks into soil This is accomplished by means of the expansive action of water when it freezes within crevices of the rocks, thus rending them asunder and helping to pulverize them into soil

(W. A BEN)

FROSTBITE, a form of mortification (*q v*), due to the action of cold in cutting off the blood-supply from the fingers, toes, nose, ears, etc In comparatively trifling forms it occurs as "chaps" and "chilblains," but the term frostbite is usually applied only to more severe cases, where the part affected becomes in danger of gangrene The degree of cold necessary to produce frostbite varies within wide limits and particularly with the associated conditions A degree of cold that would be borne with impunity by a healthy person in dry air leads to frostbite when (as in the trenches during the World War) the feet are soaked through, movement is limited, and mental anxiety is great If the individual be underfed in addition a relatively slight degree of cold leads to severe frostbite An immediate application of snow, or ice-water, will restore the circulation, the application of heat would cause inflammation But if the mortification has gone too far for the circulation to be restored, the part will be lost, and surgical treatment may be necessary

FROSTBURG, a town of Allegany county, Md , U S A , in the north-western part of the State It is on Federal highway 40, and is served by the Cumberland and Pennsylvania and the Western Maryland railways The population was 6,017 in 1920 (89% native white) The town lies amid beautiful scenery, about 2,000 ft above sea-level, on a plateau between the Great Savage and the Dans mountains It is the seat of a State normal school (opened 1904) and is the centre of the coal region of the State The town itself is almost completely undermined In 1926 Allegany county produced 2,275,374 tons of coal Frostburg was settled in 1812 and incorporated in 1870 It was called Mount Pleasant until about 1830, when the present name was adopted in honour of one of the founders, Meshech Frost.

FROST-WEED (*Helianthemum canadense* or *Crocanthemum canadense*), a North American plant of the rock-rose family (Cistaceae), native to dry rocky places and sandy soils from Maine to Ontario and Wisconsin southward to North Carolina and Missouri It is a slender, sparsely branched, slightly woody perennial, with small, narrow, nearly stalkless leaves and showy yellow flowers, $\frac{3}{4}$ in to $1\frac{3}{4}$ in. across, usually borne singly or rarely two together, the petals soon falling These are followed later by small short clusters of cleistogamous flowers, without petals, borne in the axils of the leaves The plant is remarkable in that late in autumn crystals of ice sometimes shoot from the fissured bark at the base of the stem, whence the popular name. The hoary frost-weed (*H. majus* or *C. majus*), a similar species but of more western and southern range, exhibits the same peculiarity.

FROTHINGHAM, OCTAVIUS BROOKS (1822–1895), American clergyman and author, was born in Boston (Mass), Nov 26, 1822 His graduation from Harvard college in 1843 and

from the Divinity school in 1846 was followed by pastorates at Unitarian churches in Salem, Jersey City, and New York city until ill-health compelled his resignation in 1879. In 1881 he returned to Boston, where he died on Nov. 27, 1895. To this later period of his life belongs his best literary work, although he remained a greater orator than he was a man of letters. Always on the unpopular side, he was not only an anti-slavery leader when abolition was not popular even in New England, and a radical and rationalist when it was impossible for him to stay conveniently in the Unitarian church, but he was the first president of the National Free Religious Association (1867) and an early and ardent disciple of Darwin and Spencer.

His works include *Stories from the Life of the Teacher* (1863), *A Child's Book of Religion* (1866), *Life of Theodore Parker* (1874), *The Cradle of the Christ* (1877), *The Spirit of New Faith* (1877), *Transcendentalism in New England* (1876), *George Ripley* (1882), *Memoir of William Henry Channing* (1886), *Boston Unitarianism, 1820–50* (1890) (really a biography of his father), and *Recollections and Impressions 1822–90* (1891).

FROUDE, JAMES ANTHONY (1818–1894), English historian, son of R H Froude, archdeacon of Totnes, was born at Dartington, Devon, on April 23, 1818. He was educated at Westminster and Oriel college, Oxford, then the centre of the ecclesiastical revival, and was elected a fellow of Exeter college (1842). Froude joined the High Church party and helped J H Newman, afterwards cardinal, in his *Lives of the English Saints* He was ordained deacon in 1845 By that time his religious opinions had begun to change, he grew dissatisfied with the views of the High Church party, and came under the influence of Carlyle's teaching. Signs of this change first appeared publicly in his *Shadows of the Clouds* (1847), published under the pseudonym of "Zeta," and his complete desertion of his party was declared a year later in his *Nemesis of Faith.*

On the demand of the college he resigned his fellowship at Oxford. The first two volumes of his *History of England from the Fall of Wolsey to the Defeat of the Spanish Armada* appeared in 1856, and the work was completed in 1870 Froude held that the office of the historian was simply to record human actions and that history should be written as a drama Accordingly he gives prominence to the personal element in history His work is often marred by prejudice and incorrect statements The keynote of his *History* is contained in his assertion that the Reformation was "the root and source of the expansive force which has spread the Anglo-Saxon race over the globe." Hence he overpraises Henry VIII and others who forwarded the movement, and speaks too harshly of some of its opponents. A strong anti-clerical prejudice is manifest in his historical work generally, and is doubtless the result of the change in his views on church matters and his abandonment of the clerical profession Carlyle's influence on him may be traced both in his admiration for strong rulers and strong government, which led him to write as though tyranny and brutality were excusable, and in his independent treatment of character His rehabilitation of Henry VIII was a useful corrective, but his representation of him as the minister of his people's will is founded on the false theory that the preambles of the acts of Henry's parliaments represented the opinions of the educated laymen of England. He was not a judge of evidence, and seems to have been unwilling to admit the force of any argument or the authority of any statement which militated against his case. He worked diligently at original manuscript authorities at Simancas, the Record Office and Hatfield House; but he used his materials carelessly, and evidently brought to his investigation of them a mind already made up as to their significance He was constitutionally inaccurate, and seems to have been unable to represent the exact sense of a document which lay before him, or even to copy from it correctly.

Few more brilliant pieces of historical writing exist than Froude's description of the coronation procession of Anne Boleyn through the streets of London, few more full of picturesque power than that in which he relates how the spire of St. Paul's was struck by lightning; and to have once read is to remember for ever the touching and stately words in which he compares the monks of the London Charterhouse preparing for death to the Spartans at Thermopylae Proofs of his power in the sustained narration of stirring events are abundant; his treatment of the Pilgrimage of Grace, of the sea fight at St. Helena and the repulse of the French invasion, and of the murder of Rizzio, are among the most conspicuous examples of it Nor is he less successful when recording pathetic events, for his stories of certain martyrdoms, and of the execution of Mary queen of Scots, are told with exquisite feeling and in language of well-restrained emotion. And his characters are alive We may not always agree with his portraiture, but the men and women whom he saw exist for us instinct with the life with which he endows them and animated by the motives which he attributes to them. His successes must be set against his failures. At least he wrote a great history, one which can never be disregarded by future writers on his period, be their opinions what they may; which attracts and delights a multitude of readers, and is a splendid example of literary form and grace in historical composition.

On the death of his adversary Freeman in 1892, Froude was appointed to succeed him as regius professor of modern history at Oxford. His lectures on Erasmus and other 16th-century subjects were largely attended. He died on Oct 20, 1894. His long life had been full of literary work For 14 years he was editor of *Fraser's Magazine.* He was one of Carlyle's literary executors, and brought some sharp criticism upon himself by publishing Carlyle's *Reminiscences* and the *Memorials of Jane Welsh Carlyle,* for they exhibited the domestic life and character of his old friend in an unpleasant light Carlyle had given the manuscripts to him, telling him that he might publish them if he thought it well to do so, and at the close of his life agreed to their publication. He also wrote *Thomas Carlyle: a History of the First Forty Years of His Life* (1882) and *Thomas Carlyle, a History of His Life in London* (1884); *Short Studies on Great Subjects* (1867–82); and an historical novel, *The Two Chiefs of Dunboy* (1889). He was twice married. His first wife, a daughter of Pascoe Grenfell and sister of Mrs Charles Kingsley, died in 1860, his second, a daughter of John Warre, M P for Taunton, died in 1874

See H. Paul, *Life of J. A. Froude* (1905).

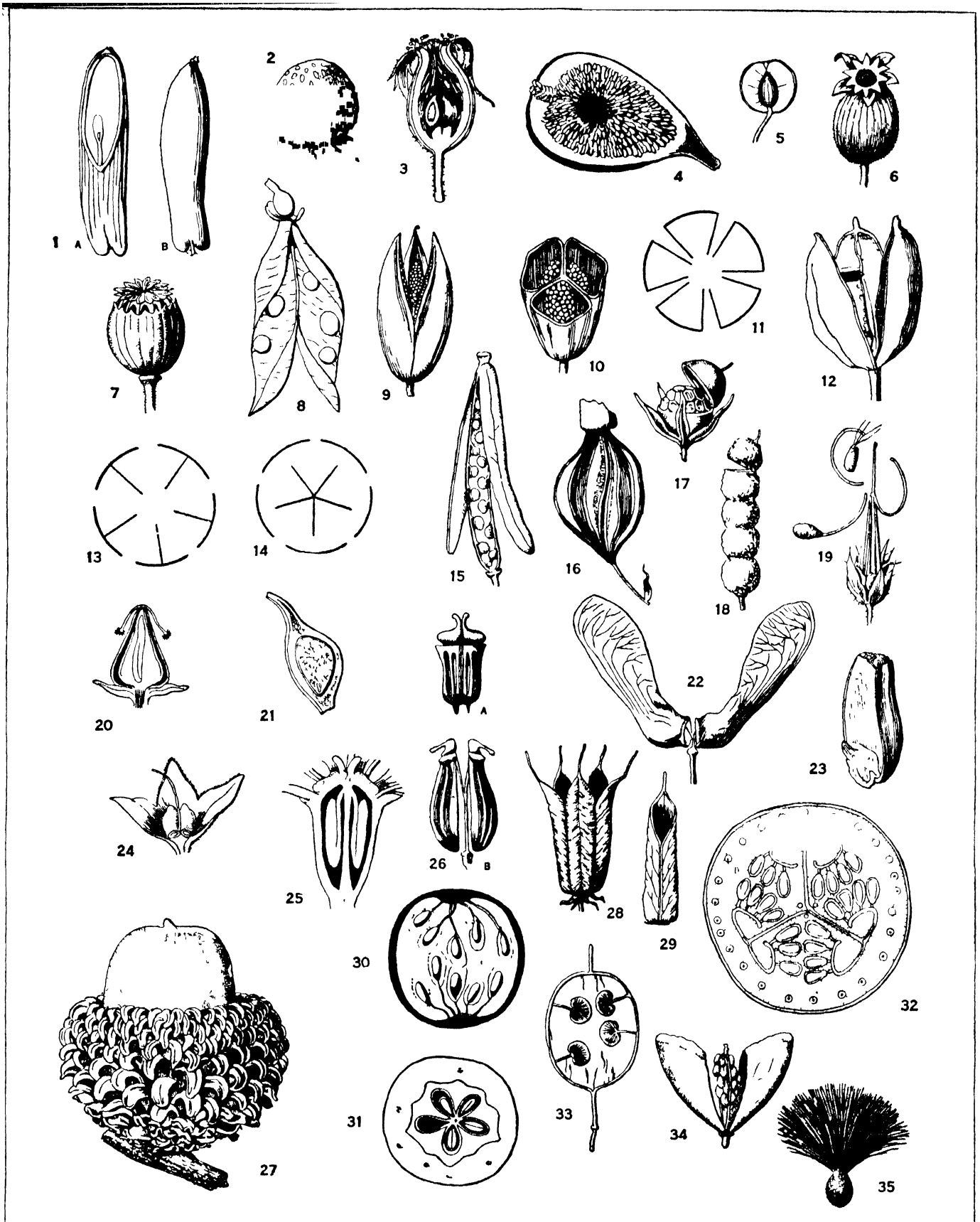
FROZEN CREDIT, credit (generally bank loans) which has been extended but which the creditors find it impossible or highly inexpedient to collect at maturity or at any given time Banks may make loans to corporations which are apparently in good financial condition and yet which, upon the maturity of the loan, are, temporarily at least, unable to liquidate To enforce payment might result in financial embarrassment or bankruptcy of the borrowing firm, which with an extension of the loan might continue successfully. In such a case the bank will often renew or extend the loan, and this credit is said to be *frozen,* a term signifying the opposite of "liquid" as applied to credit, capital or assets.

FROZEN DISHES: *see* ICE CREAM.

FROZEN MEAT: *see* MEAT.

FRUCTOSE, occurs mixed with glucose (*q v*) in fruit juices, and is combined with glucose as sucrose (cane sugar). It has the same molecular formula as glucose, $C_6H_{12}O_6$, and is a ketose (ketone-alcohol) of the hexose class It is also known as fruit-sugar or laevulose, the latter name arising from the fact that solutions of the sugar are laevorotatory, *i e*, rotate the plane of polarization of light to the left. It is sometimes prescribed for diabetics in place of sucrose. (*See* CARBOHYDRATES)

FRUGONI, CARLO INNOCENZIO MARIA (1692–1768), Italian poet, was born at Genoa on Nov. 21, 1692 He took Monastic vows at an early age. From 1716 to 1724 he filled the chairs of rhetoric at Brescia, Rome, Genoa, Bologna and Modena successively. Through Cardinal Bentivoglio he was recommended to Antonio Farnese, duke of Parma, who appointed him his poet laureate; and he remained at the court of Parma until the death of Antonio, after which he returned to Genoa Through the intercession of Bentivoglio, he obtained from the pope the remission of his monastic vows. After the peace of Aix-la-Chapelle he returned to the court of Parma, and devoted his later years to poetry. He died on Dec. 20, 1768. Frugoni was one of the best of the school of the Arcadian Academy, and his lyrics and pastorals had great facility and elegance.



1. Section and whole fruit of ash, 2 Strawberry, 3 Fruit of Rose, 4. Fig Peduncle, 5 Cherry, 6 Seed-vessel of Campion, 7. Poppy capsule, 8. Pea pod, 9 Meadow Saffron Capsule, 10. Meadow Saffron fruit, 11 Diagram of pentalocular capsule, 12. Flower-de-Luce capsule, 13. Diagram showing loculicidal dehiscence, 14 Diagram showing septifragal dehiscence, 15 Seed-vessel of Wall-flower, 16 Orchid capsule, 17. Seed-vessel of Anagallisarvensis, 18. Lomentum of Hedysarum, 19 Geranium fruit, 20. Dry one-seeded Dock fruit, 21. Achene of Ranunculus arvensis, 22. Common Sycamore fruit, 23 Section of wheat-grain, 24 Comfrey fruit, 25. Ovary of Foeniculum officinale, 26a Carum Carui fruit, 27 Querous Aegilops, 28 Columbine fruit, 29. Single follicle, 30 Section of Gooseberry, 31 Section of Apple, 32 Section of Melon, 33 Honesty, 34. Silicula of Shepherd's purse, 35 Asclepias seed

Editions of his collected works appeared at Parma (10 vols, 1799) and at Lucca (15 vols, 1799), a selection at Brescia (4 vols., 1782). *See* Calcaterra, *Storia della poesia frugoniana* (1920), and A Equini, *C. I Frugoni alle corti dei Farnesi et dei Borboni di Parma* (2 vols., Milan, 1919–20).

FRUIT, in its popular sense is any product of the soil that can be enjoyed by man or animals, in the Bible the word is often extended to include the offspring of man and of animals, *e g*, in such expressions as "the fruit of the womb," "fruit of thy cattle" (Deut xxvii 4) More often it is employed to denote a group of edible parts of plants, as contrasted with another group termed "vegetable" But the term is a loose one, including, *e.g*, the stalks of the rhubarb

In its strict botanical sense the fruit is developed from the flower as a result of fertilization of the ovule This phenomenon induces various changes, the anther and stigma wither, the petals drop off and the sepals may be shed or undergo modifications, the ovary enlarges to form the *pericarp* and the ovules develop into the seeds, containing the embryo-plant The term fruit is strictly applied only to the mature pistil or ovary, but it often includes other parts of the flower Normally no fruit is produced unless fertilization is effected, but in certain plants, mostly cultivated varieties, this is not the case (*e g*, the seedless oranges and grapes, the banana and the bread-fruit)

Functions of Fruit.—The fruit protects the growing and aids in distributing the mature seeds This latter function is very important and numerous devices secure a wide and effective dispersal These may be classified according to the agents employed as animate and inanimate To the second group belong also those methods by which the plant itself propels the seed forcibly from the fruit Some plants employ a combination of the two Thus in the gorse the seeds are shot out by the splitting and curling of the pod in which they are contained, and they must then be buried by ants in order to germinate Violent dehiscence occurs in many plants (fig 28) In the squirting cucumber the walls of the pericarp exert pressure on the pulpy contents in which the seeds are placed In the balsam (*Impatiens*) also the seeds are actively expelled Other inanimate agents are water and wind Fruits or seeds are sometimes sufficiently buoyant to float for a long time in water Thus the coconut may be carried hundreds of miles in the sea, the fruits and seeds of West Indian plants are sometimes thrown up by the Gulf Stream on the coasts of Europe and will often germinate, in the water lily and many other aquatic plants, the seeds float for a time before sinking to the bottom In many cases the wind plays a part in distribution In the poppy and many Caryophyllaceae (figs 6, 7) there is a capsule opening by pores borne on a long stalk which sways in the wind, thus jerking out the seeds In the pine, sycamore (fig 22), ash (fig 1) and many others, there is a wing-like development, in numerous Compositae the fruit is crowned by a plumose pappus (*e g*, dandelion, thistle); in the clematis, the style becomes feathery, while the seeds of the willow and poplar bear tufts of silky hairs The fruit of the bladder-senna (*Colutea*) is easily rolled by the wind, while in the Rose of Jericho (*Anastatica hierochuntina*), the whole plant dries up after developing its fruits and forms a mass, easily rolled over the dry ground by the wind

Birds and mammals are also utilized as dispersal agents by plants The mistletoe develops a sticky layer round the seeds which stick to the bill of the bird that eats the berries, these may be wiped off on the bark of trees, thus transporting the embryo to a new host More commonly, the fruit develops hooks which become entangled in the fur or feathers Such are the fruits of cleavers (*Galium aparine*), *Ranunculus arvensis* (fig 21), etc Another method is to provide the seed with a hard covering, while surrounding this with a succulent and often brightly coloured integument, thus the seed can pass through the alimentary tract of an animal without injury, *e g.*, plum, cherry (fig 5); or providing the true fruit with stiff hairs, which cling to the beak of the bird which eats the fleshy receptacle, *e g*, rose (fig. 3).

Classification and Structure.—Fruits may be divided into two groups. "A" consists of true fruits, developed from the ovary alone. Of these (1) consists of those in which the surrounding *pericarp*, round the seed, is not fleshy or fibrous. These again may be subdivided, (i) Indehiscent fruits, not opening to allow the escape of the seeds Such are generally one-seeded The *achene* has the pericarp closely applied to the seeds, though separable from it Achenes are borne singly in the dock; aggregated together in the buttercup (fig 21), on a fleshy receptacle, which may be convex as in the strawberry (fig 2) or concave, as in the rose (fig 3) Thus what is popularly called the fruit of these last three is really the swollen receptacle with the carpels In *Clematis* the style, and many *Compositae* (in which the fruit is often called a *cypsela*) the modified calyx remains adherent to the fruit. A *caryopsis* differs from an achene in that the pericarp and seed become fused, wheat and grasses generally show this type of fruit. A *nut* possesses a hardened pericarp, often surrounded by bracts at the base, and containing, when mature, a single seed. Examples are the hazelnut and the acorn (fig 27). Achenes, in which the pericarp is extended to form a winged appendage, as in the ash (fig 1) and sycamore (fig 22) are often called *samaras* Those fruits which break into two or more one-seeded, indehiscent portions (*mericarps*) are termed *schizocarps* Examples are found in the Geraniaceae, in which the mericarps separate from below upwards, in the Euphorbiaceae, etc (ii) Dehiscent fruits, in which the pericarp splits to allow the escape of the seeds They are generally many-seeded When such a fruit dehisces by the ventral or, occasionally (*Magnolia*) by the dorsal, suture, it is called a *follicle* There are usually several aggregated together, *e g*, columbine (figs 28, 29) A *legume* or *pod* differs in dehiscing by both sutures This is characteristic of leguminous plants, such as the pea (fig 8) In *Arachis* the fruit does not dehisce, being produced under-ground *Hedysarum* and others have a pod that separates transversely into single-seeded mericarps (fig 18), such a structure is called a *lomentum* and must be looked upon as a modified legume which no longer dehisces In *Erythrina monosperma* there is only one seed In the Cruciferae (wallflower, cabbage, shepherd's purse), the characteristic fruit is a *siliqua* (fig 34), which is long and narrow, or short and broad, *silicula* In both of these there are two carpels, dehiscing by two valves from below upwards, the valves separating from the placentas and leaving them united by a false septum As in the legume, single-seeded and lomentaceous modifications are found It is a development of the type of fruit known as a *capsule*, which is exhibited by the iris (fig 12) Capsules which open by pores (*porose*) are seen in the poppy (fig 7) and *Campanula* A *pyxidium* is a capsule opening by a lid, as in the pimpernel (fig 17) Another type of capsule is exhibited by the Geraniaceae (fig 19) (2) Fruits in which the pericarp is differentiated into distinct layers, one of which is succulent or fibrous To this group belong many of the edible fruits In the *drupe*, as shown by the cherry (fig 5), plum, etc, the endocarp is usually hard and the mesocarp pulpy and succulent, though in the almond it is tough and in the coconut fibrous. In the raspberry and bramble several small drupes are aggregated into an *etaerio* The *berry* includes various types of fruit, all characterized by the fact that the seeds are immersed in pulp. To this group belong the barberry, gooseberry (fig 30), currant and pomegranate

"B"—Fruits which include parts other than the ovary These are called *pseudocarps* or false fruits The fleshy, indehiscent *pome* of the apple (fig 31), hawthorn, etc., incorporates the receptacle, which becomes much swollen The true fruit is the core. Superficially the pome resembles the "hip" of the rose. The fruits of the pineapple (*sorosis*) and fig (fig 4) are compound pseudocarps, *i e*, are formed from a number of flowers. In the pineapple, the fruit called a *sorus* is formed by the coalescence of a spike of flowers, as is also the case in the mulberry. In the fig, the whole inflorescence is a hollow structure bearing male and female flowers in the cavity, each female flower forms a single true fruit (*See* ANGIOSPERMS; FLOWER; SEED.)

FRUIT-BAT: *see* FLYING FOX, CHIROPTERA.

FRUIT COOKERY. Though certain fruits, *e g.*, bread-fruit, dates, figs, form the staple food of various tropical peoples, fruits are used by nations in the temperate zones mainly as an

agreeable means of introducing liquid into the system: for their mixture of salts and vegetable acids, *e g*, tartaric, malic, citric; for their slight laxative properties, as an anti-scorbutic and as a valuable medium for supplying the body with vitamins Fruits can be classified as small fruits, including currants, raspberries, blackberries, strawberries, etc ; apricots, plums, cherries, etc , citrus fruits, *i e*, oranges, tangerines, lemons, grapefruit, etc , orchard fruits, apples, pears, etc ; vine (grapes); and a few fruits which do not come into any of these categories, as for instance, pineapple, avocado, olive, etc Fresh fruit is used as a first course and as dessert, and for fruitades

Methods of Cooking.—There are innumerable ways of serving fruit, and owing to the great variety of fruits at the disposal of mankind it is possible to employ every known method of cookery in preparing fruit dishes (*see* PRESERVING AND BOTTLING; CONFECTIONERY; PASTRY)

Stewed Fruit —A great number of fruits can be cooked by stewing either by a waterless method or with the addition of a little water and sugar By the waterless method the fruit is placed in a stone jar (with or without sugar according to taste) in a pan of boiling water In this way, all the juices of the fruit are conserved without loss of flavour Where water is added this should be as little as possible with due consideration for the amount of water (generally about 80%) already contained in the fruit If desired to keep the fruit whole it is wiser to boil the sugar and water before adding the fruit All fruit should be stewed slowly Over-heating causes the pectin in fruit to jelly Dried fruits should be soaked before stewing in order to restore the water

Baked Fruits —Apples may be cored, filled with sugar and cooked in a baking dish A compote of fruit is baked fruit to which is added a sugar syrup

Fried Fruit —A number of fruits may be dipped in batter and fried in deep fat and served as fritters In this case, the fruit, if large, is cut into suitable portions, or if small, is left whole in a sugar syrup for a short time before frying Certain fruits may be sliced and pan-fried as a vegetable

Fruit Salads —These may be sweet or savoury and are made by mixing different fruits together with certain flavourings, *e g*, liqueurs, essences, oil, vinegar, etc , to form a salad When raw fruits are used they are usually soaked in a marinade of their own juices and the flavourings for some time before dishing

Fruit Moulds —When hot stewed fruit is thickened with a liaison of corn-flour, tapioca, sago, etc , or when mixed with jelly powders, gelatin, agar agar, etc , it can be turned out into a wet mould and allowed to cool and served as a blancmange Dried fruits may be thickened with starch liaisons but it is best to use gelatin or jelly for setting soft small fruits, as this does not spoil the colour of the fruit

Fruit Ices —These differ from ice-creams in that they possess no cream or custard foundation and are made with a fruit syrup which may, in some cases, be thickened with gelatin to give a smooth appearance (J A SI)

FRUIT FARMING. With the larger consumption of fruit and the higher prices paid for it, fruit farming is developing in all parts of the world, the principal fruits eaten being apples, oranges and bananas, though every kind of fruit is consumed in some quantity As an instance of the increased consumption, the annual consumption of apples per head for the quinquennium ending 1904 in Great Britain was 14·4 lb., and rose to 22 8 lb in 1924 Of oranges the consumption per head per annum for the quinquennium ending 1904 was 14 7 lb and 18·1 lb in 1924 This consumption of oranges is about the same as that of the United States, though the American consumption of apples per head of population is estimated to be double that of Great Britain

The British consumption of bananas per head was estimated at 30 in 1924; though not a large figure, it represents a great increase since 1900 For other fruits it has been estimated as. pears 2 lb., plums 3 lb., cherries 1 lb , currants 1 lb., strawberries 2 lb., gooseberries 1·7 lb Much of this fruit is produced in England, though a much larger quantity is imported, and in consequence the British market is of great importance to every fruit-exporting country.

In 1924 the net imports of fruits into the United Kingdom was valued in the customs returns at £44,800,000 This is more than three times as much as the average annual value of imported fruit during the quinquennium ending 1913 Comparing the expenditure per head, for the quinquennium 1909–13, it was 6s 6d and £1 per head in 1924, much less money being spent in home produced fruits; while according to the report of the agricultural output of England and Wales for 1925, the estimated value of the fresh fruit sold off the farms over one acre in size was £9,420,000, or less than a quarter of the value of the fruits imported

FRUIT PRODUCTION IN GREAT BRITAIN

The climate of England permits of outdoor culture of but a portion of the fruits eaten, these being known as the hardy fruits The following table gives in detail the output of fruits from holdings over one acre in size in England and Wales for 1925, the year when the last census of production was made —

	Gross production in cwt.	Estimated value
Orchard Fruits		£
Apples	6,520,000	3,750,000
Pears	82,000	80,000
Cherries	340,000	1,130,000
Plums	801,000	1,180,000
Nuts and other kinds		170,000
Small Fruits		
Strawberries	705,000	1,410,000
Raspberries	145,000	450,000
Black currants	188,000	660,000
Red and white currants	66,000	100,000
Gooseberries	590,000	550,000

The apple crop is therefore by far the most valuable, next come plums, followed closely by strawberries and gooseberries

The climate is a handicap to the production of fruit on a commercial scale in Scotland Nevertheless, there is an important fruit industry at Blairgowrie, Perthshire, where the largest raspberry area in the United Kingdom exists There is also a strawberry industry in the Clyde valley

Special Fruit Areas.—Most of the fruit of England is the output of a comparatively few districts where growers have specialized on fruit production Orchard fruits and small fruits are produced in most counties of England, but experience has shown that crops of a satisfactory size and quality are only secured in certain areas where the soil and climatic conditions are favourable, and where growers have a knowledge of the technique of fruit growing In fact, there is a tendency against widening the areas over which fruit is produced in favour of securing a relatively more intense production in the few selected centres. (*See* subsequent section. *Fruit Plantations*) No doubt, the oldest fruit area lies in the south-west of England, in Devon, Somerset, Gloucestershire and Hereford, where orchard fruit has been grown since Norman times In these counties each farm has its orchard of apple trees, the numbers of which by the terms of the lease have to be kept constant The orchard is laid down to grass, and often provides grazing for pigs, calves, ewes and lambs Formerly grass orcharding was used for the production of cider fruits only, but in recent years both cider and market varieties of fruit have been cultivated Some of the commercial fruit plantations of market varieties have also been laid down to grass, so that grass orcharding must now be regarded as one of the recognized systems of English fruit production The method, though found suitable for apples, damsons, plums and cherries, cannot be used with success either for bush fruits or for the best dessert pears and plums

ORCHARD FRUITS

Apples in Grass Orchards.—The grass certainly affects the growth of the trees, and where new fields are being planted the soil should be kept cultivated until the trees are from eight to ten years old before grass seeds are sown Where planting is done directly in a grass orchard the turf soil surrounding the young

tree should be kept clear for three or four years, after which the trees may be left to take care of themselves. The trees, propagated as standard on vigorous stock, are planted in rows 40 ft. apart so as to allow plenty of room for development and for sheep to graze under the branches Young trees need staking and to be protected from damage by cattle, sheep and rabbits

With this method of growing fruit the cost of production is low, and the grass crop provides a certain return Apples from grass orchards are usually well coloured, of firm flesh and keep well in storage On the other hand, the crop generally is very uneven, with a high proportion of small and blemished specimens Varieties of apples, such as Worcester Pearmain, Blenheim Orange, Bramley Seedling, Newton Wonder and Anne Elizabeth, are the best for growing in grass orchards The apple trees in grass orchards are prone to biennial cropping, and the yield varies widely from year to year, averaging four to six tons to the acre

Plums and Cherries in Grass Orchards.—The real dessert plums are seldom grown in grass orchards, but the method is very popular for the production of the damson, the Aylesbury prune and some of the common jam plums

Cherry growing in grass orchards seems to have been practised from early times, not only in England, but throughout France, Switzerland, Italy and Western Europe

It is estimated that in England there are approximately 741,000 cherry trees, mostly grown in grass orchards, of which no less than 456,000 are in Kent This county has been the home of the cherry industry for more than two centuries and the Kentish farmers take pride in the management of the well-grazed orchards Cherries prefer light, well drained land, such as the brick earths and the light loams overlying the chalk Not more than 60 to 70 trees are planted to the acre, for when fully grown a tree is of great size, capable of yielding over a ton of cherries in a season These cherry orchards are stocked heavily with sheep, sometimes 12 or 15 to the acre, so that the sheep could not secure a living from the grass alone and much additional food, such as cake, turnips and hay must be used This close grazing and its consequent heavy natural manuring seems to be productive of the best fruit bearing trees and of the largest cherries. This Kentish method is accepted as the best method and copied elsewhere

The varieties of cherries mostly grown in grass orchards are the sweet cherries, Early Rivers (black), Governor Wood (yellow), Knights Early (black), Black Tartarian, Elton (yellow), Waterloo (black) and Napoleon Bigarreau (yellow) When the last census was taken in 1925 the yield of cherries was estimated at 349,000 cwt, or an average yield per tree of nearly 53 lb

Fruit Plantations.—Distinct from grass orcharding, there has been established in England within the past 60 years a definite fruit growing industry concentrated entirely on fruit growing and having little or nothing to do with other kinds of farming The holdings, often owned or rented on special terms, are planted thickly with fruit and the soil is kept cultivated as in a garden. At times these fruit plantations contain wholly apple trees, with vigorous trees and dwarf growing bushes so ingeniously interplanted that the land may carry 200 or in extreme cases 400 trees and bushes to the acre Notably in Worcestershire plantations of plums exist, and in a few other places plantations of pears may be found. The more generally favoured practice, however, is to cultivate what is termed a mixed plantation where apples, plums and even gooseberries, red currants and raspberry canes all find a place. These mixed plantations produce most of the market fruits of Great Britain; they are unique, for though copies of the English system may be seen in France, Belgium and the Netherlands, the system is not typical of the fruit plantations of any other country

Mixed plantations suggested by the British Ministry of Agriculture are:—

1 *Mixed Standard Plantation*—Bramley Seedling and Lord Derby apples, 40 ft square, with bush Czar plums interplanted at 20 ft apart. The intermediate land planted either with Stirling Castle or Lane Prince Albert apples at 10 ft. square or with soft fruits, gooseberries or red currants at 5 ft.

2 *Bush Apple Plantation.*—Worcester Pearmain (dwarfing stock) and Allington Pippin (dwarfing stock) 18 ft. square, interplanted with soft fruits of 6 ft. square.

3. *Bush Plums.*—Victoria and Czar at 14 ft. square, interplanted with soft fruits at 7 ft. square.

4. *Bush Pears.*—Conference (quince), Durondeau (quince) at 12 ft square, interplanted with soft fruits at 6 ft. square.

These mixed plantations are concentrated in special areas when soil conditions are favourable, such as the sandy loams of Kent, the brick earths of Middlesex, the alluvial deposits of the Isle of Ely, Lincolnshire and Norfolk, and the loams and old red sandstone of Worcestershire and Herefordshire.

The Kentish fruit area now extends eastwards from Bexley and Farnborough through Maidstone, Sittingbourne and Canterbury to Sandwich, running down southwards to Tunbridge Wells and to Rye in Sussex In this region where the soils and aspect are favourable these mixed plantations are to be found, some growers having as much as 50 acres of fruit. London is the principal market, though large quantities are sent to the midland and northern markets

Middlesex still produces large quantities of apples, pears and plums, but fruit growing has waned in favour of vegetable growing, which is now the more important industry In the eastern counties there has been built up within the present generation a fruit industry which has become one of the largest in Great Britain The plantations, though mainly planted on the alluvial deposits around the Wash, stretch outwards through the Isle of Ely into the counties of Cambridge, Huntingdon, Norfolk and northwards to Spalding in the Holland division of Lincolnshire.

The Worcestershire and Herefordshire areas are spoken of as the West Midland area Starting on the small holdings in the Vale of Evesham, the fruit planting has progressed rapidly and now extends from Birmingham almost to Bristol and westwards into Hereford The holdings, which range from small statutory cottage holdings, are densely planted with fruit trees and interplanted thickly with either bush fruits or vegetables Practically all kinds of fruit are produced, but mainly plums This area is favourably situated to supply the markets of South Wales and the industrial towns of the Midlands.

In the valley of the River Tamar in Cornwall and Devon there is a fruit area of small size but important for early fruits. From here come the early strawberries, gooseberries, currants, plums and raspberries, that ripen a week or ten days before the other districts

Pear Production.—The prevailing climate of the United Kingdom is scarcely warm or dry enough for pear growing, yet in sheltered spots much can be done Trees are propagated as standard and half standard on the pear stock and as bushes on the quince stock The most productive varieties under English conditions are the Hessle, Chalk and Lammas, but these are of indifferent quality Varieties such as Fertility, Conference, Durondeau, Marguerite Marillat, Clapps Favourite, Dr Jules Guyot are some of the more suitable for English markets and are now being planted The home production in 1925 from 1,976,460 trees amounted to 83,000 cwt., which is approximately 12% of the demand

Plums.—The great plum area lies in the West Midlands, where there is an intense production, mainly of the Yellow Pershore Egg in Worcestershire and of the Blaisden Red in Gloucestershire. In other areas the chief varieties are Czar (an early dark culinary plum), the Victoria (a large red plum), and Monarch (a late round purple) The English season extends from August till the end of September

Before the English crop is ready importations have commenced from Spain, France and Belgium and of these the gages are the best known These delicious fruits arrive during and throughout June, July and August.

SMALL FRUITS

Black Currants.—Black currants are not suited for growing under the shade of top fruits and are not found often in the mixed plantations. They grow best in open field culture, in soil of light texture, farmed highly. The bushes are planted in rows 6 to 8 ft.

apart. Black currant growing has become a special industry on the sandy soils of East Norfolk. Kent, Worcestershire and Herefordshire are also important centres of production. Varieties such as Biskoop Giant (the earliest), Seabrooks Black, and Goliath (mid-season) and Baldwin (late) are the main sorts grown Septembers Black and Davidsons Eight are promising new introductions.

The black currant bushes have suffered much in the past from diseases such as Big Bud and Reversion, but in recent years scientific workers have shown that these may be controlled with spring spraying of lime-sulphur Since these sprayings have been made crops have improved and acreages have extended. The average yield in 1908 fell to the low figure of 9 cwt. per acre, since when it has risen steadily until by 1925 it had reached 16 cwt per acre. In 1927 the Ministry of Agriculture commenced a scheme whereby young bushes were inspected during the growing season and certificates issued in respect of well-grown bushes true to variety and free from reversion. A register of growers having these certificates was issued to facilitate growers in securing healthy bushes, for that seems to be of paramount importance. The planting of bushes propagated from reverted parents has been shown to be disastrous, for the planter has little or no chance of securing a crop The total production in England and Wales rose from 51,000 cwt in 1908 to 188,000 cwt in 1925; but even that quantity is insufficient, so that about one-third has to be imported

The Strawberry.—The strawberry crop is essentially a crop for open field culture, and especially for production on suitable soils About 90% of the consumption is produced at home, the mild, temperate and humid climate of Great Britain being favourable to strawberry production and berries of Royal Sovereign, the Duke and Joseph Paxton are of a size and quality not reached in other lands In 1925 strawberries in England and Wales covered 29,300 ac., having risen from 21,672 ac. in 1913

The Hampshire area, centred at Botley, Fareham and Swanwick, is perhaps the most famous, for here there are over 3,000 ac planted in close concentration. The holdings vary from one to five acres, though a few growers have large farms The soil is of a sandy character of easy cultivation, but rather poor and requiring liberal fertilization with stable dung, bone meal and dried blood to yield good crops. The early maturing Royal Sovereign predominates, and few are left for jam purposes The berries are picked by gangs of pickers into chip baskets, holding at first 1 lb. and 2 lb and later in the season 3 lb. and 4 lb respectively. From the various stations within this area approximately 2¾ million chip baskets are sent to markets all over England and Wales and as far north as Dundee and Aberdeen.

In Kent the area is now less concentrated, but it has an important production; the Kent soil is heavier and more retentive of moisture and larger yields per acre are obtained On the fertile soils in the Wisbech area, between King's Lynn, March and Spalding, the average to strawberries is nearly four times that of the Hampshire area. The crop here is later and the growers, missing to some extent the consumers' early market, concentrate on big yields, a large proportion of which goes for making jam In addition to the Royal Sovereign, the heavy cropping Sir Joseph Paxton, Madame Kooi, and the Laxton are grown Yields are larger than in Hampshire and growers have been known to pick over two tons to the acre.

In all areas the strawberry plants have suffered from pests and diseases, such as eelworm, red plant and patch. At the request of growers the Ministry of Agriculture caused research investigations to be instituted at the horticultural research station at Long Aston, and in addition a strawberry experimental station has been established at Botley by the Hampshire county council. The ministry also initiated a scheme of certificates similar to that for black currant growers.

Storage, Grading, Packing and Marketing.—Soft fruits, such as strawberries, currants, gooseberries, raspberries, cherries and plums, are in the main marketed directly they are picked without grading, for there seems a general belief that such fruits will not stand further handling and cannot therefore be graded. Where grading is attempted for strawberries it is usually done by the picker. Some have graded both cherries and plums with success In these cases the corps are taken to the packing sheds and graded by hand into three grades, the best cherries being packed in one-pound cartons covered with celapane paper and marketed in crates holding eight cartons. The best grade plums have been packed in chip baskets of four pounds and marketed in crates holding four baskets.

French growers specially grade their plums for the English market, and pack into small neat wooden boxes, sometimes separating each plum with white paper South African plums for the English market are well packed so that each plum rests in its own nest of wood wool in flat boxes, being sold by the dozen and not by the pound.

Such well graded produce is doing much to create an impression in favour of grading, all the hardy fruits unless graded and packed in a recognized market package fetching low prices Quicker work is made by using machinery to group certain fruits according to size, after they have been sorted into different grades by hand and the cull fruits removed. Some fruit growers have established their own grading rooms, but a beginning, too, has been made in establishing public fruit packing stations on lines comparable, though smaller, to those found in the fruit districts of the United States The first public company was incorporated in 1924 as British Fruit Packing Co., with a packing house at East Peckham, Kent. This company undertook to provide boxes and paper, to grade, pack and sell at a fixed charge all fruit delivered to the station. The grower was relieved of the labour of grading and packing and of the task of selling; he shared the goodwill attaching to the company's label and had the fruit dealt with by skilled people In 1925 the company handled 60,000 bushels of apples In 1926 the business was transferred to East Farleigh (Kent) and a branch opened at Faversham (Kent)

The fruit growers of Cottenham (Cambridge) combined and opened a packing station in 1925; similarly equipped with grading and packing machinery, mostly imported from the United States. The business was conducted on co-operative lines and in consequence the society has enjoyed a loan from the Ministry of Agriculture for the purchase of the machinery. During the year 1925 over 10,000 bushels were handled The failure of the apple crop in Cambridge in 1926 and 1927 prevented the station from reopening Nevertheless, these and other British packing stations are too few in number to handle the apple and pear crops, to say nothing of the other fruits.

CANADA

The Canadian fruit areas of importance are three (*a*) Nova Scotia, (*b*) Ontario and (*c*) British Columbia The Nova Scotia area is the oldest; the British Columbia area the youngest; that of Ontario by far the most important.

Fruit Growing in Nova Scotia.—The fruit growing industry, mainly apples, of Nova Scotia is concentrated in the narrow Annapolis valley which runs almost down to the Bay of Fundy. The soil is rich, light and of an alluvial nature; the rainfall is heavy and the district well drained by four rivers. The climate is cold, with snow in winter; the summers are moderately hot with bright sunshine

There is great similarity in the plan of the orchards, half-standards being planted widely in rows fully 40 ft. apart. Some orchards are 80 to 100 years old, though the majority would be from 20 to 30 years and a few are quite young Grass orchards are not favoured, and all but the backward growers keep the land well cultivated with disc harrows from spring until July 1, when seed of clover, vetches, rape, millet or buckwheat is sown to produce a green crop for ploughing in to provide soil humus.

The district is by no means free of pests, and in old neglected trees scab, and scabby blotch, the codling moth, brown tail moth and aphis can be found. It is said that most growers spray three or four times and the best five or six—using lime-sulphur, Bordeaux mixture, arsenate of lime and nicotine.

The fruit after picking is taken into the packing stations, where it is graded into Grade 1, Grade 2, Domestic and Grade 3, after which it is packed into wooden barrels each holding 120 lb The

larger growers of from 70–100 ac. have their own packing houses, but the majority adopt a co-operative method of packing and selling and for that purpose have formed a number of societies or companies each of which owns one or more packing houses. Throughout the Annapolis valley there must be over 100 of these packing houses.

Forty of the fruit packing companies have carried co-operation a stage further by combining to form a central trading organization registered as the United Fruit companies of Nova Scotia. This company acts as a selling agency for all its subsidiary companies and has sales which exceed 400,000 barrels of apples annually. The total production of apples is estimated at 1,400,000 barrels, of which at least two-thirds is annually exported to Great Britain. The chief varieties grown are the Baldwin, Blenheim, Gravenstein (early), Golden Russet, Kings and Ribston Cherries, strawberries, pears are also grown in smaller quantities

Fruit Growing in Ontario.—The province of Ontario produces 60% of the apples, 69% of the plums, 84% of the pears, 92% of the peaches, and 98% of the grapes of the Dominion of Canada The apples are produced over an area stretching from Lake Ontario in the west to Lake Huron in the east, and from Lake Erie in the south to Georgian bay in the north The other fruit crops and some apples are concentrated into a narrow strip of land between Hamilton and Niagara and lying between the Western hills and Lake Ontario This Niagara area is regarded as the garden of Canada.

The soil is silty, though varying considerably in texture, so that patches of very light, medium and heavy soils occur frequently and each is cropped in a special way Orchards of peach trees abound on the light soils, pears, plums and apples on the medium, whilst grapes and currants are found on the heavy Fields of strawberries and raspberries are common The Niagara district lying well south has a climate coming under the moderating influence of the Great Lakes, so that the day and night temperatures are more even and spring frosts are very rare. All these factors combined are said to give high flavour and piquancy to Ontario grown fruit and to render safe the production of good annual crops

The apple trees in the orchards follow the English system, but in culture, cover cropping, manuring with artificials, and spraying to control pests the methods are akin to those practised in Nova Scotia The grading of the fruit is done in the orchards mostly by hand, for few have yet adopted the packing house system so commonly seen elsewhere. The fruit districts are in close proximity to populous districts and much is sold for local consumption, leaving but little for export.

Fruit Production in British Columbia.—The bulk of the fruit crop of British Columbia is grown in the Oakanagan valley The valley is situated in the Rockies over 1,000 ft above sea-level and has a large lake of deep, cold, blue water running down the centre for 80 to 90 miles Towering immediately above the lake in the east are the rugged mountains of the Gold Range, and on the west those of the Coast Range In past ages the mountain slopes have been subjected to glacial action, and the soil brought down the mountain sides has been deposited as bench on the slopes immediately above the lake. It is on these benches, both flat and hilly, that the fruit, primarily apples, with a few pears, plums, cherries and prunes, is grown Normally the benches look like heaps of dry dust, and produce nothing but bunch grass, but when artificially irrigated large crops of fruit of the finest appearance can be produced. Every bit of land capable of irrigation has been planted to fruit, so that the fruit area is very compact and very similar from the top end of the lake to the bottom. The district is very cold in winter and hot, dry and sunny during the summer. Little summer rain falls, so that the trees would stand little chance if the melting snow water had not been harnessed in its downward course and led to irrigate the orchard soils.

The land under the trees is cover cropped to alfalfa (mostly), vetches or sweet clover, for the practice of clean-cultivation has not been successful The fruit on the trees are much thinned after the June drop and trees are sprayed five or six times to prevent insect pests from doing damage. Under these conditions it is not surprising that high quality clean fruit is produced.

In each centre, Vernon, Kelowna, Penticton, etc., local growers have combined to form fruit companies for the co-operative storing, grading and packing of the fruit ready for marketing. In British Columbia the standard box of 40 lb. is used for apples. None of the packing houses—nor any of the members—are permitted to sell fruits on the markets, the selling being left to a central agency, the Associated Growers of British Columbia, Ltd., with headquarters at Vernon. The annual sales of this central agency exceed 3,000,000 boxes of fruit (of which over 2,500,000 are apples) and over 12,000,000 lb. of vegetables The chief varieties of apples grown are McIntosh Red and Jonathan, Wealthy, Kings, Delicious and some Cox's Orange Pippin.

AUSTRALIA AND NEW ZEALAND

Enjoying a wide range of soil and climate, it is not surprising that districts can be found in Australia where nearly every kind of fruit may flourish. Large scale production is, however, restricted to fruits that can be exported under refrigeration, for the main market is Great Britain. In the census for 1926 the main fruits grown and produced were as follows.—

Australian Fruit Production, 1926

	Area	Production
Bananas . .	9,754 ac	40,795,700 dozens
Oranges .	33,000 ,,	63,363 tons
Peaches . . .	21,000 ,,	45,570 ,,
Apples .	81,000 ,,	173,334 ,,
Vines for raisins	48,000 ,,	145,015 ,,
Pears	17,000 ,,	31,057 ,,

Apples are the most important crop not only in production but for export Tasmania is the oldest fruit growing centre and still has the largest industry Next in order of importance are Victoria, Western Australia and South Australia The total value of the Australian fruit crop in 1925 amounted to £6,283,000 and with the grape harvest included it reached a total of £10,000,000

Growers have copied the orcharding systems of both Great Britain and the United States for apple and pear growing, apricot and peach culture closely resemble that of California New South Wales, Victoria, and South Australia have taken the lead in irrigation of orchards, utilizing the waters of the Murrumbidgee and the Murray rivers with schemes under Government direction.

Of apples, the principal varieties grown are Sturmer Pippin, Cleopatra, Scarlet Pearmain, Cox's Orange Pippin, Ribston Pippin, Dunn's Seedling and the American Jonathans and Rome Beauty; of pears, Doyenne du Comice, Josephine, Bon Morceau, Beurre Bosc and Keiffer, etc. The Australian growers, and especially those of Tasmania, have introduced most varieties grown in England and the best of the American kinds, with the inevitable result that too many kinds are grown to market to the best advantage.

To a large extent the grading and packing is modelled on the American system and improvements in the market package are made annually There now exists a plan for linking up the fruit areas with district packing houses and cold stores working as co-operative concerns. Stage by stage these are coming into operation; but it will be some years before complete standardization is effected At present the Western Australian apples are packed in bushel cases made of red eucalyptus wood, Tasmania uses white gum wood, while New Zealand uses deal.

In New Zealand the fruit-growing lands are situated in the provinces of Auckland, Hawkes Bay, Nelson, Canterbury and Otugo. The orchards are surrounded with shelter belts of rapid growing Australian wattles, usually three rows, for it is held that one of the first essentials in successful fruit production in New Zealand is adequate shelter to protect the trees when in blossom The fruits from New Zealand are juicy and well flavoured, much as those grown in England, but the skins are more polished and coloured by the bright sunshine.

The fruit industry of Australia and New Zealand acquires added importance in virtue of its season of harvest synchronizing with the lean fruit months of countries in the Northern Hemi-



APPLE TREE CULTURE IN THE UNITED STATES

1 Apple tree, unpruned The tangled mass of small branches causes stunted fruit and shuts off sunlight from the ripening fruit

2. Apple tree, same as fig 1, properly pruned, giving ample access to sunlight throughout tree, and space between the branches which bear fruit

3 A young apple tree growing according to the sod mulch system soil is not cultivated but is sown to grass, clover, alfalfa or other light crop and mowed several times during the season Covering the ground it serves as a mulch and, as it works down into the soil, forms humus Grasses are used for mulch in the East, alfalfa in the West

4 A heavily pruned mature tree, typical of those found in old orchards, which may have grown untended for many years Pruning restores the tree

5 Colonies of bees brought into the orchard to help the setting (fertilization) of the fruit by carrying pollen from one variety to another

6 A well pruned young apple tree. The wide angle formed by the trunk and each of the main branches is to be noted The wire protector at the base of the tree prevents destruction of bark by rabbits and other gnawing animals

7 Vigorous growth of young wood in old trees due to severe pruning

8 Apple orchard in bloom the weather at blossom time is important in determining the set of fruit (*see* fig 5) Several dry days, with temperature about 65°, are required

9 Typical fruit farming scene in the Great Lakes region, western New York. Because of the moderating influence of a large body of water, the climate is favourable for most deciduous fruits, including peaches and grapes

10 Orchards on hillsides are particularly satisfactory in many sections because of favourable air drainage The level floor of a valley is usually undesirable for fruit plantations because of the accumulations of cold air which causes freezing injuries

sphere. Great Britain, for instance, is able to draw supplies of apples and pears from the Northern Hemisphere from September till April, and from Australia and New Zealand from May till August.

SOUTH AFRICA (1928)

The potential capacity of South Africa for fruit production is fast becoming recognized. Large numbers of trees have been planted, but only a few have reached the production stage. The statistics show the trees of bearing and non-bearing ages.—

	Trees
Peaches (bearing)	5,427,170
(non-bearing)	1,437,750
Plums (bearing)	1,171,120
(non-bearing)	640,960
Pears (bearing)	642,480
(non-bearing)	513,850
Apples (bearing)	1,814,880
(non-bearing)	1,161,570
Oranges (bearing)	1,623,100
(non-bearing)	1,936,180

These figures clearly show that in a few years' time South Africa will rank amongst the great fruit producing countries, whilst its production will resemble that of California, which enjoys a summer climate not very dissimilar. Irrigation is practised, particularly for the citrus groves.

Apples of a sort have been grown for generations in all parts of South Africa, especially on the high plateaux of the Transvaal, Free State and Natal, and recently, when the commercial possibility of production was realized, many commercial orchards were established mainly in the same regions, for apples seem to do better on the high veldt than in the hot plains. The rainfall is mainly in the summer; for the winter is dry, with frost at night. Sunshine at all times is very bright. Some apples are grown in the eastern portion of Cape Province near the sea, where these conditions are reversed.

The peaches, pears, plums and apricots are grown in special areas, of which the district at the back of Cape Town is well known, though some are produced in the Orange Free State and the Transvaal The pear probably does best. It is the longest in coming into bearing, but has a commercial life twice as long as the peach tree and yields large crops. William Bon Chretien, Beurre Bosc, Beurre Hardy and Louise Bonne are favourite kinds. Plums and peach trees commence to give a commercial return in about four years, in seven or eight they are in full cropping and have a life of about 20 years.

Oranges are now grown throughout the South African Union and also in Southern Rhodesia, but as yet the trees are young and only yield light crops. In 1907 only 3,000 boxes were exported to the United Kingdom, in 1925 the number had reached 1,000,000 boxes. It is estimated that within the next 15 years South Africa and Southern Rhodesia will be able to send to the United Kingdom 10,000,000 cases a year. The chief varieties grown are the Washington Navel and Late Valentia, though the Jaffa and the Mediterranean Sweet are being planted. The Late Valentia has proved very suitable for South Africa. The trees grow well and the fruit packs and carries satisfactorily; it arrives in the United Kingdom during September, October and November. The Washington Navel is earlier and reaches the British markets in June, July and August. Orange growing in South Africa is done by the white population helped by native labour. All exported oranges must conform in grade, quality and packing to the Government regulations which define the grades. The future prospects for fruit production in South Africa seem particularly bright.

MISCELLANEOUS PRODUCTION

Oranges.—In pride of place the orange comes after the apple. It requires a warm climate, such as is found in Spain, California, the West Indies, Palestine and in some parts of Australia and South Africa.

Oranges ripen at different times in the various countries of production, and so reach the markets at different seasons of the year. Oranges from the West Indies, Palestine and Spain are on sale during the winter months from November to April, those from California in January to July. The South African and Australian crops arrive in Britain from June to November. Oranges from all these places are sent for sale to England; but the Californian crop is marketed mainly in the United States, though a small quantity is exported to Europe. The Spanish oranges differ a good deal, those of the Mediterranean seaboard being the sweeter, whilst the Sevilles, a speciality of the south, are bitter and largely used for making marmalades. These Sevilles are sold during January.

No general organization exists for grading and packing, nor has the Spanish Government passed any laws to compel grading. A few large growers do their own grading and packing, but in general the fruit is taken over by merchants who grade and pack in accordance with their own standards.

The total orange area in Palestine is over 8,000 ac , with extensive new annual planting being made on the coastal strip near Jaffa. Both Jewish and Arab labour is employed Camels are used to take the cases of oranges to Jaffa, whence they take 12 to 20 days by ship to reach England. The large oval Jaffa oranges enjoy a high reputation.

Orange growing in California is on a large and elaborately organized scale. Washington Navel (maturing from November to May) and Valentia (from May to November) are the two main varieties. Many Tangerines and Mediterranean Sweet have been planted in recent years. In order to protect the maturing fruits against frost, oil pots are used to heat the orchards.

The Californian orange growers are great believers in bud selection. In propagating citrus trees nurserymen now use buds from parent trees with known and satisfactory performance records These are grafted on the sour orange, which has proved to be the best stock for California.

Grape Fruit.—Grape Fruit is a comparatively new fruit to Europe. It was not till 1920 that the import figures of grape fruit were given as a separate item in the British trade statistics. Imports into England rose from 13,424cwt. in 1920 to 77,880 cwt. in 1924. The Florida fruits, mainly of the Duncan, Walters, and Hale varieties, are marketed almost throughout the year, the South African from June to September, and the West Indian from December to April.

Government standards of grading and packing are in force in South Africa for all exported fruits In the West Indies, especially in Jamaica, the grape fruit is found wild in many places.

Bananas.—In the Western hemisphere this important tropical fruit is cultivated in the Central American States, Colombia, Brazil and in the West Indies. It is grown in the Canaries and Madeira, and has been introduced to West and East Africa, where it grows in a semi-wild state on both sides of the Equator. Eastwards, the banana is found in Burma, Assam, Indo-China and China, and southwards in Queensland. It grows in many islands of the Pacific, and there is an extensive production in the Philippine islands. In most of these places the banana is an important local food.

Great Britain draws its supplies from two main areas: the British West Indies with Central America and Colombia together supply about 75% of the British imports, the other 25% comes from the Canary islands and Madeira:—

Great Britain's Importation of Bananas

Main supplying countries	Year 1904	Year 1924
Canaries (and Madeira)	1,767,000	2,649,064
Central America and Colombia	361,000	6,875,501
British West Indies	535,000	1,705,533
Total (from all sources)	2,664,000	11,307,940

The banana is easy to grow provided there is sufficient heat and an abundance of water Suckers planted soon take root and grow into plants which yield fruit in about 18 months, but the plant bears only a single bunch in its life cycle. The Gros Michael is the principal kind grown in Central America and Jamaica. Individual bunches of these vary between 50–80 lb. in weight. This banana is large, has a thick skin, and may be

marketed in towns far from the centre of production. Unfortunately it is liable to the Panama disease (*Fusarium cubense*), which in the past has caused so much loss, especially in the West Indies

The Canary banana has bunches weighing from 25 to 65 lb, and carrying from 125 to 200 separate fruits. The individual fruits are thin skinned, small and of high class Owing to the delicacy of the skin of the fruit and the structure of the bunch special precautions in handling, packing and carriage have to be made The supplies sent to Great Britain from the Canary islands are wrapped in cotton wool and packed in crates to prevent damage and decay

EXTERMINATING PESTS

Spraying Mixtures.—No matter where grown, all kinds of fruit are attacked by pests In mild, humid atmospheres tree pests are usually of a fungoid nature, in the dry, warm regions insects and bacteria are ripe In temperate zones all three are present. All parts of the fruit trees suffer, including the foliage, the blossom, and the fruits, where the last named are affected their value is considerably reduced Apples, for instance, holed with the codlin moth, a pest very prevalent in box apple districts of America, or spotted with scab, as is common in Great Britain and the eastern district of America and Canada, are practically valueless and would be culled out in grading Similarly, cherries with worms of the cherry fly, and gooseberries covered with mildew are of little value

The fruit grower who would produce high grades of fruit has to carry on a regular campaign to keep pests under control For deciduous fruits like apples, pears, plums, cherries, gooseberries and currants, etc, a series of sprays on the trees is regularly practised in all districts One spray, called the winter spray, is applied when the trees and bushes are dormant, and other sprays in the spring and early summer when the foliage is developing or out Formerly sprays of lime, lime and salt, lime and sulphur and caustic soda were used as winter sprays, but whilst all these sprays would cleanse the trees and bushes of lichens and mosses, would kill any adult insects that were hiding, they either had no effect on the insect eggs or killed a few only, for which reason they have been supplanted by sprays of a coal tar distillate type These tar distillate sprays, mixed with water for top fruits in the ratio of 7½ of spray fluid to 92½ water and applied to the trees when dormant, kill the lichens and mosses, adult insects, and the eggs of most of the insects which attack fruit The same fluid in the ratio of 5 of spray to 95 water may also be used for bush fruits This discovery has placed a most efficient spray at the service of fruit growers and large quantities are now used as winter sprays. The proprietary washes known on the English markets as Carbokrimp, Mortegg, Ialine, Aboline, and Sterolite are of this class

The first of the summer sprays is applied to the apple trees when the blossom buds are just developing and a second is made immediately after the petals have fallen, and repeated, if necessary, in two to three weeks' time Pears and other top fruits are the better for being treated similarly. The spray used is Bordeaux mixture—4 lb. copper sulphate, 4 lb quicklime, and 50 gal of water into which 2 lb. of lead arsenate has been added The Bordeaux-arsenate mixture sticks to the foliage and protects it against fungus diseases like scab and leaf eating caterpillars and all biting insects Instead of the Bordeaux mixture many growers prefer to use a lime-sulphur spray, which is safer for tender varieties, such as Cox's Orange Pippin, James Grieve and Rival. Lime sulphur, one gal to 29 gal of water, is largely used for spraying gooseberry bushes to prevent mildew and for black currant bushes (one part lime-sulphur to 12 parts of water), to control the bud mite.

Spraying must be thoroughly and intelligently done, and that largely is a matter of understanding the technique and having suitable machinery. The sprayers may vary in size from a small knapsack costing £3, or a barrel on wheels with a hand pump costing £20, or a large portable machine with pump (motor) costing over £100 Pumps which release the spray from the nozzle at a pressure of 200 lb. are the more efficient. These repeated sprayings have become a necessity and no growers could now succeed without them in producing high grade clean fruits. (*See* also under APPLE GROWING, etc) (H V. T.)

UNITED STATES

With the wide range of climatic and soil conditions in the United States, it is possible to grow to perfection in one part of the country or another most of the temperate zone fruits and many others of semi-tropical origin It is not surprising, therefore, that fruit growing occupies an important place in the agriculture of the country The total farm value of fruit and nuts in 1919 was placed at $730,000,000 The production of some of the principal fruits is given in the following table

Total Production of Fruit in United States in 1919 and 1922-6
(In thousands of bushels, boxes, tons or quarts)

	1910	1922	1923	1924	1925	1926
Apples (bu)	142,086	202,702	202,842	171,725	172,389	246,460
Peaches ,,	53,178	55,853	45,382	53,848	46,562	68,425
Pears ,,	15,006	20,705	17,345	18,866	20,720	25,644
Plums ,,	19,084					
Apricots (tons)	175	145	210	142	140	
Oranges (box)	16,390	31,341	36,341	29,300	33,725	34,312
Grapefruits (box)	5,705	7,674	8,453	8,842	8,100	7,916
Lemons (box)	3,983	3,402	6,840	5,125	7,136	7,200
Grapes (tons)	1,258			1,778	2,064	2,349
Strawberries (qts.)	176,932			284,716	211,396	256,411
Raspberries (qts)	61,334					
Black and dew (qts)	39,945					
Cranberries (qts)	35,260					
Currants (qts)	7,615					
Other berries (qts)	3,004					

The combined production of all fruit has increased greatly since the beginning of the century Keen competition has led to a gradual decline of fruit farming in the less favourable regions and a concentration in sections where natural conditions and good transport facilitate production and marketing. Farm orchards in the marginal regions are becoming less important also because little or no attempt is made to control pests there, so that the fruit is usually of low quality

Apples are the most extensively cultivated of all fruits They are grown commercially in all except a few of the warmest and most southern States and in the two or three northern States of the Great Plains region. Outstanding apple sections are found in New York and in parts of Ohio and Michigan adjoining the Great Lakes, Washington, and several other portions of the north-west States; the Shenandoah-Cumberland region including parts of southern Pennsylvania, western Maryland, West Virginia and Virginia; the New England States, the Ozark regions of Arkansas and Missouri, southern Ohio, Illinois, Colorado and California. Pears are grown only in the cooler climates with important centres in California, New York, Washington, Oregon and Michigan. Quinces are grown in a very limited way in the same regions. Important commercial peach areas are found in Georgia, California, Texas, the Ozarks, the Carolinas and Tennessee, the Middle Atlantic States and those parts of New York, Michigan, Ohio and Pennsylvania that have the advantage of the moderating influence of the Great Lakes. Plums are most largely grown in California, Washington and Oregon, although several native species are widely distributed, yet not extensively grown, throughout the eastern States and in the upper and lower Mississippi valley. Commercial sweet cherry production is confined to the Pacific coast while sour cherries are grown most extensively east of the Rocky mountains, especially in New York, Michigan and Wisconsin The commercial production of apricots is carried on only in California. The important citrus regions are limited to southern and central California and southern Florida.

The American *Labrusca* grapes are largely grown along the

shore of Lake Erie in Western New York, Pennsylvania, Ohio, and the eastern shore of Lake Michigan. Other important sections are found in the Hudson valley and in the Ozark region. Muscadine grapes have recently been planted largely in the southern Atlantic and the Gulf coast states, especially in North Carolina. Numerous attempts have been made to grow European grapes in the eastern part of the United States but the cultivation of this species is now confined to California, where it is the most important fruit Large commercial areas of strawberries are found in Florida, Alabama, the Carolinas, Tennessee, Arkansas, Missouri, Eastern Maryland, Delaware, south-western Michigan and New York. Raspberries are extensively grown in Washington and throughout the north-eastern part of the United States with specially concentrated areas in the fruit regions around the Great Lakes and in the Hudson valley Blackberries are grown farther south along the Ohio river in the Ozark region and in Texas Dewberries are also grown in the Pacific States. Currants and gooseberries are found mostly in the Hudson river valley and in Western New York near Lake Ontario, but they are among the least important fruits Cranberries are confined to limited areas in Massachusetts, New Jersey, Wisconsin and Long Island, N Y Among the cultivated fruits that have been planted on a commercial scale in recent years might be mentioned the persimmon and blueberries which are found in the temperate regions and the olive, dates, avocado, mango and loquat which are grown chiefly in California, Arizona and Florida

The fruit industry in the United States traces back to the first settlers of America Old world species have become well established in the new country Most of the apples and peaches grown in the United States are American varieties of European species Foreign grapes, plums, pears, cherries, apricots are as extensively grown as are varieties developed in America. A number of the native fruits are among the important cultivated sorts notably the *Labrusca* and several other species of grape, several species of plums, raspberries, blackberries, dewberries, blueberries and cranberries The strawberries are mostly hybrids of American and foreign sorts There are many other promising native fruits which are being grown locally and which are also being used extensively by experiment stations throughout the country in breeding work. These State and Federal experiment stations have produced thousands of seedlings of fruits of known parentage the aim being to develop varieties that have fewer faults from the standpoint of the grower than the existing sorts The ideal variety combines the desirable features of high quality, productivity, resistance to extreme cold in winter, to late spring frosts, and to diseases and insects.

Varieties.—The variety list for most fruits is very extensive, though the tendency is to limit the number of varieties grown Over 900 sorts of apple have been described, among the varieties found in the newer plantings being the McIntosh, Delicious, Northern Spy, Rhode Island Greening, Cortland and Jonathan, all being of very fine quality The Baldwin, York Imperial, Rome Beauty and Yellow Newton are still standard sorts used extensively for cooking Ben Davis, Roxbury Russet, Spitzenburg, Tompkins King were formerly of high rank but are no longer planted on account of low quality or susceptibility to disease. Bartlett, Bosc, Seckel and Kieffer are the important commercial pears. The Elberta peach is the most important variety in all sections both north and south; the Hale, Belle of Georgia, Carmen, Greensboro and Champion are also prominent sorts; Muir is widely grown for drying on the Pacific coast, and Cling and Phillips are among those used for canning The chief apricots are the Royal and the Blenheim. Montmorency and Early Richmond are the standard sour cherries, and Napoleon, Bing and Lambert the principal sweet sorts. Among the European plums the Italian prune, Tragedy and Pond, Imperial Epineuse, Jefferson and Reine Claude, Bradshaw and Shropshire Damson are extensively grown; the Burbank, Climax and Satsuma are the important Japanese sorts. Only two varieties of orange are widely grown in California—Washington Navel and Valencia; Parson Brown and Homosassa come from Florida, and Satsuma oranges from the Gulf States. The Duncan and the Marsh are the important grapefruit varieties; and the Eureka and Lisbon are the lemons grown in the United States. Among the grapes the Concord, Worden, Niagara, Winchell are the outstanding American sorts; the Raisin Muscat, Muscat of Alexandria, Mission, Malaga, Sultanina are the important representatives of the old world varieties The important strawberries are Missionary, Klondike, Premier, William Belt, Sample, Senator Dunlap, Glen Mary, Marshall and Chesapeake although numerous other sorts are grown locally In the bush fruits list the Cuthbert, Latham, June, Herbert are important red raspberries; Gregg and Plum Farmer are standard black raspberries, Eldorado, Snyder and Mersereau the outstanding blackberries The loganberry and the Lucretia are the most important of the dewberry type. The Industry is the only European gooseberry that does fairly well, but it is not grown as widely as the Chautauqua and Poorman varieties of American origin The Cherry and the Fay are the important currants.

Orchard Methods.—Frost constitutes the greatest uncertainty in fruit growing No fruit and no fruit section is entirely safe from unseasonable cold weather, and in occasional years even the most reliable and hardy varieties in established fruit sections suffer during the winter or have the bloom killed or seriously curtailed by late frosts in spring Winter injury to the plant and the fruit buds is a more important problem in the northern sections, although there are also serious losses from unfavourable weather at blooming time. Only the hardier varieties are chosen and cultural operations are done in such a way as to insure the best maturity of fruit and wood The proximity of large bodies of water is a most important feature of the oldest established fruit sections in Western New York, in the Hudson Valley, and in south-western Michigan The influence of the Atlantic on the New England States and of the Pacific in the north-west also has its beneficial effects on the fruit growing industry in those parts; frequent extremes of temperature are avoided during the winter, and in spring the buds remain dormant for a week or ten days later than in less favoured regions of the same latitude. The inland sections, notably those in the Shenandoah-Cumberland region, the Ozarks and the Mississippi valley are specially hazardous so far as the injury from spring frosts is concerned. In favourable climates the site of a fruit farm is generally chosen with reference to its freedom from frost pockets Orchard heating has not proved economical for deciduous orchards except in the north-west, but this method of avoiding injury from frosts is extensively practised among the citrus growers in California and Florida By the use of 30 to 50 small oil or coal fires per acre it is possible to raise the temperature 4° to 5° F and thus prevent damage from cold The overhead cost of heating may run as high as $50 to $75 per acre but heated citrus orchards may show a profit over a ten year period, of from 30% to 50% over unheated orchards

While the climate determines whether or not it is possible to grow fruit in any locality, the soil is probably the most important factor in determining the yields and profits For most tree fruits the fertility of the surface soil is less important than is a good depth and proper drainage of the sub-soil. Most fruit growers have learned to avoid obvious defects such as shallow or impervious soil; but it is, unfortunately, difficult to predict the drainage conditions in years of unusual rainfall during late spring and late autumn, so in every fruit section one finds many orchards established on ill-suited land Even in a given orchard trees in one row may yield two to four times as much fruit as borne by the same variety a few hundred feet removed.

The standard planting distances for mature apple trees is 40 x 40 feet Practically all other tree fruits are set 20 x 20 feet apart. Small fruits are planted in rows far enough apart to permit cultivation by horse- or tractor-drawn implements It is important to reduce the amount of man labour required, the land being a relatively cheap item in most cases In apple orchards, fillers or semi-permanent trees are sometimes allowed to occupy the intervening spaces for the first 15 to 25 years after planting. In many cases intercrops such as corn, tomatoes, strawberries and the like are grown for the first 2 to 4 years. In setting out a

modern fruit plantation particular attention is given to cross-pollination, since many kinds of fruits will set more abundantly if they have the stimulus of pollen from another variety of the same species Some cherry, plum and apple trees may bloom heavily but set few if any fruits without cross-pollination The weather at blooming time may interfere with the flight of bees, or the temperature may be too low for the proper development of the young fruits, so that severe losses are not infrequently encountered even though cross-pollination has been provided

Orchard soil management is concerned chiefly with the conservation of soil moisture and the supply of nitrogen to the plants. Early ploughing in spring and the frequent stirring of the soil during the summer is the standard procedure for most fruits The tendency is to plough earlier in the spring and not so late in the autumn, for nitrates and moisture are thus provided at a minimum expense at a time when the tree is making most rapid growth Cover crops of rye, oats, legumes or even volunteer crops of weeds are allowed to occupy the land during late summer and autumn By absorbing excess moisture and plant food from the soil and thus reducing the supply to the tree the cover crop helps to mature the fruit and allows the tissues to develop hardiness against cold When ploughed under in late autumn or early spring the cover crop tends to replenish the humus supply of the soil Grass interferes with the growth and productivity of the trees, but it is possible to overcome much of this injury by applying readily available nitrogenous fertilizers Many fruit growers are now turning to a method of sod culture with nitrates Nitrogen is necessary for vigorous shoot growth; it causes the flowers to set fruit and to develop to the proper size Peaches require most nitrogen and are the first to suffer when the element is deficient Cherries, plums, pears and apples follow in the order given. While other elements than nitrogen, especially phosphorus and potash, are applied to fruits, they seldom prove profitable in the cultivated orchard except on very poor soils Phosphorus seems to be especially needed by strawberries Cultivation in most cases not only liberates adequate supplies of nitrates and other food elements for fruit plants by destroying the grass and weed growth but also tends to conserve the soil moisture by providing a dust mulch An adequate supply of soil moisture is an important factor with all small fruits, and with tree fruits in the less humid sections of the country Irrigation is a common practice with fruits throughout the north-west and in many parts of California, but is not used in the eastern part of the United States except for special plantings of strawberries and raspberries.

Pruning practices vary greatly for the different fruits and for a given fruit in different sections The present tendency is to prune young trees less severely, although it is generally recommended that some attention be given to shaping of the main framework Experiments have definitely shown that the heavy cutting formerly believed to be necessary to train the tree may delay bearing from two to five years. As the trees grow older, the most common practice is to remove the crowding branches and any weak, shaded or diseased wood After a time it becomes necessary to cut back the high branches in order to confine the bearing surface within a reasonable distance of the ground and within the allotted space Extra heavy cutting is sometimes practised to rejuvenate tall and neglected trees Among the tree fruits, peaches and apricots receive the most frequent and the most severe cutting, to force an abundance of new shoot growth and increase the size of the fruits While the sour cherry commonly receives the least pruning many growers find that the heavy cutting given to keep the tree small, also stimulates a desirable wood growth and provides somewhat hardier buds. Mature apples may be pruned every few years by cutting out much wood, or they may receive a more detailed pruning annually. Although it is recognized that very severe cutting may in some cases reduce the total yield, most growers seem to find that the quality of the fruit is greatly improved and orchard practice is facilitated enough to justify the costs of the operation. The pruning of grapes and bush fruits is more nearly standardized than the practice for tree fruits, heavy cutting and thinning out of old wood each year being the rule. The refinements of pruning frequently practised in Europe are not followed in the United States, chiefly because economic conditions do not permit of much hand labour and also because there seems to be little need; its problems, as well as other cultural operations, have, however, been the subject of much study by the agricultural experiment stations in recent years Such matters as the regularity of bearing, flower bud formation, fruit setting, growth and quality of fruit, and winter injury have been shown to be associated with the physiological disturbances caused by the removal of leaves and twigs

Pests and Diseases.—The control of orchard pests is attempted in all fruit growing localities; effective spray schedules have been worked out for most of the pests and special spray services under the supervision of experts are maintained by progressive groups of growers Schedules generally give the spray or dust mixtures to be used with particulars of pests to be combated at various times throughout the season; insecticides and the fungicides are applied in liquid or dust form and power sprayers are chiefly used. In some modern orchards the mixtures are piped from a central mixing and power plant to various sections of the orchard where the spray hose may be attached to convenient outlets Lime sulphur and Bordeau mixture and corresponding sulphur and copper-lime dusts are the standard fungicides, while lead arsenate, nicotine sulphate and oil emulsions are used as insecticides Timeliness and thoroughness of application are important

Among the more important diseases which can be successfully controlled by spraying are apple-scab, bitter-rot, blotch and apple cedar rust; peach-scab, leaf-curl and brown-rot; black-rot on grapes; citrus scab and melanose The various fruits are also subject to injury by sucking insects such as scales, aphids, red mite, and pear psylla as well as by a large number of biting insects among which the most important are the codling moth and the green fruit worms, plum curculio, canker worms, tent caterpillars and grape phylloxera Fumigation with hydrocyanin gas is used for citrus scale, and peach tree borers are now controlled by the use of a volatile paradichloro-benzine which is placed about the base of the tree A few pests such as blight, yellows and mosaics, cannot as yet be satisfactorily controlled by spray, and many troublesome insects such as fruit flies, Japanese beetles and others are being introduced in spite of rigorous quarantine, new sprays being required to hold these in check Rodents—especially mice, rabbits and gophers—do considerable damage to the young fruit plantations and many growers find it necessary to carry on systematic control measures involving their wholesale destruction

Transport and Marketing.—More and more attention is given to the proper harvesting and handling of fruit since much of the marketing quality depends upon the proper time of harvesting and handling While most fruits improve in quality if they can become ripe or nearly so while on the tree, it is often impractical to allow the ripening process to proceed far where the product must be shipped hundreds or even thousands of miles to market. In most cases the fruit is harvested in a hard ripe stage so that it reaches the market in firm condition with as much quality as possible If picked too green the fruit tends to wilt, fails to attain a satisfactory quality and breaks down prematurely; but there is a temptation, nevertheless, to harvest early since prices for the first products are high. Pressure testers have come into use for determining the proper time for picking pears, for these give a definite standard of maturity and overcome many difficulties previously experienced. Much damage formerly resulted from the careless handling of citrus fruit due to the small abrasions on the skin, and subsequent attacks by blue mould and other rot-causing organisms; this is now largely avoided by providing the pickers with canvas gloves and blunt picking shears; the same problem confronts the deciduous fruit industry, and much loss is incurred by bruising and moulds. Rapid advances have been made in the proper grading and standardization of fruit and the most important fruit States have laws regulating the standard grade requirements for the different fruits. The

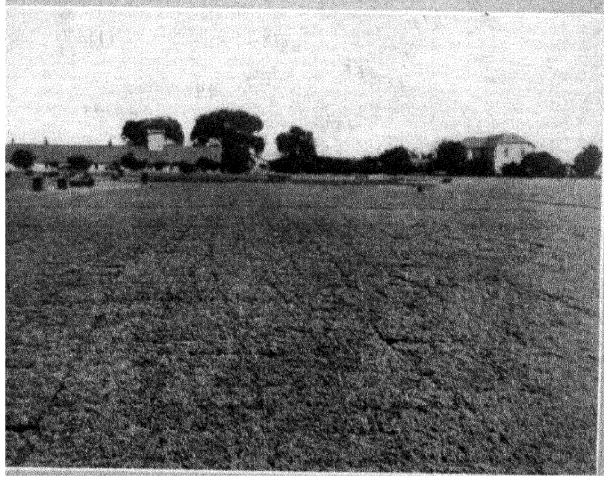
FRUIT FARMING













BY COURTESY OF (1) THE NATIONAL ORCHARD HEATER CO., (2) THE CATERPILLAR TRACTOR CO., (3, 5) THE CALIFORNIA STATE DEPARTMENT OF AGRICULTURE, (4, 6) THE CALIFORNIA FRUIT GROWERS EXCHANGE

MODERN METHODS USED IN CITRUS FRUIT FARMING

1. Protection against frost In California citrus grove oil heaters placed at regular intervals throughout groves diffuse heat when frost threatens Many fruit crops are saved in this way
2. Soil cultivation In citrus grove with tractor Top soil is loosened with disc harrow to prevent it from drying out too fast, thereby saving moisture for development of trees and fruit A tractor driven carefully will move among the trees without causing damage
3. Apricot and pear trees in full bloom on a California ranch. Pear orchard in foreground, apricot trees in background with profuse bloom
4. Typical fruit picking scene in a California valley. Expert pickers carry bags slung from shoulders and use short ladders to reach the fruit Each piece of fruit is carefully picked by hand, placed in the bag and transferred to containers on the ground Wagons passing between rows of trees collect containers for delivery to packing house
5. Making raisins of muscat grapes The grapes are placed on tables or drying floors in open fields, where a maximum of sunlight and air gives good drying conditions In some seasons the grapes must be dried in a drying house, seen in this illustration in the left background
6. Interior view of packing house in the California citrus fruit district Oranges are delivered by conveyor to four hoppers (right background), from which they pass along the sorting tables. Girls wearing soft gloves to prevent scratching skin of oranges (which would cause premature decay) wrap each piece of fruit in tissue paper and pack carefully in wooden crates Roller conveyors remove the crates

Federal government maintains a shipping point inspection, at numerous centres to certify the condition and grade of fruit at the time it is loaded, and federal inspection at the receiving end is available to the grower. More and more of the fruit is being graded, packed and shipped co-operatively at a central fruit packing house. Trained help is employed, and special machinery is used for sizing, packing and loading In the citrus industry the fruit has for many years been washed before it is packed, and this is now necessary to remove arsenical spray residue on apples, especially those grown in the north-west where the codling moth has to be combated and where the rain does not wash off the spray Fruits are packed in many different kinds of container but in practically all cases the buyer retains the package. The tendency is toward standardization and the use of smaller packages as for example the bushel box or basket in place of the barrel. The fancy grades of fruit are wrapped in oil-treated tissue to prevent scald. Shredded oil paper placed throughout the package also serves the same purpose A recent development is the marking of individual fruits to distinguish the brand. Most of the fruit moves under refrigeration, and special fast freight service is available from the Pacific and other important fruit sections The rapid advances in the cultivation of fruit and the increased production of competing products has emphasized the need for more careful and economical methods of marketing and distribution Numerous agencies, including the railroad, receiver, broker, truckers and retailers, are involved in the disposition of the crop and the grower may often receive only a small fraction of the price that the ultimate consumer pays.

Large quantities of fruit, especially apples, are kept in cold storage warehouses to supply the market throughout the winter and late spring Other fruits such as peaches, pears, plums and strawberries are held for periods of several days to a month or more Only certain varieties are suitable for prolonged keeping and these must go into storage in proper condition Storage scald and internal breakdown are common storage difficulties These can be prevented by the use of oiled paper wrappers and by allowing the fruit to mature properly before storing

Canning and Export.—The bulk of the fruit is consumed in the fresh state, but in recent years the canning industry has made great strides The combined pack of the more important fruits in 1919 was over 20,000,000 cases, and the value of the canned fruits of 1925 was estimated at nearly $101,911,000 Peaches contributed over one-third to the 1919 total, about as much as the next three important fruits—apricots, apples and pears—combined. In the last few years the freezing of fresh fruit with or without sugar has come into extensive practice. The fruit is held indefinitely in the original container at a low temperature, to be used subsequently by large consumers such as bakers and ice cream manufacturers Cherries, strawberries and raspberries are successfully preserved thus and the result is as good as or better than fresh fruit and more suitable than canned fruits for trade purposes Fruit juices are manufactured widely, especially grape, cider and orange juice. It is interesting to note that the early settlers grew fruits almost exclusively for the purpose of manufacturing drinks, but the juice industry is now a by-product except in the case of grapes

The fruit drying industry is very extensive In 1919 about 575,000,000 lb. of evaporated fruit were produced. Raisins accounted for approximately one-half of this amount and prunes for a little less than one-fourth. Apricots, apples and peaches made up practically all of the remainder. Large quantities of the fresh fruit and of the by-products are exported to Great Britain and Germany and other European countries. Approximately 5,000,000 boxes and 1,500,000 bbl. of apples, about 420,000,000 lb. of dried fruits and over 225,000,000 lb. of canned fruits are exported each year.

BIBLIOGRAPHY.—Among the many modern works of a scientific nature on fruits in America may be mentioned Chandler's *Fruit Growing* and Gardner, Bradford and Hooker's *Fundamentals of Fruit Production*. The various fruit monographs published by the New York agricultural experiment station at Geneva, N.Y. are the standard references for a description and history of the varieties of deciduous fruits. A recent comprehensive survey of the industry in the United States is found in the 1925 *Yearbook* of the U.S. department of agriculture. The Federal and State experiment stations throughout the country have contributed largely to the advancement of the fruit industry and their numerous bulletins on insects, diseases and cultural problems are of great value. (A. J. HE.)

FRUIT PRESERVATION: *see* CANNING; JAMS AND JELLIES.

FRUIT-SUGAR: *see* FRUCTOSE, CARBOHYDRATES and SUGAR.

FRUMENTIUS (*c.* 300–*c.* 360), the founder of the Abyssinian church, traditionally identified in Abyssinian literature with Abba Salama or Father of Peace (*see* ETHIOPIA), was a native of Phoenicia. According to Rufinus (x. 9), who gives Aedesius as his authority, a certain Tyrian, Meropius, accompanied by his kinsmen Frumentius and Aedesius, set out on an expedition to "India," but fell into the hands of Ethiopians on the shore of the Red Sea and was put to death. The two young men were taken to the king at Axum, where they obtained, in time, great influence. With the help of Christian merchants who visited the country Frumentius gave Christianity a firm footing In 326 he was consecrated bishop of Axum by Athanasius of Alexandria, who in his *Epistola ad Constantinum* mentions the consecration, and gives details of Frumentius's work

FRUNDSBERG, GEORG VON (1473–1528), German soldier, was born at Mindelheim on Sept. 29, 1473 He fought for the German king Maximilian I. against the Swiss in 1499, and in the same year was among the imperial troops sent to assist Ludovico Sforza, duke of Milan, against the French Still serving Maximilian, he took part in 1504 in the war over the succession to the duchy of Bavaria-Landshut, and afterwards fought in the Netherlands Frundsberg assisted Maximilian to organize the *Landsknechte* (*q.v.*), and subsequently at the head of bands of these formidable troops he was of great service to the Empire and the Habsburgs. In 1509, 1513 and 1514 he gained fresh laurels by his enterprises against the Venetians and the French When the struggle between France and the Empire was renewed he took part in the invasion of Picardy, and then proceeding to Italy brought the greater part of Lombardy under the influence of Charles V. through his victory at Bicocca in April 1522 He was partly responsible for the great victory over the French at Pavia in February 1525, and, returning to Germany, assisted in suppressing the Peasants' Revolt, using on this occasion, however, diplomacy as well as force He died at Mindelheim on Aug 20, 1528 Frundsberg was a capable and chivalrous soldier, and a devoted servant of the Habsburgs With his grandson the family became extinct

See Adam Reissner, *Historia Herrn Georgs und Herrn Kaspars von Frundsberg* (Frankfort, 1568) A German translation of this work was published at Frankfort in 1572. F. W. Barthold, *Georg von Frundsberg* (Hamburg, 1833), J Heilmann, *Kriegsgeschichte von Bayern, Franken, Pfalz und Schwaben* (Munich, 1868).

FRUNZE, MIKHAIL VASSILIEVICH (1885–1925), Russian soldier, was the son of a peasant who had settled in Turkistān and become a surgeon While at school he came in contact with socialists and on entering the Polytechnic Institute at St Petersburg (Leningrad) he joined the Bolshevik section of the social democratic organization In 1905 he worked in the industrial district of Ivanovo-Voznesensk and helped to organize the big textile strike of that year He was frequently arrested and in 1907 was sentenced to four years penal servitude, and to a subsequent six years on the grounds that he had offered armed resistance to the police

At the end of 1914 his penal servitude was exchanged for banishment to Siberia, where he was arrested for revolutionary activities in the following year, but soon afterwards escaped from prison and the March revolution of 1917 found him in Minsk at the head of an illegal organization in the army. He became president of a Front Committee, and later president of a Soviet in the provinces, and at the time of the November revolution came to Moscow with a detachment of 2,000 men, with which he took part in the fighting in that city. After the revolt in Jaroslav he became military commissar of that district, and in Dec. 1918, commander of an army on the Eastern Front. He later became commander in chief of four armies and directed the operations against Admiral Kolchak. When the Eastern Front was divided,

Frunze became commander on the Turkistān section of it, where he surrounded and destroyed Kolchak's southern army He afterwards took part in minor operations in Central Asia, returning to Europe in Sept 1920 when he took command of the troops that eventually drove Gen Wrangel out of the Crimea He then commanded the military forces in the Ukraine In 1924 he became vice-president of the Revolutionary Military Council, and, in the absence of Trotsky, the actual head of the Red Army He became president of this council and People's Commissar for Military and Naval Affairs in Jan 1925, but died before the end of the year

FRUNZE, the chief town of the Kirghiz A S S R, situated on the Chu river in lat 42° 45′ N long 74° 45′ E, formerly PISHPEK Its chief industries are brewing and the manufacture of tobacco (*makhorka*) A branch line from the Orenburg-Tashkent railway, passing through Chimkent and Aulie-ata, reaches the town In 1928 a line to the densely peopled Tokmak region, north west of Lake Issyk-kul, was commenced, and lines which will link Frunze and Semipalatinsk are under construction. This will open up the corn growing region round Lake Balkhash, and, it is hoped, will enable the Central Asiatic republics to depend on imported, instead of homegrown, grain and thus to increase the area under cotton

FRUSTUM, a term in geometry for the part of a solid figure, such as a cone or pyramid, cut off by a plane parallel to the base, or lying between two parallel planes, and hence in architecture a name given to the drum of a column.

FRUYTIERS, PHILIP (*fl.* 1627–1666), Flemish painter and engraver, entered the Antwerp gild of painters in 1631 He is described in the register of that institution as "illuminator, painter and engraver" He worked exclusively in water colours, "yet was so remarkable in this branch of his art for arrangement, drawing, and especially for force and clearness of colour, as to excite the admiration of Rubens, whom he portrayed with all his family." Unhappily no undoubted production of his hand has been preserved. All that we can point to with certainty is a series of etched plates, chiefly portraits Some beautiful miniatures on vellum may possibly be attributed to Fruytiers.

FRY, the name of a well-known English Quaker family. About the middle of the 18th century JOSEPH FRY (1728–1787), a doctor, settled in Bristol, where he acquired a large practice, but eventually abandoned medicine for commerce He became interested in various manufacturing enterprises, and was the founder of the Bristol firm of J S Fry and Sons, chocolate manufacturers He purchased the chocolate-making patent of William Churchman and on it laid the foundations of the business After his death the Bristol chocolate factory was carried on with increasing success by his widow and by his son, JOSEPH STORRS FRY (1767–1835). In 1795 a new and larger factory was built in Union street, Bristol, and in 1798 a Watt's steam-engine was purchased and the cocoa beans ground by steam On the death of Joseph Storrs Fry his three sons, Joseph (1795–1879), Francis, and Richard (1807–1878) became partners in the firm, the control being mainly in the hands of FRANCIS FRY (1803–1886). Francis Fry took a principal part in the introduction of railways to the west of England, and in 1852 drew up a scheme for a general English railway parcel service He was an ardent bibliographer, and made a large collection of early English bibles In 1896 the business was converted into a private limited company, Joseph Storrs Fry being chairman and all the directors members of the Fry family

FRY, SIR EDWARD (1827–1918), English judge, second son of Joseph Fry (1795–1879), was born at Bristol on Nov 4, 1827, and educated at University college, London. He was called to the bar at Lincoln's Inn in 1854 and was made a Q C. in 1869, practising in the rolls court and becoming recognized as a leading equity lawyer. In 1877 he was raised to the bench and knighted As chancery judge he will be remembered for his careful interpretations and elucidations of the Judicature Acts, then first coming into operation In 1883 he was made a lord justice of appeal, but resigned in 1892; his knowledge of equity and talents for arbitration were utilized by the British Government from time to time in various special directions, particularly as chairman of many commissions. He retired from the bench in 1892 after 15 years of service. J. E. G. de Montmorency (*Dict Nat Biog.*) writes "Probably, when the history of English law for the period falls into perspective, it will be found that Fry did more than any other lawyer, with perhaps the exception of Lord Cairns, to secure perfect continuity in the adaptation, under purified conditions of civil procedure, of the rules of law to modern social conditions"

His retirement was only a prelude to a period of hard work as an arbitrator in many domestic questions and as an international lawyer In Nov. 1900 he was made a judge on The Hague tribunal, and sat in the first case called before the court, the "pious foundations" case between the United States and Mexico He was British assessor on the North Sea Inquiry Commission (Dogger Bank incident) in 1904, first British plenipotentiary and doyen of the conference at the second Hague Conference of 1907, and an arbitrator in the Casablanca incident between France and Germany (1908) Fry was G C B. (1907) and F R S (1883) He died at Failand on Oct 18, 1918

See Agnes Fry, *Memoir of Sir Edward Fry* (1921), which includes an autobiography and a bibliography of his numerous works.

FRY, ELIZABETH (1780–1845), English philanthropist, and, after Howard, the chief promoter of prison reform in Europe, was born in Norwich on May 21, 1780 Her father, John Gurney, afterwards of Earlham Hall, a wealthy merchant and banker, represented an old family which for some generations had belonged to the Society of Friends While still a girl she showed the benevolence of disposition, clearness and independence of judgment, and strength of purpose, for which she was afterwards so distinguished. In Aug 1800 she became the wife of Joseph Fry, a London merchant

Amid increasing family cares she was unwearied in her attention to the poor and the neglected of her neighbourhood, and in 1811 she was acknowledged by the Society of Friends as a "minister" She had made several visits to Newgate prison as early as February 1813, but the great public work of her life dates effectively from the formation of the Association for the improvement of the female prisoners in Newgate in April 1817 Its aim was the much-needed establishment of some of what are now regarded as the first principles of prison discipline, such as entire separation of the sexes, classification of criminals, female supervision for the women, and adequate provision for their religious and secular instruction, as also for their useful employment The amelioratons effected by this association, largely by the personal exertions of Mrs Fry, led to a rapid extension of similar methods to other places. In 1818 she, with her brother, visited the prisons of Scotland and the north of England The publication (1819) of the notes of this tour, and the cordial recognition of the value of her work by the House of Commons committee on the prisons of the metropolis, led to an extensive correspondence with persons interested in prison reform in Italy, Denmark and Russia Through a visit to Ireland, which she made in 1827, she was led to direct her attention to other houses of detention besides prisons; and her observations resulted in many important improvements in the British hospital system, and in the treatment of the insane

In 1838 she visited France, where she conferred with many of the leading prison officials, and personally visited most of the houses of detention in Paris, Rouen, Caen and other places In 1839 she obtained an official permit to visit all the prisons in that country, and her tour, which extended from Boulogne and Abbeville to Toulouse and Marseilles, resulted in a report which was presented to the minister of the interior and the prefect of police Before returning to England she had included Geneva, Zurich, Stuttgart and Frankfort-on-Main in her inspection. The summer of 1840 found her travelling through Belgium, Holland and Prussia on the same mission; and in 1841 she also visited Copenhagen In 1842, through failing health, Mrs. Fry was compelled to forgo further travels, but she had the satisfaction of hearing from almost every quarter of Europe that the authorities were giving increased practical effect to her suggestions She died on Oct. 12,

1845. She was survived by a numerous family, the youngest of whom was born in 1822.

Two interesting volumes of *Memoirs, with Extracts from her Journals and Letters*, edited by two of her daughters, were published in 1847. *See* also G. King Lewis, *Elizabeth Fry* (1910).

FRY, ROGER ELLIOT (1866–), British painter and art critic, son of Sir Edward Fry, was born in London, and educated at Clifton and King's College, Cambridge. He studied painting under Francis Bate and then in Paris, and exhibited at the Carfax Gallery, London, in 1903. His work, notably in his landscapes, is marked by deep feeling for form and a scholarly sense of design and technical means An active member and exhibitor of the London Group, he gave an exhibition of his own paintings in 1920. As a critic, with his wide knowledge and acute sensibility, Fry became a recognized authority in England and abroad. He published a study of *Bellini* (1899) and edited Reynolds' *Discourses* (1905), but is best known by his championship through much opposition and prejudice, of Cézanne and the post-impressionists. His *Cézanne* (1927) is an authoritative study of the master Among other publications are *Vision and Design* (1920); *Architectural Heresies of a Painter* (1921), a book of travel impressions, *A Sampler of Castile* (1923), and *Transformations* (1926) He was also joint editor of *The Burlington Magazine*

FRYATT, CHARLES (1872–1916), British seaman, was born at Parkeston, Essex, on Dec 2, 1872 He entered the service of the Great Eastern Railway Co, and in 1904 became chief officer in their service of vessels plying between Harwich and Rotterdam. In 1913 he was promoted captain At the end of July 1916, it was announced that his ship, "Brussels" had been captured and the captain himself arrested and tried by court martial, on a charge of having attempted, on March 28, 1916, to ram a German submarine The German authorities stated that Captain Fryatt had confessed that he had acted under orders from the British Admiralty, but the trial was hurried and secret, no intervention on the part of neutrals being allowed The captain was condemned to death and shot at Bruges on July 27, 1916 The body was, on July 7, 1919, brought from Belgium to England and was buried at Dovercourt, near Harwich

FRYDLANT, an old town in northern Bohemia It has local administrative functions supplemented by small but thriving textile and engineering factories, paper-mills and pottery works. The old castle situated on a small hill commanding the town epitomises its stormy history Pop 6,172 It must be distinguished from Frydlant in Moravia, a small town of 3,215 inhabitants.

FRYXELL, ANDERS (1795–1881), Swedish historian, was born at Hesselskog, Dalsland, Sweden, on Feb 7, 1795. He was educated at Uppsala, took holy orders in 1820, was made a doctor of philosophy in 1821, and in 1823 began to publish the great work of his life, the *Stories from Swedish History* Fifty-six years later, he published the 46th and crowning volume of his vast enterprise In 1833 he received the title of professor, and in 1835 he became incumbent of Sunne, where he resided for the remainder of his life On March 21, 1881, he died at Stockholm *See* his posthumously published (1884) *History of My History.*

FUAD I. (1868–), king of Egypt, was born at the palace of Gizeh on March 26, 1868, the youngest son of the khedive Ismail Pasha After his father's débâcle Prince Ahmed Fuad, as he then was, went to Italy where his youth was spent. He returned to Egypt in the 'nineties and was appointed aide-de-camp to the khedive Abbas Hilmi. He found outlet for his energies by presiding over charitable and educational institutions and was largely responsible for the foundation of the Egyptian university, of which he became president. In 1917 his elder brother, the sultan Hussein Kiamil died, and as the latter's son, Prince Kemal ed Din, renounced the rights of succession, Prince Fuad became sultan. After the termination of the British protectorate on Feb. 28, 1922, he was proclaimed king of Egypt (March 16) He had married on May 25, 1919, the Princess Nazli, daughter of Abdel Rehim Sabri Pasha, a former governor of Cairo, and his heir, Prince Faruk, was born on Feb. 11, 1920

After the serious Anglo-Egyptian crisis of 1927 King Fuad, accompanied by Sarwat Pasha, the Egyptian prime minister, visited England, where he had a great reception. He left London for Paris on July 26, and paid a state visit to Rome (Aug. 2–6) before returning to Egypt on Nov. 14 At the opening of parliament he outlined his negotiations in London with reference to Egypt and the Sudan. He also referred to the proposed extension of jurisdiction of the Mixed Courts, and the reform of the Capitulations In June, 1928 were published unsavoury revelations concerning Nahas Pasha, the nationalist premier, and certain of his colleagues. Taking advantage of the discredit thus brought on the Government, the king forced Nahas Pasha from office on July 20, dismissed parliament and announced that he would take the reins of power himself, and Mahomed Mahmud Pasha the liberal leader accepted the premiership at his hands (*see* EGYPT: *History*)

FUAD PASHA (1815–1869), Turkish statesman, was the son of the poet Kechéji-zadé Izzet Molla He was educated at the medical school and was at first an army surgeon He became secretary of the embassy in London; was employed on special missions in the principalities and at St Petersburg (1848), and was sent to Egypt as special commissioner (1851) He was five times foreign minister During the Crimean War he commanded the troops on the Greek frontier and distinguished himself by his bravery He was Turkish delegate at the Paris conference of 1856, was charged with a mission to Syria in 1860; grand vizier in 1860 and 1861, and also minister of war He died at Nice in 1869 Fuad was renowned for his boldness and promptness of decision, as well as for his ready wit and his many *bons mots* Generally regarded as the partisan of a pro-English policy, he served his country well by his able management of foreign affairs, and not least by his efficacious settlement of affairs in Syria after the massacres of 1860

FUCHOW: *see* FOOCHOW

FUCHS, LEONHARD (1501–1566), German physician and botanist, was born at Wembdingen, Bavaria, on Jan 17, 1501, and studied at Ingolstadt, receiving his M D in 1524. Having adopted Protestantism, he wandered from place to place, in 1529 successfully treating the "English sweating sickness," which had spread to the Continent In 1535 he became professor of medicine at Tubingen, where he remained till his death, on May 10, 1566 His most valuable work is the herbal, *De historia stirpium* (Basle, 1542) The genus fuchsia is named after him His collected works were published at Frankfurt in 1566

FUCHSIA, a genus of plants of the family Onagraceae, characterized by entire, usually opposite leaves, pendant flowers, a funnel-shaped, brightly coloured, quadripartite, deciduous calyx, four petals, alternating with the calycine segments, eight, rarely ten, exserted stamens, a long filiform style, an inferior ovary, and fruit, a fleshy ovoid many-seeded berry All the members of the genus, except a few New Zealand species, are natives of Central and South America—occurring in the interior of forests or in damp and shady mountainous situations The various species differ not a little in size as well as in other characters; some, as *F. verrucosa*, being dwarf shrubs; others, as *F arborescens* and *F apetala*, attaining a height of 12 to 16ft, and having stems several inches in diameter

F coccinea was the first species cultivated in England, where it was long confined to the greenhouse. The numerous hybrid forms now existing are the result chiefly of the intercrossing of long-flowered with globose-flowered plants In some varieties the blossoms are variegated, and in others they are double. There appears to be little limit to the number of forms to be obtained by careful cultivation and selection

Ripe seed is sown either in autumn or about February or March in light, rich, well-drained mould, and is thinly covered with sandy soil and watered A temperature of 70° to 75° Fahr has been found suitable for raising The seedlings are pricked off into shallow pots or pans, and when 3in in height are transferred to 3in. pots, and are then treated the same as plants from cuttings. Fuchsias may be grafted readily, preferably by the splice or whip method, the apex of a young shoot being employed as a scion; but the easiest and most usual method is by cuttings

Among the more hardy or half-hardy plants for inside borders are varieties of the Chilean species, *F macrostemma* (or *F. magellanica*), a shrub 6 to 12ft high with a scarlet calyx For inside culture may be mentioned *F boliviana* (Bolivia), 2 to 4ft high, with rich crimson flowers with a trumpet-shaped tube, *F corymbiflora* (Peru), 4 to 6ft high, with scarlet flowers nearly 2in long in long terminal clusters, *F fulgens* (Mexico), 4 to 6ft, with drooping apical clusters of scarlet flowers, *F microphylla* (Central America), with small leaves and small scarlet funnel-shaped flowers, the petals deep red, *F procumbens* (New Zealand), a pretty little creeper, the small flowers of which are succeeded by oval magenta-crimson berries which remain on for months, and *F splendens* (Mexico), 6ft high, with very showy scarlet and green flowers These wild species, however, cannot compare in beauty or freedom of blossom with the numerous varieties raised by gardeners The nectar of fuchsia flowers contains nearly 78% of cane sugar, the remainder being grape sugar The berries of some fuchsias are subacid or sweet and edible From certain species a dye is obtainable The so-called "native fuchsias" of southern and eastern Australia are plants of the genus *Correa*, family Rutaceae



BY COURTESY OF THE ROYAL HORTICULTURAL SOCIETY

FLOWERING BRANCH OF FUCHSIA, (FUCHSIA COCCINEA) AND SINGLE ENLARGED FLOWER (SHOWN ON THE RIGHT). A NATIVE OF TROPICAL SOUTH AMERICA AND THE FIRST SPECIES TO BE GROWN IN ENGLAND

FUCHSINE, also termed magenta or roseine, the first dyestuff of the triphenylmethane or carbonium series (*See* DYES, SYNTHETIC)

FUCINO, LAGO DI, a lake bed of the Abruzzi, Italy (Lat *Lacus Fucinus*), in the province of Aquila, 2 m E of the town of Avezzano The lake was 37 m in circumference and 65 ft deep From the lack of an outlet, the level of the lake was subject to great variations As early as A D 52 the emperor Claudius, realizing a project of Julius Caesar, constructed a tunnel 3½ m long, with 40 shafts at intervals, by which the surplus waters found an outlet to the Liris No less than 30,000 workmen were employed for eleven years in driving this tunnel In the following reign the tunnel was allowed to fall into disrepair, but was repaired by Trajan It is still preserved but is no longer in use Various attempts to reopen it from 1240 onwards were unsuccessful By 1852 the lake had gradually risen until it was 30 ft above its original level In 1854–75 Prince Alessandro Torlonia, the great Roman banker, drained the lake at the cost of some £1,700,000, becoming proprietor of the site in return The reclaimed area is 12½ m long, 7 m broad, and is cultivated by families from the Torlonia estates The outlet by which it was drained is 4 m. long and 24 sq yd in section

See A. Brisse and L. de Rotrou, *Le Desséchement du lac Fucin, exécuté par S E le Prince A Torlonia* (Rome, 1876), E Agostinoni, *Il Fucino* (Bergamo, Arti Grafiche, 1908) well illustrated.

FUEL: A GENERAL SURVEY. Fuel is a term applied to materials used to produce heat by combustion in air Man alone among living creatures has discovered ways of creating heat and power by the use of fuel He has thereby improved his means of procuring food, has adapted himself to live and flourish on almost the entire area of the globe and has secured an immeasurably increased standard of comfort Modern civilization could no longer exist if fuel supplies failed or became exhausted Generally speaking, the bulk of natural fuels such as coal, wood, peat, oil and natural gas, are made up of compounds of carbon, hydrogen and oxygen in association with small proportions of nitrogen and sulphur, in addition to moisture and mineral ash; but in special circumstances such elements as phosphorus, and the more readily oxidizable metals such as magnesium and aluminium may be utilized as fuel.

When the constituent elements of a fuel burn, or unite with oxygen, heat is evolved, and a fuel is completely burned only when the whole of its combustible components are oxidized to the highest possible degree In the process a definite quantity of heat is produced which can be calculated approximately from the chemical composition of a fuel Thus one pound of carbon in complete combustion to carbon dioxide (CO_2), produces 14,650 B Th U ; but only 4,410 B Th U are produced in burning to the lower oxide, carbon monoxide, (CO) If however, this is subsequently burned to CO_2 the balance of 10,240 B Th U. is liberated. Hydrogen burns to water vapour, 53,000 B Th U being produced per lb of hydrogen burned The value of a fuel depends primarily upon its potential heat producing capacity per unit mass or "calorific value", but the calorific intensity, or the temperature to which this amount of heat can raise the products of combustion without excess air, is also of importance The impurities in a fuel affect both its calorific value and calorific intensity

I. SOLID FUELS

Solid fuels may be divided into two main groups as being "natural" or "manufactured" In the former category are coal, wood, peat and other vegetable matter, and in the latter, products such as coke and charcoal, obtained by destructive distillation, viz, by heating the raw material in the absence of air, by which process gas and tar are also yielded Such processes form the basis of the manufacture of both metallurgical coke and gas, two very important industries

COAL

Of all known fuels, coal (*q v*) is by far the most important. In spite of developments in the use of oil and water power it still provides three-quarters of the world's total energy supplies Further, the reserves of coal, which according to recent estimates may be expected to last some 1,000 years at the present rate of consumption, are far above those of any other combustible Even in America, the most important petroleum consuming country in the world, coal accounts for some 70% of the energy produced, natural oil and natural gas for 25% and water power for only 5%

Coal is a stratified mineral which has been formed by the action of decay, heat and pressure upon accumulations of vegetable, and woody, or cellulosic, matter laid down in bygone ages It varies widely in composition and properties. While the proportions of the elements present in any particular variety of coal and its behaviour under various forms of treatment are known, the fundamental causes of the differences between the different types have not yet been placed upon a really rational basis A knowledge of the true constitution of coal, which is being sought by many research workers, could not fail to be of the greatest assistance to those responsible for the proper utilization of a vast but irreplaceable store of fuel

Classification.—Many classifications of coal have been suggested, but none is entirely satisfactory Thus, classification may be by geological age, coking properties, commercial application, chemical composition, etc There is, in fact, no sharp distinction between any one coal and its nearest relation, but rather an innumerable family with characteristics changing gradually from one extreme to the other The following main divisions are however, commonly made: (1) peat, (2) lignites and brown coals, (3) cannel, (4) bituminous coals and (5) anthracite

	Carbon (C)	Hydrogen (H)	Oxygen (O)	Nitrogen (N)	Sulphur (S)	Ash
Cellulose (forms the bulk of plant structure)	44·4	6 2	49·4			
Wood .	48·5	6·0	43·5	0·5		1 5
Peat .	58·0	6·3	30·8	0·9	trace	4·0
Lignite . .	67·0	5 1	19·5	1·1	1·0	6·3
Coal . .	77·0	5·0	7·0	1·5	1·5	8·0
Anthracite .	90·0	2·5	2·5	0·5	0·5	4·0

The chemical composition of solid fuels (moisture free) is given by Butterfield on p. 890; it will be seen that the transition from cellulose to anthracite is marked by an elimination of oxygen, and a corresponding increase of carbon.

Regnault and Gruner were among the first to formulate methods for the classification of coal, which they grouped according to its flaming characteristics and the nature of the coke residue. S. W Parr of the University of Illinois has proposed a classification based upon the heat value of the true coal substance "Unit Coal," free from ash or sulphur, which is given by the formula $\frac{\text{Total B Th.U} - 5000\ S}{1-(1\ 08A+0\ 55\ S)}$ where S and A are the percentages of sulphur and ash respectively. One of the best methods of classification is that of Seyler, in which coals are divided according to their hydrogen content into five groups which are further subdivided according to the carbon content This classification has been used by the British Geological Survey in publications on the coals of South Wales

For carbonization purposes one of the most important properties of bituminous coals is their ability to form coherent coke and the extent to which they swell or shrink during this process This behaviour forms the basis of a useful subclassification of such coals Illingworth and others have classed coals according to the temperatures at which certain constituents decompose

Tests on Carbonaceous Materials.—Accurate tests are available for such characteristics of coal as its calorific value or ultimate chemical composition, and independent determinations of these should agree closely Tests of an empirical nature, such as "proximate" analysis and special tests such as determinations of agglutinating or caking value are less specific but may be equally important Since in such cases variation of method might produce widely divergent results, the same convention must be adopted by different workers

In 1920 the British Government Fuel Research Board, which is responsible for the Physical and Chemical Survey of the National Coal Resources, appointed a committee to examine methods of analysis, including (1) proximate and (2) ultimate analysis, (3) determination of caking index and (4) measurement of calorific value The following methods of analysis have been adopted

(1) *Proximate Analysis* This consists of the determination of moisture, ash, volatile matter and fixed carbon in a sample of coal ground to pass a standard sieve of 60 meshes to the inch and air dried

(a) *Moisture* —This is given by the loss in weight of one to two grammes of coal, when heated for one hour at a temperature of 105–110° C Coals specially liable to oxidation should be heated in a current of dry nitrogen

(b) *Ash*.—1 to 2gm of the coal in a platinum or silica dish is heated gradually in air to about 800° C. When combustion is complete the residue is cooled and weighed

(c) *Volatile Matter*.—1gm of the coal is heated for 7 minutes at a temperature of about 925° C in a platinum crucible of special shape closed by a well fitting lid The loss of weight is taken conventionally to represent the volatile matter.

Fixed Carbon.—This value is obtained by subtracting the sum of the percentages of ash, volatile matter and moisture from 100.

(2) *Ultimate Analysis* This consists of the determination of the proportions of the various constituent elements of the coal The carbon and hydrogen are determined by the combustion of 0 2 of a gram of coal in a current of oxygen The products of combustion are passed over copper oxide at a temperature of 800° C and then over granular lead chromate at a temperature of 600° C to absorb sulphur compounds. The carbon dioxide and water produced are weighed separately and from these weights are calculated the percentages of carbon and hydrogen in the coal. Nitrogen is determined by digesting one gram of coal with sulphuric acid according to the method of Kjeldahl The nitrogen is thereby changed into ammonia which after distillation is titrated with standard solutions The sulphur is determined by conversion into sulphate by heating the coal gently with a fusion mixture of lime and magnesia ("Eschka's method").

(3) *Caking Index* This is used as a rough measure of the power which a coal possesses of being converted by heat in the absence of air into a coherent mass of coke. It is obtained by heating a mixture of coal and sand in various proportions in a covered crucible, the caking index being the maximum proportion of sand to coal which allows of the residue being strong enough to bear a 500gm weight with the production of not more than 5% of loose powder

Calorific Value.—The heat evolved by the complete combustion of a fuel may be determined in various ways, but the most accurate method is by means of the bomb calorimeter 1gm of finely powdered coal is pressed into the form of a cylindrical pellet, accurately weighed, and inserted in a strong metal bomb with an airtight cover This is filled with oxygen to a pressure of about 25 atmospheres and immersed in a calorimeter vessel containing water. The pellet is ignited by passing a momentary current of electricity through a thin wire within the bomb and the heat evolved by the combustion of the coal is measured by the rise in temperature produced, proper cooling corrections being applied The accuracy obtainable is of the order of two or three units in the fourth significant figure The calorific value of dry coal varies from 10,000 to 15,000 B.Th U per lb. according to the type Approximate values in the same units for other dry fuels may be taken as wood, 8,000, peat 10,000, lignite, 12,000; bituminous coal, 14,000, and anthracite, 15,000

In practice the heat obtainable from a fuel is always less than in theory, since losses due to imperfect combustion and to heat carried away in the flue gases, in clinkers and in ashes, can never be entirely avoided Further, in fuels containing hydrogen the calorific value measured in the calorimeter and used generally for scientific purposes (the "gross" calorific value) is higher than that obtainable under working conditions (the "net" calorific value) by an amount equal to the latent heat of vaporization of the water formed Examples of the magnitude of the differences are —

	Calorific Value (B Th U. per pound)	
	Gross	Net
Methane (CH_4)	23,830	21,450
Acetylene (C_2H_2)	21,460	20,700
Hydrogen (H_2)	61,750	57,790
Carbon Monoxide (CO)	4,390	4,390

For coal containing 5% of hydrogen the difference between the gross and net calorific values is about 3%

Constitution of Coal.—Scientific workers to-day are realizing the important bearing of the nature of the actual coal substance upon fuel problems Since coal is derived from vegetable matter, it is to be expected that among its major constituents will be degradation products of cellulose and lignin together with small proportions of resinous bodies and compounds containing nitrogen and sulphur There has been controversy as to the exact mechanism of this gradual transformation of vegetable matter into coal, and the question will probably be settled definitely only after a systematic study of deposits of coal in which all stages of maturing from peat to anthracite are represented.

The more important methods of research which have been employed in investigating the constitution of coal may be briefly enumerated as (a) extraction by solvents; (b) action of reagents, *e g*, controlled oxidation, hydrogenation, chlorination, methylation, etc ; (c) carefully regulated destructive distillation; (d) microscopic examination of thin sections or etched surfaces; and (e) examination by X-rays These methods have all contributed useful information

One of the most recent investigations has been to determine the effect of hydrogen under high pressure upon the coal substance, by which it has been found possible to confer caking properties on coals which are normally non-caking. Even anthracite has yielded to this treatment, while the substance of certain types of coal has been converted into a mineral oil. By the extraction of coal with benzene under high pressure, F Fischer in Germany and W A Bone in England have been able to separate the constituents in which the caking properties of a coal appear to reside. Similar results were obtained by S W Parr in America by the use of phenol and xylene as solvents Bone obtained a considerable yield of mellitic and other benzene carboxylic acids in the

oxidation products of the residue from the benzene extraction, and concluded that a considerable proportion of the coal substance possesses a six carbon ring structure, each carbon of the ring being connected to other carbon atoms

According to R V Wheeler bituminous coal consists essentially of insoluble ulmins in which organized plant tissues are dispersed By mild oxidation, *e g*, with hydrogen peroxide or with air at 100–150° C the ulmins are rendered soluble in alkali and may thus be separated from the organized plant remains. Fossil plant cuticles and other tissues have been recognized in this residue The ulmins when oxidized by dilute nitric acid yield oxalic, succinic, picric and pyromellitic acids, indicating that the ulmin molecules consist of benzenoid groupings linked together by such structures as pyrol and furan or their derivatives The results of the destructive distillation of coal have proved difficult of interpretation from the point of view of the constitution of the coal substance, owing to overlapping of the various decomposition processes taking place. Examination of the oils produced by hydrogenation of coal seems to confirm the views of Bone and of Wheeler on the six carbon ring structure of the coal substance By microscopic study of thin sections Dr Marie Stopes has identified four main ingredients in British banded bituminous coal which she has designated vitrain, clarain, durain and fusain Thiessen on the other hand considers that American coals contain three main ingredients which he terms mother of coal, attritus and anthraxylon C A Seyler has applied the methods of metallography to the microscopical examination of coal surfaces and has been able thereby to identify directly many forms of plant tissue in the coal

Wood.—The use of wood as a fuel is of great antiquity and, although in industrial countries it has been almost entirely superseded by coal, large quantities are still employed locally It cannot be economically transported large distances by rail, and its use is as a rule contingent upon its being at hand more or less in a waste form, for example, in portions of woodlands unsuitable for timber Large quantities of waste wood are produced in process of conversion, some of which is used either for the production of power or for domestic purposes or is distilled for making charcoal, acetate of lime and wood alcohol.

The structural basis of wood is cellulose, of which the simplest form may be taken as $C_6H_{10}O_5$ The composition of wood tissue has been expressed by Schultze and Schappe as "an aggregate of cellulose and a lignone complex" namely 5 $C_6H_{10}O_6$, $C_{10}H_{18}O_8$, or, in percentage composition, C = 49 66, H = 5 74, O = 44 60 The water content of green wood ranges from 50% to over 200% of the weight of dry fibre; in other words wood may contain as much as two parts of water to 1 part of fibre, according to species, the position in the tree and age On air-drying this is reduced to some 15% to 20%, or still further by artificial drying; dried wood, however, may under certain conditions re-absorb moisture

Both the inflammability and the calorific value of wood are greater in the soft resinous varieties such as pine, fir and spruce, than in hard woods like oak or elm, the calorific value after air drying varying from 6,500 to 9,000 B Th U per lb The temperatures attained, however, are comparatively low owing to the high moisture and hydrogen content On this account raw wood is unsuitable for metallurgical operations, but before the days of coke manufacture large quantities of wood charcoal were used in the iron industry.

Peat.—Vast accumulations of peat occur in Europe, North America and northern Asia but the industry has been developed only in regions deficient in coal. In Ireland some 7,000,000 tons are consumed annually; Russia, Sweden, Germany and Denmark also produce and use considerable quantities, and it is used locally in England and Scotland Peat bogs are formed chiefly in temperate humid climates by the accumulation and partial decomposition of vegetable remains under conditions of deficient drainage, the immersion excluding air and preventing complete decay.

Winning of Peat.—The chief use to which peat has hitherto been put is as a domestic fuel, usually hand cut; and though progress has been made in recent years in the excavation and spreading of peat by mechanical methods, there is as yet no general adoption of such methods. In many bogs roots and tree trunks are found, but if, as is believed, such obstructions occur only near the edges they would not necessarily preclude the successful application of mechanical winning Peat is cut by spade in the form of blocks which are spread out on the bog to dry, and, when dry, weigh ¾ to 2lb each In machine winning a dredger or excavator digs the peat from the drained bog and delivers it to a macerator which extrudes the peat pulp through a rectangular orifice, this is then cut into blocks which are spread upon the surface of the bog; after a week or two these are collected into small piles, or "footings," and after further drying are built in open order into small clamps Maceration tends to a more uniform shrinkage, and a denser and tougher fuel; it also accelerates drying under unfavourable weather conditions. Hydraulic excavating can also be used and is specially applicable to bogs containing roots and tree trunks, the peat being washed down by a jet of water under a pressure of about 150lb per sq in and the pulp run to a sump Here after slight maceration it is pumped to a draining ground in a layer about 9in thick, which, after partial drying, can be cut up Complete drying is effected in the usual manner

Peat varies from a light spongy material mainly composed of sphagnum moss in the upper layers to a dense brown more humified substance at the bottom of thick bogs. In its natural state it contains from 90% to 95% of water but by draining this may be reduced to 88% or 91% The "water ratio" (the ratio of water to dry peat substance) of peat containing 95% water is 19 1, that of peat containing 90% water 9 1 the latter will thus contain twice as much solid matter although its water content has only been reduced by 5% The moisture may be reduced by (a) air-drying, (b) evaporation by heat with partial heat recovery, (c) mechanical pressure; or (d) electrical osmosis Many methods involving combinations of two or more of these have been tried, but as yet air-drying is used in all schemes working on a commercial basis By air-drying the water may be brought down to about 25%, the calorific value then being about 7,000 B Th U Peat thoroughly dried by heat takes up about 16% of water on exposure to air; it is thus useless to dry it artificially below this limit The density of air-dried cut peat is about 0·5, that of macerated machine-cut peat 0 85 to 1 0 For industrial purposes 1⅔ tons of air-dried peat is about equivalent to a ton of coal, but owing to its lower density nearly 3½ times the storage space is required

The ash in peat varies considerably, say from 1% to 8%, usually increasing with depth. The nitrogen likewise increases with the depth from 1% to 2% The proximate analysis of a good Irish peat, air-dried, may be taken as moisture, 20 2; organic volatile matter, 49 5; fixed carbon, 26 8, and ash, 3·4 Peat burns readily with a smoky flame and a characteristic odour The ash is powdery and light except in certain varieties high in ash through the inclusion of sand, etc Peat is largely used for domestic purposes and forms a fuel suitable for boiler firing either in the briquetted or pulverized form; it has also been used in gas producers, and the coke from carbonized peat forms a suitable fuel for small producers such as are sometimes used for motor transport purposes

Lignite.—It has been estimated that about 50% of the world's total coal reserves are lignitic, but being inferior in some ways to bituminous coal these reserves have not been exploited to anything like the same extent. During recent years, however, the growing urgency of the fuel problem has led to extensive developments, especially in Germany, where the production of lignite in 1927 reached the enormous figure of 150,000,000 tons, nearly equalling the output of bituminous coal. Schemes for its utilization, particularly by resort to briquetting, are also receiving attention in Australia, Canada, America, New Zealand and other countries

Lignite is intermediate in its properties between peat and bituminous coal, containing when dry some 60 to 75% of carbon

and a variable proportion of ash Raw lignite conforms to two types, brown or amorphous and black or pitch-like; it is characterized by a high water content which may amount to as much as 60% in the brown varieties. On weathering a proportion of this moisture is given up, and a disintegration or crumbling of the material occurs which reduces its value as a fuel Lignite tends also to disintegrate during combustion; hence the losses through the grate are relatively high It does not store well, it is uneconomic to transport long distances and it is liable to spontaneous combustion Against these drawbacks, many of the beds lie close to the surface and are of great thickness, sometimes over 100ft ; they are, therefore, easily worked, and the cost of production is low

The U S. Geological Survey restricts the term lignite to brown coals of woody or amorphous structure, classifying the bituminous or black lignites as sub-bituminous coal. The latter, however, retain some of the more characteristic features of lignites; in particular, a high moisture content—usually averaging from 10 to 25%—and a tendency to disintegration on air-drying which differentiates them from true bituminous coals

Bituminous Coals.—A large variety of coals is included under the term bituminous but all are broadly characterized by their high volatile content (which causes them to burn with a long smoky yellowish flame), and their resistance to weathering The carbon content varies from 75 to 90%, moisture usually being below 10% The non-caking varieties are used largely for furnace work, the caking varieties for gas and metallurgical coke manufacture For steam raising the non-caking type is used and also a class of feebly-caking coals intermediate between bituminous coals and anthracite and designated anthracite coals. The well-known Welsh steam coals belong to this class

Cannel.—Cannel coal is composed largely of certain resinous or waxy plant materials and is characterized by the high yields of oil and gas which it gives on distillation For gas manufacture, however, the high ash content of many seams is a disadvantage, while natural petroleum has largely destroyed its value for oil production Recently it has been suggested that cannel might be profitably treated for the extraction of oils, the solid residue being gasified in ammonia recovery producers

Anthracite.—Anthracites are characterized by their low percentage of volatile matter, less than 8% Their high calorific value and the comparative absence of smoke on combustion make them the most valuable type of coal for steam raising and power purposes generally Many seams are inclined to be friable and in certain parts (S Wales) this has given rise to briquetting industries for the utilization of the fine coal, or duff, as lump fuel

Coke.—When a raw carbonaceous fuel is "distilled" or "carbonized" by heating it in the absence of air, gas and tar vapours are evolved and a residue known as coke remains The characteristics of a coke vary with the type of coal treated, the temperature and time of carbonization, and the peculiarities of the plant in which the operation is carried out Coke may, however, be broadly divided into two classes, namely metallurgical coke and gas coke. The former is the main product of the carbonization of coal at about 1,000° C in the so-called coke ovens, the tar and gas obtained usually being considered as by-products It is used for the reduction of iron ore and for various other metallurgical processes, its essential property being strength to withstand the heavy loads placed upon it in the blast furnace The desired properties in coke are frequently obtained by blending coals having properties complementary one to the other At about 1,000° C gas coke is also the most important by-product of carbonization of coke in vertical or horizontal retorts for gas manufacture. Its chief use is as a furnace fuel and in the production of water- and producer-gas. Coals rich in volatiles are used for gas manufacture but the best metallurgical coke is produced from coals containing not more than 20 or 30% of volatiles. In either case a caking power sufficient to produce a strong well knitted coke is required. Non-caking coals such as lignite produce a pulverulent coke of little value.

Recently the possibility of producing economically a third type of coke by carbonization at about 600° C has attracted considerable attention. This "low temperature coke" retains some 8% or 9% of volatiles compared with only 1% or 2% in gas or metallurgical coke, and so can be ignited almost as easily as coal and burns freely in open grates, producing a pleasing glowing fire It thus forms an excellent smokeless substitute for household coal; but it is lighter and more friable than ordinary cokes The gas yield is less from low temperature carbonization than from high but the tar yield is increased.

From one ton of coal the yields of coke are approximately as follows —

Metallurgical by-product coke	13 -14 cwt.
Gas coke	13 5-14 0 cwt.
Low temperature coke	14 -15 cwt.

Since the heating of the ovens is usually effected by producer gas made from a proportion of the small coke, the amount of coke available for sale will be less than these figures

The following analyses are typical of cokes produced by the three methods under conditions of proper quenching If the coke has been badly quenched or stored in the open the moisture content will be much greater

	Metallurgical coke	*Gas coke*		*Low Temperature coke*
Proximate Analysis		Horizontal	Vertical	
Moisture	0 7	0 9	0 6	2 0
Volatile matter	2 6	2 9	3 5	7 5
Fixed carbon	88 2	86 5	86 4	80 0
Ash	8 5	9 7	9 5	10 5
Ultimate Analysis (dry coke)				
C	88 0	85 8	85 4	78 7
H	0 5	0 6	0 8	2 5
N	1 0	1 2	1 2	1 5
S	0 9	1 9	1 8	1 0
O	0 9	0 6	1 0	5 6
Ash	8 7	9 9	9 8	10 7

Structure of Coke.—Recent work has shown that the physical characteristics of coke have an important bearing upon its suitability for different uses The cell structure of coke appears to be due to the formation of bubbles during the fusion of certain portions of the coal substance and their subsequent perforation Its exact nature depends largely upon the conditions of heating, the type of coal dealt with, and the fineness to which it is ground prior to carbonization. Thus the dense coke made from finely divided coal of suitable coking properties consists of minute cells of uniform structure, but dense cokes can be produced even from strongly swelling coals by blending or by pressure during carbonization, usually effected by preventing expansion by walls, etc

In addition to the chemical tests already described which are applicable to any solid fuel, certain special tests have been devised for the investigation of other properties of coke Those most usually relied upon are determinations of specific gravity (apparent and true), and porosity Strength is measured by the "shatter test," in which 50lb of 2in. screened coke are dropped four times from a height of 6ft. on to an iron plate and the proportion broken determined A limit of 1% has been adopted as the maximum allowable sulphur content in blast furnace coke Reactivity to carbon dioxide is also of importance, and is receiving much attention by research workers

Charcoal.—Charcoal is the solid residue of the destructive distillation of wood. Formerly it was manufactured for smelting purposes by the charring process in which large heaps of wood, covered with earth and turf and provided with flues, were set on fire and allowed to smoulder until the volatile matter was completely driven off, no by-products being recovered In many countries of Europe and Asia charcoal is still prepared in earth kilns. It is only where concentrated supplies of waste wood are available that it is prepared in retorts. In such cases the charcoal becomes practically a by-product of the wood alcohol and acetic acid industry.

Charcoal is a brittle and porous material retaining the original shape of the wood while its microstructure preserves the vegetable cell structure By far the greater portion of the world's supply of charcoal is used for heating and cooking Other uses are for

the manufacture of gunpowder, absorbent and decolourizing agents, heat insulating materials and for hop drying, case-hardening steel, etc As a fuel it is frequently used in gas producers. Good charcoal is deep black in colour and breaks with a bright fracture It rings when struck and burns without smoke In the dry state the apparent specific gravity varies from about 11 for a soft wood to ·20 for a hard wood The true specific gravity of charcoal substance varies between 1 and 2 The carbon content increases with the temperature at which it is prepared, being about 65% for 250° C, 96% for 1,500° C, the loss of weight involved at the high temperatures however, is very serious, the percentage yield falling from about 50% at 250° C to 15% or less at 1,500° C Charcoal is comparatively low in ash and varies from 12,000 to 14,000 B Th U in calorific value The charcoals prepared at low temperatures are exceedingly inflammable, imperfectly charred pieces often being used in Europe for kindling purposes

Briquettes.—Fuels prepared from fines and dust by moulding under pressure either with or without a binding material are called briquettes Pitch and coal tar are the binders most commonly used, the amount required depending upon the hardness of the coal and the proportion of dirt and moisture, but usually lying between 6 5 and 10% One of the most important factors in the prosperity of a briquette works is the cost of pitch which, during recent years, has been very high Hence other materials such as clay, tar, crude oil, peat, silicate of soda, molasses, sulphite liquor, etc , have been tried Binders have also been prepared by the fermentation of waste straw, farmyard manure or seaweed, the latter having the advantage of being smokeless but being difficult to make waterproof In Europe large quantities of briquettes are made from lignite by pressure alone

Briquetting forms a means of utilizing quantities of small coal, which, though of good quality, is unsaleable, or of coals which are deficient in caking power and are therefore unsuitable for coke-making or for burning in the fine state Special processes are required for absolutely non-coking materials, such as anthracite duff, since these disintegrate on the fire through the melting out and burning of the pitch Germany occupies the premier place in the briquetting industry, using mainly brown coal, but briquetting is also carried on in France, Austria, the United States and Wales Coal briquettes are used on railways and steamers, and for industrial purposes, but lignite briquettes which do not stand transport well are chiefly used as household fuel in the neighbourhood of their manufacture

Briquettes are usually of rectangular shape varying in weight up to about 28lb , but smaller egg-shaped or ovoid briquettes are produced in roll presses for domestic purposes They should be uniform in composition and weight, of high calorific value, strong, waterproof and able to bear transport or storage without disintegration The density should be about 1 3, the same as that of the lump coal The ash content where pitch or a similar binder is used is less than that of the original coal, which should be small, but when inorganic binders such as clay or lime are adopted the non-combustible constituents of the binder are added to the ash of the coal The average ash content of a commercial briquette of good quality is about 7% The calorific value is affected by the binder, but in pitch briquettes the calorific value is slightly greater than that of the raw coal

Briquetting under pressure either at ordinary temperatures or at temperatures high enough to cause incipient fusion of some of the constituents, is sometimes adopted as a preliminary process in the carbonization of blends of finely ground coal It not only aids the production of a homogeneous fuel, but simplifies the retorting process

Utilization of Solid Fuels.—The Physical and Chemical Survey of the National Coal Resources (Great Britain) is engaged on a close examination of the properties of the whole range of British coal seams Samples consisting of carefully cut pillars of coal representing the entire thickness of the seam are taken from suitable points and are examined inch by inch, since every seam presents in its stratifications material of widely differing properties Large scale work, sometimes on as much as 500 tons, is also carried out to find the purpose for which a seam is most suitable. Similar investigations are in train in other countries.

Substantial economies in the use of coal might be effected by an improved distribution of the various available grades and to this end a wider adoption of the method of buying to specification would be advantageous. It is not easy to lay down suitable specifications for widely differing purposes; but in Great Britain gas is now sold on a thermal basis and great interest is being taken in the feasibility of selling coal by some analogous method which would take account not only of calorific value, but also of other properties

Since the World War the world's annual production has remained more or less stationary at 1,200 million tons, a figure roughly the same as the maximum reached in the period immediately preceding the war By far the greater proportion of this coal is of the bituminous type, anthracite and lignite each accounting for approximately 10% of the total The production of lignite is, however, increasing very rapidly

Data are not available to show accurately the proportions of coal which are used for different purposes but the following percentage figures give an estimate of distribution, and at the same time show how prevalent is the burning of coal in its raw state — Railways, 20%, Domestic Consumers, 15%, Metallurgical Coke, 15%, Electricity Production, 5%, Gas Manufacture, 5%, and Industrial and other Uses, 40%

The Combustion of Fuel.—The combustion of a solid carbonaceous substance is an exceedingly complex process, taking place in several stages and involving the interaction of gases, water vapour and solid carbon The theoretical amount of air necessary to burn a fuel completely to carbon dioxide and water-vapour can be calculated from a knowledge of its ultimate analysis by the use of the equations, (1) $C+O_2=2CO_2$, and (2) $2H_2+O_2=2H_2O$ From (1) it follows that 12lb of carbon will require 32lb of oxygen and from (2) that 1lb of hydrogen will require 8lb of oxygen, for complete combustion, thus to burn the carbon and hydrogen in a pound of coal of composition C=73 1%, H=5·5%, O=8 7% will take respectively $\frac{0\cdot731\times32}{12}$ (=1 95) pounds, and $0\cdot055\times8$(=0 44) pounds of oxygen, a total of 2 39 pounds of oxygen, or 10 3 pounds of air

In a similar manner the percentage of carbon dioxide in the flue gases corresponding to the theoretical proportion of air can be calculated The equations, however, tell us nothing regarding the manner in which gases are given off from the raw material and interact among themselves and with oxygen and water vapour before the final products of complete combustion are formed A complex mixture is involved containing simple gases such as hydrogen and carbon monoxide, in addition to molecules of greater complexity which are less directly acted upon by oxygen than the simpler ones The combustion of the heavier hydrocarbons presents great difficulty since the action of heat causes them to form still denser aggregates Even the combustion of such a comparatively simple gas as methane (CH_4) has been shown by Bone to proceed in stages involving the entry of successive atoms of oxygen Methyl alcohol is first formed, but this is subsequently oxidized to an unstable compound which breaks up into formaldehyde and steam. Under certain conditions of slow combustion further stages are involved before complete oxidation is effected, but under high temperature conditions the formaldehyde is decomposed into carbon monoxide and hydrogen, which then burn directly to carbon dioxide and steam.

Combustion of Carbon in the Lower Layers of a Furnace.—It is not definitely known whether solid carbon burns directly to carbon dioxide or whether it proceeds first to carbon monoxide and so to CO_2 Three possible reactions are involved.

$$C+O_2=CO_2$$
$$C+O=CO$$
$$CO_2+C=2CO$$

The older theory which is still widely quoted is that the carbon is first burnt to CO_2, which is subsequently reduced to carbon monoxide by contact with heated coke.

By circulating air or oxygen at temperatures from 100° C to

900° C over purified wood charcoal Rhead and Wheeler were led to the conclusion that CO_2 and CO are formed simultaneously from an unstable "physicochemical complex" C_xO_y which is the first product of the action of oxygen on carbon. Langmuir's experiments appear to show that the first gaseous product of the interaction between carbon and oxygen is carbon dioxide, as he was unable to detect the presence of carbon monoxide. On passing upwards the two oxides in the presence of carbon react one upon the other in accordance with the reversible reaction $C+CO_2 \rightleftarrows 2CO$, the final products being formed in definite relative proportions which depend upon the conditions, such as temperature and concentration of the various gases present, and also upon whether sufficient time has elapsed for equilibrium to be established In the reaction quoted above, equilibrium is established at 850° C, when the percentages of CO_2 and CO are 6 23 and 93 77 respectively, at 1,200° C when they are 0 06 and 99·94 Under furnace conditions the gas leaving the incandescent bed will thus be almost entirely composed of carbon monoxide With coal firing this carbon monoxide is consumed together with the gases of distillation by the secondary air, but even a coke fire, although smokeless, may give off carbon monoxide if the supply of secondary air should be deficient or badly distributed

The Combustion of Raw Carbonaceous Fuels.—When a raw carbonaceous material is burned it must first be heated up to the point of decomposition The gases evolved at this stage vary in composition, but consist chiefly of hydrocarbons, hydrogen, carbon monoxide, water and tarry vapours, mixed with a certain amount of solid carbon in a finely divided state. As the combustion proceeds the fuel is freed from volatile matter and converted into coke

Distillation takes place in the upper layers of an ordinary fire, and in order to burn the gas and smoke "secondary air" must be supplied at some point above the fire bed The solid coke burns in the lower portions of the fire, "primary air" for this purpose passing through the bed from under the grate. Thus combustion both of solid carbon and of volatile matter is involved Special devices are sometimes used to force the volatile products through the incandescent coke, for example, by down draught in which the flue gases are drawn away below the grate, or by downward combustion in which the raw fuel is introduced at the bottom of the fire In practice air in excess of that theoretically necessary for complete combustion is always required In good boiler practice 50% of excess air is about the minimum amount necessary to ensure absence of smoke and fairly complete combustion Too much air is undesirable, since by cooling down the gases it may retard combustion and aggravate the production of black smoke, and will increase heat losses The best furnace conditions are obtainable with mechanical methods of continuous firing in which the air supply is under more exact control than can be obtained when the firing door has to be opened at frequent intervals for hand charging

The Blast Furnace.—Coal and coke are used in large quantities, not only for the production of heat but also for chemical purposes such as the smelting of iron ores, where carbon effects the removal of oxygen, so producing metallic iron The process is an ancient one, but until the middle of the eighteenth century the fuel used was charcoal By far the greater proportion of smelting furnaces have, however, now adopted coke, although a small amount of raw coal such as Scottish splint is used. The blast furnace in which pig iron is produced consists of a hollow shaft, 80 to 100ft in height, with an internal diameter increasing from 10 or 15ft. at the top and bottom to some 20 to 25ft. in the centre At the bottom of the shaft is a hearth upon which the superincumbent column of coke and iron ore rests The exact lines of a blast furnace are of importance and vary with the types of ore Air under a pressure of 5 to 6lb per square inch and at a temperature of about 725° C can be blown in through tuyères in the lower portion of the furnace.

The ores used may be either oxides or carbonates of iron. The reactions occurring are complex; in the lower portion of the furnace near the tuyères the fuel is burnt by the blast to carbon monoxide, which effects the reduction of the ore in the upper portion of the shaft, where spongy iron impregnated with carbon and carbon monoxide is produced by a series of reactions of which the following is the resultant:—$Fe_2O_3+3CO=2Fe+3CO_2$. This spongy iron is melted as it passes through the lower layers and can be drawn off from time to time through tapping holes. Limestone is added to the charge in order to assist in fluxing

Blast furnace practice has been greatly influenced by the work of Sir Lowthian Bell, who in 1872 applied the laws of mass action to the reactions in the blast furnace, and came to the conclusion that the practical limit for the ratio of CO to CO_2 in the gases leaving the furnace could not be reduced below 2 0 In modern blast furnaces a ratio of 1·7 has been reached, but in average practice a ratio of 3 0 is more common. Bell's argument, however, remains valid, although imperfections in scientific measurement affected the accuracy of his calculation It will thus be seen that fuel economy in iron and steel practice depends essentially upon finding uses for the combustible gases (100 B Th U.) which are necessarily rejected in large quantities from the shaft In modern furnaces these may be used either for heating the blast, or for power and heat requirements in the subsequent treatment of the pig iron. Concentration of coke ovens, blast furnaces and steel making in the same works enables the fuel consumption per ton of finished steel to be reduced to a minimum, from 30 to 33cwt. or less of coal per ton of finished steel.

Pulverized Fuel.—During recent years attention has been drawn to the possibilities of burning fuel in pulverized form When powdered fuel is blown into a furnace as a cloud the surfaces exposed to air are enormously increased; combustion is therefore both efficient and rapid. Pulverized fuel thus offers considerable advantages and its use is being developed, especially in America, while large installations are at work in Europe. Attention is also being paid to the possibility of its adoption by steamships and the voyages of U.S.S. "Mercer" across the Atlantic in 1927–28 led to the converting of other Shipping Board freighters to the use of slack coal.

Fuel for Domestic Purposes.—The fuel used for warming buildings, producing hot water and cooking is a very considerable item, probably amounting in the aggregate to 15% of the total British consumption. The manner of its use varies widely according to climate and custom Thus in Great Britain, where extremes of temperature are rare but rapid changes common, and where ample supplies of cheap bituminous coal have been available, the open fire persists; but to cope with the severe winters of parts of America and Europe, central heating or closed stoves, generally consuming anthracite, coke or briquettes, are necessary In England the substitution of coke for raw coal is extending, and attention is being paid to the possibility of manufacturing a carbonized fuel more easily ignited than gas or metallurgical coke.

II. LIQUID FUELS

The use of fuel in liquid form is undoubtedly of very ancient origin, vegetable and animal oils being burned for the production of light and, to a limited extent, of heat The modern oil industry, however, originated about the middle of the 19th century in the distillation of Scottish shales, which was carried out on a considerable scale during the subsequent 50 years, the most important products for fuel purposes being kerosenes and paraffin wax. When, however, natural petroleum was discovered, its phenomenal development gradually affected more and more the shale oil industry and the enormous quantities of natural oil now produced completely overshadow that obtained by distillation.

Petroleum.—Natural petroleum forms the basis of practically all industrial liquid fuels The development of the internal combustion engine has increased enormously the consumption of the lighter types of oils; the heavier fractions being utilized as fuel oils. Petroleum supplies also illuminating oil and the mineral lubricating oil which is required in such large quantities for mechanical equipment.

Crude petroleum is a mixture of hydrocarbons and small proportions of oxygen, nitrogen and sulphur derivatives of hydrocarbons It can be divided into two main classes known respectively as paraffin base crudes and asphalt base crudes, according

to whether the residue after distillation consists mainly of paraffin wax or is of an asphaltic nature. In a third type, known as mixed base crudes, paraffins and asphalts co-exist.

The carbon in a crude petroleum varies under analysis from about 81 to 87%, hydrogen from 10 to 14%, oxygen and nitrogen from 1 to 7%. Sulphur is an undesirable constituent; it is usually present only in small quantities but special methods of refining are necessary where it occurs in larger proportions.

Petroleum, which is usually associated with water and natural gas, is found in voids in porous sedimentary rock where the geological formation is such as to allow the oil to collect from over a wide area Impervious rock usually overlays the petroleum containing strata which is commonly concave downwards (anticline), the dome formed collecting natural gas at the top, under which is oil floating upon water Occasionally the oil occurs in strata which are concave upwards, collecting in a pool from which it is prevented from escaping downwards by underlying impervious strata In the former case the oil is obtained by drilling the non-porous strata, when the natural gas and oil are forced to the surface by the pressure exerted by the underlying water Under these conditions the well is termed a "gusher," but sooner or later it usually becomes necessary to pump out the oil.

It has been estimated that not more than 20% or 30% of the oil present in a natural well reaches the pipe line The porous rock retains a considerable proportion and further waste occurs through infiltration of water and the escape of natural gas, in addition to losses due to improper storage and fires Possibly some such means as mining may be developed for the recovery of a further percentage, but this has not yet become feasible economically

Petroleum Resources.—In 1928 the U S A produced about 70% of the world's total annual supply of one million barrels of petroleum, but important oilfields are being worked also in Russia, Dutch East Indies, Persia, India, Galicia, Mesopotamia and Burma Various attempts have been made to predict the world's oil resources but such computations have usually proved too conservative Haslam, however, has recently estimated that the United States and Mexico control some 20% and Great Britain 70% of the total recoverable supplies Many petroleum producing districts have passed the peak of their productivity, but supplies have been maintained by the opening up of further fields It is, however, certain that if oil requirements continue to increase at the present rate, a period will ultimately be reached when other sources, such as shale deposits, which exist in vast quantities, will have to be tapped For this to become commercially possible the shortage of natural petroleum will have to reach a point sufficiently acute to be marked by considerable advance in prices

Preparation of Fuel Oils.—Crude petroleums are usually subjected to fractional distillation, the more volatile constituents being used as motor spirit, which is also obtained from natural gas. Other fractions are kerosene, gas oil, fuel oil and lubricating oil, a heavy viscous residue being left in the still. The great demand for motor spirit has had the effect of increasing the amount of light fractions "topped" from the crude, which may reach 20% or more of the total An additional quantity is obtained by cracking some of the heavier fractions, *e g*, gas oil; the light product is a gasoline with anti-knock qualities Standard specifications for motor and aviation spirit have been laid down by the British Engineering Standards Association Crude petroleum which has lost its volatile constituents by evaporation during storage is sometimes used in the natural state as fuel oil; distillate and residual fuel oils are also used

The gross calorific value of fuel oil averages about 19,000 B.Th U. per lb, but an oil of high specific gravity and comparatively low calorific value may contain more heat units per gallon than one of low specific gravity and high calorific value.

The flash point of an oil is the temperature at which under defined conditions a momentary flash is produced when a flame is brought near the surface. A minimum flash point is laid down in navy and other specifications The temperature at which sufficient vapour to support continuous combustion is given off by an oil is known as the fire point; it is usually about 20° F higher than the flash point.

The viscosity of oil, which changes rapidly with temperature, is determined by its resistance to flow as measured by the amount passing through a standard orifice in a prescribed time The formation of solid paraffins, etc., may also cause difficulty in pumping oil through pipes at low temperatures. Asphalt base crudes as a rule must be preheated to reduce their viscosity to a degree which allows of ready atomization in the burner

The chief drawback in the use of fuel oil is the presence of foreign matter, for it has been shown that sulphur and asphalt play little part in the difficulties that have been experienced. Consequently all fuel oil should be strained, filtered or centrifuged

Artificial Liquid Fuels.—To countries not possessing oil fields the problem of developing means of obtaining fuel oils from available materials, if only for emergency use, is of great importance. Several such processes are feasible, and attempts are being made to bring them to a commercial stage

From Carbonization Processes—The tars formed by the destructive distillation of coal, lignite or shale at low temperatures yield under suitable treatment a range of fuel oils European oil shales yield over 20 gallons of oil per ton, while in the United States there are large shale deposits capable of yielding over 40 gallons per ton About 15–22 gallons of crude tar per ton of bituminous coal can be obtained After dehydration and removal of suspended matter this is suitable for use in Diesel engines, but its flash point is below the Admiralty specification, while after removal of the light spirit the residue is above the specified viscosity By fractionation and refining, however, fuel and lubricating oils can be obtained in addition to a quantity of motor spirit The tar from high temperature distillation also contains petroleum constituents, but in relatively small quantities. It is frequently used as a fuel, the lighter fractions forming the source of an excellent fuel (benzole) for internal combustion engines

Synthetic Fuels from Carbon Monoxide—In the first of these, described initially by the Badische-Anilin und Sodafabrik and developed by Fischer in Germany and Patart and Audibert in France, carbon monoxide and hydrogen are produced by the action of steam upon red-hot incandescent carbonaceous matter according to the water-gas reaction, $C+H_2O \rightleftharpoons CO+H_2$, and the recombination of the gaseous molecules is subsequently effected by the action of heat in the presence of a catalyst. By suitable adjustment of pressure and temperature, together with a suitable choice of catalyst, products varying from oxygen-containing compounds such as methyl and ethyl alcohol to liquid and solid hydrocarbons of the paraffin series may be obtained Patart has developed a method in which water gas made from coal or coke is used for producing alcohols by heating it to about 400° C at 300 atmospheres in catalyst tubes, while in the Fischer process synthetic liquid and solid hydrocarbons of the petroleum series are produced at atmospheric pressure.

It is not easy at the present stage of progress to estimate the extent to which the high thermal losses associated with these processes will affect the commercial position of the production of motor spirit from coal, which can only be decided from the results of working a full-scale plant

Hydrogenation of Coal.—Another process for the manufacture of oils and motor spirit from coal is that of hydrogenation investigated by Bergius. Hydrogen is added to coal by the action of heat and high pressure in such a proportion as to bring the carbon-hydrogen ratio to about that of natural oil, the molecules being caused to split up and combine with this hydrogen for the production of an artificial oil material. The coal after mixing with a small quantity of alkaline iron oxide (luxmasse) and suitable oil or tar (usually obtained from previous runs) is forced into a reaction bomb to which hydrogen at 180–200 atmospheres is pumped, the temperature being raised to some 400° C. Approximately 50% of the coal is converted into oil, which on distillation yields 20 to 25% of pitch Of the remaining 50% of the coal 20% is converted into gas, 8% into water, 0·5% into ammonia, while 11 5% remains as insoluble organic matter, the ash being 10%.

An intermediate scale Bergius plant has been installed at the

British Fuel Research Station and a large scale unit is being erected in Germany A modification of the Bergius process is being worked commercially for the production of motor spirit by the Interessen Gemeinschaft at Leuna in Germany.

Utilization of Liquid Fuels.—Liquid fuels derived from petroleum may be utilized either by combustion in furnaces or to produce energy directly in the cylinders of internal combustion engines Either light or heavy oils are applicable to the internal combustion engine; the former can be ignited by a flame or spark while with heavier oils vaporization and ignition are effected by the high temperature developed on the compression stroke

In furnaces oil must be changed prior to combustion from the liquid to the gaseous state In general a mixture of heavy and light gaseous hydrocarbons is formed, and for smokeless combustion these must be brought into contact with a sufficient supply of air at a high temperature to ensure the complex series of changes involved in the successive picking up of molecules of oxygen overtaking the tendency of the heavier molecules to split up into solid carbon and hydrogen under the action of heat

Oil Burners.—Preliminary vaporization is sometimes effected by the application of heat to light oils, but in general fuel oils are pre-heated only sufficiently to ensure free flow in the pipe line and burners The main function of the burner is then to break up or atomize the oil, which enters the furnace in the form of fine mist or spray and is volatilized almost immediately. There are three main types of atomizing burners; firstly the spray type in which a current of steam or air is used to break up the oil into a fine spray, secondly rotary burners where atomizing is effected by a disk or cylinder rotating at high speed, and thirdly mechanical spray burners where the oil is forced by high pressure through fine slots or orifices

Each type has its advantages and disadvantages and the choice of burner must depend on local conditions Thus, atomizers are cheap and simple in design and operation, but it is not practicable to use them with small flames and close regulation is difficult, and since they can only be used with dry steam there is a chimney loss in sensible heat of steam Air atomization is used only when compressed air is already available; short intense flames are readily obtained and closer adjustment is possible than with steam Rotary burners are often low in efficiency, but they are easy to operate and are very useful for low pressure installations where pressure for other types is not available Mechanical spray burners require neither high pressure air nor steam, and are efficient at high capacities Short intense flames can be obtained and less energy is necessary than is required in either air or steam atomization The disadvantages include high first cost of installation, lack of flexibility and tendency to clogging of fine orifices

Advantages of Oil Fuel.—The price of oil on a thermal basis is usually relatively high, but it has many advantages over solid fuels. For the same calorific value it is considerably lighter than coal and is only half the volume The saving in weight and storage space made possible and the ease of bunkering are of particular significance for steamships, especially since the labour entailed in stoking and trimming coals is reduced and the handling of ash eliminated Further, the quality of oil is more uniform than that of coal, it is not liable to spontaneous combustion and it is clean and safe. Efficiencies up to 80%, and high flame temperatures, are easily obtainable with oil fuel. It is interesting to note that in 1927 36% of the tonnage recorded in Lloyd's Register was equipped to burn oil though it does not follow that all these vessels were actually *using* oil.

Fuels for Light Internal Combustion Engines.—In light internal combustion engines such as are used in aircraft and motor vehicles the fuel used is termed *petrol* in England, *gasolene* in America and *essence* in France. It usually consists of the lighter hydrocarbons obtained from crude oil by distillation, of specific gravity about ·725 and net calorific value 18,600 B.Th.U. per lb.

Liquid fuel is vaporized more or less completely in its passage by the suction of the engine through fine orifices (carburettor jets) and subsequently through the induction pipes and manifolds. On reaching the cylinders it consists of a mixture of liquid mist, hydrocarbon vapours and air. The efficiency of combustion depends largely upon the completeness with which the fuel is vaporized; if fuels of the kerosene type, which are less volatile than motor spirit, are used, they must be previously converted into vapour by the application of heat in a specially designed vaporizer

The theoretical efficiency obtained in the engine varies with the compression ratio, the highest practicable value of which depends upon the design of the engine and certain characteristics of the fuel used, in particular the latter's tendency to produce detonation or "knocking." Benzol and alcohol can stand much higher compression ratios than other fuels before this phenomenon occurs Detonation can be inhibited by the introduction into the spirit of small quantities of tetra ethyl lead, but since this material possesses toxic properties caution is necessary in its use.

Fuels for Heavy Oil Engines.—The Diesel engine, unlike the gas or petrol engine, draws in air during the suction stroke without admixture of liquid fuel or gas Oil is injected mechanically in the form of spray during the earlier portion of the working stroke, and burns at the high temperature brought about by the compression A third type of engine, often termed semi-Diesel, is intermediate between the gas and Diesel engine, the oil being injected into a combustion space incorporating surfaces maintained at a much higher temperature than the remainder of the engine cylinder Ignition is effected partly by exposure to these surfaces and partly by the temperature induced by moderate compression of the air drawn in during the suction stroke The fuels used are intermediate in gravity and volatility between fuel oil and Diesel engine oil. The fuel for semi-Diesel and Diesel engines may be either gas oil or the residuum left in the still after distillation Tar oils are sometimes used but owing to the difficulty of ignition special precautions have to be taken.

The British Admiralty specify for Diesel engine purposes either shale oil, petroleum, or a distillate or residual product of petroleum, with a flash point not lower than 175° F The sulphur content is limited to 3% and a maximum acidity is also specified The viscosity must not exceed 2,000 for an outflow of 50 cubic centimetres at a temperature of 32° F as determined in the Admiralty-type Redwood viscometer for testing oil fuel

III. GASEOUS FUELS

It has already been pointed out that before final combustion all fuel is converted to the gaseous state. In this section, however, fuels which when supplied to consuming appliances are already in the gaseous form will be considered separately These may be grouped as natural gas, coal gas obtained by destructive distillation of carbonaceous material at high or low temperatures and gas obtained either by partial combustion or by the action of steam on red hot carbonaceous materials The latter comprise water gas, producer gas and blast furnace gas or other gas obtained as a by-product from industrial or chemical processes.

Natural Gas.—Natural gas usually occurs in conjunction with petroleum or coal, being stored in porous rocks with an impervious covering, from which it is obtained by drilling In the United States very large quantities have been recovered and used for industrial and domestic purposes, as much as 800,000 million cu ft per ann from 1917 to 1922, and in 1926 1,300,000 million cu ft.; but its utilization in isolated oil-fields is a serious problem. Natural gas consists chiefly of methane (CH_4) and other light hydrocarbons, its calorific value varying from 700 B.Th U per cu.ft to 1,500 B Th.U. or more It frequently contains hydrocarbons liquid at ordinary temperatures and pressures which can be recovered by washing or other treatment, several million tons of such spirit ("casing-head" gasoline) being obtained annually.

Coal Gas.—Coal gas is obtained by the distillation of coal and was formerly made almost solely for illuminating purposes; but the introduction of the incandescent mantle and the development of gas cooking and heating, have made calorific value a far more important criterion than illuminating power This change has had a profound effect on the process of manufacture During the 19th century gas practice tended towards constantly rising temperatures in horizontal retorts. Until about the middle of the century oval or D shape retorts of metal were used, but these

were replaced later by retorts of fireclay or other refractory material, about 16in. wide × 24in broad × 20ft long, installed in benches one over the other and heated by flues in which is burned producer gas Such retorts are still largely used, but the vertical retort—which was introduced about the beginning of this century —now carbonizes half of the gas-works coal in Great Britain Vertical retorts are 20 to 25ft high with a rectangular section of 33 to 43in by 10 to 14in , they may be either intermittently or continuously operated, and in them the coal travels by gravity

The quantity and yield of gas vary with the parent coal, the temperature and time of carbonization, the type of retort, etc. A typical town gas has the following percentage volume composition —carbon dioxide 2·2, oxygen 0 5, unsaturated hydrocarbons 2 0, carbon monoxide 14 0, hydrogen 52·0, methane, etc , 23·0, nitrogen 6 3; calorific value 500 B Th U per cubic foot

During recent years the practice of passing steam through the charge in vertical retorts during carbonization has gained ground, since an increased yield can be obtained thereby through the water gas action (*see* below) The calorific value of the resultant gas is reduced, but owing to the large volumes produced the aggregate thermal yield is considerably increased For example. in a test of Yorkshire coal in vertical retorts without steaming, the British Fuel Research Board obtained 13,100 cu ft of 544 calorific value gas or 71 3 therms (1 therm=100,000 B Th U). In a parallel test with the same coal, steaming to the extent of 20% by weight of the coal charged increased the yield to 22,580 cu ft of 460 calorific value gas or 103 8 therms Experiments have shown that if a small quantity of oil be introduced into the retort by suitable means, in addition to the steam, both high yields and high calorific value may be obtained Thus a series of tests using 4 75gal of gas oil per ton of coal and 5% of steam gave 15,450 cu ft of 558 calorific value gas or 86·2 therms An increased measure of elasticity is therefore conferred on the vertical retort Variations of these methods for increasing the thermal yield or the elasticity of working of vertical retorts are under investigation in the industry.

The purification of coal gas is of great importance especially for domestic purposes. The purification system includes condensers and scrubbers for cooling the gas and extracting such valuable by-products as tar, benzol, naphthalene and ammonia, but small quantities of impurities as cyanogen and sulphur compounds remain Sulphuretted hydrogen is removed by passing the gas through layers of hydrated ferric oxide, the spent material being "revivified" by oxidation in the atmosphere, and after repeated use sold for sulphuric acid manufacture The removal of carbon disulphide is more difficult but processes are now available whereby it may be converted to sulphuretted hydrogen and removed as above

In Great Britain gas is now usually sold by the therm (100,000 B Th U) and gas undertakings are given freedom regarding the calorific value of the gas which they supply This must be declared and cannot be altered without due notice, the Company being responsible for making the necessary adjustment to consumers' fittings. In Great Britain declared values vary from 640 to 280 B Th U , such extremes however being exceptional. Taking 26 of the most important undertakings, the declared value of gas supplied varied between 450 and 560 B.Th.U., and of these 11 declared a value of 500 B.Th U.

Water Gas.—Large quantities of water gas are used industrially and are also distributed both in Europe and America for town purposes This gas is usually enriched by gas from cracked oil and is then termed carburetted water gas

When steam is passed over highly heated carbonaceous matter a strong reaction occurs. The oxygen in the steam combines with the carbon, the final products of the reaction being formed in definite relative proportions depending upon temperature and concentration of the different gases present and also upon whether there is sufficient time for chemical equilibrium to be established. Two primary reactions occur, viz , (1)—$H_2O+C \rightleftarrows H_2+CO$, and (2)—$2H_2O+C \rightleftarrows 2H_2+CO_2$. In addition to these there are many others of which perhaps the most important are, (3)—$C+CO_2 \rightleftarrows 2CO$, and (4)—$H_2O+CO \rightleftarrows H_2+CO_2$

It can be shown experimentally that above 1000° C reactions (1) and (3) predominate, while reactions (2) and (4) predominate at temperatures below about 700° C. The percentage of carbon monoxide is high and that of carbon dioxide low at high temperatures (about 1000° C) whilst the reverse is the case below 700° C It is desirable then, in order to get the richest possible water gas, that the temperature of the fuel bed should not fall below 1000° C

The reactions (1) (2) and (3) are strongly endothermic in character, that is to say they are accompanied by the absorption of heat and if no heat be applied during the reaction the temperature of the fuel bed will fall Water gas producers are therefore generally worked upon an intermittent system; that is to say, the gas-making period during which the temperature of the fuel bed falls considerably is followed by a period of heat recuperation, in which the steam is replaced by a blast of air, the oxygen of which combines with the carbon with evolution of heat so that the temperature of the fuel bed is again raised to that necessary to produce gas of the required CO content

Water gas made from coke under commercial conditions usually has a calorific value of about 300 B Th U per cu ft , the percentage volume composition being approximately.—carbon dioxide 3 5, carbon monoxide 44 0, hydrogen 48 0, methane, etc 0 5, nitrogen 4 0, calorific value 308 B Th U per cubic feet While water gas is sometimes used as a diluent for richer gases such as coal gas, it is usually delivered as carburetted water gas "enriched" with oil gas obtained by cracking petroleum oil in "carburettors" incorporated in the plant and heated by waste heat during the blow period The composition varies but the following may be taken as typical.—carbon dioxide 3 0, unsaturated hydrocarbons 8 5, benzene 1 5, carbon monoxide 28 0, hydrogen 37 0, methane, etc 20 0, nitrogen 2 0 , calorific value 500 B Th U per cubic foot The calorific intensity of water gas is higher than that of coal gas owing to the heat capacity of the products of combustion being low It can for this reason be made to burn with a short flame and is especially valuable for processes such as steel welding, where intense local heat is necessary It has also been used, especially in Sweden, for small steel melting and re-heating furnaces

Producer Gas.—For many industrial purposes a cheaply made gas which need not necessarily possess a high calorific value is of importance. Low calorific value gas is produced by the incomplete combustion of the carbon of the raw material, so that the products of combustion are rich in carbon monoxide Such a gas would contain a proportion of CO_2, and the whole of the nitrogen from the air used to supply the necessary oxygen Gas of this type is often referred to as Siemens gas As we have already shown, the combustion of carbon to carbon monoxide is an exothermic reaction in which large quantities of heat are given off The bulk of this heat may be utilized if the hot producer gas be immediately consumed in the furnace, but if required for storing, this sensible heat must necessarily be lost. The temperature of producers working in this manner will tend to be high and artificial cooling may be necessary

Alternatively a power gas though not water gas, may be produced by combining the above processes with the water gas process; thus if a mixture of air and steam properly proportioned is admitted to a producer, both water gas and partial combustion gas are made simultaneously and continuously, the heat evolved during the exothermic reaction of $C+O=CO_2$ being utilized to maintain the temperature of the fuel bed which is being continually cooled by the endothermicity of the water gas reaction. The composition of producer gas varies widely but the following may be taken as a typical gas suitable for a steel melting furnace where a high proportion of CO is considered desirable: carbon dioxide 2·5, carbon monoxide 30·0, hydrogen 12·0, methane, etc 3·0, nitrogen 52·5; calorific value 164 B.Th U. per cubic foot. For power gas associated with maximum ammonia recovery a large proportion of steam must be used. In such a case the composition would be approximately· carbon dioxide 16·0, carbon monoxide 12·0 hydrogen 24·0, methane, etc. 3·0, nitrogen 45·0; calorific value 145 B.Th.U per cubic foot

Producer gas forms a good fuel for gas engines. It may be made in positively blown producers or, for comparatively small powers, in those of the suction type where the vacuum induced in the suction stroke of the engine draws the necessary air and vapour through the producer It is essential, however, that the gas be cooled down before delivery to the engine, and that it should be thoroughly cleaned from both dust and tarry vapours

By-product Gas.—The iron and steel industry presents two important cases of large quantities of valuable gas being obtained as a by-product of major operations. These comprise (a) blast furnace gas and (b) coke oven gas

Blast Furnace Gas.—In blast furnace operations a low grade gas is necessarily evolved A typical percentage composition for such a gas would be. CO_2, 10, CO, 30, H_2, 1, N_2 59, with a net calorific value of 100 B Th U per cubic foot From each cwt of coke consumed in the furnace some 165,000 cu ft (at 15° C and 760mm) of this gas would be obtained at a temperature of about 250° C In modern steel works it is utilized for many purposes, including the pre-heating of the blast in Cowper stoves, steam raising, gas engines, steel furnaces and soaking pits, etc

Coke Oven Gas.—The rich gas given off in by-product coking is similar in composition to retort gas made for town purposes but it is usual to extract the benzene Its composition is approximately carbon dioxide 3 0, unsaturated hydrocarbons 4 0, carbon monoxide 6 0, hydrogen 49·0, methane, etc 34·0, nitrogen 4 0, calorific value 580 B Th U per cubic foot Where coke ovens are associated with steel works it is frequently possible to use some of the surplus gas upon the works, but when, as often happens, they are situated at a colliery, or are totally independent, difficulties arise in its disposal and it may be burnt to waste The question of its utilization in greater measure for town purposes over long distances is the subject of experiment and of enquiry at the present time, and there is no doubt that if certain difficulties associated with constancy of supply etc can be overcome it will find such an outlet in increasing quantities In both Europe and America long distance pipe-lines are frequent, the gas being transported economically under pressures up to about 45lb. per sq.in Recently schemes have been considered for carrying gas long distances at pressures up to 450lb per square inch.

Combustion of Gases.—The advantages of gaseous fuels are (a) ease of distribution, (b) high thermal efficiency of utilization, (c) no smoke or ash, (d) ease of control giving either oxidizing or reducing flames and flames of varying temperatures

The general question of combustion has already been dealt with, but certain special considerations are applicable to the case of gaseous combustion In the burning of gases both rapidity of combustion and length of flame can be controlled by suitable adjustment of the gas rate and the primary and secondary air supplies

Gas Burners Gas burners vary widely but most types can be divided into two main classes according to whether or not air is mixed with the gas prior to its reaching the point of combustion A relatively long flame, which may be suitable for certain types of furnace work, is produced by burning gas without primary air. On the other hand burners of the well-known Bunsen type can, if desired, be adjusted to give a rapid rate of combustion with relatively short flames, such as are necessary where the combustion space is limited or maximum flame temperatures are required

Submerged Combustion. Lately, with a view to obtaining increased efficiencies in water or steam heating, attempts have been made to develop a type of burner in which gas can be consumed under water. For such submerged combustion it is obviously essential that sufficient primary air for complete combustion should be intimately mixed with the gas.

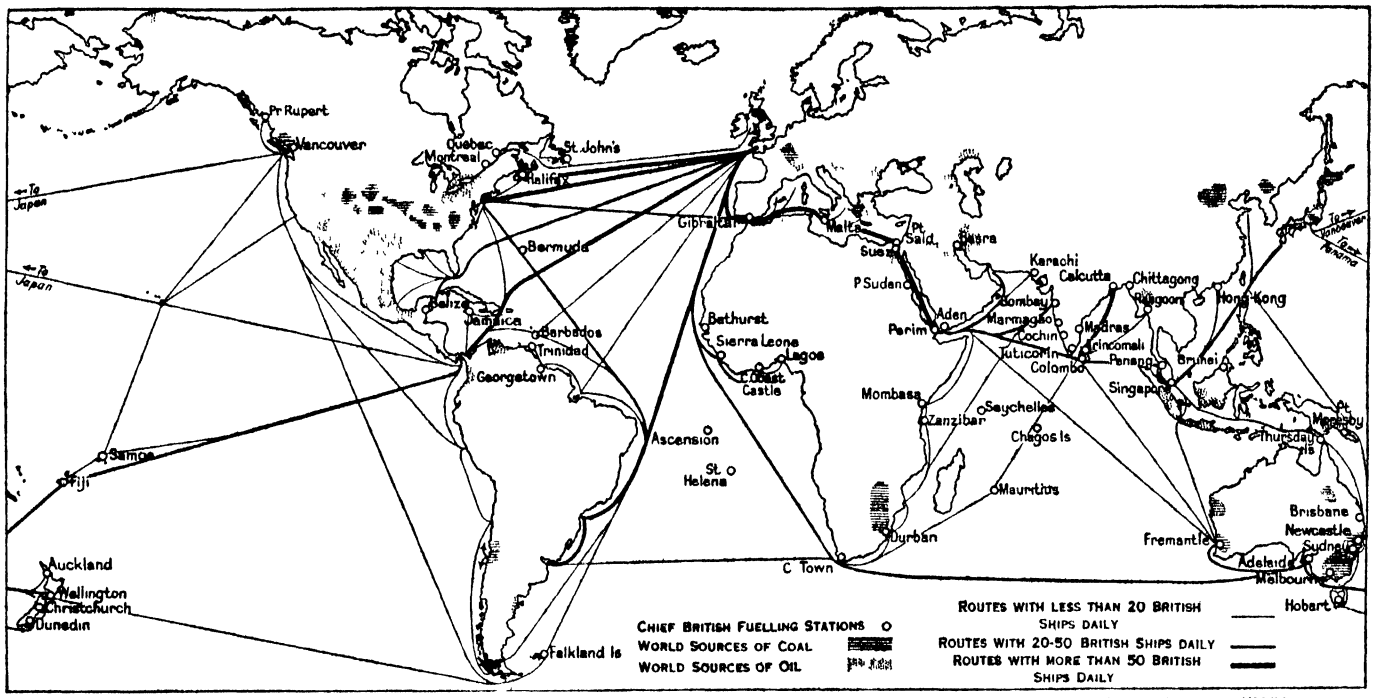
Surface Combustion.—Sir Humphry Davy in the earlier part of the nineteenth century discovered that a warmed platinum wire when introduced into a non-explosive mixture of air and coal gas became incandescent and continued to glow until practically the whole of the oxygen was consumed. Further experiments, particularly by Dulong and Thomson and Döbereiner, showed that many other substances possessed the same power. Before commencing work on this subject in 1902 W. A. Bone proved (1) "that the power of accelerating gaseous combustion is possessed by all surfaces at temperatures below the ignition point in varying degrees, dependent upon their chemical characters and physical texture" and (2) "that such an accelerated surface combustion is dependent upon an absorption of the combustible gas, and probably also of the oxygen by the surface, whereby it becomes 'activated' (probably ionized) by association with the surface" and (3) "that the surface itself becomes electrically charged during the process" Bone also pointed out that "there are experimental grounds for the belief that not only does the accelerating influence of the surfaces rapidly increase with the temperature, but also that the differences between the catalysing powers of various surfaces, which at low temperatures are often considerable, diminish with ascending temperatures until at bright incandescence they practically disappear" This accelerated combustion has been applied by Bone to various industrial heating appliances as a means of increasing the efficiency of heating operations In these a mixture of air and gas in correct proportions is caused to burn without flame in contact with incandescent surfaces. The advantages are (1) accelerated combustion, (2) concentration of combustion where required, (3) minimum excess air, (4) high temperature, (5) rapid heat transfer by radiation

Surface combustion has been applied to gas furnaces, gas cookers and heaters, etc , gas and air being forced by slight pressure through a porous diaphragm of refractory material, the mixture burning on the exit surface and maintaining it at incandescence without flame Other applications include boiler heating where the gas is burnt in boiler tubes filled with granular fireclay.

For further particulars reference should be made to the following articles Under COAL AND COAL MINING will be found a general survey of the world's coal resources and of the methods of coal mining; cognate articles will be found under ANTHRACITE, LIGNITE, PEAT, COKE and PULVERIZED FUEL. Mineral oil is treated under PETROLEUM, SHALE OIL, GASOLENE and PARAFFIN OIL *See* also GAS MANUFACTURE, NATURAL GAS and PRODUCER GAS (C. H. L.)

FUELLING STATIONS are repositories or warehouses located at convenient ports for supplying coal and oil to commercial and naval vessels In the latter half of the 19th century as steam vessels replaced the old sailing ships in ocean transport, the trade of the world began to settle down upon definitely fixed routes and, with the opening of the Suez and afterwards of the Panama canals, the great sea lanes encompassing the globe were completed. Along these lanes fuelling stations have grown up at ports where merchant ships have found it convenient to take fuel for replenishing their bunkers In the early days of steam, the endurance of the ships was low, frequent bunkering was necessary, and coaling stations came into being at every few hundred miles along the trade routes The increased size of ships, improvements in the steam engine, the use of oil fuel, and lastly the introduction of the internal combustion engine, have now added greatly to the time that ships can keep to sea without refuelling Consequently some of the older coaling stations are decreasing in importance, whilst others, under the influence of oil are growing rapidly At few but the terminal ports on the great trade routes, is either coal or oil native, and the "bunkering" trade, which carries oil or coal from its sources to the fuelling stations, forms no small part of the commerce of the world.

Naval Fuelling Stations.—With the growth of the commercial fuelling stations, strategic positions, usually separate from them, were chosen for supplying the needs of the navies charged with the duty of protecting and keeping open the trade routes. Until 1878 the question of coaling stations for the British fleet was not seriously considered but, in that year, the threat of war with Russia drew attention to the exposure of the expanding British commerce to the depredations of hostile cruisers. Public alarm was caused by the impotence of the steam navy, unless it had supplies of coal at its command the world over, and a royal commission under the presidency of the earl of Carnarvon was appointed to enquire into and report upon the protection of British commerce at sea. Unfortunately, the cardinal fact that the basis of the protection of seaborne commerce must be a mobile navy was ignored and the necessary standard of naval strength was excluded from the terms of reference of the commission. It was



MAP OF THE WORLD SHOWING BRITISH FUELLING STATIONS ON THE MAIN OCEAN ROUTES, TOGETHER WITH THE PRINCIPAL WORLD SOURCES OF COAL AND OIL, ONLY THE LARGEST STATIONS HAVING FACILITIES FOR FUELLING BOTH COAL AND OIL STEAMERS

not recognized, at the time, that it is the movement of commerce at sea in war time and not its security in port that is vital to the British empire, in other words, that a navy, to protect commerce, must also protect its ports and coaling stations A mass of important evidence as to the chief maritime communications and the trade thereon was accumulated and the commission made its report in 1881 This report contained recommendations to erect fortifications at certain ports and resulted in the initiation of a great scheme of passive defence of the coaling stations which has since been proved to have been entirely incorrect in principle Heavy guns were mounted in forts at Cape Town, Singapore, Hongkong, Bermuda and elsewhere, but this was done in such a dilatory manner that most of the works were obsolete before they were completed The commission however recognized that none of these forts could exist without the support of a naval force, and they went beyond their terms of reference to issue a grave warning as to the then state of the navy, which eventually bore fruit in the Naval Defence Act of 1889

From this time forward it was recognized that the basis of imperial defence against attack from overseas was the maintenance of sea supremacy, and that this must be the determining factor in deciding the defensive policy of the Empire, and the protection of its trade. The defence of the fuelling stations, be they commercial or purely naval, must depend primarily upon the navy They require only sufficient passive local defences to deal with predatory raids of cruisers such raids can be made by a few cruisers at most and, unless supported by troops, a contingency impossible in the face of a strong naval force, can have no permanent effect Coal stored on shore cannot be damaged by gunfire from a ship and men must be landed to damage or appropriate it Oil fuel, however, unless stored in underground tanks, is vulnerable both from gunfire and from aerial attack Therefore fuelling stations, in common with all commercial ports, now require defence from aerial attack, if they are situated within the radius of hostile aircraft or are liable to a raiding attack from cruisers which carry aircraft

The World War demonstrated that the fleet which establishes and maintains the command of the sea has no difficulty in keeping itself supplied with fuel Even at the height of the intensive German submarine campaign, the British navy was never seriously hampered by shortage of fuel The fleets did not seek established fuelling stations to replenish, but improvised bases in sheltered waters within each sphere of operations, to which fuel was sent in oilers and colliers Thus the fuelling stations did not play an important part in the actual operations of the fleets but, under their protection, acted as replenishing stations for the fleet fuelling vessels and served the needs of isolated cruisers protecting the trade routes and of the merchant ships dependent on them

The British navy now depends almost entirely upon oil fuel and besides the large stocks of this fuel maintained at the home dockyards, oil depots have been established at the old coaling stations at Gibraltar, Malta, Port Said, Suez, Aden, Ceylon, Rangoon, Singapore, Hongkong, Jamaica, Sierra Leone, the Cape of Good Hope, Falkland Islands, Halifax, Vancouver and in the Australian and New Zealand ports The vital supplies of fuel are thus assured to it, although only a small portion of the world's supply of oil is as yet produced within the British Empire

Commercial Fuelling Ports.—The importance to commerce in war time of this well placed chain of fuelling stations cannot be exaggerated (*see* MAP) The normal bunkering ports upon each trade route are situated at points where it is obviously convenient and economical for merchant ships to break their voyages to replenish with fuel Some of these fuel supplies are held in foreign ports which might, in war time, be closed to British ships and therefore alternative fuelling stations in territory under Imperial control are a necessity for maintaining the flow of seaborne trade The chief British fuelling stations, both naval and commercial are shown on the map, together with the main trade routes, the volume of trade upon each being indicated approximately by the thickness of the lines

The principal sources of the world's fuel supplies are shown upon the map The chief coal fields are in the temperate zones, mainly in the northern hemisphere; petroleum comes from two main belts, each situated between latitudes 40 N and 10 S, one in central America and the other in the Middle East, between Persia and the Dutch Indies Great Britain is the greatest coal exporting country in the world and exports about 30% of the coal mined, about one third of which goes to make up the "bunker trade" for keeping the coaling stations on the trade routes replenished In addition to the bunker coal sent to the Continental ports, British coal is sent to the West Indies and as far south as Buenos Aires It supplies the Mediterranean ports and the coaling stations on the eastern trade routes as far east as Singapore and Hongkong.

The United States is the largest producer of coal in the world but uses about 95% of the coal mined for home consumption Of the 5% exported in the coastwise trade to the Atlantic and

Pacific ports and the Panama canal area, a small proportion only is represented by the bunker trade The Canadian coal fields of Nova Scotia and Vancouver each have a coastwise export trade upon their respective coasts and the Chilean coal fields support a small export trade in the south Pacific. Natal coal finds its way to the Red Sea, where it comes into competition with cargoes from the British coalfields. it is sent to India and Ceylon and, as far east as the Dutch Indies and Singapore; Colombo and Sabang are important bunkering ports where British and Natal coals are obtainable. Coal from the Japanese and Chinese coal fields is exported as far west as Singapore The Australian coalfields, the most important of which is situated at Newcastle (New South Wales), supply a coastwise trade to the Australian and New Zealand ports and Australian coal can be obtained as far north as Singapore It is a notable fact that Singapore, one of the four greatest seaports in the world, is the terminal point of four streams of the coal export trade for bunkers, two of the coal-fields being over 6,000 miles away Yet Singapore is situated in close proximity to the oilfields of Burma, Borneo and the Dutch Indies

Oil Fuel.—Turning to the world's sources of oil, the United States, Mexican and northern South American fields produce the greatest quantity, their output in 1927 representing no less than 84 3% of the world supply Next in order come the Rumanian, Polish and South Russian Group with 8 2%, whilst the Persian, Burma, Dutch East Indies and Egyptian fields account for 6·5%. The remaining 1% comes from other countries, this includes a considerable amount from the Argentine and a small supply from Japan.

In 1927 the world produced and used three times as much oil as in 1913 and a glance at the map shows that the general flow of the oil carrying trade is, with the world supplies as they are at present, in the reverse direction to that of coal Special ships are necessary for carrying oil and the world tonnage of oil "tankers" rose from 1,500,000 in 1913 to over 6,000,000 in 1927, more than one third of which is under the British flag Oil is being used in ever increasing quantities for marine propulsion Apart from the burning of oil fuel under steam boilers in warships and large liners, the internal combustion engine is demanding an increasing quantity of its special fuel In 1927 5 2% of the world merchant ship tonnage was driven by oil motor engines, more than a quarter of these being British ships. in the same year more than one half of the merchant ships under construction in the world were to be motor driven Oil is evidently the future fuel upon the sea on account of its economy, flexibility and ease in handling and the increased endurance at sea which it affords Provision is already being made for it, for in 1927 there were over 350 fuel oil bunkering stations in being, more than one quarter of which (excluding the great naval stations) were in British territory

Coal will continue to be used at sea especially for short voyage traffic in countries where no oil is found and where it is therefore expensive *e g*, the British Continental, coastwise and Mediterranean trades. But science has discovered a process of distilling oil from coal and with the development of this invention upon a commercial basis, Great Britain will be able to use her inexhaustible coal supplies more economically and so become an oil as well as a coal producing country Such a development would be of inestimable economic value to Great Britain She stands in her unalterable position at the centre of the world trade routes: her great trade has been built up on cheap and abundant coal: now that the oil era has dawned she requires but a similar supply of the new fuel to increase her trade and maintain the prosperity built on her mines.

Whatever fresh sources of oil are opened or new methods of using coal are invented the fuelling stations are likely to remain unchanged, except for the type of fuel they stock Their position has been established by years of trade upon routes which are fixed. Merchant ships will always re-bunker on their particular routes where fuel is to be obtained most cheaply and upon those routes must be maintained adequate supplies of fuel for the navy whose duty it is to keep the high roads of the sea safe and secure to all traders, both in peace and in war. (S T. H. W.)

FUEL RESEARCH BOARD. This board was appointed in Great Britain in 1917 as one of the research boards of the newly formed Department of Scientific and Industrial Research, "to investigate the nature, preparation and utilization of fuel of all kinds, both in the laboratory, and, when necessary, on an industrial scale." Sir George Beilby, F.R S , was the first chairman of the board and director of fuel research He retired in 1923 when Sir Richard Threlfall, G B E , F R S., was appointed chairman, and Dr C H Lander, C B.E , M.Inst C E , director of fuel research.

Two main lines of enquiry have been pursued. (1) a survey and classification of the coal seams in the various mining districts, and (2) an investigation of the practical problems which must be solved if any large proportion of the raw coal at present burned in its natural state is to be replaced by the various forms of fuel obtainable from coal by carbonization and "gasification" processes

Coal is not a definite homogeneous substance, and its composition and properties vary greatly in the different seams, and even throughout a single seam, but comparatively little is known as to the precise variations that occur The object of the physical and chemical survey of the national coal resources is to determine the variations that occur, the purposes for which each seam is best fitted and the best means of preparing each coal for the market Local laboratories are established for this purpose in the various coalfields, and advisory committees, on which the coal owners and mine managers are represented, have been appointed in the various areas

The second main line of investigation is being carried out at the fuel research station at East Greenwich, London, where full size retorts, boilers, coal cleaning plant, etc , are installed, as well as the necessary laboratories The general idea of the station is that the operation of treating coal should be carried out in plant of a size used in commercial practice, but with equipment and methods of control to allow of an accuracy of measurement closely approaching that of laboratory work The plant includes settings of vertical and horizontal gas retorts, each with a nominal capacity of ten tons of coal a day The amount of coal carbonized in 1927 amounted to 4,500 tons, producing over 68 million cubic feet of gas Low temperature carbonization has been intensively studied and a type of retort for this purpose developed Some 1,600 tons of coal were treated by this method in 1927 A complete coal washery has been installed containing examples of six different types of washers, as well as screening plant. Boilers, water-gas plant, producer plant, and briquetting plant, are provided The production of oil from coal by the Bergius method of hydrogenation is being studied in a plant with a capacity of one ton of coal a day. The object of these experiments is two-fold. (1) to ascertain the suitability of the various coals for the different treatments, and (2) to improve the efficiency of the treatments The inception of the station is due to the imagination and foresight of the late Sir George Beilby, and it provides unique facilities for the work required The cost of the work carried out under the director of fuel research is met from the funds voted by parliament, and amounts to between £80,000 and £90,000 per annum Detailed annual reports are published in England by H M Stationery Office. (C. H. L)

FUENTEOVEJUNA, a town of Spain, province of Cordova, on the Fuente del Arco-Belmez-Cordova railway. Pop (1920) 15,547. Fuenteovejuna is built on a hill, in a district well watered by tributaries of the Guadiato and Zújar, which, besides producing much oil, wheat, wine and honey, also contains important coal, lead and mica mines ' Sheep and goats are reared and pigs are kept in oak forests near by. Leather, preserved meat and flour are manufactured in the town. The parish church occupies the site of an ancient palace of the knights of Calatrava (*c.* 1163–1486), which was earlier a Moorish castle.

FUENTERRABÍA (formerly sometimes *Fontarabia;* Lat *Fons Rapidus*), a town in northern Spain, province of Guipúzcoa; on the San Sebastian-Bayonne railway; near the Bay of Biscay and on the French frontier. Pop. (1920) 5,570. Fuenterrabía, on the slope of a hill on the left bank of the river Bidassoa, near the point where its estuary begins, became popular towards the close of the 19th century as a summer resort for visitors from

the interior of Spain. Hotels and villas were then built on the lower ground beside the estuary This large modern suburb stands out in strong contrast to the picturesque old town, with its heavy, ruined ramparts, its steep, narrow streets and gabled houses with overhanging upper stories, its castle and its fine Gothic church. The town has a tiny harbour for fishing vessels and makes cider, fishing tackle and pickles fish

Fuenterrabía formerly possessed considerable strategic importance, and it has frequently been taken and retaken in wars between France and Spain. The rout of Charlemagne in 778, associated by Milton (*Paradise Lost,* i 587) with Fontarabia, is generally understood to have taken place not here but at Roncesvalles (*q v*), nearly 40 m E S E Unsuccessful attempts to seize Fuenterrabía were made by the French troops in 1476 and again in 1513 In 1521 they captured it but it was retaken in 1524 The prince of Condé sustained a severe repulse under its walls in 1638, and the town then received from Philip IV the rank of city, a privilege which involved some measure of autonomy In 1719 Fuenterrabía surrendered to the duke of Berwick and his French troops and in 1794 it again fell into the hands of the French, who so dismantled it that it has never since been reckoned by the Spaniards among their fortified places It was by the ford opposite Fuenterrabía that the duke of Wellington, on Oct 8, 1813, successfully forced a passage into France in the face of an opposing army commanded by Marshal Soult Severe fighting also took place here during the Carlist War in 1837

FUERO, a Spanish term, derived from the Latin *forum* (*q v*). The Castilian use of the word in the sense of a right, privilege or charter is perhaps to be traced to the Roman *conventus juridici* (assize towns), also known as *jurisdictiones* or *fora,* in Pliny's time already numerous in the Iberian peninsula In each of these provincial *fora* the Roman magistrate paid all possible deference to the established law of the district; and every free subject could demand that he should be judged in accordance with the customs and usages of his proper forum It is highly probable that the old administrative arrangements of the provinces, and especially of the towns, remained practically undisturbed at the period of the Gothic occupation of Spain [1] The Theodosian Code and the Breviary of Alaric alike seem to imply a continuance of the municipal system established by the Romans, the later Lex Visigothorum does not appear to have contemplated any marked interference with the former *fora* During the Arab occupation the Christians were, sometimes at least, judged according to their own laws in separate tribunals presided over by Christian judges,[2] and the mere fact of the preservation of the name *alcalde* (*q v*), an official whose functions corresponded so closely to those of the *judex* or *defensor civitatis,* suggests that the old municipal *fora,* if much impaired, were not even then in all cases wholly destroyed When the word *forum* (or *forus,* Ducange) begins to appear in documents of the 10th century in the sense of a liberty or privilege, it is generally implied that the thing so named is nothing new The earliest extant written fuero is probably that granted to the province and town of León by Alfonso V in 1020 It emanated from the king in a general council of the kingdom of León and Castile, and consists of two parts, the "fuero general" applying to the kingdom at large and the "fuero municipal," a mere municipal charter. The "fuero general" does not profess to supersede the *consuetudines antiquorum jurium* or Chindaswint's codification of these in the Lex Visigothorum, the "fuero municipal" is for the most part but a resuscitation of usages formerly established Almost contemporaneous with it was that granted to Nájera by Sancho el Mayor of Navarre (*ob.* 1035), and confirmed, in 1076, by Alfonso VI [3] In the fuero of Cardeña, granted by Ferdinand I. in 1039, reference is made to a previous forum Burgense (Burgos), which, however, has not been preserved, if, indeed, it ever had been reduced to writing at all The fuero of Sepúlveda (1076) points back to a remote antiquity. Among the later fueros of the 11th century, the most important are those of Jaca (1064) and of Logroño (1095) The former, unusually large in its concessions, rapidly extended to many places in the neighbourhood, while the latter, given also to Miranda by Alfonso VI, was extended in 1181 by Sancho el Sabio of Navarre to Vitoria, thus constituting one of the earliest written *fora* of the "Provincias Vascongadas" In the 12th and 13th centuries the number of such documents increased rapidly, that of Toledo, granted to the Mozarabic population in 1101, but greatly enlarged and extended by Alfonso VII (1118) and later sovereigns, was the basis for many other Castilian fueros Latterly the word fuero came to be used in Castile in a wider sense, as a general code of laws, thus about the time of Saint Ferdinand the old Lex Visigothorum was translated into the vernacular and called the Fuero Juzgo, and among the compilations of Alfonso the Learned were an *Espejo de Fueros* and the *Fuero de las leyes,* or *Fuero Real* The famous code known as the *Ordenamiento Real de Alcalá,* or *Fuero Viejo de Castilla,* dates from a later period As the power of the Spanish crown was gradually concentrated and consolidated the local fueros slowly yielded before the force of imperialism, and only those of Navarre and the Basque provinces (*see* BASQUES) managed to survive At the death of Ferdinand VII in 1833, these rights were set aside by Castaños The result was a civil war, which terminated in a renewed acknowledgment of the fueros by Isabel II (1830) The provisional government of 1868 also promised to respect them, and similar pledges were given by the governments which succeeded In consequence, however, of the Carlist rising of 1873–76, the Basque fueros were finally extinguished in 1876 The history of the *Foraes* of the Portuguese towns, and of the *Fors du Béarn,* is analogous to that of the fueros of Castile

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FUERO JUZGO, the Spanish term for the translation of the *Lex Visigothorum* made by order of St Ferdinand in 1241 (*see* FUERO, GERMANIC LAWS) after his capture of the city of Córdoba from the Moors He directed this translation to be called the *Fuero de Córdoba,* but the rather barbarous name of Fuero Juzgo prevailed This version was corrected under Ferdinand's son, Alfonso the Wise, but it varied in many particulars from the original Latin It was received not only in the free parts of Spain (supplemented by their local *fueros*) but in the Mohammedan parts, where it was applied to the Christian populations It has never been repealed, though little is now in force.

FUERTES, LOUIS AGASSIZ (1874–1927), American artist and naturalist, was born at Ithaca, N Y, on Feb 7, 1874, youngest son of Prof. Estevan Antonio Fuertes of Porto Rico and Mary Stone Perry Fuertes of New York He was educated at Cornell university and received art training from Abbott H Thayer. As a painter of birds he was pre-eminent in America during a period of 30 years from 1897 to 1927. Enthusiastic and industrious, he produced abundantly, mainly as an illustrator of popular and technical ornithological books. He painted also a limited number of large pieces, some of which are owned by the New York Zoological Society. His most extensive work was a series of large plates illustrating "The Birds of New York," published by the State and covering practically every species of eastern North America. A similar work for the State of Massachusetts was incomplete at his death. His work is characterized by a fidelity to nature involving not only objective but subjective accuracy. His genius lay in the power to reproduce subtle, fleeting and intangible qualities of birds which reflected their individuality to a remarkable degree. This was quite as much the result of a highly sympathetic and very extensive knowledge of birds in their

[1] *See* Savigny, *Gesch d rom Rechts,* especially i pp. 154, 259 *seq.*
[2] *Cf* Lembke u Schafer, "Geschichte von Spanien," in *Geschichte der europaischen Staaten* i. 314; ii, 117
[3] "Mando et concedo et confirmo ut ista civitas cum sua plebe et cum omnibus suis pertinentus sub tali lege et sub tali foro maneat per saecula cuncta Amen. Isti sunt fueros quae habuerunt in Naxera in diebus Sancti regis et Gartiani regis." (I order and permit and confirm that this town with its people and all that pertains to them shall remain under such law and such *forum* for all time. Amen These are the fueros which they held in Naxera in the days of King Sancho and King Garcia)

haunts as it was of technical skill. His travels covered a wide field in North America, Mexico, West Indies, South America, Europe and Africa. His field experience, therefore, was of the widest

FUERTEVENTURA, an island in the Spanish archipelago of the Canary islands (*q v*) Pop. (1920) 11,703; area 665 sq m. Fuerteventura lies between Lanzarote and Grand Canary. It has a length of 52 m., and an average width of 12 m Lava streams and other signs of volcanic action abound, but there has been no igneous activity since the Spaniards took possession The highest peak reaches 2,500 ft In external appearance, climate and productions, Fuerteventura greatly resembles Lanzarote. Oliva (pop 1920, 2,377) is the largest town Cabras (1,016) on the eastern coast is the chief port

FUGGER, the name of a famous German family of merchants and bankers The founder of the family was Johann Fugger, a weaver at Graben, near Augsburg, but its real greatness was established by his grandsons, Andreas and Jakob, who greatly extended the business in Augsburg, which they inherited from their father Andreas, called the "rich Fugger," had several sons, among them being Jakob, who was granted the right to bear arms in 1452, and who founded the family of Fugger vom Reh, which died out in 1583 Jakob Fugger died in 1469, and three of his seven sons, Ulrich (1441–1510), Georg (1453–1506) and Jakob (1459–1525), men of great resource and industry, inherited the family business and added enormously to the family wealth In 1473 Ulrich obtained from the emperor Frederick III the right to bear arms for himself and his brothers, and about the same time he began to act as the banker of the Habsburgs, a connection destined to bring fame and fortune to his house Under the lead of Jakob the Fuggers were interested in silver mines in Tirol and copper mines in Hungary, while their trade in spices, wool and silk extended to almost all parts of Europe Their wealth enabled them to make large loans to the German king, Maximilian I, who pledged to them the county of Kirchberg, the lordship of Weissenhorn and other lands, and bestowed various privileges upon them Jakob built the castle of Fuggerau in Tirol, and erected the Fuggerei at Augsburg, a collection of 106 dwellings, which were let at low rents to poor people and which still exist Jakob Fugger and his two nephews died without direct heirs, and the family was continued by Georg's sons, Raimund (1489–1535) and Anton (1493–1560), under whom the Fuggers attained the summit of their wealth and influence

Jakob Fugger's florins had contributed largely to the election of Charles V to the imperial throne in 1519, and his nephews and heirs maintained close and friendly relations with the great emperor In addition to lending him large sums of money, they farmed his valuable quicksilver mines at Almaden, his silver mines at Guadalcanal, the great estates of the military orders which had passed into his hands, and other parts of his revenue as king of Spain, receiving in return several tokens of the emperor's favour In 1530 Raimund and Anton were granted the imperial dignity of counts of Kirchberg and Weissenhorn, and obtained full possession of these mortgaged properties; in 1534 they were given the right of coining money, and in 1541 received rights of jurisdiction over their lands Continuing their mercantile career, the Fuggers brought the new world within the sphere of their operations, and also carried on an extensive and lucrative business in farming indulgences. Both brothers found time to acquire landed property, and were munificent patrons of literature and art. Before this time the total wealth of the family had been estimated at 63,000,000 florins. The Fuggers were devotedly attached to the Roman Catholic Church Jakob had been made a count palatine (*Pfalzgraf*) and several members of the family had entered the church; one, Raimund's son, Sigmund, becoming bishop of Regensburg.

In addition to the bishop, three of Raimund Fugger's sons attained some degree of celebrity Johann Jakob (1516–1575), was the author of *Wahrhaftige Beschreibung des österreichischen und habsburgischen Nahmens,* which was largely used by S. von Bircken in his *Spiegel der Ehren des Erzhauses Österreich* (Nuremberg, 1668), and of a *Geheim Ernbuch des Fuggerischen Geschlechtes.* He was also a patron of art, and a distinguished counsellor of Duke Albert IV of Bavaria. Another of Raimund's sons was Ulrich (1526–1584), who became a Protestant and took refuge in the Rhenish Palatinate; greatly interested in the Greek classics, he occupied himself in collecting valuable manuscripts, which he bequeathed to the university of Heidelberg Raimund's other son was Georg (d 1579), who inherited the countships of Kirchberg and Weissenhorn, and founded a branch of the family which still exists, its present head being Georg, Count Fugger of Kirchberg and Weissenhorn (b 1850)

Anton Fugger left three sons, Marcus (1529–1597), Johann (d. 1598) and Jakob (d 1598), all of whom left male issue. Marcus was the author of a book on horse-breeding, *Wie und wo man ein Gestut von guten edeln Kriegsrossen aufrichten soll* (1578), and of a German translation of the *Historia ecclesiastica* of Nicephorus Callistus

Johann Fugger had three sons, Christoph (d 1615) and Marcus (d 1614), who founded the families of Fugger-Glott and Fugger-Kirchheim respectively, and Jakob, bishop of Constance from 1604 until his death in 1626 The family of Kirchheim died out in 1672 That of Glott was divided into several branches by the sons of Otto Heinrich and of his brother Johann Ernst (d 1628). These lines, however, have gradually become extinct except the eldest line, represented in 1909 by Karl Ernst, Count Fugger of Glott (b 1859). Anton Fugger's third son Jakob, the founder of the family of Wellenburg, had two sons who left issue, but in 1777 the possessions of this branch of the family were again united by Anselm Joseph (d 1793), Count Fugger of Babenhausen. In 1803 Anselm's son, Anselm Maria (d 1821), was made a prince of the Holy Roman Empire, the title of Prince Fugger of Babenhausen being borne by his direct descendant Georg (b. 1889). On the fall of the empire in 1806 the lands of the Fuggers, which were held directly of the empire, were mediatized under Bavaria and Wurttemberg The heads of the three existing branches of the Fuggers are all hereditary members of the Bavarian Upper House

Augsburg has many interesting mementoes of the Fuggers, including the family burial-chapel in the church of St. Anna; the Fugger chapel in the church of St Ulrich and St. Afra; the Fuggerhaus, still in the possession of one branch of the family; and a statue of Johann Jakob Fugger.

In 1593 a collection of portraits of the Fuggers, engraved by Dominique Custos of Antwerp, was issued at Augsburg. Editions with 127 portraits appeared in 1618 and 1620, the former accompanied by a genealogy in Latin, the latter by one in German. Another edition of this *Pinacotheca Fuggerorum,* published at Vienna in 1754, includes 139 portraits. See *Chronik der Familie Fugger vom Jahre 1599,* edited by C Meyer (Munich, 1902); A Geiger, *Jakob Fugger, 1459–1525* (Regensburg, 1895), A Schulte, *Die Fugger in Rom, 1496–1523* (Leipzig, 1904), R Ehrenberg, *Das Zeitalter der Fugger* (Jena, 1896), K. Habler, *Die Geschichte der Fuggerschen Handlung in Spanien* (Weimar, 1897), A Stauber, *Das Haus Fugger* (Augsburg, 1900); and M. Jansen, *Die Anfange der Fugger* (Leipzig, 1907), R Ehrenberg, *Capital and Finance in the Age of the Renaissance: A Study of the Fuggers and their Connexions* (Eng. trans. by H. Lucas, 1928).

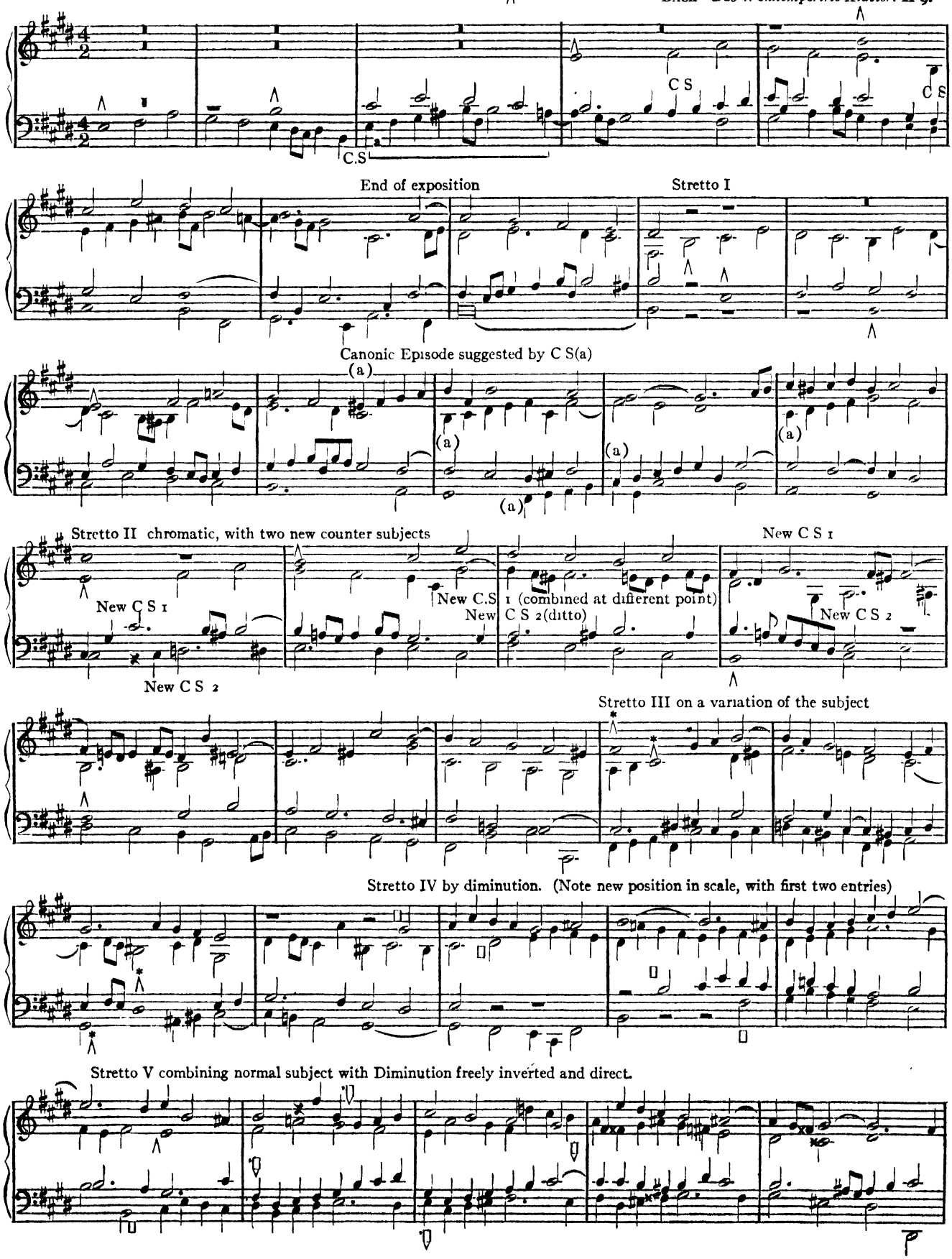
FUGITIVE SLAVE LAWS, a term applied in the United States to the statutes passed by Congress in 1793 and 1850 to provide for the return of negro slaves who escaped from one State into another or into a public territory

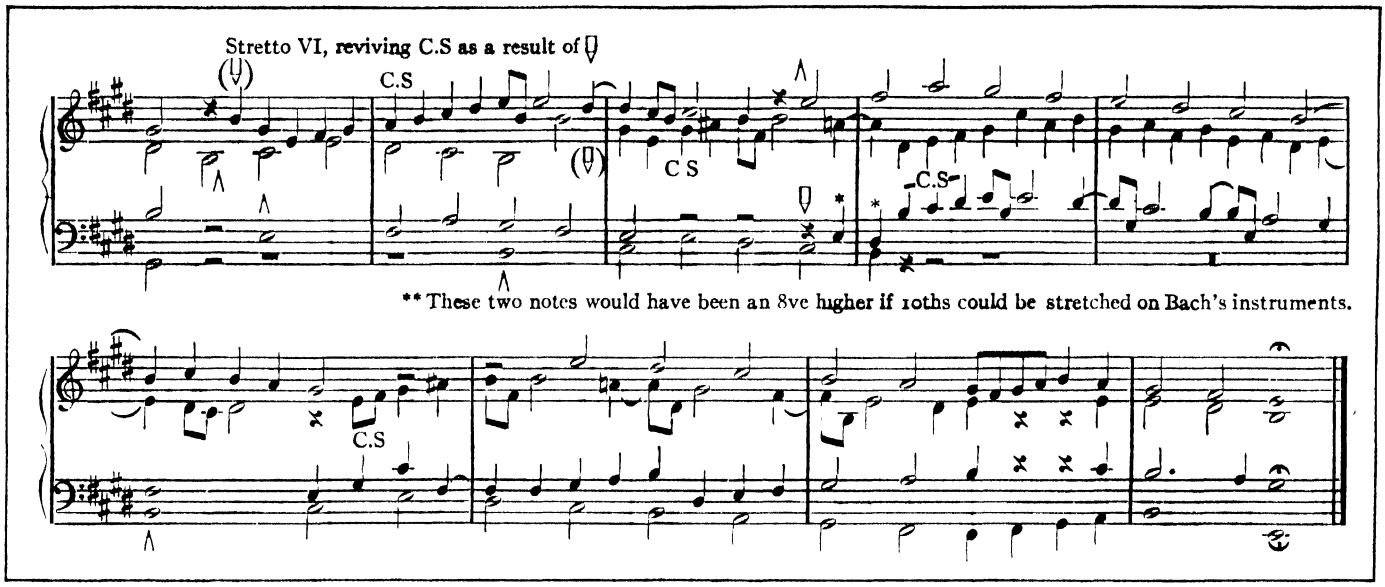
The first specific legislation on the subject was enacted on Feb. 1, 1793; by its provisions any Federal district or circuit judge or any State magistrate was authorized to decide finally and without a jury trial the status of an alleged fugitive The measure soon met with strong opposition in the northern States, and Personal Liberty laws were passed to hamper officials in the execution of the law; Indiana in 1824 and Connecticut in 1828 providing jury trial for fugitives who appealed from an original decision against them. In 1840 New York and Vermont extended the right of trial by jury to fugitives and provided them with attorneys As early as the first decade of the 19th century individual dissatisfaction with the law of 1793 had taken the form of systematic assistance rendered to negroes escaping from the South to Canada or New England—the so-called "Underground Railroad" (*q v*) The decision of the Supreme Court of the United States in 1842 that State authorities could not be forced to act in fugitive slave cases, but that national

I *Stretto-Fugue in 4 parts.*

∧=Subject. C.S=Counter subject. □=Diminution. ∨=Inversion *∧=Variation.

BACH *Das Wohltemperirte Klavier.* II 9.





authorities must carry out the national law, was followed by legislation in Massachusetts (1843), Vermont (1843), Pennsylvania (1847) and Rhode Island (1848), forbidding State officials to help enforce the law and refusing the use of State gaols for fugitive slaves

The demand from the South for more effective Federal legislation was voiced in the second Fugitive Slave Law, enacted on Sept. 18, 1850, as a part of the Compromise measures of that year. Special commissioners were to have concurrent jurisdiction with the U S courts in enforcing the law, fugitives could not testify in their own behalf; no trial by jury was provided, penalties were imposed upon marshals who refused to enforce the law or from whom a fugitive should escape, and upon individuals who aided negroes to escape, the marshal might raise a *posse comitatus;* a fee of $10 was paid to the commissioner when his decision favoured the claimant and only $5 when it favoured the fugitive, and both the fact of the escape and the identity of the fugitive were to be determined on purely *ex parte* testimony. The severity of this measure led to gross abuses and defeated its purpose, the number of abolitionists increased, the operations of the Underground Railroad became more efficient, and new Personal Liberty laws were enacted in Vermont (1850), Connecticut (1854), Rhode Island (1854), Massachusetts (1855), Michigan (1855), Maine (1855 and 1857), Kansas (1858) and Wisconsin (1858) These Personal Liberty laws forbade justices and judges to take cognizance of claims, extended the *habeas corpus* act and the privilege of jury trial to fugitives, and punished false testimony severely These State laws were one of the grievances officially referred to by South Carolina (in Dec. 1860) as justifying her secession from the Union Attempts to carry into effect the law of 1850 aroused much bitterness The arrests of Sims and of Shadrach in Boston in 1851, of "Jerry" M'Henry, in Syracuse, N Y, in the same year; of Anthony Burns in 1854, in Boston; and of the two Garner families in 1856, in Cincinnati, with other cases arising under the Fugitive Slave Law of 1850, probably had as much to do with bringing on the Civil War as did the controversy over slavery in the Territories

For some time after the beginning of the Civil War the Fugitive Slave Law was considered still to hold in the case of fugitives from masters in the border states who were loyal to the Union government, and it was not until June 28, 1864 that the Act of 1850 was repealed.

See J. F. Rhodes, *History of the United States from the Compromise of 1850*, vols. i. and ii (1893), and M G M'Dougall, *Fugitive Slaves, 1619–1865* (Boston, 1891).

FUGUE, in music, the mutual "pursuit" of voices or parts. It was, up to the end of the 16th century, if not later, the name applied to two art-forms (A) *Fuga ligata* was the exact reproduction by one or more voices of the statement of a leading part. The reproducing voice (*comes*) was seldom if ever written out, for all differences between it and the *dux* were rigidly systematic; *e g*, it was an exact inversion, or exactly twice as slow, or to be sung backwards, etc, etc Hence, a rule or *canon* was given, often in enigmatic form, by which the *comes* was deduced from the *dux*; and so the term *canon* became the name for the form itself and is still retained (B) A composition in which the canonic style was cultivated without canonic restriction was, in the 16th century, called *fuga ricercata* or simply *ricercare,* a term which is still used by Bach as a title for the fugues in *Das musikalische Opfer*

Fugue is a texture the rules of which do not suffice to determine the shape of the composition as a whole. Schemes such as that laid down in Cherubini's treatise, that legislate for the shape, are pedagogic fictions; and such classical tradition as they represent is too exclusively Italian to include Bach Yet, strange to say, the Italian tradition in fugue style is represented by hardly any strict works at all Under the general heading of CONTRAPUNTAL FORMS many facts concerning fugues are discussed; and only a few technical terms remain to be defined here.

(i) If during the first entries or "exposition" of the fugue, the counterpoint with which the opening voice accompanies the answer is faithfully reproduced as the accompaniment to subsequent entries of the subject, it is called a *countersubject.* Obviously the first countersubject may continue with a second when the subject enters in the third part and so on The term is also applied to new subjects appearing later in the fugue in combination (immediate or destined) with the original subject Cherubini, holding the arbitrary dogma that a fugue cannot have more than one subject, applies the term to the less prominent of the subjects of what are commonly called double fugues, *i.e.*, fugues which begin with two parts and two subjects simultaneously, and so also with *triple* and *quadruple* fugues It is remarkable that Bach (with only three known exceptions) never writes this kind of double fugue, but always introduces his new subjects later.

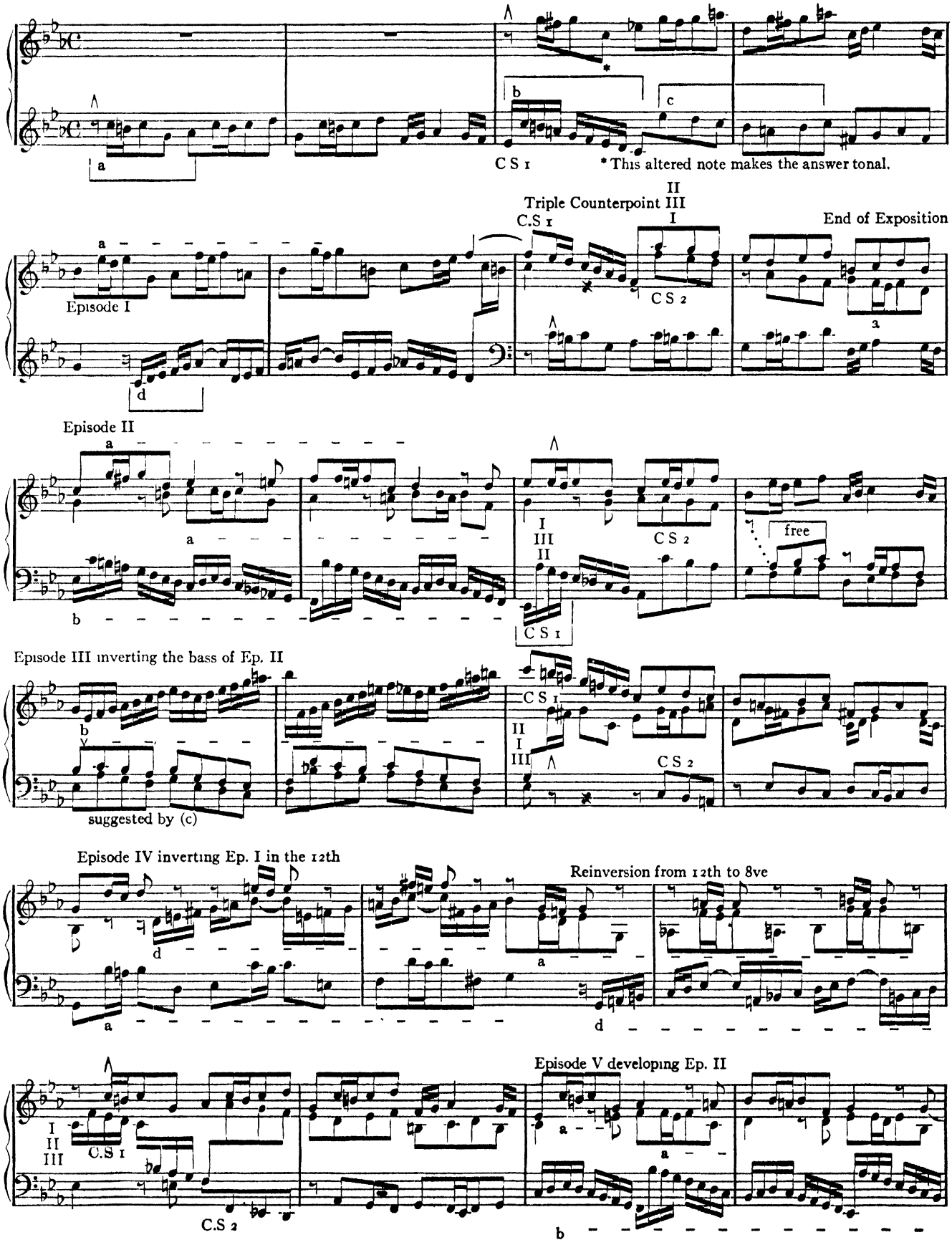
(ii) *Episodes* are passages separating the entries of the subject. There is no reason for distinguishing episodes that occur during the exposition from later episodes. Episodes are usually developed from the material of the subject and countersubjects; they are, when independent, conspicuously so.

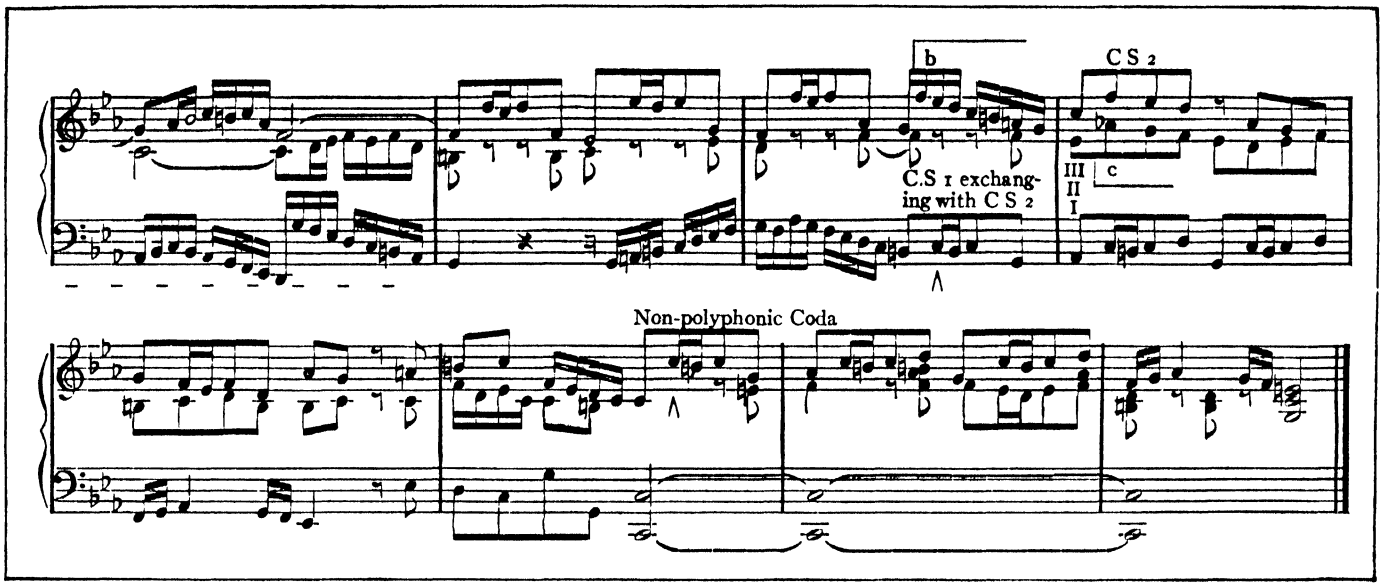
(iii) *Stretto* is the overlapping of subject and answer. A *stretto maestrale* is one in which the subject survives the overlapping. The makers of musical terminology have no answer to the question of what a non-magistral stretto may be.

(iv.) The distinction between *real* and *tonal* fugue is a matter of detail concerning the answer. A fugal exposition is not intended to emphasise a key-contrast between tonic and dominant Accordingly the answer is (especially in its first notes and in points that tend to shift the key) not so much a transposition

II. *Fugue in 3 parts, with 2 countersubjects and highly organized episodes.*

BACH *Das Wohltemperirte Klavier* I 2.





of the subject to the key of the dominant as an adaptation of it from the tonic part to the dominant part of the scale or vice versa; in short, the answer is as far as possible *on* the dominant, not *in* the dominant This is effected by a kind of melodic foreshortening on principles of great aesthetic interest but difficult to reduce to rules of thumb The rules as often as not produce answers that are exact transpositions of the subject; and so the only kind of "real" fugue (*i e*, fugue with an exact answer) that could rightly be contrasted with the tonal fugue would be that in which the answer ought to be tonal but is not

The term "answer" is usually reserved for those entries of the subject that are placed in what may be called the "complementary" position of the scale, whether they are tonal or not. Thus the order of entries in the exposition of the first fugue of *Das Wohltemperirte Klavier* is subject, answer, answer, subject, a departure from the usual rule, according to which subject and answer are regularly alternated in the exposition

The nature of fugue and of polyphony as building harmony in "horizontal" melodic threads instead of in "vertical" chordal lumps is all summarized by Milton, during no classical period of polyphony, but in the chaotic time half-way between the death of Frescobaldi and the birth of Bach

> His volant touch,
> Instinct through all proportions, low and high,
> Fled and pursued transverse the resonant fugue.
> *Paradise Lost*, book XI.

(D. F. T)

FÜHRICH, JOSEPH VON (1800–1876), Austrian painter, was born at Kratzau in Bohemia on Feb 9, 1800 He was celebrated as a composer of scriptural episodes, and his sacred subjects were transferred in numberless repetitions to the roadside churches of the Austrian State. Fuhrich has been fairly described as a "Nazarene," a romantic religious artist whose pencil gave shape to countless incidents of the gospel and scriptural legends. He composed with great skill, especially in outline. His mastery of distribution, form, movement and expression was considerable He had, however, no feeling for colour; and when he produced monumental pictures he was not nearly so successful as when designing subjects for woodcuts. Führich's illustrations to Tieck's *Genofeva*, the Lord's Prayer, the Triumph of Christ, the Road to Bethlehem, the Succession of Christ according to Thomas à Kempis, the Prodigal Son, and the verses of the Psalter, became well known. In 1834 he was made custos and in 1840 professor of composition in the academy of Vienna After this he completed the monumental pictures of the Church of St. Nepomuk In 1872 he was pensioned and made a knight of the order of Franz Joseph. He died on March 13, 1876

See Mor. Dreger, *Jos. Führich* (1912), H. V. Wörndle, *Jos. v. Führichs Werke* (1914); also his autobiography published in 1875 and a memoir by his son, Lucas (1886).

FUJI or FUJIYAMA, a celebrated quiescent volcano of Japan, standing 70 m W S W of Tokyo It rises to a height of 12,395 ft and its southern slopes reach the shore of Suruga Bay It is a cone of beautifully simple form, the more striking to view because it stands isolated, but its summit is not conical, being broken by a crater some 2,000 ft in diameter (*See* JAPAN)

FU-KIEN, one of the three maritime provinces of south China situated between Chekiang on the north and Kwangtung on the south Its western boundary follows the crest of the high ranges which form the water-parting between the Kan section of the Yang-tze basin and streams flowing eastwards to the China sea These ranges effectively separate it from its western neighbour Kiangsi and form the boundary zone between Mandarin, spoken in that province, and the Fu-kien dialects, of which there are about seven main varieties Topographically isolated on the landward side and with a distinct group of languages, Fu-kien has marked individuality The province is mountainous and, apart from its border ranges, is crossed by several ridges with the S W - N E axis characteristic of the eastern portion of the south China highlands A longitudinal system of drainage parallel to these ridges has been tapped by coastal streams of which the most important is the Min, which drains two-thirds of the province These streams are navigable for large vessels only for comparatively short distances inland but small junks penetrate far upstream and they are invaluable for floating down timber The climate is sub-tropical, although the winters are cool on the hills, and the rainfall high and well distributed seasonally, with, however, a marked maximum during the summer monsoon. (Foochow, *c* 60 in per year) This implies a rich vegetation and favourable conditions for crop production in the valleys, where two crops of rice are harvested, the first in June and the second in September. The forests are still of great importance and, as a source of timber, Fu-kien is only rivalled by Manchuria and Hunan in all China The most important woods are fir, pine and rosewood, mostly floated in the form of big rafts down to Foochow, a great timber emporium The camphor of Fu-kien, however, formerly very important, has been altogether eclipsed by that of Formosa, and the European market for tea, exported from Foochow, is now comparatively insignificant Yet Fu-kien remains a great tea-growing province with a large home market A special feature is its production of flower-scented teas, for the manufacture of which there are nearly 50 factories in Foochow. Of recent years this has called into existence a large flower-growing industry. There is also a large manufacture of paper from bamboo pulp In addition to its agricultural and timber resources, Fu-kien has considerable and varied mineral wealth, including coal, iron, copper, gold, silver, graphite and good clay for porcelain. Mines are scattered widely over the province. Foochow, on the navigable lower Min and the outlet for the northern and central

interior, is the capital of the province and the largest city Amoy, where another system of valleys finds its contact with the sea, is the great regional centre for the south There are several smaller intermediate ports and in the extreme north Funing is open to foreign trade

The great majority of the population of Fu-kien, estimated at 20,000,000, lives in the coastal zone, where the density is very high There is close contact with the Chinese communities of Malaya and other districts of the Far Eastern Tropics to which the Fu-kienese emigrate in considerable numbers.

The situation of Fu-kien immediately opposite Formosa, Japan's chief base for trade and influence in the maritime provinces of south China, gives the province strategic importance. In the concessions of 1915 Japan obtained from the Chinese Government an undertaking not to give permission to foreign nations to construct on the coast of Fu-kien dockyards, coaling stations for military use, naval bases, etc , nor itself to borrow foreign capital for the purpose of setting up such establishments

FUKUI, a town of Japan in the province of Echizen, near the west coast, 20 m N by E of Wakasa Bay It lies in a volcanic district much exposed to earthquakes Fukui is now in a flourishing condition, with several local industries, especially the manufacture of paper, and an increasing population exceeding 50,000

FUKUOKA, a town on the north-west coast of the island of Kyushu, Japan, in the province of Chikuzen, 90 m NNE of Nagasaki by rail Pop *c* 80,000 With Hakata, on the opposite side of a small coast stream, it forms a large centre of population, with an increasing export trade and several local industries, *e g*, silk-weaving There are several other places of this name in Japan, the most important being Fukuoka in the province of Mutsu, North Japan, a railway station on the main line from Tokyo to Aimori Ura Bay Pop *c* 7,000

FULANI, a long-headed white race of pastoralists of disputed origin with considerable intermixture of other blood, calling themselves *Fulbe* (sing *Pullo*), distributed from the upper Nile to Senegal They have regular features and narrow nose, wavy hair, light complexion, are long-limbed, highly strung. They live independently, or near cultivators whose cattle they herd, and in certain districts constitute the ruling class, as in the theocratic States of Fouta Jalon, French Guinea They conquered the Hausa States of Nigeria about 1804, and maintained precarious power up to the establishment of the British Protectorates (1904). Some have taken up cultivation They are usually Muslims and observe the Koranic code, a small proportion are Animists (Senegal, French Sudan and on the Niger)

See Arcin, *La Guinée Française* (1907), Delafosse, *Haut Sénégal Niger* (1912), Meek, *The Northern Tribes of Nigeria* (1925)

FULBERT (*c.* 960–1028), bishop of Chartres, was probably of French origin He was educated at the school of Rheims under Gerbert, afterwards Pope Sylvester II, and in 990 opened a school at Chartres which soon became famous throughout Europe His pupils, among whom was Berengarius of Tours, affectionately termed him "Socrates." While interested in the propagation of secular learning, Fulbert emphasized the distinction between human knowledge and divine revelation As bishop of Chartres from 1006, he advocated ecclesiastical reforms and in 1020 rebuilt the burnt cathedral

His discourses, hymns and interesting letters are in Migne, *Patrol Lat* vol 141 *See* C Pfister, *De Fulberti Carnotensis episcopi vita et operibus* (Nancy, 1886)

FULCHER OF CHARTRES (1059–*c* 1130), French chronicler, was a priest who was present at the council of Clermont in 1095, and accompanied Robert II., duke of Normandy, on the first crusade in 1096 He became chaplain to Baldwin, king of Jerusalem His *Historia Hierosolymitana* or *Gesta Francorum Jerusalem expugnantium,* one of the most trustworthy sources for the history of the first crusade, covers the period between the council of Clermont and 1127, and the author only details events which he himself had witnessed. It was used by William of Tyre Fulcher died after 1127, probably at Jerusalem. He has been confused with Foucher of Mongervillier (d 1171), abbot of St -Père-en-Vallée at Chartres, and also with another person of the same name who distinguished himself at the siege of Antioch in 1098

The *Historia,* in an incomplete form, was first published by J. Bongars in the *Gesta Dei per Francos* (Hanover, 1611). The last edition is by H Hagenmeyer (Heidelberg, 1913). There is a French translation in t xxiv. of Guizot's *Collection des mémoires relatifs à l'histoire de France* (1823–35).

See H von Sybel, *Geschichte des ersten Kreuzzuges* (Leipzig, 1881); and A Molinier, *Les Sources de l'histoire de France* (1902).

FULDA, a town and episcopal see of Germany, in the Prussian province of Hesse-Nassau, between the Rhön and the Vogel-Gebirge, 60 m NE from Frankfort-on-Main by rail. Pop (1925) 29,958

Fulda owes its existence to its abbey, and became a town in 1208 In the middle ages there were many struggles between the abbots and the townsfolk It came finally into the possession of Prussia in 1866 From 1734 to 1804 Fulda was the seat of a university, and latterly many assemblies of German bishops have been held in the town

The great Benedictine abbey of Fulda was founded in 744 at the instigation of St Boniface by his pupil Sturm, who was the first abbot, and became a missionary centre It was liberally endowed with land and soon became one of the most wealthy establishments of its kind About 968 the pope declared its abbot the primate of Germany and Gaul, and later he became a prince of the Empire The school at Fulda was the centre of theological learning in the early middle ages Among its teachers were Alcuin, Hrabanus Maurus, who was abbot from 822 to 842, and Walafrid Strabo Early in the 10th century the monastery was reformed by monks from Scotland, but had declined considerably before the Reformation In 1752 the abbot was raised to the rank of a bishop, and Fulda ranked as a prince-bishopric This was secularized in 1802 In 1816 the greater part of the principality was ceded by Prussia to Hesse-Cassel, a smaller portion being united with Bavaria Sharing the fate of Hesse-Cassel, this larger portion was annexed by Prussia in 1866 In 1829 a new bishopric was founded at Fulda

The present cathedral was built early in the 18th century on the model of St Peter's at Rome, but it has an ancient crypt, restored in 1892 Opposite the cathedral is the former monastery of St Michael, now the episcopal palace The Michaelskirche, attached to it, is a small round church built, in imitation of the Holy Sepulchre, in 822 and restored in 1853 The library, the palace, the former Benedictine nunnery (founded 1625, and now used as a seminary), and the Minorite friary (1238) now used as a warehouse, may be noted Industries include weaving and dyeing, the manufacture of linen, felt and tapestry There are also railway works in the town, and trade is in cattle.

FULGENTIUS, SAINT (468–533), bishop of Ruspe, in the province of Byzacene, in north Africa, was born at Telepte He was well educated and became fiscal procurator, but later took up the monastic life About the year 500, persecution drove him to Syracuse and Rome On his return he was made abbot of a small community on an island, and in 508, against his will, was elected bishop of Ruspe. Two years later he was banished, with other African bishops, whom he represented at a disputation before King Thrasimund in 515 On the death of the king in 523, Fulgentius was able to return to Ruspe, where he remained until 532, when he retired to a monastery on the island of Circe, and practised a strict asceticism He died on Jan. 1, 533. Of his works, which were written against Arianism and Pelagianism, and are penetrated by the thought of St. Augustine, the chief are *Ad Trasimundum regem Vandalorum libri tres, De Fide, Ad Monimum, De Veritate praedestinationis et gratiae Dei, De remissione peccatorum* and *Contra Arianos.*

The best edition is in Migne, *Patrol. Lat.,* vol. lxv. *See* also A. Mally, *Das Leben des heiligen Fulgentius* (1885), and O Bardenhewer, *Patrologie* (Freiburg, 1901).

FULGENTIUS, FABIUS PLANCIADES, Latin grammarian, a native of Africa, flourished in the first half of the 6th (or the last part of the 5th) century A.D. He is to be distinguished from Fulgentius, bishop of Ruspe (468–533), to whom he was probably related, and also from the bishop's pupil and biographer,

Fulgentius Ferrandus. Four extant works are attributed to him. (1) *Mythologiarum libri iii.*, dedicated to a certain Catus, a presbyter of Carthage, containing 75 myths explained in the mystical and allegorical manner of the Stoics and Neoplatonists As a Christian, Fulgentius sometimes quotes the Bible by the side of the philosophers; (2) *Expositio Vergilianae continentiae* (*continentia* = contents), a sort of appendix to (1), explains the twelve books of the *Aeneid* as a picture of human life The three words *arma* (= virtus), *vir* (= sapientia), *primus* (= princeps) in the first line represent respectively *substantia corporalis, sensualis, ornans* Book i. symbolizes the birth and early childhood of man (the shipwreck of Aeneas denotes the peril of birth), book vi. the plunge into the depths of wisdom (3) *Expositio sermonum antiquorum*, explanations of 63 rare and obsolete words, supported by quotations (sometimes from authors and works that never existed) It is much inferior to the similar work of Nonius (4) *Liber absque litteris de aetatibus mundi et hominis.* The ms. heading of this work gives the author's name as Fabius Claudius Gordianus Fulgentius (Claudius is the name of the father, and Gordianus that of the grandfather of the bishop, to whom some attribute the work) The title *Absque litteris* indicates that one letter of the alphabet is omitted in each book (A in bk 1, B in bk ii) Only 14 books are preserved The matter is chiefly taken from sacred history In addition to these, Fulgentius speaks of early poems in imitation of Anacreon, and of a medical work (*Physiologus*) Fulgentius is a representative of the so-called late African style, taking for his models Apuleius, Tertullian and Martianus Capella

See the edition of the four works by R. Helm (1898, Teubner series); also M. Zink, *Der Mytholog Fulgentius* (1867), E Jungmann, "De Fulgentii aetate et scriptis," in *Acta Societatis Philologae Lipsiensis*, i (1871), A Ebert, *Allgemeine Geschichte der Litt des Mittelalters*, i; article "Fulgentius" by C F Bohr in Ersch and Gruber's *Allgemeine Encyklopädie;* Teuffel-Schwabe, *History of Roman Literature* (Eng trans), H Liebeschutz, *Fulgentius Metaforalis* (1926) on his influence on mediaeval mythology, O. Friebel, *Fulgentius, der Mythograph und Bischof* (Paderborn, 1911), attempts to identify the two on stylistic grounds.

FULGINIAE, an ancient town of Umbria, Italy, on the later line of the Via Flaminia, 15 m. S. of Nuceria. It lay 1½ m S. of the modern Foligno It was of comparatively late origin as it had no city walls, but, in imperial times it became important as a junction on the new line of the Via Flaminia Three miles to the N was the independent community of Forum Flaminii, the site of which is marked by the church of S Giovanni Profiamma, at or near which the newer line of the Via Flaminia rejoined the older It was no doubt founded by the builder of the road, C Flaminius, consul in 220 B.C. (*See* FOLIGNO and FLAMINIA, VIA)

FULGURITE, in petrology the name given to rocks which have been fused on the surface by lightning, and to the characteristic holes in rocks formed by the same agency (from Lat. *fulgur*, lightning). When lightning strikes the naked surfaces of rocks, the sudden rise of temperature may produce a certain amount of fusion, especially when the rocks are dry and the electricity is not readily conducted away. Instances of this have been observed on Ararat and on several mountains in the Alps, Pyrenees, etc. A thin glassy crust, resembling a coat of varnish, is formed; its thickness is usually not more than one-eighth of an inch, and it may be colourless, white, yellow, brown or black.

Another type of fulgurite is commonest in dry sands and takes the shape of vertical tubes which may be nearly half an inch in diameter Generally they are elliptical in cross section, or flattened by the pressure exerted by the surrounding sand on the fulgurite at a time when it was still very hot and plastic. These tubes are often vertical and may run downwards for several feet through the sand, branching and lessening as they descend Tubular perforations in hard rocks have been noted also, but these are short and probably follow original cracks. The central cavity of the tube and the bubbles in its walls point to the expansion of the gases (air, water, etc.) in the sand by sudden and extreme heating. Very fine threads of glass project from the surface of the tube as if fused droplets had been projected outwards with considerable force. (J S F)

FULHAM, a western metropolitan borough of London, England, bounded north-west by Hammersmith, north-east by Kensington, east by Chelsea, and south-east, south and south-west by a wide loop of the river Thames. Pop (1921) 157,938 In the north Fulham includes the residential district known as West Kensington, and farther south that of Walham Green. It lies almost entirely on a low gravel terrace north of the Thames. The lowest part, the riverside district adjoining Chelsea, is liable to flood, and suffered in the floods of Jan 1928 Chelsea basin is in this part; and there are many wharves along the river front, which is longer than that of any other London borough. The borough has no outstanding industries, but many men are employed on the railways, and there are also motor works, breweries and wallpaper, tobacco, biscuit and pickle factories The manor house or palace of the bishops of London stands in grounds, beautifully planted and surrounded by a moat, believed to be a Danish work, near the river west of Putney bridge Its oldest portion is the picturesque western quadrangle, built by Bishop Fitzjames (1506–22). The public recreation grounds include the embankment and gardens between the river and the palace grounds, and there are also two well-known enclosures used for sports within the borough Of these Hurlingham park is the headquarters of the Hurlingham Polo club and a fashionable resort; and Queen's club, West Kensington, has tennis and other courts for the use of members, and was also the scene of important football matches, and of the athletic meetings between Oxford and Cambridge Universities, and those between the English and American universities held in England. In Seagrave road is the Western fever hospital The parliamentary boroughs of Fulham east and west each return one member Area, 1,703 5 ac

Fulham, or in its earliest form *Fullanham*, is uncertainly stated to signify "the place" either "of fowls" or "of dirt" The manor is said to have been given to Bishop Erkenwald about the year 691 for himself and his successors in the see of London, and Holinshed relates that the bishop of London was lodging in his manor place in 1141 when Geoffrey de Mandeville, riding out from the Tower of London, took him prisoner There is no record of the first erection of a parish church, but the first known rector was appointed in 1242.

FULK (d 900), archbishop of Reims, and partisan of Charles the Simple in his struggle with Odo, count of Paris, was elected to the see as archbishop in 883 upon the death of Hincmar. In 887 he was engaged in a struggle with the Normans who invaded his territories. Upon the deposition of Charles the Fat he sided with Charles the Simple in his contest for the West Frankish dominions against Count Odo of Paris, and crowned him king in his own metropolitan church at Reims after most of the nobles had gone over to Odo (893) Upon the death of Odo he succeeded in having Charles recognized as king by a majority of the West Frankish nobility. In 892 he obtained special privileges for his province from Pope Formosus. From 898 until his death he held the office of chancellor, which for some time afterwards was regularly filled by the archbishop of Reims. In his efforts to keep the wealthy abbeys and benefices of the church out of the hands of the nobles, he incurred the hatred of Baldwin, count of Flanders, who secured his assassination on June 17, 900, a crime which the weak Carolingian monarch left unpunished.

Fulk left some letters, which are collected in Migne, *Patrologia Latina*, vol. cxxxi. 11–14

FULK, king of Jerusalem (b 1092), was the son of Fulk IV., count of Anjou, and his wife Bertrada (who ultimately deserted her husband and became the mistress of Philip I of France). He became count of Anjou in 1109, and showed himself a doughty opponent to Henry I. of England, against whom he continually supported Louis VI of France, until in 1127 Henry won him over by betrothing his daughter Matilda to Fulk's son Geoffrey Plantagenet Already in 1120 Fulk had visited the Holy Land, and become a close friend of the Templars On his return he assigned to the order of the Templars an annual subsidy, while he also maintained two knights in the Holy Land for a year In 1128 he was preparing to return to the East, when he received an embassy

from Baldwin II, king of Jerusalem, who had no male heir to succeed him, offering his daughter Melisinda in marriage, with the right of eventual succession to the kingdom. Fulk accepted the offer, and in 1129 he came and was married to Melisinda, receiving the towns of Acre and Tyre as her dower. In 1131 he became king of Jerusalem His reign is not marked by any considerable events: the kingdom which had reached its zenith under Baldwin II, and did not begin to decline till the capture of Edessa in the reign of Baldwin III, was quietly prosperous under his rule. In the beginning of his reign he had to act as regent of Antioch, and to provide a husband, Raymund of Poitou, for the infant heiress Constance But the great problem with which he had to deal was the progress of the atabeg Zengi of Mosul In 1137 he was beaten near Barin, and escaping into the fort was surrounded and forced to capitulate A little later, however, he greatly improved his position by strengthening his alliance with the vizier of Damascus, who also had to fear the progress of Zengi (1140), and in this way he was able to capture the fort of Banias, to the north of Lake Tiberias Fulk also strengthened the kingdom on the south; while his butler, Paganus, planted the fortress of Krak to the south of the Dead Sea, and helped to give the kingdom an access towards the Red Sea, he himself constructed Blanche Garde and other forts on the S W to overawe the garrison of Ascalon, which was still held by the Mohammedans, and to clear the road towards Egypt Twice in Fulk's reign the eastern emperor, John Comnenus, appeared in northern Syria (1137 and 1142), but his coming did not affect the king, who was able to decline politely a visit which the emperor proposed to make to Jerusalem. In 1143 he died, leaving two sons, who both became kings, as Baldwin III and Amalric I

Fulk continued the tradition of good statesmanship and sound churchmanship which Baldwin I and Baldwin II had begun Unfortunately he neglected to envisage the needs of the northern principalities, and to head a combined resistance to the rising power of Zengi of Mosul

His reign in Jerusalem is narrated by R Rohricht (*Geschichte des Konigreichs Jerusalem*, Innsbruck, 1898), and has been made the subject of a monograph by G Dodu (*De Fulconis Hierosolymitani regno*, Paris, 1894) (E B)

FULK NERRA (*c* 970–1040), count of Anjou, eldest son of Count Geoffrey I, "Grisegonelle" (Grey Tunic) and Adela of Vermandois, was born about 970 and succeeded his father in the countship of Anjou on July 21, 987 He was successful in repelling the attacks of the count of Rennes and laying the foundations of the conquest of Touraine (*see* ANJOU) In this connection he built a great number of strong castles, which has led in modern times to his being called "the great builder" He also founded several religious houses, among them the abbeys of Beaulieu, near Loches (*c* 1007), of Saint-Nicholas at Angers (1020) and of Ronceray at Angers (1028), and, in order to expiate his crimes of violence, made three pilgrimages to the Holy Land (in 1002–1003, *c* 1008 and in 1039) On his return from the third of these journeys he died at Metz in Lorraine on June 21, 1040 By his first marriage, with Elizabeth, daughter of Bouchard le Vénérable, count of Vendôme, he had a daughter, Adela, who married Boon of Nevers and transmitted to her children the countship of Vendôme Elizabeth having died in 1000, Fulk married Hildegarde of Lorraine, by whom he had a son, Geoffrey Martel (*q v*), and a daughter Ermengarde, who married Geoffrey, count of Gâtinais, and was the mother of Geoffrey "le Barbu" (the Bearded) and of Fulk "le Réchin" (*see* ANJOU)

See Louis Halphen, *Le Comté d'Anjou au XIe siècle* (1906) The biography of Fulk Nerra by Alexandre de Salies, *Histoire de Foulques Nerra* (Angers, 1874) is confused and uncritical. A very summary biography is given by Célestin Port, *Dictionnaire historique, géographique et biographique de Maine-et-Loire* (3 vols, Paris-Angers, 1874–78), vol ii pp 189–192, and there is also a sketch in Kate Norgate, *England under the Angevin Kings* (2 vols., 1887), vol. i. ch iii. (L. HA.)

FULLER, GEORGE (1822–1884), American figure- and portrait-painter, was born at Deerfield (Mass), in 1822. At the age of 20 he entered the studio of the sculptor H K Brown, at Albany (N Y), where he drew from the cast and modelled heads. Having attained some proficiency he went about the country painting portraits, settling at length in Boston, where he studied the works of the earlier Americans, Stuart, Copley and Allston After three years in that city, and 12 years in New York, where in 1857 he was elected a member of the National Academy of Design, he went to Europe for a brief visit and for study. During all this time his work had received little recognition and practically no financial encouragement, and on his return he settled on the family farm at Deerfield, where he continued to work in his own way with no thought of the outside world In 1876, however, he was forced by pressing needs to dispose of his work, and he sent some pictures to a dealer in Boston, where he met with immediate success, financial and artistic, and for the remaining eight years of his life he never lacked patrons He died in Boston on March 21, 1884. Among his noteworthy canvases are: "The Turkey Pasture," "Romany Girl," "And she was a Witch," "Nydia," "Winifred Dysart" and "The Quadroon"

FULLER, JOHN FREDERICK CHARLES (1878–), British soldier, was born on Sept 1, 1878, entered the army in 1898, and served in the South African War In the World War, after holding a variety of staff appointments, he became chief general staff officer of the Tank Corps in April 1917 He had a responsible share in the project for the great tank surprise at Cambrai in Nov 1917, and in the tank successes later, until in July 1918, he was brought back to the War Office to organize the vast tank expansion then contemplated for 1919, had the war continued Colonel Fuller was for a time criticized as a tank extremist, an unpractical visionary Abroad, however, his views were acclaimed, by the French general staff, who translated and circulated them throughout their army, as "an exact vision of the future" Gradually, however, his teaching permeated the army He became in 1922 chief instructor at the Staff College, and in 1926, was appointed military assistant to the new chief of the Imperial General Staff

The result of his researches into the science of war is incorporated in his *Foundations of a Science of War* (1926), and among numerous other books, his *Tanks in the Great War* (1920), *The Reformation of War* (1923), *Sir John Moore's System of Training* (1925) and *Imperial Defence 1588–1914* (1926) attracted wide attention (*see* STRATEGY).

FULLER, MARGARET, MARCHIONESS OSSOLI, (1810–1850), American writer, was born at Cambridge (Mass), May 23, 1810 Unquestionably one of the most brilliant and scholarly of American women, Miss Fuller has been bitterly condemned and extravagantly praised Of remarkable natural endowments, she was put through such a rigorous training by her father as to make her a "youthful prodigy" and by night "a victim of spectral illusions, nightmare and somnambulism" Soon, however, the great amount of study exacted of her ceased to be a burden, and reading became a habit and a passion After her father's death in 1835 she went to Boston to teach languages in Alcott's school and in private classes, and in 1837 she was chosen principal teacher in the Green Street school, Providence (Rhode Island), where she remained till 1839 From this year until 1844 she stayed at different places in the immediate neighbourhood of Boston In 1839 she published a translation of Eckermann's *Conversations with Goethe*, which was followed in 1842 by a translation of the correspondence between Karoline von Gunderode and Bettina von Arnim. Aided by R W Emerson and George Ripley, she in 1840 started the *Dial*, a poetical and philosophical magazine representing the opinions and aims of the New England Transcendentalists. This journal she continued to edit for two years, and while in Boston she also conducted with remarkable success conversation classes for ladies on philosophical and social subjects, designed "to systematize thought" and to show women how to make the best use of their means "for building up the life of thought upon the life of action." These classes were an important step in the modern movement on behalf of women's rights; still more important was Miss Fuller's *Woman in the Nineteenth Century* (1844), an elaboration of an earlier essay in the *Dial* in which she pleaded with courageous frankness and historical fairness for greater equality between the sexes, particularly recognition of woman's

intellectual needs and capacities Her *Summer on the Lakes in 1843* (1844) Horace Greeley characterized as "one of the clearest and most graphic delineations ever given of the Great Lakes, of the Prairies, and of the receding barbarism, and the rapidly advancing, but rude, repulsive semi-civilization which were contending with most unequal forces for the possession of those rich lands." In general, however, her writing was inferior to her conversation, which, through its wit, profundity of thought, and breadth and richness of culture, early won her an admiring audience not only from the young collegians, her contemporaries, but from the most distinguished thinkers of her day

In Dec 1844 she removed to New York to write literary criticism for the *Tribune*, and in 1840 she published a selection from her articles under the title *Papers on Literature and Art* The same year she paid a visit to Europe, passing some time in England and France and finally taking up her residence in Italy There she was married to the Marquis Giovanni Angelo Ossoli, a follower of Mazzini During 1848–49 she was in Rome, and when the city was besieged she took charge of one of the two hospitals while her husband fought on the walls In May 1850, along with her husband and infant son, she embarked at Leghorn for America; but when they had all but reached their destination, the vessel was wrecked on Fire Island beach, June 16, and the Ossolis perished The Marchioness Ossoli's manuscript on the struggle for Italian freedom, with which she had deepest sympathy and which she had unrivalled opportunity to observe, was lost at the same time

It is regrettable that her somewhat sad life should have been cut off so suddenly, perhaps it is unfortunate, too, in spite of her contributions to the cause of women's freedom, that she should have lived so far in advance of her time Eccentricities that branded her in the 19th century would pass unnoticed in the 20th She suffered as much from the adoration of her admirers as from the sneers of her enemies She was called the high priestess of Transcendentalism, and yet her clear vision unerringly detected the flaws in the Brook Farm scheme Her incisive intellect, her relentless truthfulness, her impulsive warm-heartedness, all doomed her to disappointments and to misinterpretations contradicted by her journals and letters Nevertheless, by her high standards and by her familiarity with European literature, she remains an important figure in the history of American culture

After Margaret Fuller's death her brother, Arthur E Fuller, republished her works—her *Woman in the Nineteenth Century* and kindred papers in 1855, with an introduction by Horace Greeley, her *Summer on the Lakes* and her European letters, together with an account of her death and with numerous tributes to her, as *At Home and Abroad* (1856), her collected critical essays and "A Rhythmical Translation of Goethe's Tasso" as *Art, Literature and the Drama* (1859) He added *Life Without and Life Within* (1859), a collection of essays, poems, etc The best biographies are *Memoirs of Margaret Fuller Ossoli*, by R W Emerson, W H Channing and J F Clarke (1852, several times reprinted) and *Margaret Fuller Ossoli* (1884), by T W Higginson, which contains a bibliography and which is based largely on unedited material *See* also *Margaret Fuller (Marchesa Ossoli)* by Julia Ward Howe (1883), her edition of the *Love Letters of Margaret Fuller*, 1845–1846 (1903) and F A Braun's *Margaret Fuller and Goethe* (1910) *Margaret Fuller* (1920), by Katharine Anthony, is a rather unconvincing "psychological" biography

FULLER, MELVILLE WESTON (1833–1910), American jurist, chief justice of the Supreme Court of the U S , was born at Augusta, Me , on Feb. 11, 1833 After he had graduated at Bowdoin College in 1853 he spent a year at the Harvard Law School, and in 1855 began the practice of law at Augusta In 1856 he removed to Chicago, Ill , where he continued to practise until 1888 He was a member of the Illinois Constitutional Convention in 1862 and of the State house of representatives from 1863 to 1865. In 1888, by President Cleveland's appointment, he succeeded Morrison R. Waite as chief justice of the Supreme Court of the United States. In 1899 he was appointed by President McKinley a member of the arbitration commission at Paris to settle the Venezuela-British Guiana boundary dispute

FULLER, THOMAS (1608–1661), English divine and historian, eldest son of Thomas Fuller, rector of Aldwincle St. Peter's, Northamptonshire, was christened on June 19, 1608 At 13 he was sent to Queen's college, Cambridge, graduating M.A. in 1628 In that year he removed to Sidney Sussex college, and in 1630 was presented by Corpus Christi college to the curacy of St Benet's, Cambridge In June of the same year his uncle, John Davenant, bishop of Salisbury, gave him a prebend in Salisbury, where his father, who died in the following year, held a canonry The rectory of Broadwindsor, Dorsetshire, then in the diocese of Bristol, was his next preferment (1634)

At Broadwindsor he compiled *The Historie of the Holy Warre* (1639), a history of the crusades, and *The Holy State and the Prophane State* (1642) This popular work describes the holy state as existing in the family and in public life, gives rules of conduct, model "characters" for the various professions and profane biographies He was in 1640 elected proctor for Bristol in the convocation of Canterbury, which assembled with the Short Parliament His first published volume of sermons appeared in 1640 under the title of *Joseph's party-coloured Coat*, which contains many of his conceits He was not formally dispossessed of his living and prebend on the triumph of the Presbyterian party, but he relinquished both preferments, to become lecturer at the chapel of St Mary Savoy Some of the best discourses of the witty preacher were delivered at the Savoy to audiences which extended into the chapel-yard In one he set forth the hindrances to peace, and urged the signing of petitions in the cause of peace to the king at Oxford, and to the parliament Fuller was one of a party entrusted to carry the Westminster petition to the king at Oxford The deputation was turned back (Jan. 4, 1643) at Uxbridge, and the members of the party spent a brief period in gaol But the petition reached the king by other means, and was published with his reply In Aug 1643 Fuller joined the king at Oxford

The spirit of Fuller's preaching, always characterized by calmness and moderation, gave offence to the high royalists, who charged him with lukewarmness in their cause To silence unjust censures he became chaplain to the regiment of Sir Ralph Hopton. For the first five years of the war, he had "little list or leisure to write, fearing to be made a history, and shifting daily for my safety All that time I could not live to study, who did only study to live" After the defeat of Hopton at Cheriton Down, Fuller retreated to Basing House He took an active part in its defence In his marches with his regiment round about Oxford and in the west, he collected details from churches, old buildings, and the conversation of ancient gossips, for his *Church-History* and *Worthies of England* He compiled in 1645, a small volume of prayers and meditations—the *Good Thoughts in Bad Times*—printed at Exeter, where he remained until the surrender of the city to the parliament in the summer of 1647 Under the Articles of Surrender Fuller made his composition with the Government at London

In 1647 Fuller began to preach at St Clement's, Eastcheap, and elsewhere in the capacity of lecturer At Chelsea he covertly preached a sermon on the death of Charles I , but he did not break with his Roundhead patrons James Hay, 2nd earl of Carlisle, made him his chaplain, and presented him in 1648 or 1649 to the curacy of Waltham Abbey

His possession of the living was in jeopardy on the appointment of Cromwell's "Tryers", but Fuller evaded their inquisitorial questions by his ready wit He was not disturbed at Waltham in 1655, when the Protector's edict prohibited the adherents of the late king from preaching Lionel, 3rd earl of Middlesex, who lived at Copt Hall, near Waltham, gave him what remained of the books of the lord treasurer his father; and through the good offices of the marchioness of Hertford, part of his own pillaged library was restored to him Fuller, thus provided with books, wrote his descriptive geography of the Holy Land, called *A Pisgah-Sight of Palestine* (1650), and his *Church-History of Britain* (1655), from the birth of Jesus Christ until the year 1648. With the *Church-History* was printed *The History of the University of Cambridge since the Conquest* and *The History of Waltham Abbey*. These works were furthered by his connection with Sion college, London, where he had a chamber, as well for the convenience of the press as of his city lectureships His last

and best patron was George Berkeley, 1st Earl Berkeley (1628–98), of Cranford house, Middlesex, whose chaplain he was, and who gave him Cranford rectory (1658) His later works are: *An Alarum to the Counties of England and Wales* (1660), *Mixt Contemplations in Better Times* (1660); and *A Panegyrick to His Majesty on his Happy Return* (1660) He resumed his lectures at the Savoy, where Samuel Pepys heard him preach, and became chaplain in extraordinary to Charles II In the summer of 1661 he visited the west in connection with the business of his prebend, which had been restored to him On Sunday, Aug 12, while preaching at the Savoy, he was seized with typhus fever, and died at his new lodgings in Covent Garden on Aug 16 He was buried in Cranford church Fuller was twice married, his second wife, Mary Roper, being a sister of Viscount Baltinglass

Fuller's writings were the product of a highly original mind He had a fertile imagination and a happy faculty of illustration. Antithetic and axiomatic sentences abound in his pages, embodying literally the wisdom of the many in the wit of one He was "quaint," and something more "Wit," said Coleridge, in a well-known eulogy, "was the stuff and substance of Fuller's intellect It was the element, the earthen base, the material which he worked in, and this very circumstance has defrauded him of his due praise for the practical wisdom of the thoughts, for the beauty and variety of the truths, into which he shaped the stuff Fuller was incomparably the most sensible, the least prejudiced, great man of an age that boasted a galaxy of great men" (*Literary Remains*, vol ii [1836], pp 389–390) This opinion was formed after reading *The Church History* and the *Worthies of England* Charles Lamb had a profound admiration for Fuller and made selections from his works

There is an account of the life and writings of Fuller by William Oldys in the *Biographia Britannica*, vol iii (1750), based on Fuller's own works and the anonymous *Life of . Dr Thomas Fuller* (1661, reprinted in a volume of selections by A L J Gosset, 1893) The completest account of him is *The Life of Thomas Fuller, with Notices of his Books, his Kinsmen and his Friends* (1874), by J E Bailey, who gives a detailed bibliography (pp 713–762) of his works *The Worthies of England* was reprinted by John Nichols (1811) and by P A Nuttall (1840) His *Collected Sermons* were edited by J E Bailey and W E A Axon in 1891 Fuller's quaint wit lends itself to selection, and there are several modern volumes of extracts from his works

FULLER'S EARTH, so named from its use by fullers as an absorbent of the grease and oil of cloth, a clay-like substance, which from its variability is somewhat difficult to define (Ger *Walkererde*, Fr *terre à foulon, argile smectique*) In colour it is most often greenish, olive-green or greenish-grey; on weathering it changes to a brown tint or it may bleach As a rule it falls to pieces when placed in water and is not markedly plastic, when dry it adheres strongly to the tongue; since, however, these properties are possessed by many clays that do not exhibit detergent qualities, the only test of value lies in the capacity to absorb grease or clarify oil Fuller's earth has a specific gravity of 1·7–2·4, and a shining streak, it is usually unctuous to the touch Microscopically, it consists of minute irregular-shaped particles of a mineral that appears to be the result of a chloritic or talcose alteration of a felspar The small size of most of the grains (less than ·07 mm) makes their determination almost impossible Chemical analysis shows that the peculiar properties of this earth are due to its physical rather than its chemical nature

The following analyses of the weathered and unweathered condition of the earth from Nutfield, Surrey, represent the composition of one of the best known varieties·

Blue Earth (dried at 100° C)

Insoluble residue	69·96	Insoluble residue	
Fe_2O_3	2·48	SiO_2	62·81
Al_2O_3	3·46	Al_2O_3	3·46
CaO	5·87	Fe_2O_3	1·30
MgO	1·41	CaO	1·53
P_2O_5	0·27	MgO	0·86
SO_3	0·05		69·96
NaCl	0·05		
K_2O	0·74		
H_2O (combined)	15·57		
	99·86		

Yellow Earth (dried at 100° C.)

Insoluble residue	76·13	Insoluble residue	
Fe_2O_3	2·41	SiO_2	59·37
Al_2O_3	1·77	Al_2O_3	10·05
CaO	4·31	Fe_2O_3	3·86
MgO	1·05	CaO	1·86
P_2O_5	0·14	Mgo	1·04
SO_3	0·07		76·18
NaCl	0·14		
K_2O	0·84		
H_2O (combined)	13·19		
	100·05		

(Analysis by P. G Sanford *Geol. Mag*, 1889, 6, pp 456–526.)

Of other published analyses, not a few show a lower silica content (44%, 50%), along with a higher proportion of alumina (11%, 23%)

Fuller's earth may occur on any geological horizon, at Nutfield in Surrey, England, it is in the Cretaceous formations; at Midford near Bath it is of Jurassic age, at Bala, North Wales, it occurs in Ordovician strata, in Saxony it appears to be the decomposition product of a diabasic rock In America it is found in California in rocks ranging from Cretaceous to Pleistocene age, in South Dakota, Custer county and elsewhere a yellow, gritty earth of Jurassic age is worked, in Florida and Georgia occurs a brittle, whitish earth of Oligocene age Other deposits are worked in Arkansas, Texas, Colorado, Massachusetts and South Carolina

Fuller's earth is either mined or dug in the open according to local circumstances It is then dried in the sun or by artificial heat and transported in small lumps in sacks In other cases it is ground to a fine powder after being dried, or it is first roughly ground and made into a slurry with water, which is allowed to carry off the finer from the coarser particles and deposit them in a creamy state in suitable tanks After consolidation this fine material is dried artificially on drying floors, broken into lumps, and packed for transport The use of fuller's earth for cleansing wool and cloth has greatly decreased, but the demand for the material is as great or greater than it ever was It is now used very largely in the filtration of mineral oils, and also for decolorizing certain vegetable oils It is employed in the formation of certain soaps, cleansing preparations, pigments for wall-papers, and the finest grade is utilised in toilet requisites

The name "Fuller's Earth" is applied to a subdivision of the Jurassic rocks of south-west England (*see* JURASSIC SYSTEM)

(J A H)

FULLERTON, LADY GEORGIANA CHARLOTTE (1812–1885), English novelist and philanthropist, youngest daughter of the 1st Earl Granville, was born at Tixall Hall, Staffordshire In 1833 she married Alexander George Fullerton, then an Irish officer in the Guards In 1844 she published her first novel, *Ellen Middleton*. In 1846 she entered the Roman Catholic Church In 1856 she became one of the third order of St Francis, and thenceforward devoted herself to charitable work She died at Bournemouth on Jan 19, 1885 Among her other novels were *Grantley Manor* (1847), *Lady Bird* (1852) and *Too Strange not to be True* (1864)

See Mrs A Craven, *Lady G Fullerton, sa vie et ses oeuvres* (1888); C M Yonge, *Lady Georgiana Fullerton* (1897)

FULLERTON, a city of Orange county, Calif., U.S.A., 30m S E of Los Angeles, served by the Pacific Electric, the Santa Fe, the Southern Pacific and the Union Pacific railways The population was 4,415 in 1920, and was estimated locally at 10,500 in 1928. Walnuts and fruits are grown, and large quantities of crude oil are shipped There are producing wells within the city limits The city was incorporated in 1904

FULMAR, the name of several species of petrels, *Fulmarus glacialis*, one of the largest petrels (*Procellariidae*) of the Northern Hemisphere, is about the size of the common gull (*Larus canus*) and not unlike it in coloration, except that its primaries are grey instead of black. The bird ranges over the North Atlantic In the Pacific it is represented by *F. glupischa*. In the British Isles, the fulmar breeds in St. Kilda and Skye, but has rapidly extended its breeding area in recent years. Its range towards the Pole seems to be bounded only by open water. By

British seamen it is called the "molly mawk" (corrupted from *Mallemuck*). It only visits land to deposit its single white egg, which is laid on a rocky ledge, in a shallow nest lined with a little dried grass. Many of its breeding-places are valuable property to those who live near them and take the eggs and young The oil from the young has been found to possess the same qualities as cod-liver oil. However, it has a strong scent, which is retained by an egg or skin of the bird for years. The bird, when seized, ejects this oil from its mouth In courtship, the male and female simultaneously display the mauve lining of the mouth. The giant fulmar (*Macronectes giganteα*) of the southern Pacific sometimes reaches Oregon It has a wing-spread of seven feet

FULMINIC ACID, a volatile explosive liquid, C.NOH, having an odour of prussic acid, has not been obtained in a state of purity It is set free from sodium or potassium fulminate by dilute sulphuric acid followed by extraction with ether The chemical constitution of fulminic acid and its salts has long been a matter of controversy among chemists, although the general consensus of opinion favours the view epitomized by the foregoing chemical formula which represents the acid as carbyloxime (carbonyloxime) or the oxime (*q v*) of carbon monoxide Accordingly fulminic acid belongs to the small group of organic substances regarded as containing bivalent carbon The best known fulminates are those of mercury and silver The preparation of the former is described under MERCURY, FULMINATE OF, the latter is produced similarly by adding ethyl alcohol to a nitric acid solution of silver nitrate The liquid is gently heated until frothing occurs and when the vigorous reaction has subsided, silver fulminate, C NOAg, separates in opaque white needles which are sparingly soluble in water This salt is an extremely dangerous compound since it detonates even more violently than the mercury compound Cadmium, cuprous and thallous fulminates have been prepared (L Wohler and Martin, 1917), they are all violently explosive

The production of fulminate from ethyl alcohol, acetaldehyde and similar two-carbon compounds supported the older view that fulminic acid and its salts also contained two carbon atoms in the molecule ($C_2H_2O_2N_2$), but this hypothesis was disproved completely by J U Nef (1894) who prepared fulminates from organic compounds containing only one carbon atom For example, he obtained mercuric fulminate by the interaction of mercuric chloride and sodium nitromethane, CH_2 NO ONa Another neat synthesis of metallic fulminates from a one-carbon compound was discovered by H Wieland (1907) on warming methylnitrolic acid, NO_2 CH NOH, with excess of silver nitrate in dilute nitric acid silver fulminate separates in considerable yield The synthesis of benzaldoxime from benzene and mercuric fulminate in presence of hydrated aluminium chloride (R Scholl, 1899) is corroborative evidence in favour of the carbyloxime structure of fulminic acid Further confirmation is afforded by the physico-chemical evidence adduced by L Wohler (1905) who, by the freezing-point method, found that in decinormal aqueous solution, sodium fulminate had an apparent molecular weight of 34·9; this corresponds with the molecular weight of undissociated C:NONa, divided by the dissociation factor (1 85) generally observed for sodium salts of monobasic acids. This result excludes the dimeric formula, $C_2N_2O_2Na_2$ *Fulminuric Acid*, $C_3H_3O_3N_3$, colourless prisms soluble in water and deflagrating at 145°C, is obtained through its ammonium salt by boiling mercuric fulminate with an aqueous solution of ammonium chloride *Metafulminic Acid,* containing water ($2H_2O$) and melting at 85–86° C, and at 102° C when anhydrous, is formed by the spontaneous polymerization of fulminic acid

See "Fulminic and Fulminuric Acids," Thorpe's *Dictionary of Applied Chemistry,* vol III, p. 280 (1922). (G. T. M.)

FULTON, ROBERT (1765–1815), American engineer, was born in 1765 in Little Britain (now Fulton, Lancaster county), Pa. At an early age he was bound apprentice to a jeweller in Philadelphia, but subsequently adopted portrait and landscape painting as his profession In 1787 with the object of studying with his countryman, Benjamin West, he went to England, and there became acquainted with the duke of Bridgewater, Earl Stanhope and James Watt Partly by their influence he was led to devote his attention to engineering He obtained an English patent in 1794 for superseding canal locks by inclined planes, and in 1796 he published a *Treatise on the Improvement of Canal Navigation.* He then took up his residence in Paris, where he projected the first panorama ever exhibited in that city, and constructed a submarine boat, the "Nautilus." It was at Paris also in 1803 that he first succeeded in propelling a boat by steam-power. Returning to America he continued his experiments with submarine explosives, but failed to convince either the English, French or United States Governments of the adequacy of his methods With steam navigation he had more success. In association with Robert R Livingston (*q v*) he constructed the "Clermont," which, engined by Boulton and Watt of Birmingham, began to ply on the Hudson between New York and Albany in 1807 By an act passed in 1808 the navigation monopoly was secured to them and their associates for a period depending on the number of steamers constructed, but limited to a maximum of 30 years. In 1814–15, on behalf of the United States Government, he constructed the "Fulton," a vessel of 38 tons with central paddle-wheels, which was the first steam warship. He died at New York on Feb 24, 1815 Among Fulton's inventions were machines for spinning flax, for making ropes, and for sawing and polishing marble

See C D Colden, *Life of Robert Fulton* (1817), Robert H Thurston, *History of the Growth of the Steam-Engine* (1878), George H Preble, *Chronological History of Steam Navigation* (Philadelphia, 1883), and Mrs A C Sutcliffe, *Robert Fulton and the Clermont* (1909)

FULTON, a city of Missouri, U S A, 25m N E of Jefferson City, on Federal highway 54 and the Chicago and Alton railroad; the county seat of Callaway county The population was 5,595 in 1920 (22% negroes) Cattle, mules, grain and hay are raised in the region, and there are coal mines and mineral springs near the city The principal manufactures are fire-brick and shoes. Fulton is the seat of Westminster college for men (Presbyterian), founded in 1849 as Fulton college, Synodical college (Presbyterian, 1871) and William Woods college (Christian, 1890), both for women; a State school for the deaf (1851); and the oldest State hospital for the insane in Missouri (1847) The town was laid out in 1825 and named Volney, but was re-named a little later in honour of Robert Fulton It was incorporated in 1859.

FULTON, a city of Oswego county, New York, U S A, on the Oswego river and canal, 12m from Lake Ontario. It is served by the Lackawanna, the New York Central, and the New York, Ontario and Western railways The population was 13,043 in 1920 (85% native white) Ample water-power is furnished by the river, and the manufactures are numerous and varied, including paper, aluminium goods, cutlery and chocolate candy, with an aggregate output in 1925 valued at $20,129,033 On July 3, 1756, on an island 4m N of Fulton, an attacking force of 700 French and Indians under De Villiers was defeated by 300 British under Capt John Bradstreet, who soon afterwards built a fort within the present limits of the city Settlement by civilians began in 1793 The village was named after Robert Fulton It was incorporated in 1835, and in 1902, combined with Oswego Falls, was chartered as a city.

FUMARIC AND MALEIC ACIDS, unsaturated organic acids $C_4H_4O_4$ showing stereoisomerism. Fumaric acid is found in fumitory (*Fumaria officinalis*), various fungi (*Agaricus piperatus,* etc) and Iceland moss It is obtained by heating malic acid alone to 150° C, or by heating it with hydrochloric acid or hydrobromic acid It may also be obtained by boiling monobromosuccinic acid with water, and by heating maleic acid to 210° C It crystallizes in small prisms or needles, and is practically insoluble in cold water It sublimes to some extent at about 200° C, being partially converted into maleic anhydride and water, the reaction becoming practically quantitative if dehydrating agents be used. Potassium permanganate oxidizes it to racemic acid (*see* TARTARIC ACID).

Maleic acid is obtained by distilling malic or fumaric acids, or by heating fumaric acid with acetyl chloride to 100° C It crystallizes in monoclinic prisms, which are easily soluble in water,

melt at 130° C, and boil at 160° C, decomposing into water and maleic anhydride When heated with concentrated hydrobromic or hydriodic acid, it is converted into fumaric acid Oxidation converts it into mesotartaric acid Maleic anhydride is obtained by distilling fumaric acid with phosphoric oxide It forms triclinic crystals which melt at 60° C, and boil at 196° C On a manufacturing scale maleic anhydride is prepared by aerial oxidation of benzene vapour with a vanadium pentoxide catalyst This preparation of the anhydride from benzene, a cyclic compound, affords additional confirmation of the *cis*-configuration assigned to maleic acid Both acids yield acetylene by the electrolysis of aqueous solutions of their alkali salts, and on reduction both yield succinic acid, whilst by addition of hydrobromic acid they both yield monobromosuccinic acid From these results it follows that the two acids are structurally identical, the isomerism being due to differences in the spatial arrangement of their constituent atoms (*see* STEREOCHEMISTRY), thus

$$\begin{matrix} H-C-CO_2H \\ \| \\ H-C-CO_2H \end{matrix}$$ Maleic acid (cis) $$\begin{matrix} H-C-CO_2H \\ \| \\ HO_2C-C-H \end{matrix}$$ Fumaric acid (trans)

The foregoing formulae account for maleic acid readily yielding an anhydride, whereas fumaric acid does not, and for the behaviour of the acids towards bromine, fumaric acid yielding ordinary dibromosuccinic acid, and maleic acid the isomeric isodibromosuccinic acid

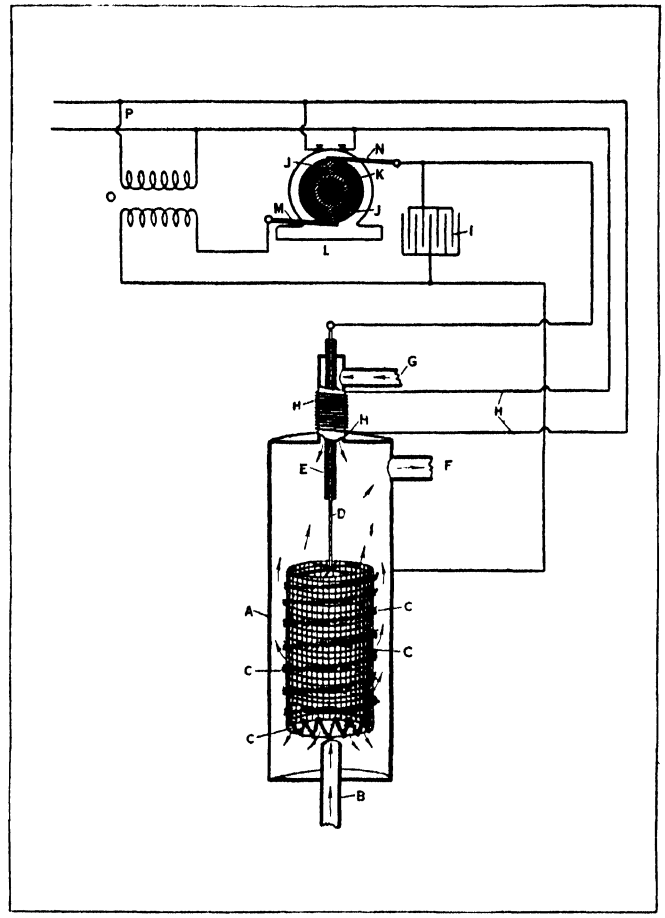
FUMAROLE, a vent from which volcanic vapours issue, named indirectly from Lat *fumariolum,* a smoke-hole The vapours from fumaroles were studied first by R W Bunsen in Iceland, and afterwards by H Sainte-Claire Deville and other chemists and geologists in France, who examined the vapours from Santorin, Etna, etc The hottest vapours issue from dry fumaroles, at temperatures of at least 500° C, and consist chiefly of anhydrous chlorides, notably sodium chloride The acid fumaroles yield vapours of lower temperature (300° to 400°) containing much water vapour, with hydrogen chloride and sulphur dioxide The alkaline fumaroles are still cooler, though above 100°, and evolve ammonium chloride with other vapours Cold fumaroles, below 100°, discharge principally aqueous vapour, with carbon dioxide, and perhaps hydrogen sulphide The fumaroles of Mont Pelée in Martinique during the eruption of 1902 were examined by A Lacroix, and the vapours analysed by H Moissan, who found that they consisted chiefly of water vapour, with hydrogen chloride, sulphur, carbon dioxide, carbon monoxide, methane, hydrogen, nitrogen, oxygen and argon, issuing at a temperature of about 400°. (*See* VOLCANO)

FUME PRECIPITATION, ELECTRICAL. The precipitation of smoke by electricity was described in 1824 by Hohlfeld, a teacher of mathematics in Leipzig, but only after it was independently rediscovered and critically studied by Sir Oliver Lodge about 1884 did it attract general attention and lead to attempts at industrial applications At the time, however, these proved unsuccessful due to the lack of modern equipment It was not until 1906, following experiments at the University of California, that the process was commercially successful.

The first installation was at the Selby Smelting Works, near San Francisco, where it was used for the removal of sulphuric acid mist from about 5,000cu ft of gases per minute By 1910 a plant to remove dry dust and fume from 250,000cu ft of gas per min was built at another smelter, and in 1912 the process was successfully extended to the removal of cement dust at nearly a red heat from 1,000,000cu ft of gas per min at the Riverside Portland Cement Company, a mill of 2,500bbls daily capacity, in the heart of the Californian orange groves, threatened with legal closure as a nuisance because of the dust emitted

The method removed 98% of the dust, the daily catch being about 100 tons, and equivalent after 13 years to a fully loaded freight train 100 miles long Although first applied purely to mitigate nuisances, the demand for the process to-day is primarily based on a greater profit to be derived from the gases cleaned or the material removed At one time during the World War, the Riverside plant was making even more profit from potash incidentally recovered in its dust than from its cement

Research Corporation.—Another circumstance aiding the development through friendly public interest was the creation in 1912, under the auspices of the Smithsonian Institution, of the Research Corp in New York city, to hold and administer as an endowment for research most of the United States patent rights to the process The corporation besides supervising construction and development of this particular process, also serves in



FROM SMITHSONIAN REPORT, 1913

REPRODUCTION OF THE PATENT OFFICE DRAWINGS FOR THE FIRST COMMERCIALLY SUCCESSFUL ELECTRICAL SYSTEM OF FUME PRECIPITATION, DESIGNED BY COTTRELL IN 1908

general as a clearing house for information and as an intermediary and trustee between inventors, the industries and the public.

The Process.—Technically the process consists in securing a uniform, copious but non-disruptive discharge of electricity from small electrode surfaces of one polarity into a stream of cloudy gas. The fine solid or liquid particles composing the dust, fume or smoke are immediately attracted to, and deposited on, large electrode surfaces of opposite polarity, the particles having become charged from the condensation on their surfaces of a portion of the electricity passing between the electrodes The process is diagrammatically illustrated here Alternating current from service lines is stepped up in a transformer to a high voltage and then converted to a direct, or rather a pulsating unidirectional, current by a commutator or "rectifier" driven by a synchronous motor One side of the line is grounded and connected to a pipe or "treater" carrying the fume-laden gases This pipe serves as the collecting electrode The other side of the line terminates in a wire serving as the discharge electrode, which is hung axially within the pipe Voltage is regulated to secure as strong a glow as corona discharge from the wire electrode as possible without passing over into a disruptive discharge, *i e*, a spark or arc. This adjustment is easier when the discharge electrode is the negative, though either polarity may be used

The gas treaters now in general use consist either of a multiplicity of pipes similar to that in the figure, or of plates hung

vertically in a flue, the wires being stretched parallel between them The materials of construction, including the collecting electrodes, vary from iron and lead to reinforced concrete and vitrified earthenware, depending on the composition and temperature of the gas stream to be treated.

Factors in Design.—Most plants are designed with electrodes of opposite sign 2 to 6in apart and operating at 30,000 to 80,000 volts The size of installation is determined primarily by the volume of gas to be treated and the percentage of suspended matter to be removed, the amount, kind and size of particle of the latter being of minor importance. If P is the ratio of out-going to incoming suspended matter, t the average time in seconds that the gas remains between the electrodes, and K, a constant depending upon the apparatus, voltage, temperature and kind of raw gas, then $P=K^t$. In most commercial practice t averages about 2 seconds and K varies from 0 2 to 0·7, the gases travelling from 10 to 40ft through the electric field of linear rates of 3 to 15ft per second Removal of 90% to 99% of the suspended matter is usually aimed at, and the energy required is 1 to 3kw. hours per 100,000cu ft of gas treated

Industrial Uses.—The earliest applications of the process were to the smelting and sulphuric acid industries Installations in such plants in 1926 still outnumbered those in all other industries, and amounted to several hundred scattered throughout the world Equipments at cement mills were fewer in number but handled a large volume of gas and a large tonnage of precipitate Other important applications are to the detarring of coke-oven gases, the cleaning of producer and iron blast-furnace gas, the cleaning of ventilating air in crushing, grinding and polishing mills (especially where cost of heating in winter makes recirculation of air important), the recovery of sludge acid fumes in petroleum refineries, the recovery of dust from brown-coal dryers, and the removal of ash from the stack gases of large power-plants burning powdered coal On a laboratory scale the process has also been applied successfully to sanitary atmospheric analysis and to gas masks, including the removal of bacteria from air

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FUMIGATION, the process of producing smoke or fumes, as by burning surphur, frankincense, tobacco, etc, whether as a ceremony of incantation, or for perfuming a room, or for purposes of disinfection or destruction of vermin In medicine the term has been used of the exposure of the body, or a portion of it, to fumes such as those of nitre, salammoniac, mercury, etc ; fumigation by the injection of tobacco smoke into the great bowel, was a recognized procedure in the 18th century for the resuscitation of the apparently drowned. "Fumigated" or "fumed" oak is oak which has been darkened by exposure to ammonia vapour

FUMITORY, in botany, the popular name for the British species of *Fumaria,* a genus of small, branched, often climbing annual herbs with much-divided leaves and racemes of small flowers It is included in the family Fumariaceae The flowers are tubular with a spurred base, and in the British species are pink to purplish in colour They are weeds of cultivation growing in fields and waste places *F capreolata* climbs by means of twisting petioles In past times fumitory was in esteem for its reputed medicinal properties; and in England, boiled in water, milk or whey, it was used as a cosmetic The root of the allied species (*Corydalis tuberosa*) is known as *radix aristolochia,* and has been used medicinally for various cutaneous and other disorders, in doses of 10 to 30 grains Some 11 alkaloids have been isolated from it The herbage of *Fumaria officinalis* and *F. racemosa* is used in China as an application for glandular swellings, carbuncles and abscesses, and was formerly valued in jaundice

The climbing fumitory or Alleghany-vine (*Adlumia fungosa*), native to moist woods in the north-eastern United States, with delicate flowers and foliage, is cultivated as an ornamental vine

FUNCHAL, the administrative centre of the Portuguese archipelago of the Madeiras; on the south coast of Madeira, in 32° 37′ N and 16° 54′ W Pop (1920) 20,844 Its white-washed houses, in their gardens full of tropical plants, are built along the curving shore of Funchal bay, and on the lower slopes of an amphitheatre of mountains, which form a background 4,000 ft high Numerous country houses (*quintas*), with terraced gardens, vineyards and sugar-cane plantations occupy the surrounding heights The chief buildings include the cathedral, Anglican and Presbyterian churches, hospitals, opera-house, museum and casino In the steep and narrow streets, which are lighted by electricity, wheeled traffic is impossible; sledges drawn by oxen and other primitive conveyances are used instead (*see* MADEIRA) In winter the fine climate and scenery attract numerous invalids and other visitors, many foreigners engaged in the coal and wine trades also reside here permanently The British community was first established here in the 18th century. Funchal is the headquarters of Madeiran industry and commerce (*see* MADEIRA) Funchal is connected by cable with Carcavellos (for Lisbon), Porthcurnow (for Falmouth, England) and St. Vincent in the Cape Verde islands (for Pernambuco, Brazil).

FUNCTION, in mathematics, a variable whose values are determined by those of one or more other variables The word *variable* here denotes a symbol which stands for any one of a class of things called *values* of the variable Although the terms thus defined apply to other entities as well as to numbers, the mathematical theory of functions is in the main concerned with variables whose values are numbers If y and x are two such variables, and if to each value of x corresponds one value of y and only one, then y is said to be a *single-valued function* of x The functional relation is expressed by the equation $y=f(x)$, in which the symbol f may be replaced by some other letter Here x is said to be the *independent variable,* and y the *dependent variable* If more than one value of y corresponds to a value of x, the variable y is a *many-valued function* of x

The set of values assigned to a variable is called the *domain* of that variable, and a theory of functions must rest on precise notions about domains One of its goals should be a classification of functions with respect to their properties in given domains As with the natural sciences, however, a mere taxonomy based on the presence or absence of distinctive traits cannot be the sole objective These traits, the processes connected with them, and their consequences are the matters of greatest interest In the general subdivision of mathematics styled *analysis* (*q v*) the rôle of the theory of functions consists in a critical examination of the validity of analytical processes It is concerned mainly with the idea of a limit, and with the consequences of that notion, upon which the infinitesimal calculus is based.

If the domains of both dependent and independent variables consist of real numbers only, the corresponding function is a *real function of a real variable* (or variables) If the independent variable has complex values (*i e*, numbers of the form $a+b\sqrt{-1}$ where a and b are real) we have a *function of a complex variable.* The theory of such functions is equivalent to that of pairs of

real functions of two real variables Historically, however, much of the theory of functions of a complex variable has been otherwise developed, and its field has included topics analogous to those whose treatment for real variables is considered as lying in the province of the infinitesimal calculus, rather than in that of a general theory of functions

I. FUNCTIONS OF REAL VARIABLES

1 **The Development of the Theory of Functions** goes back to Descartes' publication of his work on analytic geometry (1637) The abscissas x and ordinates y of a plane curve are variables; the curve pictures the dependence of the one on the other The word function seems first to have been used in such a sense by Leibniz (1694), who thus denoted certain lengths such as abscissas, ordinates, tangents, normals, radii of curvature, associated with the position of a point on a curve J Bernoulli (1698) applied the term to mathematical expressions involving variables and constants The notation $f(x)$ was used by L Euler in 1734 His *Introductio in Analysin Infinitorum* (1748) may be regarded as the first treatise on the theory of functions, although its point of view would now be described as elementary and formal As in the definition of Bernoulli, a function is identified with its analytic expression and according to the form of this expression it is classified as explicit or implicit, algebraic or transcendental

The eighteenth century was a constructive period in mathematics, an epoch of discovery, when scientific accuracy played a subordinate rôle. The first part of the nineteenth century ushered in the present era of criticism The *Théorie des fonctions analytiques* of J. L Lagrange (1797) was a precursor of this change Better foundations were here sought by basing the processes of the calculus on the properties of series of powers of the independent variable Analytic expressions were still of central interest, but soon a new point of view was forced upon mathematicians by the discovery of J B J Fourier (1807) that a single analytic expression, a trigonometric series, may represent, in different domains, what had been regarded as different functions It was believed at first that an arbitrary function could be represented by a series of Fourier When it appeared that there were necessary restrictions, the way was open to a treatment of functions based on their intrinsic properties In connection with his proof of the convergence of Fourier series (1829) P G Lejeune-Dirichlet gave essentially the definition of a function that appears at the head of this article (*Werke*, vol 1, p. 135)

Among the founders of the modern theory of functions, both real and complex, three are pre-eminent, A L Cauchy (1789–1857), G F B Riemann (1826–66), and K Weierstrass (1815–97). To the latter is especially due the *arithmetization* of the subject, whereby all definitions are based on equalities and inequalities concerning numbers, and geometrical notions are avoided The theory of aggregates (*q v*), which furnishes a necessary foundation for ideas regarding domains, and which arose from the investigations of G Cantor (1845–1918), has become one of the most important adjuncts of the theory of functions. Its development has been connected with recent generalizations of the notion of integration by H Lebesgue (1902) and others

2. **The Real Variable and its Domain.**—The domain of a real variable is a set of real numbers, which may be positive or negative integers, rational numbers (fractions) or irrationals. In accordance with a fundamental postulate, such sets may be put into one-to-one correspondence with points on a line-segment, hence the point thus associated with a number is often substituted for it in the terminology of the subject Domains are then referred to as *point sets* (*q v*), and the domain of a single variable is said to be a *linear point set or aggregate*. Since in most cases the domain of a variable is an infinite set of numbers, a general theory of such aggregates and of their properties is fundamental We shall not here attempt to describe that theory, for an account of which the reader is referred to the article on NUMBER

The most important domains for a real variable x are *intervals* consisting of all real numbers between given numbers a and b, or, in geometric language, of all points on an x axis between the point $x=a$ and the point $x=b$. Such an interval is denoted by the symbol $[a, b]$ It is *closed* if it includes the values $x=a$ and $x=b$, and is *open* if it does not include them. A *neighbourhood* of a point x' is an interval which includes that point. A domain has an *upper bound* if its numbers are all less than a fixed number N; it has a *lower bound* if its numbers are all greater than a fixed number M; when one of these bounds does not exist, the domain is said to be *unbounded* or *unlimited* in that sense For functions of more than one variable (*see* § 8 below), the notion of *region* corresponds to that of interval for a single variable

A point x' is a *limit point* of a domain if in every neighbourhood of that point there is a point of the domain other than x'; the point x' may or may not itself belong to the domain Every bounded set of points whose number is infinite has at least one limit point, but this is not true, for example, of the set of all positive integers, which has no upper bound This set is, however, said to have the limit $+\infty$ (positive infinity) and similarly a set without a lower bound has the limit $-\infty$.

A function is defined when, in addition to specifying the domain of the independent variable x, we give a rule which will serve to compute the corresponding values of the dependent variable y Such a rule may be, and commonly is, given by an analytic expression in x whose value for each x of the given domain is to be taken as the value of y, or different expressions may serve for different parts of the domain of x Such expressions *represent* the function for the corresponding values of x We shall now consider some of the basic notions of the theory of functions of a real variable To supplement this necessarily brief introduction to the subject, the reader should consult the authorities cited at the end.

3 **Upper and Lower Bounds: Limits.**—For a given function $y=f(x)$ defined on a given domain of values of x, the values of y also form a domain. If these values have an upper or a lower bound the same is said to be true of the function In particular, if a function defined for a given domain of x has an upper bound, it has a *least upper bound* which is either, (1) a value of y not exceeded by any other value of y, but not a limit point of the y domain, or (2) a limit point for the values of y which is not exceeded by any of those values, but which may or may not itself be a value of y In case (2) the least upper bound is the *upper limit* of the function, *i e*, the least upper bound of the limit points of y In these definitions, whose extension to lower bounds is obvious, we may restrict the domain of x to a part of the total domain of definition of the function As an illustration of these terms it is to be noted that the function represented by the expression x^2 has for its least upper bound, which is also the upper limit, on the open interval $[0, 1]$ of the x axis the value $y=1$, but this value is not attained by the function on that interval, since the end-point $x=1$ is not included The difference between the least upper bound and the greatest lower bound of a function in a domain is called the *oscillation* or *fluctuation* of the function for that domain

In order to describe the variation of a function on a given domain, we style $f(x)$ *monotonic increasing* if for every sequence of increasing x values the corresponding values of $f(x)$ always increase; similarly a function is *monotonic decreasing* if its values decrease as x increases. The least upper and greatest lower bounds of such functions correspond to end values or limits of the x domain. *Oscillating functions* are non-monotonic; an important class, those of *limited variation*, is composed of functions representable as differences of monotonic functions

The properties specified so far are related to the behaviour of a function throughout a domain The most important notion connected with the neighbourhood of a point, $x=X$, is that of *the limit of $f(x)$ as x approaches X*. We suppose $f(x)$ a single-valued function on a domain for which X is a limit point, but of which X is not necessarily a member. By a δ-neighbourhood of X we designate all x's of the domain, except X itself, that lie between $X-\delta$ and $X+\delta$. Let ϵ be the fluctuation of $f(x)$ on a δ-neighbourhood of X. If ϵ can be made arbitrarily small by making δ a sufficiently small positive number, $f(x)$ is said to approach a limit as x approaches X. It can be proved that there then exists a number L such that no matter what positive

number ϵ is preassigned the numerical value of $xf()-L$ is less than ϵ for all values of x in a δ-neighbourhood of X. This number L is the limit of $f(x)$ as x approaches X, a relation whose symbolic expression is $\lim_{x=a} f(x)=L$

The definition of a limit is extended to unbounded domains, with the notation $\lim_{x=+\infty} f(x)=L$, if for every positive number ϵ a number N exists such that the numerical value of $f(x)-L$ is less than ϵ for all values in the domain of x that are greater than N. There are similar definitions for a limit as x becomes negatively infinite, and for a function's becoming positively or negatively infinite The *sum of an infinite series* furnishes an important application of these definitions Consider, for example, the series $\frac{1}{2}+\frac{1}{4}+\quad+\frac{1}{2^n}+\quad$, of which the sum of n terms is $s_n=\frac{1}{2}+\frac{1}{4}+\quad+\frac{1}{2^n},=1-\frac{1}{2^n}$, a function of the real variable n on the domain of all positive integers, $n=1, 2, 3$ The numerical difference of s_n and 1 is $\frac{1}{2^n}$, and this can be made less than any preassigned positive number ϵ for all values of n greater than any positive number N for which $\frac{1}{2^N}$ is less than ϵ Thus $\lim_{n=\infty} s_n=1$, and this limit is, by definition, the *sum* or *value* of the series

Various extensions of the notion of limit play a considerable rôle in the modern theory of functions For example, although $f(x)$ may not have a limit as x approaches X when *all* values of the domain are considered, there may be partial domains for which a limit exists In fact it can be proved that if X is a limit point of a domain, then there is always at least one set of values belonging to this domain on which $f(x)$ either approaches a limit or becomes infinite as x approaches X Restricted domains of especial interest are those whose values are all greater than X, or all less than X For a domain of the former sort, for example, we write $\lim_{x=X+0} f(x)=L$, or $f(X+0)=L$ If $f(x)$ is bounded and monotonic on such a domain, $f(X+0)$ always exists

4 **Continuity.**—It is to be noted that in the definition of a limit we have not assumed that L is the value of $f(x)$ for $x=X$, or even that $f(X)$ exists A function defined on an interval $[a, b]$ including the point X is *continuous* at X if it has the limit $f(X)$ as x approaches X on the interval An extension of this definition styles $f(x)$ *continuous on the right* at X if $f(X+0)=f(X)$; we similarly describe continuity on the left A function is *continuous throughout an interval* $[a, b]$ if it is continuous at every point of the interval If $[a, b]$ is closed, it is here implied that $f(a)=f(a+0)$, and $f(b)=f(b-0)$

Sums, differences, products and quotients of functions continuous on an interval are also continuous there, with the exception that a quotient may not be continuous for values which make its denominator equal to zero More generally, it may be stated that every function of a continuous function is continuous in the sense that if $f(x)$ is continuous at X, and if $F(y)$ is defined throughout a neighbourhood of $y=f(X)$ and is continuous at $f(X)$, then $F[f(x)]$ is continuous at X

Since a continuous function [for example, $f(x)=x\sin 1/x$] may oscillate infinitely often in the neighbourhood of a point, it is obvious that a complete graphic representation of all such functions is not possible. On the other hand all functions are continuous whose graphs as drawn in a system of ordinary rectangular coordinates are unbroken curves of one piece over an x interval If this interval $[a, b]$ is closed, a function thus graphically defined is evidently bounded on $[a, b]$ and can easily be shown to have maximum and minimum values there Further, every length between those of $f(a)$ and $f(b)$ will fit as an ordinate of the curve $y=f(x)$ somewhere between $x=a$ and $x=b$. The corresponding properties are shared by all functions that are continuous on a closed interval. Another property of all functions continuous on a closed interval $[a, b]$ is that of *uniform continuity*, according to which it is always possible to subdivide $[a, b]$ into a finite number of parts such that in each the fluctuation of the function is less than a preassigned positive number On this property rests the proof that every function continuous on a closed interval $[a, b]$ has a definite integral from a to b (*see* § 6 below)

A function continuous on $[a, b]$ is completely determined by its values at all rational points of $[a, b]$, or by its values at any other set of points everywhere dense on $[a, b]$, *i.e.*, a set whose points are to be found in every subinterval of $[a, b]$ Since the rational points of an interval are enumerable, that is, can be put into one-to-one correspondence with the set of all positive integers, it follows that a continuous function can be completely defined by an enumerable number of conditions

5 **Discontinuous Functions.**—A function defined on a neighbourhood of X, but not necessarily at X itself, is *discontinuous* at X if any part of the definition of continuity is not satisfied This will be the case, in particular, if the function is not defined at X An *infinite discontinuity* occurs if the function becomes infinite as x approaches X, either on the whole interval, or on some set of points of which X is a limit point If the function is bounded on a neighbourhood of X but is not continuous at X, it has a *finite discontinuity* at that point One class, that of *removable discontinuities*, consists of those presented by functions which have a limit L as x approaches X on a neighbourhood of X, but either $f(x)$ is not defined at X or $f(X)$ is not equal to L When $f(X)$ is suitably defined the function becomes continuous at X Another variety of finite discontinuities is presented when $f(X+0)$ and $f(X-0)$ each exist, but these two limits are not equal In other cases the function may oscillate so that its fluctuation in every neighbourhood of X is greater than a positive constant [this is, for example, true of $f(x)=\sin 1/x$ at the origin] Here the greatest and least limits approached by $f(x)$ on all sets of points to the right of X and for which X is a limiting point, together with similar limits on the left [designated $f(X+0)$, $f(X+0)$, $f(X-0)$, $f(X-0)$, respectively], furnish a measure of the *oscillation of* $f(x)$ *at* X Examples can be given of functions that are discontinuous at every point of an interval, and of others that are continuous at every irrational point and discontinuous at every rational point

6 **Derivatives and Integrals.**—The differential calculus is based on the idea of the *derivative* of a function $f(x)$ at a point X, (*see* CALCULUS) This is, by definition,

$$\lim_{x=X} F(x)=f'(X), \text{ where}$$

$$F(x)=\frac{f(x)-f(X)}{x-X}.$$

When X is considered as a variable, $f'(X)$ is said to be the derived function of $f(X)$, but the term derivative is also used with this meaning It is the main business of the differential calculus to investigate formulas for the derivatives of various analytic expressions and to make application of these formulas The theory of functions concerns itself with conditions for the existence of the derivative and with generalizations of its definition A function continuous at a point does not necessarily have a derivative there, Weierstrass has given an example of a function continuous at every point of an interval but without a derivative at any point whatever If, however, a function defined and single-valued throughout a neighbourhood of X has a derivative at X, then it is continuous at that point

Various generalizations of the notion of a derivative have been found useful, particularly those in which the limit entering into the definition is taken over restricted domains for x Thus the limit $F(X+0)$ is designated the *progressive derivative* of $f(x)$ at X, and $F(X-0)$ the *regressive derivative*, $\overline{F(X+0)}$, $\underline{F(X+0)}$, $\overline{F(X-0)}$, $\underline{F(X-0)}$ are upper and lower extreme derivatives on the right and left respectively. The derivative of the derivative is called the *second derivative*, and the process may be carried on to *derivatives of the nth order* From the existence of the derivative of order $n-1$ it does not follow that there is a derivative of nth order, or, if the latter exists, that it is continuous.

The integral calculus had its source in problems such as that of determining the area under a curve, for which a solution is obtained by subdividing the region under consideration into parts that are approximately rectangular and taking the limit of the sum of the partial areas This led to the definition of the integral of $f(x)$ from a to b by means of the formula

$$\int_a^b f(x)dx=\lim_{\Delta x=0}[f(x_1)\Delta x_1+f(x_2)\Delta x_2+\quad\cdots+f(x_n)\Delta x_n]$$

The notation implies that the interval $[a, b]$ has been divided

into n successive subintervals of lengths $\Delta x_1, \Delta x_2, \ldots, \Delta x_n$, all less than Δx, and that $x_1, x_2, \ldots, x_n$ are points chosen arbitrarily in the respective subintervals corresponding to their subscripts. The integral thus defined is called the *definite integral*, to distinguish it from an *indefinite integral* or *primitive function* of $f(x)$, *i.e.*, a function $\phi(x)$ whose derivative is $f(x)$. The two notions are brought together by the theorem that if $f(x)$ is integrable, that is, has a definite integral from a to b, and if x is between a and b, then an indefinite integral $\phi(x)$ can differ at most by a constant from the definite integral of $f(x)$ from a to x. Every function continuous on a closed interval $[a, b]$ is integrable from a to b.

The integral as thus defined is called the *Riemann integral* since its precise formulation was given in the famous memoir of Riemann on trigonometric series (1854). A necessary and sufficient condition that a function bounded on a closed interval $[a, b]$ be integrable from a to b can be given in terms of the notion of *content*. The content of a set of points in an interval $[a, b]$ may be defined as the integral from a to b of a function equal to 1 at each point of the set, and to 0 at all other points. The condition for integrability is that the points of discontinuity of $f(x)$ on $[a, b]$ form a set whose content is zero.

More general definitions of integration, especially that due to Lebesgue, have had a very considerable influence on recent progress in the theory of functions. These generalizations are largely based on extensions of the notion of content, one of their aims has been to frame definitions so that integrals shall be differentiable and derivatives integrable for broad classes of functions. Another line of investigation has concerned itself with *improper integrals*, those in which either the function becomes infinite between the limits of integration, or the latter are not both finite.

7 **Types of Analytic Representation.**—In elementary analysis it is customary to identify functions with analytic expressions. According to a familiar classification the elementary functions are *polynomials*, of form $a_0x^n+a_1x^{n-1}+\cdots+a_n$, *rational functions*, quotients of polynomials, *power functions*, of form x^n, *algebraic functions*, given by equations $f(x, y)=0$ where $f(x, y)$ is a polynomial in both x and y, *transcendental functions*, such as the *exponential function* a^x, the *logarithmic function* $\log x$, *trigonometric* and *inverse trigonometric functions* such as $\sin x$, $\sin^{-1}x$; and functions defined by a finite number of functional operations within this class.

Limits of sets of elementary functions furnish a more general class of analytical representations. These may take the form of infinite series or products, or definite integrals. Representations by infinite series are of especial importance. An infinite series of functions of x defined on $[a, b]$,

$$f_1(x)+f_2(x)+\cdots+f_n(x)+\cdots,$$

is said to converge for $x=X$, if the sum of n terms has, for $x=X$, a limit when n becomes infinite. This limit is the *value of the series* for $x=X$. A function is represented by a *convergent series* of functions on $[a, b]$ if the value of the function at each point of (a, b) is the value of the series at that point. Among the series most studied have been the *power-series*, of type

$$c_0+c_1(x-x_0)+c_2(x-x_0)^2+\cdots,$$

and *trigonometric series*, whose nth terms are of type $a_n\cos nx+b_n\sin nx$. Infinite series that are not convergent may still, in a sense, represent a function. Hence such *divergent series* have also been the objects of much research.

8 **Functions of More Than One Variable.**—Many of the properties of functions of one variable can be readily generalized for functions of two or more variables. As the geometry of several dimensions is, however, far more complicated than that of one dimension, it is clear that new notions must be introduced. Modern investigations have not stopped with functions of finitely many variables, but have gone on into domains of infinitely many dimensions.

II. FUNCTIONS OF COMPLEX VARIABLES

1 **Complex Numbers and Their Geometric Representation.**—The operations of addition, subtraction, multiplication and division with non-vanishing divisor, when applied to real numbers yield only real numbers, but this does not hold good in the case of root extraction. We must, for example, either regard $\sqrt{-1}$ as indicating an impossible operation, or else we must enlarge the number system so as to give a meaning to this symbol. The purpose last indicated is accomplished by the definitions of complex numbers (*see* COMPLEX NUMBERS) and the elementary operations associated with them. It is only when complex numbers are admitted that we can assert the fundamental theorem of algebra according to which every algebraic equation with real coefficients has a solution.

A complex number is indicated by the symbol $a+ib$, where a and b are real numbers, and i is the so-called *imaginary unit*, sometimes written $\sqrt{-1}$ since, by definition, $i^2=-1$. Addition, subtraction, multiplication and division are defined by the following formulae, together with the assumption that the associative, commutative and distributive laws (*see* under those headings) hold for complex as well as for real numbers:

$$(a+ib)+(c+id)=(a+c)+i(b+d),$$
$$(a+ib)-(c+id)=(a-c)+i(b-d),$$
$$(a+ib)(c+id)=(ac-bd)+i(ad+bc),$$
$$\frac{(a+ib)}{c+id}=\frac{(a+ib)(c-id)}{(c+id)(c-id)}=\frac{ac+bd}{c^2+d^2}+i\frac{bc-ad}{c^2+d^2},\quad (c^2+d^2)\neq 0.$$

If b is zero, $a+ib$ is identified with the real number a, so that the system of complex numbers includes that of real numbers. If b is not zero, $a+ib$ is said to be *imaginary* and a is the *real part* of $a+ib$. The numbers $a+ib$ and $a-ib$ are then *conjugate imaginaries;* the sum and the product of two conjugate imaginaries are both real. Two complex numbers $a+ib$ and $c+id$ are equal when and only when $a=c$ and $b=d$.

As real numbers may be represented by points on a straight line, so a one-to-one correspondence exists between all complex numbers (x, y) and the points of the plane whose coordinates are (x, y) in a given rectangular system (*see* ANALYTIC GEOMETRY). It is therefore customary to use the words *point* and *number* interchangeably for $z=x+iy$. The operations of adding and subtracting two complex numbers corresponding to points P_1 and P_2 give the points P_3, P_4 corresponding to a vector addition and subtraction, respectively, of directed segments from the origin of coordinates to P_1 and P_2 (*See* VECTOR ANALYSIS.) A geometric picture of multiplication and division is most simply obtained by using a polar coordinate system in which the radius vector $r=OP$ is always positive, and θ is the angle from the positive x axis OX to OP. From elementary trigonometry we have $z=x+iy=r(\cos\theta+i\sin\theta)$. The rule already adopted for multiplication gives, after a trigonometric reduction,

$$r_1(\cos\theta_1+i\sin\theta_1)r_2(\cos\theta_2+i\sin\theta_2)=r_1r_2[\cos(\theta_1+\theta_2)+i\sin(\theta_1+\theta_2)].$$

Hence to obtain the radius vector, or *modulus*, and the *angle* of the product of two complex numbers, we multiply their moduli and add their angles. Similarly, in division we divide moduli and subtract angles. These definitions may be extended to products and quotients involving several terms. In particular, if m is a positive integer we have $z^m=r^m(\cos m\theta+i\sin m\theta)$, and in accordance with the usual definitions the same formula holds if m is a negative integer, or any rational number. Here, however, it must be observed that if θ_1 is the angle of z that lies between 0 and 2π, then for all integral values of n, positive or negative, $\theta_1+2n\pi$ is also an angle of z. If each of these possible values of θ is used in the formula for z^m where m is the reciprocal of an integer p, it will be seen that $z^{1/p}$ has p values.

From the geometric theorem that a straight line segment is shorter than any broken line joining its extremities we deduce the result that the modulus of a sum of complex numbers is not greater than the sum of the moduli of the terms, or, to use a customary notation,

$$|z_1+z_2+\cdots+z_n|\leq|z_1|+|z_2|+\cdots+|z_n|.$$

2 **Complex Variables: Limits.**—A complex variable is one whose values are complex numbers. If the values of a complex

variable w are determined by those of another complex variable z, the variable w is a function of z If we write $w=u+iv$ and $z=x+iy$, it is clear from the definition just adopted that u and v are each functions of x and y if w is a function of z, and conversely The theory of functions of a complex variable is, from this point of view, identical with that of pairs of real functions of two real variables

Since the totality of complex numbers corresponds to that of all points of the plane, the domain of a complex variable is in general two-dimensional A *region* is a domain consisting of all points of a single piece of the plane bounded by one or more closed curves, if its boundary consists of one closed curve of a single piece that does not cut itself, a region is said to be *simply connected,* otherwise it is *multiply connected* As to the boundary curves, we shall hereafter suppose them to be such as to allow the integration of a continuous function over them (*see* § 5, below) A region is *open* if it does not include its boundary, it is *closed* if all points of the boundary are included A *neighbourhood* of a point is an open region to which the point belongs

A function $w=f(z)=u(x, y)+iv(x, y)$, defined so as to be single-valued at each point of a neighbourhood of $z=Z=X+iY$ except possibly at Z itself, is said to approach the limit $W=U+iV$ as z approaches Z, provided we have

$$\lim_{x=X,\ y=Y} u(x, y)=U,\ \lim_{x=X,\ y=Y} v(x, y)=V.$$

An equivalent definition is the following $\lim_{z=Z} f(z)=W$ if for every positive number ϵ there exists a positive number δ such that $|f(z)-W|<\epsilon$ for all points z other than Z for which $|z-Z|<\delta$ The function $f(z)$ is continuous at Z if $\lim_{z=Z} f(z)=f(Z)$, a necessary and sufficient condition is that both $u(x, y)$ and $v(x, y)$ be continuous at (X, Y) A function is continuous throughout a region if it is continuous at each point of the region

3 **Analytic Functions.**—The definition of the derivative of a function of a complex variable is formally the same as for a real function of a real variable

$$f'(z)=\frac{d}{dz}f(z)=\lim_{\Delta z=0}\frac{f(z+\Delta z)-f(z)}{\Delta z}=\lim_{\Delta z=0}\frac{\Delta f}{\Delta z}$$

If we write the difference quotient $\Delta f/\Delta z$ in the form

$$(\Delta u+i\Delta z)/(\Delta x+i\Delta y),$$

it is clear that in terms of the two real variables Δx and Δy we are requiring the existence of a *two-dimensional* limit Even when u and v have partial derivatives (i e , derivatives with respect to one variable taken as though the other variable were constant) $\partial u/\partial x$, $\partial u/\partial y$, $\partial v/\partial x$, $\partial v/\partial y$, the derivative of $f(z)=u+iv$ may not exist. For example, if $f(z)=x-iy$, we have

$$\frac{\Delta f}{\Delta z}=\frac{\Delta x-i\Delta y}{\Delta x+i\Delta y}=\frac{1-i\Delta y/\Delta x}{1+i\Delta y/\Delta x};$$

since $\Delta y/\Delta x$ has no limit that is independent of the way that Δy and Δx approach zero, the same is true of $\Delta f/\Delta z$ Functions of a complex variable that have derivatives thus form a restricted class, even among those that have derivatives with respect to x alone and with respect to y alone A function single-valued in a region S is said to be analytic throughout that region if it has a derivative at each point of S; it is analytic *at a point* Z if there is a neighbourhood of Z throughout which it is analytic Synonymous terms are *monogenic, holomorphic, regular* It has been proved (by Ed Goursat, 1900) that if $f'(z)$ exists at each point of S, then $f'(z)$ is a continuous function of z throughout S Necessary and sufficient conditions that $f'(z)$ exist are that the partial derivatives of u and v exist, are continuous and satisfy the *Cauchy-Riemann equations,*

$$\partial u/\partial x=\partial v/\partial y,\quad \partial u/\partial y=-\partial v/\partial x$$

In § 5 below it is shown that if $f'(z)$ exists, then its derivative also exists at each point of S and similarly for the derived functions of higher order Thus the second partial derivatives of u and v also exist. By differentiating the first Cauchy-Riemann equation with respect to x and the second with respect to y, then adding, we see that u satisfies *Laplace's equation*

$$\partial^2 u/\partial x^2+\partial^2 u/\partial y^2=0,\ \text{similarly for } v$$

Polynomials in z are analytic throughout the entire plane Rational functions are analytic except at points where their denominators vanish Exponential, logarithmic and trigonometric functions of z require definition Thus we wish to define e^z so that it will be single-valued and analytic throughout the entire plane and will be identical with the real exponential function e^x when $z=x$, similarly for sin z and cos z It can be shown that the only functions satisfying these requirements are the following,

$$e^z=e^x(\cos y+i\sin y),\ \sin z=(e^{iz}-e^{-iz})/2i,\cos z=(e^{iz}+e^{-iz})/2;$$

they also satisfy the formal identities that hold for real exponential and trigonometric functions. The logarithm of z (to the natural base e) is the function $w=\log z$ which identically satisfies the equation $e^w=z$ If (r, θ) are polar coordinates of z, we have $\log z=\log r+i\theta$, where $\log r$ is the real logarithm of the positive real number r The angle θ is, however, as we have seen, infinitely many-valued Hence $\log z$ is infinitely many-valued; any two of its values differ by an integral multiple of $2\pi i$ The inverse trigonometric functions can be expressed in terms of logarithms From these elementary functions one may pass to algebraic functions and the elliptic and abelian functions associated with them (*See* ELLIPTIC FUNCTIONS, and the authorities cited at the end)

4 **Geometrical and Physical Applications.**—As has already been indicated, there were reasons of a purely mathematical nature for the introduction of complex numbers and functions of complex variables Without them certain inverse operations on real numbers would have no meaning and many of the theorems of analysis would have awkward restrictions In the applications of the theory of analytic functions in geometry and physics, however, is to be found one of the chief reasons why this theory has dominated analysis for the last three-quarters of a century. The Cauchy-Riemann equations and Laplace's equation are of central importance in the theory of maps and in various problems of mathematical physics (*see* SPHERICAL HARMONICS and CONFORMAL REPRESENTATION). Pairs of solutions, u and v, of those equations combine to form analytic functions $u+iv$ of the complex variable $x+iy$ Thus theorems about analytic functions have interpretations in such fields as those of conformal mapping and of the conduction of heat and electricity

A conformal map may, for example, be described mathematically as follows· A plane region S is said to be mapped upon another plane region Σ in a one-to-one manner if to each point of one region corresponds one and only one point of the other. If a rectangular co-ordinate system (u, v) is set up for Σ and a system (x, y) for S, it follows that u and v are functions of x and y; if these functions are continuous, S is said to be mapped continuously on Σ To a piece of curve of length Δs in S will correspond a piece of length $\Delta\sigma$ in Σ. If Δs approaches zero, while one end-point is kept fixed, the ratio of $\Delta\sigma$ to Δs may approach no limit, or it may approach different limits on different curves, or it may approach the same limit on every curve through the fixed point In the last case this limit is the *scale* of the map at that point. If a continuous one-to-one map has a scale at every point it is said to be conformal, and it can be shown that if two curves intersect at a point of S the corresponding curves intersect at the same angle in Σ. It can then be proved that either the pair (u, v), or the pair $(w_1, -v)$ satisfies the Cauchy-Riemann equations. Every analytic function $w=f(z)$ has, as we have seen, a real part u and a pure imaginary part iv such that u and v satisfy the Cauchy-Riemann equations. It therefore defines a conformal map of a suitably chosen z-region on a w-region. The correspondence of two geographic maps, such as a stereographic map and a Mercator's map of the same portion of the earth's surface, is completely described by an appropriate equation $w=f(z)$. By a theorem of Riemann's, any simply connected plane region whatever can be mapped on the interior of a circle of unit radius about the origin by a suitable analytic function. In particular, every region, finite or

infinite, bounded by a single circle or straight line is so mapped by a suitable *linear transformation* $w=(az+b)/(cz+d)$.

It would be impossible to discuss here the many physical applications of the theory of analytic functions, a brief reference to the steady flow of heat in a conducting plate must suffice Suppose a thin homogeneous metal plate is insulated except at its edge Each point of the edge is kept at a fixed temperature, but this may vary from point to point After a time each point (x, y) of the plate reaches, and maintains thereafter, a temperature $u(x, y)$, the flow of heat is then said to be steady It can be shown that u satisfies Laplace's equation Curves along which u is constant are called *isotherms*, while *lines of flow* are the curves $v=$constant that cut each isotherm perpendicularly. The fact that u and v must satisfy the Cauchy-Riemann equations again makes contact with the theory of analytic functions

5 **Integrals.**—In order to obtain a definition of integration formally similar to that used for a real function of a real variable, we consider a curve segment C interior to a region S throughout which $f(z)$ is analytic On C we take $n+1$ successive points $z_0, z_1, z_2, \ldots, z_n$, of which the first, z_0, and the last, $z_n=Z$ are fixed If the sum

$$\Sigma_n=f(z_1)(z_1-z_0)+f(z_2)(z_2-z_1)+\quad\ldots\quad+f(z_n)(z_n-z_{n-1})$$

has a limit L as we take successive subdivision schemes, such that the limit of the largest modulus $|z_k-z_{k-1}|$ is zero, and if L is the same for all such sequences of sums formed for the function $f(z)$ and for the curve C from z_0 to Z, then this limit is said to be the value of the definite integral of $f(z)$ on C from z_0 to Z, and is written $\int_C f(z)dz$ In terms of the real functions $u(x, y)$, $v(x, y)$, where $f(z)=u+iv$, this definition yields the identity

$$\int_C f(z)dz=\int_C udx-vdy+i\int_C vdx+udy,$$

where the integrals on the right are real curve or line integrals along C (*see* CALCULUS) If $f(z)$ is continuous on C, and if C is of finite length, or in particular if C is *regular* (composed of a finite number of pieces with continuously turning tangent), the integral exists.

If $f(z)$ is merely continuous throughout a region S, the value of the integral of $f(z)$ from z_0 to Z will depend, in general, on the curve of integration. But if $f(z)$ is *analytic* throughout a simply-connected region S, then the integral of $f(z)$ from z_0 to Z is the same on all regular curves in S that join z_0 and Z This follows from *Cauchy's integral theorem* (1825, proved by E. Goursat, 1900, without assuming that $f'(z)$ is continuous), which states that if $f(z)$ is continuous in a closed region S, simply or multiply connected, and analytic throughout open S, then the integral of $f(z)$ around the whole boundary of S is zero, provided each boundary curve is so traversed as to leave the interior of S to the left Hence if curves C_1 and C_2 within S extend from z_0 to Z and bound a simply connected portion S' of S, then the integral of $f(z)$ around the boundary of S' is zero, that is, the forward integral on C_1 plus the backward integral on C_2 vanishes, so that the forward integral on C_1 is equal to the forward integral on C_2 The same result is true even when C_1 and C_2 intersect at points between z_0 and Z, provided S is simply connected In this case, then, $F(z)=\int_{z_0}^{z} f(z)dz$ has a well-defined meaning It is easily proved that $f(z)$ is the derivative of $F(z)$ If $f(z)$ is analytic throughout S except at a single interior point z_0, then the integral of $f(z)$ around the boundary C is called the *residue* of $f(z)$ at z_0 Here C can be replaced by a circle of small radius about z_0 On these considerations Cauchy built his calculus of residues, one aim of which was to obtain evaluations of improper real integrals.

A most important consequence of Cauchy's integral theorem is the *integral formula*,

$$f(z)=\frac{1}{2\pi i}\int_C \frac{f(t)}{t-z}dt,$$

which holds if $f(t)$ is single-valued and analytic on the open region S bounded by C, and continuous on closed S, while z is an interior point of S Thus the function $f(z)$ is uniquely determined at each point of S by its boundary values Since the above integral can be differentiated with respect to z by differentiating the integrand, it follows that an analytic function has derivatives of all orders, the nth derivative being given by the formula

$$f^n(z)=\frac{n!}{2\pi i}\int_C \frac{f(t)}{(t-z)^{n+1}}dt$$

Among the corollaries of the integral formula are the following: (1) $f(z)$ has no maximum in the interior of S; (2) if S consists of the entire plane, then either $f(z)$ is not everywhere finite (in which case it is called an *integral function*), or else it is a constant, (3) every algebraic equation $f(z)=0$, where $f(z)$ is a polynomial of degree greater than zero, has at least one solution (the so-called *fundamental theorem of algebra*)

6 **Infinite Series.**—We define the sum or value of an infinite series of complex numbers, $w_0+w_1+w_2+\ldots+w_n+\ldots$, to be the limit of the sum of the first n terms as n becomes infinite If this limit exists the series is *convergent*, otherwise it is *divergent*. A necessary and sufficient condition for convergence is that the series of real parts and the series of pure imaginary parts of the w's both converge, a sufficient condition is the convergence of the series of absolute values of the w's

A series of functions $w_0(z)+w_1(z)+w_2(z)+\quad\ldots\quad+w_n(z)+$ may converge in some regions and diverge in others Such a series is *uniformly convergent* throughout a region S if for every positive number ϵ there exists an integer m such that

$$|s_m(z)-s_n(z)|<\epsilon$$

for all values of n greater than m, here $S_n(z)$ designates the sum of the first n terms of the series and the same m must apply for all points z of S If each of the terms of a series is single-valued and analytic and the series is uniformly convergent in S, then the sum-function is analytic in S.

Among the most important series are the *power series* $c_0+c_1(z-z_0)+c_2(z-z_0)^2+\quad\ldots\quad+c_m(z-z_0)^n+\ldots$ Such a series may converge for all values of z, or for $z=z_0$ only, otherwise there is a *circle of convergence* with its centre at Z_0, throughout the interior of which the series converges and outside which it diverges Such a series is uniformly convergent within every region interior to its circle of convergence, and hence represents an analytic function throughout the open region interior to the circle Conversely, every function $f(z)$ analytic throughout the interior of a circle is there represented by a power series, called its *Taylor's series* For the coefficients we have the formula $c_k=f^k(z_0)/k!$ Such a series may be differentiated and integrated term by term, the new series will represent the derivative and the integral of the sum of the original series throughout its circle of convergence Since the values of the derivatives of $f(z)$ at z_0 determine its Taylor's series, it follows that these values completely characterize the function itself throughout the circle of convergence A more general result may be stated as follows. If $f(z)$ is single-valued and analytic throughout S it is completely determined in that region by its value and those of all its derivatives at an interior point, or by its values at the points of an infinite set having a limiting point within S

A series in which both positive and negative powers of $z-z_0$ occur is called a *Laurent's series* Such a series has a *ring of convergence* composed of the region bounded by two concentric circles about z_0 A function analytical and single-valued in such a ring is representable there by a Laurent's series Infinite products of analytic functions have also been the subject of many investigations

7. **Singularities.**—A *singular* point is one at which a function is not analytic; an *isolated singular point* is one throughout a neighbourhood of which, except at the point itself, the function is analytic Isolated singularities of single-valued functions are divided into three classes The first is composed of the *removable singularities* where a proper definition of $f(z_0)$ would make $f(z)$ analytic at the singular point z_0 This is the only possible isolated singularity whenever $f(z)$ remains finite in a neighbourhood of z_0 Singular points of the second class are called poles; here $f(z)$ becomes infinite on all paths of approach to such a point The

third class, that of *essential singularities*, includes all other cases; here $f(z)$ becomes infinite on some sequences of points approaching z_0, but not on all such sequences; there are, in fact, sequences on which any limit whatever is approached. This last statement can be replaced by the celebrated *theorem of Picard*, according to which the equation $f(z)=A$, has, for all values of A, with at most one exception, an infinite number of solutions in every neighbourhood of an isolated singular point which is essentially singular.

The definition and classification of analytic functions in terms of their singularities was the starting-point of the program of Riemann for the theory of functions of a complex variable As an example, we may define a rational function (with suitable conventions regarding $z=\infty$) as one with no singularities throughout the plane, or at $z=\infty$, except poles.

8. **Analytic Continuation: Many-valued Functions.**—If $f(z)$ is analytic in S and $\phi(z)$ analytic in S'; if, further, S and S' overlap and $f(z)=\phi(z)$ throughout this overlapping portion, then $\phi(z)$ is uniquely determined and is said to be an *analytic continuation of* $f(z)$ *into* S'. We may thus be able to continue a function analytically by a chain of overlapping regions; the totality of functional values defined when this process has been carried as far as it will go is called a *monogenic analytic function* In particular such a monogenic function may be many-valued when a chain of regions used in its definition overlaps itself We then think of the plane of z as replaced by a many-sheeted surface called a *Riemann surface*, and of the many-valued monogenic function as single-valued on its Riemann surface This conception has been especially fruitful in the study of algebraic functions and their integrals

9 **Functions of Two or More Complex Variables.**—Many of the formulae for functions of one complex variable are readily extended to functions of more than one such variable. In other directions new difficulties appear Algebraic functions of several variables have received especial attention, but the general field of functions of more than one variable is comparatively undeveloped as yet

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The series of monographs on the Theory of Functions edited by E. Borel (Paris, 1898–) also contains many important contributions.

(D. R. C.)

FUNDAMENTALISM AND MODERNISM. Fundamentalism is the name given to a religious movement which, appearing independently in different denominations in the United States immediately after the World War, steadily gathered momentum until in 1925 it became a subject of national, as distinct from denominational, interest through the trial and conviction of John T. Scopes, teacher of science in Rhea high school, Dayton, Tenn., on a charge of violating the Tennessee law prohibiting the teaching of evolution in the State public schools.

The trial began on July 10, 1925, and was concluded on July 21, 1925, by the conviction of the defendant and his sentence to pay a fine of $100. The immediate issue was as to whether the defendant had or had not violated the provisions of the State law as to the subjects to be taught in public schools, but the wider issue was as to the extent to which the State, in its control of public education, may determine the nature of the religious instruction given to the students in its schools The trial itself was the culmination of a movement which had been going on for some years Alarmed by the steady growth of liberal tendencies, the conservatives of the different churches had banded themselves together to stay what seemed to them the rising tide of negation. The form of the movement differed in the different communions according to the particular issue which was in question at the time, but common to all the Fundamentalist groups was, first, the acceptance of a view of the supernatural which insists that God manifests His presence in nature and history through exceptional and extraordinary activities, transcending the laws of nature; and, secondly, the determination to use this conception of religion as a test to limit the freedom of teaching hitherto enjoyed by the ministers of the denomination In all this there is nothing new. In every age conservatives and liberals have carried on their conflict over some form of this issue What is new is the widespread character of the movement, the missionary enthusiasm which has been brought to it by its advocates and the consciousness on their part of interests transcending denominational lines and calling for a new alignment, with the Fundamentalists of all denominations on one side and the liberals on the other

The Presbyterian Church.—In the Presbyterian Church the controversy centred about the case of Dr Harry Emerson Fosdick, a Baptist clergyman who had been invited to act as stated supply for the First Presbyterian church in New York city. Dr. Fosdick, who was also a professor in Union theological seminary of that city and a man of moderate liberal tendencies, made it his condition of accepting the call that he should be allowed to retain his membership in the Baptist Church. A sermon preached in May, 1922, entitled "Shall the Fundamentalists Win?" was the occasion of an attack upon his theology by conservative Presbyterians, which led the General Assembly of 1923 to direct the Presbytery of New York to take such action as would require the preaching in the First Presbyterian church to conform with the Confession of Faith. The Presbytery, after full conference with Dr. Fosdick and the church, reported that such was now the case, whereupon the Assembly of 1924, without passing any judgment on Dr. Fosdick's theological views, expressed the opinion that if he were to remain longer in the pulpit of the church, he should accept the standards of doctrine required of other ministers. On this issue Dr. Fosdick withdrew, declaring that "Creedal subscription to ancient confessions of faith is a practice dangerous to the welfare of the church and to the integrity of the individual conscience."

In connection with this controversy the General Assembly in 1923 reasserted the so-called "Five Points," a declaration originally made in 1910, setting forth as essential doctrines of the Christian faith, the Virgin Birth, the physical Resurrection, the inerrancy of Scripture, the substitutionary Atonement and belief in the Miracles In reliance upon this statement the judicial commission of the Assembly, in May 1925, declared that the Presbytery of New York had erred in licensing a student who refused to affirm the Virgin Birth. The liberals attacked this procedure as an unconstitutional limitation of the liberty of interpretation accorded to every minister by the terms of subscription, and to the presbyteries by the historic precedents of the church. (*Cf.* Auburn Affirmation of May 1924, signed by 1,283 members.)

In view of these differing interpretations, the General Assembly of 1925 appointed a commission of 15 "to study the present spiritual condition of the Church and the causes making for unrest" This commission, which was continued by the Assembly of 1926, has done much to reconcile the contending factions and to vindicate the right of liberals, as well as conservatives in the church The chief opponent of this mediating policy is Prof J Gresham Machen, of Princeton theological seminary, who is himself under attack by the more moderate alumni of his own institution At their request a committee of the General Assembly has been investigating Princeton theological seminary and has recommended certain changes in its government which will make possible more unified control

The Baptist Church.—In the Baptist Church the controversy has taken the form of an effort on the part of the conservatives to secure the adoption by the annual conference of a creed which should be used as a test of ministerial fellowship This attempt failed at repeated conferences, but the conservatives, defeated at this point, have sought to secure their ends by instructions given to their board of home missions as to the conditions to be observed in the administration of their funds One large bequest was actually accepted by the board on conditions which seemed to some of its critics unduly to limit its freedom A parallel effort to secure control over the teaching of the seminaries has thus far failed of success

Not the least important feature in the Fundamentalist movement is its bearing upon foreign missions In general the policy of the different missionary boards has been to put the responsibility for determining the doctrinal qualifications of candidates upon the home church, and in the work on the foreign field conservatives and liberals have co-operated successfully in various union enterprises Fundamentalists have challenged this arrangement and attacked the theology of liberal missionaries On the whole this attack has been unsuccessful, and the unity won on the field has thus far been maintained, but the battle is by no means over A case in point is the action of the general convention of the Disciples at Oklahoma City, Okla , on Oct 6, 1925, in reaffirming the principle of close communion which has been departed from by some of their missionaries in the interest of wider co-operation

The Episcopal Church.—In the Episcopal Church the controversy has centred about the literal observance of the creeds On Oct 5, 1923, Bishop Lawrence of Massachusetts made an address (afterwards published in pamphlet form) entitled *Fifty Years,* in which he pleaded for a liberal interpretation of the creeds On Nov 14, 1923 at Dallas, Tex , the bishops of the Episcopal Church met this challenge by issuing a pastoral insisting upon literal acceptance of the creeds and questioning the good faith of those ministers who gave their historic statements a symbolic interpretation This pastoral was attacked by the liberals of the church who were organized in a body known as the Modern Churchman's Union Sermons were preached by leading liberals, like Dr Leighton Parks, of St Bartholomew's church of New York, and Dr William Russell Bowie, of Grace church of the same city, and manifestoes were issued by theologians like the volume of essays entitled *Creeds and Loyalty* by seven members of the faculty of the Episcopal theological school of Cambridge, Mass (1924) As a result of this agitation a trial for heresy begun against the Rev Lee W Heaton for denying the Virgin Birth was abandoned, and for the moment a truce was declared

The Bible Institutes.—One of the main sources of popular conservative propaganda is the so-called Bible institutes, of which the most important are the Moody Bible institute in Chicago and the Bible institute of Los Angeles These schools, interdenominational in character, recruiting their students from young people without college, and many of them without high school education, insist upon the inerrancy of the Scriptures, which they interpret commonly in the pre-millennarian sense They are carrying on an extensive propaganda partly through periodicals of interdenominational character and partly through conventions (the so-called prophetic conferences), which bring together large numbers of people. While these institutes are not designed primarily as theological seminaries, many of their pupils are finding their way into the churches and are reinforcing the conservative elements which are already there.

It is against the background of these influences that one must interpret the Tennessee trial Under the leadership of William Jennings Bryan, the conservatives had been carrying on an active campaign throughout the country, attacking the views of liberal Christians as fundamentally irreligious and unchristian and insisting not only upon rigid measures on the part of the individual churches, but also upon such a stiffening of the laws of the States as to prevent what they regard as the insidious propaganda of modernism in the schools The storm-centre of the debate was the doctrine of evolution which, as interpreted by Mr Bryan, involves a denial of the Biblical doctrine of creation and the surrender on the part of the teacher to an all-devouring materialism

As a result of his agitation, legislation similar to that of Tennessee has been attempted in a number of different States, but the only State which has adopted such legislation is Mississippi During 1927, the following States rejected anti-evolution legislation: West Virginia, Missouri, Oklahoma, New Hampshire, Arkansas, Delaware and Minnesota Both in Mississippi and Tennessee the law is now practically a dead letter, though the issue at stake has not yet been officially determined The supreme court of Tennessee reversed the conviction of Mr Scopes on purely technical grounds not involving the constitutionality of the law

In the State of Texas, the State text-book commission is given authority to prohibit the use of any text-book which the commission deems objectionable, a power which was intended to be used and has been used, for the prevention of the teaching of evolution in the schools of the State (W A Br)

FUNDED DEBT, that portion of the indebtedness of a business concern or of a Government which is represented by bonds Such indebtedness may be created originally by an issue of bonds for a particular purpose, or may have resulted from the *funding* of various floating debts, *i e* , paying off the floating debts with the proceeds of a bond issue made for that purpose When bonds representing a funded debt mature they are frequently "re-funded," *i e* , replaced by another bond issue extending over a further period

FUNDY, BAY OF, an inlet of the North Atlantic, separating New Brunswick from Nova Scotia It was first explored by the Sieur de Monts (d *c* 1628) in 1604 and named by him La Baye Française It is 145 m long and 48 m wide at the mouth, but narrows towards the head, where it divides into Chignecto bay to the north which subdivides into Shepody bay and Cumberland basin (the French Beaubassin), and Minas channel, leading into Minas basin Off its western shore opens Passamaquoddy Bay, forming part of the boundary between New Brunswick and the State of Maine The Bay of Fundy is remarkable for the great rise and fall of the tide, which at the head of the bay has been known to reach 62 feet. In Passamaquoddy bay the rise and fall is about 25 ft Though the bay is deep, navigation is rendered dangerous by the violence and rapidity of the tide, and in summer by frequent fogs At low tide, at such points as Moncton or Amherst, only an expanse of red mud is seen, and the tide rushes in a bore from 3 to 6 ft in height Large areas of fertile marshes are situated at the head of the bay, and the remains of a submerged forest show that the land has subsided at least 40 ft in the latest geological period The bay has numerous harbours, of which the chief are St Andrews (on Passamaquoddy bay) and St John in New Brunswick, and Digby and Annapolis (on an inlet known as Annapolis basin) in Nova Scotia.

FÜNEN (Danish *Fyen*), one of the larger Danish islands, second in size to Zealand, lying between that island and south Jutland Area, 2,986 sq kilometres. Its physical features are similar to those of eastern Jutland. *See* DENMARK

FUNERAL RITES: *see* DEAD, DISPOSAL OF THE.

FUNG (FUNNIYEH, FUNJ, FUNGHA), a mixed negroid race, occupying parts of Sennar and the hilly country to the south between the White and Blue Niles. They traditionally come from west of the White Nile and are affiliated to the negro Shilluks. The Fung became the dominant race in Sennar in the 15th century,

assimilated the speech, religion and habits of the Arabs settled in that region and until the 19th century were one of the most powerful of African peoples in the eastern Sudan Traces exist of the custom of king killing The king once in his reign sowed and ploughed a plot of land He wore a *takia*, a close fitting hat with two flaps stuffed to resemble wings To-day the Fung are a bright, hospitable folk Many of them are skilful surgeons and go far afield in their work The fellahin, indeed, call surgeons "Senaari" (men of Sennar) *See* H A MacMichael, *History of the Arabs of the Sudan* (1922)

FUNGI, a group of plants which includes all the lower thallophytes, are devoid of the green colouring matter chlorophyll and are reproduced by spores The thallus is unicellular or composed of branched tubes or filaments which have apical growth. The spore may consist of one or many cells The absence of chlorophyll has a striking effect on the mode of life of fungi since in its absence they are unable to synthesise carbohydrates from the carbon dioxide of the air They are dependent therefore on other plants or animals for their supplies of carbohydrates and sometimes of organic compounds of nitrogen These supplies are obtained from living organisms by parasitic fungi, or more commonly from their dead remains by fungi which are termed saprophytes Certain non-chlorophyllous organisms however are separated from the fungi and regarded as independent groups

The fungi are a large group distributed over the whole world wherever other living organisms are found on which they may depend for their subsistence The number of species is very large, probably 100,000 is a conservative estimate, but no figures,

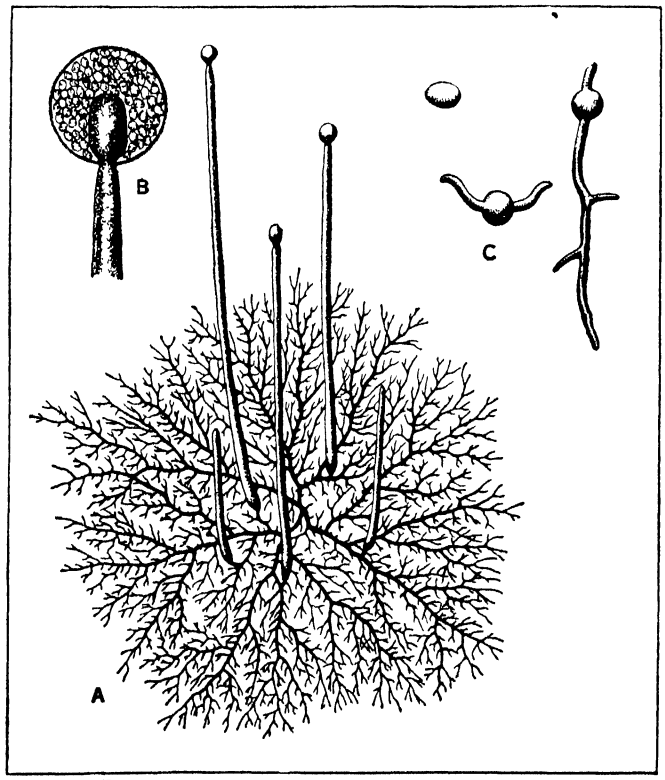


FIG. 1.—A. MYCELIUM B. SPORE. C GERM TUBES

however carefully compiled, can be other than provisional. The bulk of the species known belong to the temperate zone. A wealth of forms no doubt exists in the tropics which have yet to be discovered. Geologically the fungi are an old group; the delicate nature of their tissues has militated against their preservation as fossils, but the hyphae of parasitic fungi are found in some of the earliest plant fossils known to us, the beautifully preserved remains of the Rhynie chert of Devonian age

Organization.—If spores of common white mould (Mucor) are placed in a suitable food-solution they readily germinate, they absorb water and swell—the dark outer coat (exospore) ruptures and the thin colourless inner coat (endospore) protrudes and lengthens to form a short tube, known as the germ tube (fig 1 c). This tube grows at its tip and lengthens considerably; branches arise from it, elongate and branch in their turn and so give rise to an interconnected series of tubular structures known as hyphae. Each hypha is covered externally by a membrane and encloses a mass of protoplasm in which many nuclei are embedded In older hyphae vacuoles appear and coalesce to form a large central vacuole Through the walls of the hyphae food solutions are absorbed which provide for their further growth and extension. The whole system of hyphae thus represents the vegetative body of the fungus known as the mycelium (fig 1 a) As the development of the mycelium proceeds the work of absorption becomes restricted to the younger hyphae which are growing forward into fresh areas of the substratum The protoplasm of the older parts of the mycelium becomes stored with reserve food-materials and sooner or later from this part of the mycelium arises a new kind of hypha, devoted to the reproduction of the mould These hyphae are stouter, limited in growth and with a different reaction to such stimuli as light, gravity, oxygen, etc Thus they normally grow upwards into the air, towards the light, and terminate their growth by swelling at the tip to form a spherical head (the sporangium), the contents of which divide into many portions, each of which secretes a wall and becomes a spore (fig 1 b) The production of sporangia continues while external circumstances remain favourable and while fresh supplies of food material are available to the developing mycelium. Given these conditions there is no reason why growth should ever cease In the case of the fungi causing the well-known fairy rings, common in pastures, from a comparison of the rate of growth with the size of the ring, it has been estimated that the age of certain rings is not less than 3–400 years. Although the actively growing hyphae of *Mucor* are continuous tubes with numerous nuclei in their protoplasm and are hence described as caenocytic, the older hyphae show numerous cross walls which serve to cut off useless side-branches and to concentrate the food-reserves In the majority of fungi all the hyphae are segmented (multicellular), the segments being multinucleate or more commonly with one or two nuclei

The cell walls of certain groups of fungi (Saprolegniaceae and Peronosporaceae) give the same reactions as those of the higher plants and apparently consist of cellulose, but Gilson and Van Wisselingh have shown that in a very large number of forms the main constituent of the wall is chitin, a substance common in many animals, *e g* insects In many cases the membranes undergo secondary changes and other substances may be added such as resins and colouring matters, the walls may become thickened by the deposition of new layers and often profoundly altered by lignification and suberization (*Fomes, Daedalea*). A striking change is carbonization, in which the walls become black and brittle.

(*Daldinia, Cucurbitaria*) —In the reproductive bodies of many of the higher fungi the walls of certain hyphae become mucilaginous, being hard and horny when dry but capable of absorbing water with great rapidity and consequent swelling. Striking thickening and differentiation may occur in the walls of spores which are commonly pitted, sculptured and ridged

In the simpler types of mycelium the hyphae show little differentiation except in size. In many parasites in which the hyphae traverse the intercellular spaces of their hosts, lateral branches are produced which penetrate into the living cells and there carry on the absorption of food materials, these haustoria may have the form of simple or branched hyphae or swollen vesicles In many mycelia the hyphae may become woven together into threads or cords These may be white and tender as in the "spawn" of the common mushroom, or develop an outer hard and dark coloured layer and so assume a root-like appearance as in the rhizomorphs of the honey fungus, *Armillaria mellea.* In other cases the closely interwoven hyphae may form compact masses, varying in size from that of a pin's head (*Botrytis*) to that of a man's head and weighing 10 to 25 lb. (*Polyporus Myllitae*). These bodies known as sclerotia show also a differentiation into a hard, black outer layer and an inner white core—the whole body consisting of hyphae so closely interwoven and copiously branched and segmented as to resemble in section parenchymatous tissue of one of the higher

plants From its mode of formation, however, this tissue is more properly described as plectenchyma or pseudo-parenchyma

Both rhizomorphs and sclerotia serve for the collection and storage of reserve foods to be used in the formation of reproductive bodies, or in the resumption of vegetative activity The former also serve to extend the fungus and in some parasites act as organs of attack (*Armillaria*)

In the higher fungi a similar interweaving and compacting of hyphae are involved in the formation of the fruit bodies or sporophores and in these structures a high degree of elaboration and of differentiation of the plectenchyma may occur (Polyporaceae, Phallaceae fig 19)

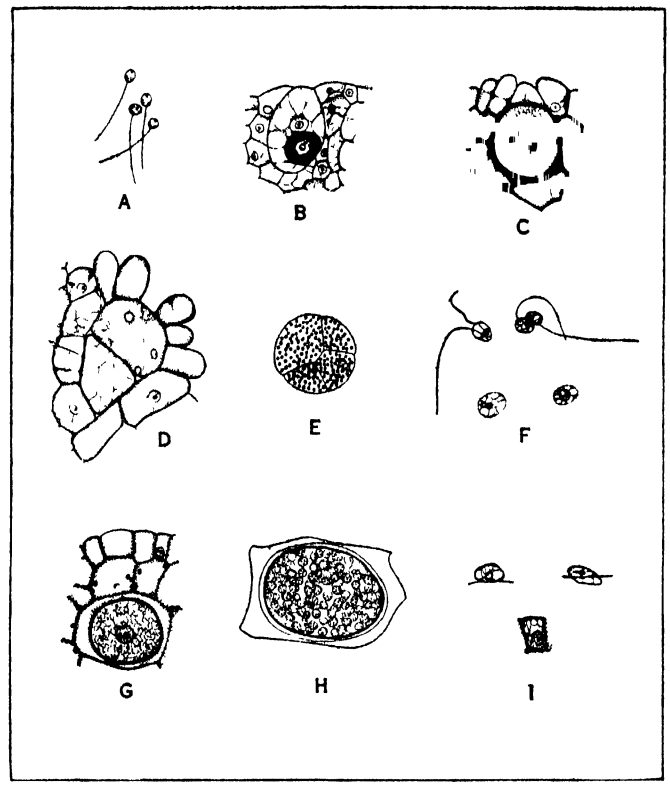
Cell Contents.—In addition to the protoplasm and nuclei, the hyphae of fungi may contain, like other vegetable cells, substances of various kinds Amongst the more easily identified are oil-drops—often coloured—crystals of calcium oxalate, proteid granules and crystalloids and resin Starch apparently never occurs but glycogen is common and other carbohydrates such as the sugars almost certainly occur in the living cell Other substances which can be readily extracted from fungal tissues include acids such as oxalic, citric and many other lichen acids, ethereal oils, resins and a number of powerful alkaloid poisons such as ergotin, muscarin, etc Many of the coloured pigments are fixed in the cell-walls or deposited on their surface (*Chlorosplenium*) but in some cases are dissolved in the oil which occurs in drops in the protoplasm (*Pyronema, Monascus*)

The particular mode of nutrition of the fungi, viz, their dependence on other organisms for their food materials, is only rendered possible by their power of secreting a whole range of ferments capable of digesting the many complex substances which go to form the bodies of plants and animals. Amongst the enzymes extracted from fungi may be mentioned as examples, *diastase* which converts starches into sugar, *cytase* with a similar action on cellulose, *peptase* which converts proteins into peptones and amides, *lipase* which hydrolyses fat and oils, *invertase* which splits cane sugar into simple sugars such as grape sugar, and *zymase* which decomposes grape sugar into alcohol and carbon dioxide These or similar enzymes are found as normal products of metabolism in plants generally where they play their part in the necessary digestion of reserve foods, etc Whilst, however, in the higher plants their work is performed with few exceptions in the cells or the tissues in which they arise, in the fungi these ferments are excreted by the hyphae in order to bring about the necessary changes in the food-substance with which they come into contact All fungi are apparently not capable of secreting every kind of ferment and so are unable to utilize all classes of food materials Many are restricted in their choice, or rather show special facility in dealing with particular materials, *e g*, horn, feathers, cellulose, fats Some moulds on the other hand (*Penicillium, Aspergillus*) can utilize almost any organic food material and a large number of enzymes have in fact been extracted from these forms

CYTOLOGY AND REPRODUCTION

Although the small nuclei of certain fungi were not recognized by early investigators, subsequent improvements in methods of research have demonstrated their presence in all the species in which they have been sought In the lower fungi the hyphae are coenocytic, *i.e*, they contain numerous nuclei and these are of small size (·001–3 m m in the Mucoraceae) In the higher fungi the segments may contain several nuclei (*Pyronema, Aspergillus*) but usually have only one or two There is no reason to doubt that not only are they as essential to the cell of the fungus as to that of any other organism, but that they are fully comparable with those of the higher plants both in essential structure and in function They normally divide mitotically (*see* CYTOLOGY) and in a number of cases, where the nuclei are of considerable size, the details of division have been minutely described (*Phyllactinia, Humaria*) Typical spindles with centrosomes and asters are formed and the chromosomes are clearly differentiated The number of chromosomes is usually small, *e g.*, eight in Phyllactinia

As in the higher plants, in those fungi in which sexual reproduction occurs, the essential feature of fertilization is the union of two nuclei. These are, in the simplest cases, the nuclei of the sexual cells or gametes and the new cell which results is known as the zygote. This has a double number of chromosomes, and is therefore described as diploid in contradistinction to the haploid nuclei of the sexual cells and of any vegetative cells associated



FROM "PROCEEDINGS OF THE ROYAL SOCIETY," BY COURTESY OF THE COUNCIL AND K M CURTIS

FIG 2.—LIFE HISTORY OF SYNCHYTRIUM ENDOBIOTICUM

A. Zoospores, B. Young protoplast within a hypertrophied epidermal cell, C Mature summer spore, D Germination of summer spore, E Young sorus, future walls indicated by lines, F. Copulation of two planogametes, G Young hypnospore, H Hypnospore during maturation of zoospore primordium, I Penetration of the zygote

with them Fertilization thus marks the end of one definite phase in the life of the fungus (haploid phase) and the beginning of a new one (diploid phase) of which the zygote is the starting point This in its turn must end with a process of reduction (meiosis) by which the haploid nuclei are again restored (*see* CYTOLOGY) Fertilization and meiosis are thus two cardinal points in the history of an organism; ending the haploid and diploid phases respectively In some of the higher fungi, these alternating nuclear phases are associated and correlated with striking differences in the vegetative structure of the mycelia concerned. In these the zygote may give rise to many generations of diploid cells which eventually produce the mother-cells—usually of special form—in which meiosis will occur These cells—gonotoconts—correspond to the spore-mother-cells of the higher plants and like them they produce a definite number (four or eight) of daughter-cells, the spores, which contain haploid nuclei.

Life History of a Simple Fungus.—Some of the essential facts referred to above may be illustrated by reference to the life history of one of the simplest of the lower fungi, *Synchytrium endobioticum*, a parasite on potato tubers where it causes the well-known and destructive wart disease The parasite enters an epidermal cell of the potato as a small naked protoplast containing a single nucleus It increases in size at the expense of the contents of the host cells and, when these are exhausted, its vegetative activity is brought to an end. It now surrounds itself with a wall of two layers, a thicker outer exospore and a thinner endospore and becomes a summer spore (fig 2 c) The exospore then ruptures and allows the endospore (prosorus), still enclosing the protoplasts, to escape into the host cell. Here the nucleus

begins to divide and by successive divisions, a number of nuclei, usually 32, are formed. The whole contents now become divided into several (five to seven) portions each of which becomes surrounded by a separate wall We have thus formed a group of cells in which as many as 300 nuclei may be formed by further division and the whole protoplasmic contents become cleft into as many small naked spores each containing a single nucleus The cells containing these spores (the sporangia) burst and liberate their contents and each spore is seen to be provided with a motile organ in the form of a delicate protoplasmic thread or cilium. By the cilia the spores are able to propel themselves in the soil water and, from this animal-like movement, are known as zoospores They settle down eventually on the surface of a young tuber, throw off their cilia and then penetrate the outer cell-wall of the host and so effect an entrance to the interior of the cell Here they repeat the development described above Thus the haploid generation of *Synchytrium* can reproduce itself and the cycle of zoospore-vegetative-cell-summer-spore-sporangia-zoospore can be many times repeated The release of the zoospores from the ripe sporangia is dependent on the presence of free water If their escape is delayed for a time they show a significant difference in behaviour They swim towards other zoospores, they fuse together in pairs and the fusion cells, now provided with two cilia, after independent movement, settle down and infect the cells of the host (fig 2 f, g) As many sporangia will liberate their contents simultaneously when wetted, it is probable that any two cells uniting together will be derived from different sporangia The zoospores in this case behave as sexual cells or gametes, there is no morphological difference, a zoospore is a potential gamete and its behaviour is determined by physiological conditions The young zygote contains two nuclei which fuse and form a diploid nucleus In the host cell it enlarges and on the exhaustion of available food surrounds itself with a double wall So far its development resembles that of a haploid plant, but it now shows a marked difference in behaviour, since it passes into a resting condition, which may persist until the next spring It is therefore known as a resting spore (fig 2 i) Eventually the nucleus divides and it is probable that there is a true meiotic or reduction division After repeated divisions, zoospores are formed and set free by the splitting of the thick wall Thus the haploid generation again begins its development Here, then, we have the nuclear cycle completed, and the haploid and diploid phases are each associated with a distinct generation of the fungus which, though resembling one another in vegetative structure, differ in the final products of their development The haploid generation is terminated by the production of gametes and their conjugation, the diploid generation is terminated by meiosis and the resulting production of haploid zoospores

Fertilization.—The conjugation of two similar gametes (isogamy) is characteristic only of the simpler fungi Throughout the whole group it is possible to trace tendencies, which have not only profoundly modified the type of sexual reproduction, but in so doing have directly contributed to the success of the fungi in their transition from an aquatic to a terrestrial mode of life. These tendencies have led to the suppression of the individualization of the gametes and the assumption of their functions by the gametangia—the structures in which gametes are formed.

In the simplest cases this has resulted in the sexual process consisting in the fusion of two entire individuals These are usually of different size and we can distinguish a smaller male and a larger female (*Polyphagus*, fig 3 d). The mature individuals thus form a single gametangium and the distinction of sex is marked by calling the male gametangium an antheridium and the female an oogonium

In most fungi the whole plant is not involved in reproduction as in *Synchytrium* and *Polyphagus*, but only certain hyphae which bear the gametangia Thus many gametangia are borne on each individual and here we can distinguish two possibilities The individual may bear gametangia of both kinds (monoecious, hermaphrodite, bisexual) or there may be two kinds of plants each bearing one kind of gametangium only (dioecious, unisexual) Since in the fungi we have only to consider sex in relation to the haploid generation, it is more convenient to distinguish these fungi by the terms first suggested by Blakeslee for the Mucoraceae—homothallic (monoecious) and heterothallic (dioecious) Thus *Polyphagus* is heterothallic

In the Mucoraceae in which both types of thallus occur, the gametangia, which contain a large number of nuclei representing the potential gametes, show no morphological distinctions into antheridium and oogonium When they fuse their contents are mingled and a large number of nuclei pair together, we thus have multiple fertilization which, however, only results in the production of one zygote, a coenozygote

In the Oomycetes, homothallism is the rule (except *Dictyuchus*), and the gametangia are clearly differentiated into antheridia and oogonia In *Monoblepharis* the antheridia give rise to a number of uniciliate male gametes which are set free in the water to find the oogonium The latter's contents round off to form one large naked uninucleate mass termed the oosphere or egg (fig. 4 a). This is not strictly a gamete, since it represents the whole contents of the gametangium and at first contains many nuclei—potential gametes In other members of this group (Saprolegniaceae, Peronosporaceae) the element of chance in fertilization is still further reduced The antheridia are brought into contact with the oogonia and the male gametes—now undifferentiated and represented only by their nuclei—are brought directly into contact with the eggs (fig 4 d, e) As in the Mucoraceae, these fungi are independent of water for fertilization It is this independence of water both for fertilization and, as will be shown later, for the dissemination of spores, that has rendered possible the migration of fungi from a life in water to an existence on land and on land plants

In the higher fungi a further modification can be traced which leads to the suppression of the function of the male organ and finally to its disappearance This does not involve the absence of fertilization, but the fusion of nuclei derived from nearly related cells of the female organ (*Ascobolus*) or of nuclei within the common mother-cell (*Humaria, Lachnea*) This leads finally to the disappearance of the female sexual organs and a condition of pseudogamy in which the cells concerned are two vegetative cells sexually different but not differentiated in structure. This is the case, *e g*, in many yeasts and in some of the higher Basidiomycetes These fusions of vegetative cells may appear to be on all fours with the anastomoses which occur not uncommonly between ordinary vegetative hyphae, but that they differ in kind is clear from the fact that they have the essential character of a sexual fusion inasmuch as they form the starting point of new development As in all types of fertilization they mark the beginning of the diploid generation A reference to the conditions existing in *Synchytrium*, where every zoospore is a potential gamete, may help the realization, that in a haploid or gametophyte generation of one of the higher fungi, however numerous the cells or diverse in structure, every nucleus has the same organization, every cell has the potentialities of a sexual cell

Asexual Reproduction.—The reproductive bodies of fungi are known as spores The simplest type of reproduction is the separation of a cell or group of cells which is capable of independent growth and which thus serves to propagate the fungus. Although physiologically these behave as spores they are usually distinguished as oidia (*Monilia*) or, in sprouting fungi such as the yeasts, as buds or gemmae From a morphological standpoint spores are marked off from the hyphae which produce them by their form, size, colour, mode and place of origin, etc. Spores formed within a special sac, the sporangium, are known as sporangiospores, or if motile as zoospores If they are cut off terminally from a hypha they are conidia and the parent hypha is a conidiophore. Chlamydospores are thick-walled, usually resting spores formed like conidia or more usually as intercalated bodies on ordinary hyphae. The various kinds of spores of fungi also receive special names in the different groups, and these, although given without any reference to general principles, are useful and convenient owing to their descriptive character

Sporophores and Fruit Bodies.—In the simplest cases, the spore-bearing structures or sporophores are hyphae which by their

form and behaviour are marked off from the rest of the mycelium They are simple or branched in a definite manner, they grow up into the air or radiate into the surrounding water They may be isolated but are frequently associated together If they are united into bundles these are called coremia, if in flat layers, sporodochia They are often borne on a plectenchymatous cushion known as a stroma, and are distributed over its whole surface In other cases the plectenchyma forms a hollow body which bears the conidia on its inner walls These structures are termed pycnidia and their conidia are usually distinguished as pycnospores

The various spore forms referred to above—sporangiospores, conidia, etc , are sometimes described as "summer" spores It is a somewhat misleading term, but it does indicate that these bodies serve the purpose of rapid propagation of the fungus under favourable conditions They are produced for the most part on haploid mycelia and appear as soon as the necessary food-materials have been accumulated by the vegetative hyphae In the higher fungi special types of fruit bodies occur which are distinguished by the fact that they consist wholly or in part of diploid hyphae and that they are concerned with the production of gonotoconts, those cells in which the reduction divisions are effected The gonotoconts produce daughter cells—the spores—with haploid nuclei Where the spores are produced within the mother-cell—endogenously—it is called an ascus and the daughter cells ascospores Where they are borne externally—exogenously—they are termed basidiospores and the mother cell a basidium Details of the structure and mode of formation of these fruit bodies will be given in later sections dealing with classification (*see* below, Ascomycetes and Basidiomycetes)

PHYSIOLOGY

The general physiology of the fungi does not differ essentially from that of other plants Their requirements are the same as those of the living cells devoid of chlorophyll of the higher plants, wherever these may occur Like them they require water, various inorganic salts and supplies of carbonaceous and nitrogenous foods in varying degrees of complexity They respire, taking in free oxygen and liberating free carbon dioxide or excreting carbonic acid Aerial hyphae transpire and often exude drops of water, waste products (*e g* , calcium oxalate) are also excreted They respond to external stimuli such as light, gravity, certain chemical substances, etc

The one fact which dominates and restricts the mode of life and nutrition of the fungi is the absence of chlorophyll and their consequent dependence on outside supplies of organic carbon and in many cases of organic nitrogen Fungi are therefore compelled to live on materials derived from other plants or from animals, and are either parasites on living organisms or saprophytes living on their dead remains No hard and fast line can be drawn between these habits There are many fungi normally living as parasites which can exist as saprophytes and vice versa The large majority of fungi are saprophytes and they, with the bacteria, are the great agents of decay in nature The vast amount of vegetable material which annually falls to the soil, the remains of herbs, the fallen leaves of deciduous trees, the fallen branches and trunks of forest giants, the excrement and the dead bodies of animals are all material for the sustenance of fungi They are abundant in the upper layers of the soil in which these organic remains become incorporated by the action of many animals, *e g* , worms, beetles, etc. In the household they are found on stale foods of every kind, on preserves, on damp clothing and leather, wall paper and plaster Special means are therefore taken to protect foods from destruction by the common moulds

Harmful Forms.—The preservation of food such as fruit, meat, etc , is effected by first sterilizing the material by heat, which destroys active mycelia and spores, and secondly by preventing the access of other air-borne spores Thus bottled fruit is heated to a temperature of 160° F, which destroys the yeasts and other fungi on the surface of the fruit, and the bottles or tins are closed whilst the space above the liquid in the tin or bottle is filled with steam The same method of procedure is adopted for the preservation of meat but the food is raised to a higher temperature The preservation of jams depends not only on the sterilization by heat during their preparation, but on the high percentage of sugar, incorporated with the fruit, which is unfavourable to the development of mycelia and of yeasts Where moist air is allowed access, by imperfect covers or bad conditions of storage, to the surface of the jam, water may be absorbed by the sugar and the concentration sufficiently reduced to allow moulds to develop The damage is therefore confined to the surface layers Where the proportion of sugar is low, yeasts may enter and cause fermentation, indicated by bubbles of gas and a pronounced alcoholic flavour

Great damage is often caused to floor-boards, wooden partitions and wall-panelling by wood-destroying fungi, notably by the dry rot fungus, *Merulius lachrymans* This attacks both soft and hard woods, its mycelium destroying the cell walls, reducing the wood to a soft brownish mass which as it dries becomes characteristically fissured by right-angled cracks When the surface of the wood is dry the mycelium is largely confined to the inner layers, but in a moist atmosphere the mycelium appears on the surface of the wood, forming continuous sheets of tissue and giving rise to numerous strands and cords which pass to neighbouring wooden structures Under these circumstances the spread of the fungus and the consequent destruction of the wood is rapid and unchecked The cords enormously extend the range of the fungus, they have been known to spread along the surface of brick walls, to penetrate the mortar between the bricks and so convey the destroyer from one room to another There is little doubt that the fungus is in most cases introduced with the wood, but the extent of the resulting damage can be minimised by ensuring that wood used in construction is dry and well seasoned and thoroughly ventilated As a preventive against the attack of this and other fungi, wood is often treated with tar, creosote and other fungicides (*See* DRY ROT) The consumption of wood in coal mines is enormously increased by the short life of the pit props, whose decay is promoted by the warm humid atmosphere so favourable to the rapid development of mycelia

Symbiosis.—The living together in close association of two dissimilar organisms is described as symbiosis and the fungi afford some of the best known instances of this mode of life Lichens form a classical example In these dual organisms a fungus and an alga are associated together Both components derive advantages from the association The alga receives from the fungus water and inorganic substances and in some cases is protected from desiccation, it grows and increases by vegetative means The fungus is, however, the dominant partner It derives its organic food supplies from the alga and in many cases has been observed to send haustoria into the alga cells It alone produces a fructification (*See* LICHENS) The parasitic fungi provide another group of examples in which, however, the relation between the symbionts is definitely antagonistic (*See* PLANT PATHOLOGY)

There exists, however, another association between fungi and the higher plants in the formations which are known as mycorrhizas These are structures in which a fungus is found growing in intimate relation with the roots of one of the higher plants They are widespread, occurring, *e g* , in the common forest trees of the temperate zone (Cupuliferae, Coniferae), in the heather and other members of the Ericaceae, in many orchids and in a large number of other plants which live in soils rich in humus. On the forest trees the mycorrhizas can be distinguished by their frequently branched coralloid appearance, and the presence of a complete mantle of fungal hyphae covering the terminal portion of the root In orchids and in members of the Ericaceae another type is found, in which the fungus is for the most part inside certain of the living cells of the root and sometimes of other members These two different types of mycorrhiza have been distinguished as ectotrophic and endotrophic These terms are convenient to distinguish extreme cases, but intermediate forms are not unusual As to the fungi concerned, a large number of the higher fungi (Hymenomycetes, Gasteromycetes) have been stated to be concerned in the formation of the mycorrhizas of forest trees They are not usually specific and not only may a number of different fungi form mycorrhizas on one and the same

species of tree, *e g*, the beech, but these in many cases show quite distinct differences in form, colour, etc. In the case of many orchids, the fungi concerned are nearly related and have been referred to the genus *Rhizoctonia*

The whole question of the significance of these structures and of the relations existing between the fungus and its host, has provided a wide field for speculation and in recent years has led to experimental investigations which have yielded important and suggestive results On the whole, these investigations may be said to support the view that these structures are of benefit to the host plant It does not follow that any obligate relation exists between the fungus and the host In the case of forest trees seedlings can be grown successfully in the absence of the fungus, but there is strong evidence that the presence of the fungus may promote the absorption of nitrogenous substances from the humus of acid soils and this may well be a decisive factor in the success of trees established in such conditions In the case of many orchids whose seeds are notoriously difficult to germinate, successful growth can be induced by sowing the seeds on a suitable medium containing the appropriate endophytic fungus Even here, however, the same results can be obtained in the absence of the fungus by a careful adjustment of the composition of the medium Interesting as these latter results may be, as indicating the possible rôle of the fungus in promoting germination, it can hardly be doubted that in nature the latter plays a decisive part It is probable that in these plants, and in forest trees, the fungus in the root cortex may serve to assist in the absorption of organic compounds The strong development of similar fungi in the tissues of those orchids, which are devoid of chlorophyll and must therefore depend for their whole supply of organic food on the humus in which they live, gives strong support to this conclusion There is no evidence that the plant in these cases is able to undertake this absorption in the absence of the fungus The presence of fungi, which probably have a similar significance to those of mycorrhizas, has been noted in other groups of plants They are known to be of regular occurrence in many liverworts, the prothallia of *Lycopodium*, the rhizome of *Psilotum* and in a number of ferns (Ophioglossaceae, Marattiaceae)

Medicinal and Dietetic Uses.—Although, in common with many other plants, fungi have played their part in the preparation of various specifics, only one yields a drug of first importance, viz, the ergot, *Claviceps purpurea* The active principles are the alkaloids, ergotamine and ergotoxine and extracts containing these are used for obstetric purposes *Boletus laricis* yields a drug long used under the name of agaricus albus

In addition to these forms, many other fungi contain poisonous substances such as alkaloids which render them extremely dangerous when used as foods (species of *Amanita, Stropharia, Russula, Boletus,* etc *See* Plate) However, there are a number of fungi which are perfectly wholesome when properly prepared, and although in England the common mushroom (*Psalliota campestris*) alone is generally eaten, on the continent of Europe many other species are eagerly sought, *e g*, *Lepiota procera, Morchella esculenta, Boletus edulis, Cantharellus cibarius* (*See* Plate) In addition to these the truffle (*Tuber*) is universally esteemed a delicacy.

Economic Uses.—The common mushroom is extensively cultivated and finds a ready sale at all seasons It is sometimes grown on beds of horse manure out of doors, but more usually in special houses or pits, or in caverns or tunnels such as disused quarries. These beds are infected with "spawn" which consists of cakes of manure permeated with the mycelium of the fungus, whose growth has been arrested by drying

The fungi which are the most important from an economic standpoint are the yeasts They owe their importance to their power of fermenting various sugars with the production of alcohol (*see* BREWING) Brewers' yeast is also used in bread-making, the "rising" of the bread being caused by the escape of the bubbles of carbon dioxide evolved by the fermenting yeast Another fungus, *Mycoderma aceti*, can, in the presence of oxygen, change the alcohol of fermented liquors to acetic acid and so produce vinegars Of minor importance may be mentioned the species of *Penicillium* with which various cheeses (Stilton, Gorgonzola) are inoculated in order to produce the characteristic green-veining and improvement in flavour

CLASSIFICATION

It has for long been recognised that the fungi proper fall into three main groups, the Phycomycetes, Ascomycetes and Basidiomycetes The scheme of classification put forward by O Brefeld and F Von Tavel has been very generally accepted and has formed the basis of more recent arrangements of the groups Brefeld's classification of the higher fungi was, however, based on the conception that their characteristic reproductive structures, the ascus and basidium, had been derived by modification from the asexual sporangium and conidiophore respectively, of certain Phycomycetes With increasing knowledge of the widespread existence of a sexual process in the higher fungi, with the modern developments of cytology, and appreciation of the rôle of the nucleus in fertilization and its importance in genetics, Brefeld's view of the origin of the ascus and basidium can no longer be maintained These structures are now recognised as the gonotoconts, the cells in which the reduction division is effected and cannot be homologised with the asexual reproduction organs of the haploid mycelium of the Phycomycetes Although the view has been expressed that the fungi are polyphyletic, *i e*, they have arisen from the algae as several distinct groups, each with an independent origin, there is considerable justification for the view that the main advance has been in one monophyletic series and that the higher fungi have originated from the Phycomycetes, though not in the manner postulated by Brefeld This view will be further discussed in the detailed consideration of the groups.

Scheme of Classification.

CLASS I PHYCOMYCETES Thallus a naked protoplast or an unsegmented coenocytic mycelium, sexual reproduction usual

Order I. *Archimycetes* Mycelium poorly developed or absent zoospores common, sexual reproduction frequent

Order II *Oomycetes* Mycelium well developed, asexual reproduction by zoospores or conidia, sexual reproduction by oogonia and antheridia, resulting in oospores

Order III *Zygomycetes* Mycelium well developed, asexual reproduction by sporangiospores or conidia, sexual reproduction by conjugation of similar gametangia and production of zygospores

CLASS II ASCOMYCETES Thallus a segmented mycelium, segments with one or many nuclei, asexual reproduction common, sexual reproduction of wide occurrence, often much reduced Characteristic spore-bearing structure the ascus

Subclass 1 Protascineae Asci free on mycelium

Orders, *Endomycetales, Exoascales*

Subclass 2 Euascomycetes Asci collected on or within a fruit body Orders, *Plectascales, Perisporiales, Hypocreales, Sphaeriales, Dothideales, Hysteriales, Phacidiales, Pezizales, Tuberales, Laboulbeniales*

CLASS III BASIDIOMYCETES Thallus a segmented mycelium, segments with either one nucleus or with two, asexual reproduction not uncommon, sexual reproduction much reduced. Characteristic spore-bearing structure the basidium.

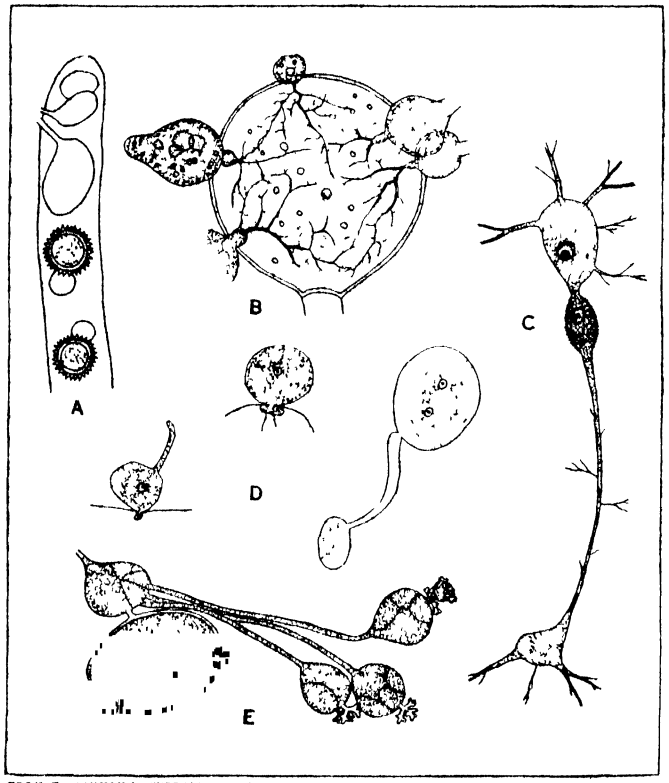
Subclass 1 Protobasidiomycetes, Basidia septate. Orders, *Uredinales, Auriculariales, Ustilaginales, Tremellales*

Subclass 2 Autobasidiomycetes, Basidia aseptate. Orders, *Tulasnellales, Dacryomycetales, Cantharellales, Polyporales, Agaricales, Plectobasidiales, Gasteromycetes*

Phycomycetes.—I The Archimycetes These parasitic and mainly aquatic forms have been looked upon as degenerate Oomycetes and were formerly included in that group Simplicity of structure, however, though it is often the result of degradation, is equally a mark of primitive organisation The fact that in this group is found the simplest type of sexual reproduction known among the fungi is justification for regarding them as an assemblage of primitive organisms, whose relation to the other groups of Phycomycetes is somewhat obscure. The simplest representatives such as *Olpidium* and *Synchytrium* live in the cells of their hosts as naked protoplasts They reproduce by unicihate zoospores, which under certain conditions behave as gametes (*see* above *Synchytrium*) The zygote resulting from the conjugation of the gametes has a period of vegetative growth and encysts to form a resting spore A similar mode of life and vegetative structure is exhibited by *Olpidiopsis* in which the zoospores are bicihate; here, however, there are no motile gametes, a larger female and a

smaller male individual fusing together. These are multinucleate and may be regarded as gametangia which have assumed the functions of gametes (fig 3 a)

In *Rhizophidium* the parasite is enclosed in a membrane and lives outside its host, into which it sends a short peg-like haustorium, which in some related forms (*Rhizidiomyces*), develops delicate absorbing threads (fig 3 b) At maturity the whole



FROM E GAUMANN, "VERGLEICHENDE MORPHOLOGIE DER PILZE" (GUSTAV FISCHER)

FIG. 3.—A HOST HYPHA WITH 3 EMPTY ZOOSPORANGIA AND 2 HYPNOSPORES (OLPIDIOPIS SAPROLEGNIAE), B, OOGONIUM OF SAPROLEGNIA WITH SPORANGIA IN DIFFERENT STAGES OF DEVELOPMENT (RHIZIDIOMYCES APOPHYSATUS), C YOUNG ZYGOTE FEMALE NUCLEUS ABOUT TO ENTER COPULATION TUBE (POLYPHAGUS EUGLENAE), D MALE INDIVIDUAL AND COPULATION PROCESS, FEMALE, AND PLASMOGAMY, E TURBINAT CELL WITH MATURE AND IMMATURE HYPNOSPORES (UROPHLYCTIS ALFALFAE)

body becomes a sporangium or acquires a thick wall and forms a resting spore Sexual reproduction is unknown, but in the related *Zygorhizidium* conjugation between two individuals creates a resting zygote (fig 3 d) This mode of sexual reproduction in which the conjugation of two individual plants is concerned is found in other forms, *e g*, *Sporophlyctis, Polyphagus* In the latter, which is parasitic on *Euglena*, the fungus possesses a highly developed system of hyphal-like haustorial threads, enabling it to attack a number of alga cells simultaneously (fig 3 c) In other members of the group these threads, though extremely delicate, may be regarded as fine hyphae In *Physodema* and *Urophlyctis* they develop at intervals large swollen vesicles, the collecting cells, which not only serve as centres for fresh hyphal development, but give rise to large, thick-walled resting spores (fig 3 e).

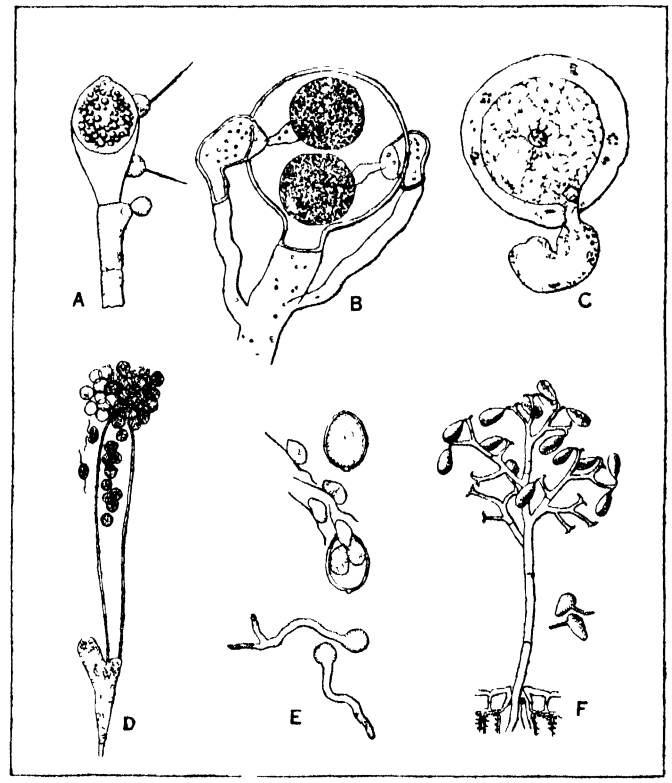
Olpidium Brassicae causes a disease of cabbage seedlings, the species of *Synchytrium* cause warts or tumour-like swellings on their hosts (*e.g*, potato, dog's mercury, dandelion) and similar lesions are caused by species of *Urophlyctis* on alfalfa, beet and other plants.

II. The Oomycetes These fungi have a well developed mycelium of large coenocytic hyphae The lower families (Monoblepharidaceae, Saprolegniaceae) are saprophytes, living in water on vegetable or animal remains, the Ancylistineae being reduced forms, parasitic on algae, eelworms, etc, the Peronosporaceae are saprophytes or highly specialised parasites on land plants.

The group exhibits in the structure both of its asexual and sexual organs a series of modifications, which can be directly related to the gradual change of habit from an aquatic to a terrestrial existence.

The lower families are propagated by zoospores, uniciliate in *Monoblepharis*, biciliate in the Saprolegniaceae and Ancylistineae (fig 4 b) borne in sporangia which, *e.g*, in *Saprolegnia*, are but slightly enlarged terminal portions of the hyphae which bear them. In *Pythium* and *Phytophthora* the sporangia are spherical or oval in form and in certain conditions (absence of free water) they can put out a germ tube and so give rise directly to a hypha. In other genera (*Peronospora*) this direct mode of germination is alone possible, zoospores are no longer produced, the zoosporangium has become a conidium—capable of germinating in moist air and so adapted for a parasitic life on land plants (fig 4 b).

In their sexual reproduction the group exhibits very strikingly the tendency already mentioned to replace the union of gametes by the fusion of gametangia In *Monoblepharis* the female organ, the oogonium, contains a single, non-motile, uninucleate egg It is fertilized by a motile spermatozoid, which closely resembles in structure the zoospores The zygote resulting surrounds itself with a thick membrane and forms a resting oospore (fig 4 a) In *Saprolegnia* the young oogonium contains many nuclei, potential gametes, but of these only a few become each the nucleus of an egg, of which there are several in the mature oogonium. There

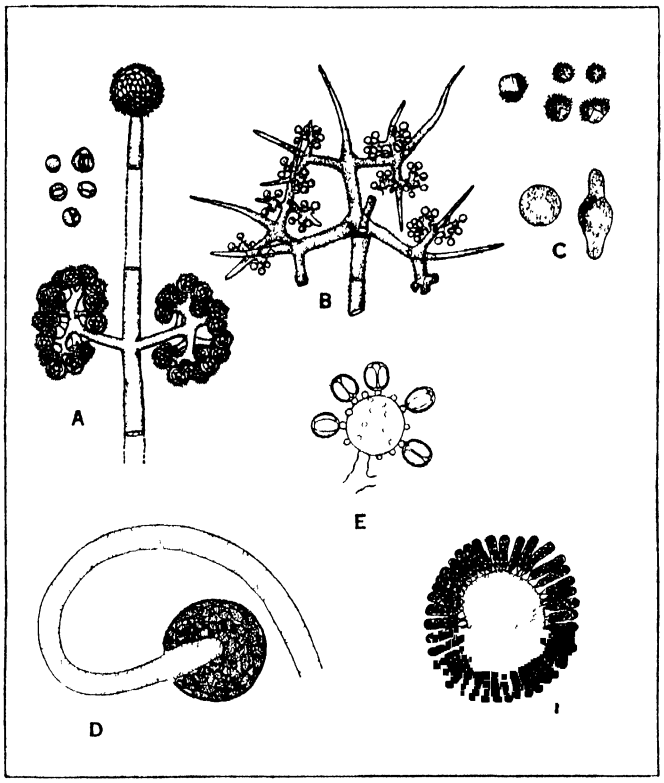


FROM (A) E GAUMANN, "VERGLEICHENDE MORPHOLOGIE DER PILZE" (GUSTAV FISCHER), (B) G MASSEE "PLANT DISEASES" (GERALD DUCKWORTH), (C) GWYNNE VAUGHAN & BARNES, "FUNGI" (CAMBRIDGE UNIVERSITY PRESS)

FIG 4.—A FERTILISATION OF MONOBLEPHARIS MACRANDRA. B PROPAGATION BY BICILIATE ZOOSPORES IN SAPROLEGNIA, C PLASMOGAMY (PYTHIUM DEBARYANUM), D CELL IN WHICH ARE PRODUCED SWARM-CELLS OR ZOOGONIDIA OF AN ACHLYA, E DEVELOPMENT OF SPORANGIA AND GERMINATION OF ZOOSPORES FORMED IN SPORANGIA IN PHYTOPHTHORA INFESTANS, F A CONIDIOPHORE ENLARGED THROUGH A STOMA OF AN ONION LEAF, AND 2 FREE CONIDIA (RIGHT) OF PERONOSPORA SCHLEIDENI

are no spermatozoids, and male gametes are not differentiated, the antheridium puts forth a fertilization tube which conveys the male nuclei to the eggs. Thus, even in members of a family exclusively aquatic, water is no longer the means by which the male gametes reach the eggs Some members of this family have but one egg in the oogonium and this is the rule in the other families. In *Albugo Blitt* the egg has many nuclei and numerous male nuclei pass from the antheridium and fuse with them. We have thus

multiple fertilizations and the oospore which results may be regarded as a coenozygote since it contains many zygote nuclei, each the result of a separate fertilization In most of the higher Oomycetes however the mature egg is uninucleate and only one male nucleus passes into it from the fertilization tube Thus the final result of the assumption of the function of the gametes by the gametangia is a single fertilization, made, however, under such conditions as to eliminate accidents and ensure the production of the zygote



FROM (A, B, C, E, F) E GAUMANN, "VERGLEICHENDE MORPHOLOGIE DER PILZE" (GUSTAV FISCHER), (D) AFTER F MOREAU IN "LE BOTANISTE"

FIG 5 —THAMNIDIUM ELEGANS A TERMINAL SPORANGIUM AND SPORANGIOLES, B CONIDIOPHORE WITH CONIDIA, C GERMINATION OF SPORANGIA WITH SINGLE SPORES, D BLAKESLEA TRISPORA, ORIGINAL FORM OF SPORANGIA, E FORMATION OF EXOGENOUS SPORANGIOLES, F SYNCEPHALASTRUM CINEREUM, DEVELOPMENT OF EXTRASPORANGIAL PARTIAL SPORANGIA

Many of this family are dangerous parasites of cultivated plants and the cause of destructive diseases, *e g* "damping off" disease of seedlings (*Pythium*), potato disease (*Phytophthora*), vine mildew (*Plasmopara*).

III The Zygomycetes. These fungi are largely saprophytic in habit and terrestrial Their mycelium resembles in structure that of the Oomycetes Zoospores are unknown, the characteristic reproductive organs of the leading family, the Mucoraceae, being sporangia which may contain (*Mucor*) thousands of spores (fig 1 b). Certain genera, however, are reproduced by conidia, *e g*, *Chaetocladium, Cunninghamella,* and there are a series of forms which show that in this family, as in the Oomycetes, a transformation of sporangia to conidia has taken place In one series this has been brought about by the gradual reduction in the number of spores in the sporangium; so, *e g*, *Thamnidium* has small sporangia with two to four or sometimes only one spore and *Chaetocladium* may be regarded as a genus in which the small sporangia each contain a single spore and hence behave as conidia (fig. 5 a, b, c).

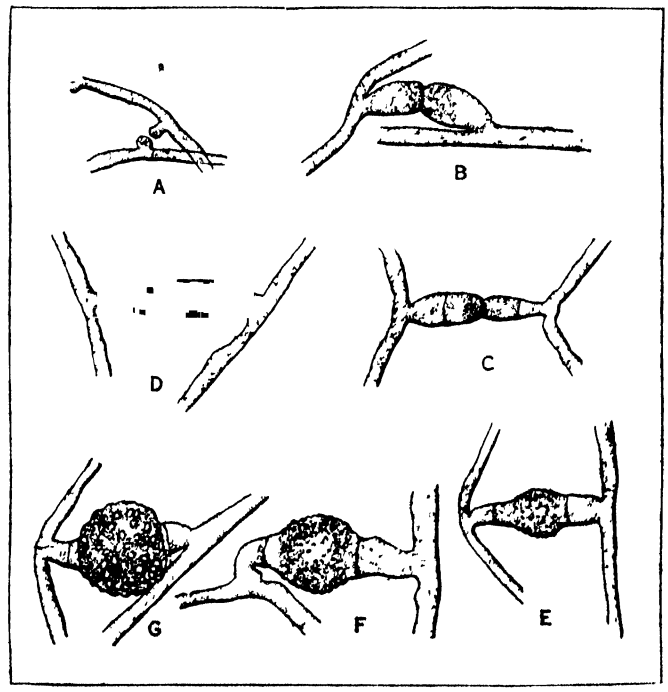
In another series, *Blakeslea* produces sporangia of normal type and also spherical heads bearing a number of small sporangia with only 3 spores. These can be related to the spherical conidiophores of *Cunninghamella* and *Syncephalis*.

In their sexual reproduction the Mucoraceae exhibit the conjugation of coenocytic gametangia, the resulting structure, the zygospore, containing many zygote nuclei. The gametangia concerned may arise on the same mycelium, on a common supporting hypha or zygophore as in *Sporodinia, Zygorhynchus*, and such forms are described as homothallic. In the majority of the species so far investigated the gametangia arise on two separate mycelia, which are different in kind There is little doubt that these two kinds of mycelium represent distinct sexes A F Blakeslee, to whom the discovery of this condition—known as heterothallism—is due, pointed out that a difference of vigour, indicated, *e g*, by a greater luxuriance of growth, was often to be observed between the two strains, which for this reason he distinguished as (+) and (−) He was able to show, moreover, by the production of so-called hybrid reactions that there is an essential sameness in all the (+) and in all the (−) strains, respectively, throughout the family, and that the (+) strains are probably to be regarded as female and the (−) as male

The germination of the zygospore usually results in the production of a "germ" sporangium and in *Phycomyces nitens* it is in this structure that the zygote nuclei undergo the reduction division The resulting spores are in the main of two kinds, producing (+) and (−) mycelia respectively, but there are also a few spores which give rise to feeble thalli—neutral mycelia—which are homothallic It is of interest to note that H Burgeff experimentally produced similar mycelia by the admixture of the contents of hyphae from (+) and (−) mycelia, and thus reached the conclusion that homothallic mycelia contain both (+) and (−) nuclei

The Entomophthoraceae is a family of insect parasites of which one, *Empusa muscae*, attacks the common house-fly They are reproduced asexually by conidia which are shot off from the conidiophores and form a halo around the dead flies

The small family of the Endogonacae with a single genus *Endogone* may be included here. The species form mostly under-



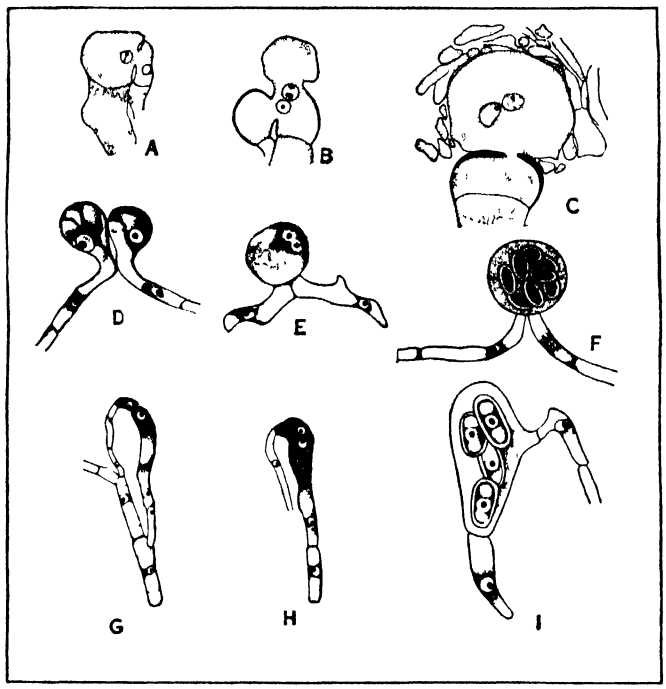
FROM GWYNNE VAUGHAN AND BARNES' "FUNGI" (CAMBRIDGE UNIVERSITY PRESS)

FIG 6.—A, B, CONTACT AND GROWTH OF PROGAMETANGIA C DIVIDED PROGAMETANGIA FORMING GAMETANGIA AND SUSPENSORS D CONJUGATION E, F, G DEVELOPMENT OF ZYGOSPORE

ground stromata in which the reproductive organs are embedded. In *Endogone lactiflua* two sexual branches of unequal size—male and female—grow up side by side They are multinucleate at first and from each a terminal cell containing a single nucleus is cut off These cells unite together and from the larger, the female, there now arises an outgrowth which rapidly enlarges, and into this pass the two sexual nuclei This outgrowth is the zygote, which not only develops a thick wall but becomes surrounded and embedded by a number of vegetative hyphae (fig. 7 a, b, c).

Its germination is unknown *Endogone* has been included in the Ascomycetes and is of considerable interest as indicating a possible relation between that class and the Zygomycetes.

Ascomycetes.—The mycelium is composed of hyphae regularly segmented into portions containing one or several nuclei. Asexual reproduction is common and this class provides a rich variety of conidial fructifications Many species may show several different



FROM (A) GAUMANN, "VERGLEICHENDE MORPHOLOGIE DER PILZE" (GUSTAV FISCHER), (B) GWYNNE VAUGHAN AND BARNES, "THE FUNGI" (CAMBRIDGE UNIVERSITY PRESS), (C, D, E) LA REVUE GENÉRALE DE BOTANIQUE (E ORLHAC, PARIS)

FIG 7 —A FORMATION OF COPULATION OPENING IN ENDOGONE LACTIFLUA B NUCLEAR MIGRATION C FORMATION OF HYPHAL SHEATH AROUND ZYGOTE D–F. DEVELOPMENT OF ASCI IN EREMASCUS FERTILIS G–I DEVELOPMENT OF ASCI IN ENDOMYCES

types of reproduction on one and the same mycelium There are many species in which the ascus fruit is rarely produced and there may consequently be many generations reproduced entirely by conidia It is not, therefore, surprising to find a large assemblage of fungi (*Fungi imperfecti*) which are only known to reproduce asexually and many of which are believed to be incomplete forms of Ascomycetes

The sexual reproduction of the lower ascomycetes (Protascineae) may be compared with that of certain Phycomycetes such as *Endogone* In *Eremascus fertilis* the sexual branches arise from two neighbouring cells of a hypha and grow up side by side They each receive a nucleus from their parent cells and then fuse together. The two nuclei unite and the zygote enlarges and forms a spherical ascus The fusion nucleus divides and eight ascospores are formed (fig 7 d, e, f) The main point in which *Eremascus* differs from *Endogone* is that the direct product of fertilization is in the latter a zygospore and in the former an ascus This then is one of the essential differences that mark off the lower Ascomycetes from the Zygomycetes The higher forms are distinguished by a further advance, in that the zygote instead of forming an ascus gives rise instead to one or many hyphae which eventually form a number of asci (ascogenous hyphae) Thus we have intercalated between the gametangium and the ascus a new mycelial generation—the diploid generation

The development of this diploid generation is accompanied in many forms with a delay in the fusion of the sexual nuclei, so that the ascogenous hyphae contain paired nuclei (dikaryons). It is in the ascus that nuclear fusion is finally accomplished, to be succeeded immediately by the meiotic phase and the formation of spores.

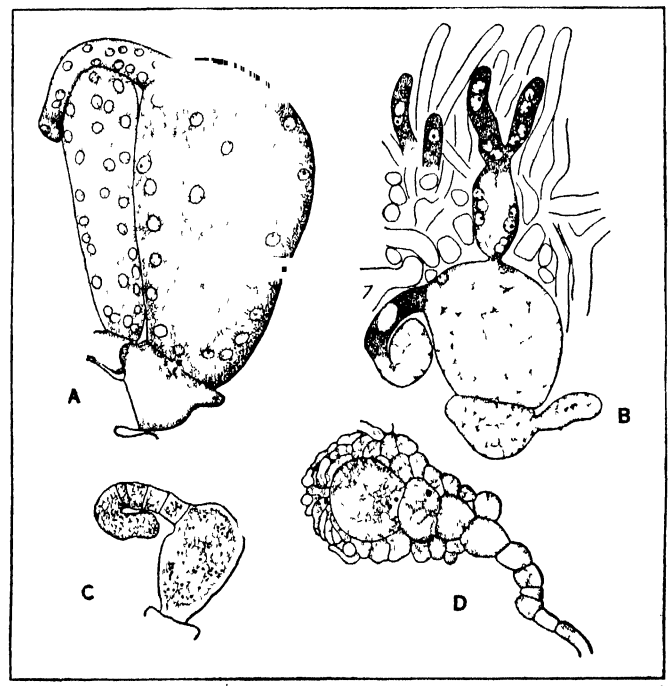
The ascogenous hyphae, however, do not form an independent self-supporting mycelium. They are dependent on the haploid mycelium for their nutrition, and this is accomplished by the enclosure of the ascogenous hyphae in a simultaneous growth of vegetative hyphae from the parent mycelium Thus we have formed the fruit body or ascophore, one of the characteristic structures of the higher ascomycetes, showing in the different families great variety in structure and organisation Whilst in many families its development awaits the stimulus which originates in fertilization, in the higher forms it may reach an advanced stage of development before the sexual organs arise, buried in its tissues

In *Eremascus* the two sexual organs are alike, but in the related *Endomyces* they are differentiated into a large female *gametangium,* the ascogonium and a smaller male, the antheridium (fig 7, g, h, i) In the Euascomycetes this differentiation in sex is maintained and the ascogonium is usually characterised by the development of a receptive portion, the trichogyne Both structures may be unsegmented, but in many families they may be divided by cross walls into several cells, the whole ascogonial branch (archicarp) thus consisting of a hypha of many cells, which is sometimes spirally coiled

The antheridium shows no corresponding development, in fact it is possible to trace throughout the whole group the gradual dwindling in importance and final elimination of this organ

With the cessation of the function of the antheridium and the establishment of some autogamic type of fertilization, the importance of the ascogonium itself begins to diminish The functionless trichogyne disappears and finally the ascogonium itself is suppressed, and fertilization is effected between two undifferentiated cells of the haploid mycelium These processes may be illustrated by reference to certain genera of the Pezizales

In *Pyronema confluens* the large pear-shaped ascogonium bears



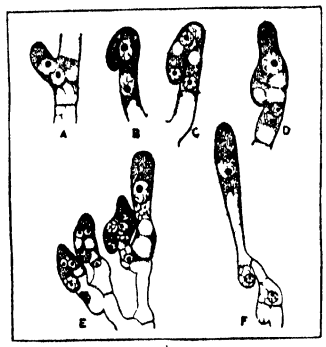
FROM (A, B) ZEITSCHRIFT FÜR BOTANIK (GUSTAV FISCHER), (C) "PROCEEDINGS OF THE ROYAL SOCIETY," (D) GWYNNE-VAUGHAN AND BARNES, "THE FUNGI" (CAMBRIDGE UNIVERSITY PRESS)

FIG 8 —A B ASSOCIATION OF MALE AND FEMALE NUCLEI IN PYRONEMA CONFLUENS. C FUSION OF ANTHERIDIUM AND SEPTATE TRICHOGYNE IN LACHNEA STERCOREA D, ASCOGENOUS HYPHAE IN HUMARIA GRANULATA

at its upper end a tubular trichogyne, the tip of which fuses with the club-shaped antheridium. All these structures are multinucleate The contents of the antheridium pass first into the trichogyne and then, by absorption of the intervening wall, into the ascogonium, where the male and female nuclei become associated (fig 8 a, b). In *Lachnea stercorea,* though the antheridium is fused with the trichogyne, the latter is septate and no male nuclei pass from the antheridium into the trichogyne (fig. 8 c). In *Lachnea cretea* no antheridium is formed though the septate tri-

chogyne is still developed In *Humaria granulata* the trichogyne has disappeared though the ascogonium has still the form of those described above and like them gives origin to the ascogenous hyphae (fig 8 d) Finally in *Humaria rutilans* the ascogonium itself has disappeared and, with it, all trace of autogamous fertilization, which is replaced by the pseudogamous fusion of vegetative cells.

A parallel series can be traced in a related genus *Ascobolus* in which the ascogonium is many-celled In *A. magnificus,* which is heterothallic, normal conjugation takes place between antheridium and trichogyne, in *A furfuraceus* antheridia are absent In one species *Ascobolus carbonarius* the antheridia are absent, but the long and often coiled trichogyne comes into contact with one of the oval, stalked conidia, borne on the mycelium, and fuses with it and thus, apparently, fertilization is effected



FROM ZEITSCHRIFT FÜR BOTANIK (GUSTAV FISCHER)
FIG 9 —A–F PYRONEMA CONFLUENS DEVELOPMENT OF ASCOGENOUS HYPHAE

This process finds an interesting parallel in one of the lichen fungi *Collema pulposum* Here the archicarp, as in many lichen fungi, is a coiled thread terminating in a long slender trichogyne, the latter comes into contact with a conidium and fusion results In other species of *Collema* the trichogynes, projecting above the surface of the thallus, get attached to their surface one or more uninucleate bodies, the so called spermatia, which are formed in flask-shaped bodies resembling pycnidia As the name implies, these spermatia have been regarded as male sexual cells, but since they can be germinated in certain cases to form mycelia, it is possible that they are to be regarded as pycnospores their function as male cells being a secondary one

It may perhaps be as well to point out, that these processes of modification and disappearance of the sexual organs, should not obscure the fact that the essential feature of fertilization is the fusion of two haploid nuclei, and it would appear that it is immaterial, whether these nuclei are derived from different sexual organs, antheridium and ascogonium, from the ascogonium alone, from an ascogonium and a vegetative cell, or from two vegetative cells In every case the process which brings them together, whether fusion immediately results or not, marks the starting point of a new development, viz , the diploid generation, represented by the ascogenous hyphae These hyphae eventually give rise to the asci and in the majority of the ascomycetes they are formed in a very characteristic way As already stated the ultimate segments of these hyphae are binucleate and any one of them may grow out to a short branch, into which the two nuclei pass This cell now curves over at the tip to form a hook, and the nuclei moving up to the summit divide there simultaneously. The spindles are so arranged that when the two cross walls are formed the summit of the crook contains two nuclei, whilst one is in the tip and another in the stalk (fig 9).

In most cases the two nuclei at the summit fuse together and form the fusion nucleus of an ascus, which is formed by the further development of the parent cell The point of the crook and the stalk lie close together and either of them may now become binucleate by the migration into it of the nucleus from the other. In this process the walls are perforated by the travelling nucleus The binucleate cell so formed may now originate a new crook and so the process may be repeated several times

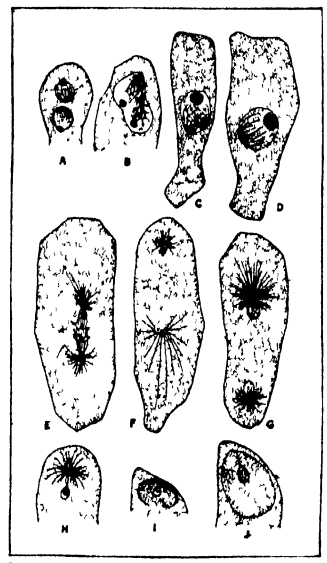
The young ascus now enlarges, the nucleus also increasing in size, and finally the latter divides; this is followed by two further divisions and thus eight nuclei are formed, which become the centres in forming eight ascospores (fig 10). The details of nuclear division in the ascus have been carefully studied in a number of forms, and there is no doubt that the first division in the ascus is the heterotype or reducing division (*see* CYTOLOGY). The two following divisions have, for the most part, the characters of post meiotic divisions, but there is no general agreement as to their interpretation In the account of the sexual process and development of the ascogenous hyphae already given, it has been assumed that the sexual nuclei are associated in pairs and pass as such (dikaryons) into the ascogenous hyphae, here the pairs may divide but later a pair of nuclei, by derivation male and female, fuse together in the ascus and so complete fertilization In such a case the first division in the ascus is a reducing division and in the two succeeding divisions the haploid numbers of chromosomes will appear

There are a number of forms however (*Sphaerotheca, Humaria, Lachnea, Ascobolus*) in which the nuclei in the ascogonium, however derived, have been described as fusing together In this case, the nuclei in the ascogenous hyphae are diploid nuclei and the fusion in the ascus is a second fusion, and results in a nucleus with a fourfold number of chromosomes (tetraploid nucleus). Obviously a double process of reduction is necessary to restore the haploid nuclei of the sexual generation, and the second reduction is stated to take place during the second or third division. Further investigation is needed either to confirm or disprove the existence of double fusion and double reduction.

The weight of evidence on the whole favours the conclusion, that single fusion is the normal process in the Ascomycetes In this respect they conform with the other large group of the higher fungi, the Basidiomycetes

The mode of spore-formation in the ascus is peculiar. The eight nuclei formed in the third division show delicate radiations, extending from a centrosome, which meet around the nucleus and thus delimit a portion of the protoplasm on which a wall is secreted to form a young spore (fig 10, h, i, j)

It has already been explained that, in the higher Ascomycetes, the developing ascogenous hyphae are enclosed by a development of the haploid mycelium, on which, in fact, they are parasitic The whole structure which results is known as a fruit body or ascophore In the simpler orders (Plectascales and Perisporiales) the enclosure is complete, the sterile hyphae compacting together on the outside to form a completely closed investment Such a fruit body is called a perithecium In other orders (Hypocreales, Sphaeriales, Dothideales) a perithecium is formed, which is often flask-shaped, and provided with a neck with a definite opening for the discharge of the spores (fig 12)



FROM E GAUMANN, "VERGLEICHENDE MORPHOLOGIE DER PILZE" (GUSTAV FISCHER)
FIG 10 —PHYLLACTINIA CORYLEA A YOUNG ASCUS WITH DICARYON B–D CAROGOMY E–G STEPS IN DIVISION OF PRIMARY ASCUS NUCLEUS (ERYSIPHE CICHORACEARUM). H–J SPORE FORMATION

The remaining orders have a fruit-body known as an apothecium Here the numerous asci are assembled, together with sterile hyphae or paraphyses, in a continuous layer known as the hymenium (fig. 13) This is freely exposed on the surface of the ripe fruit body which may be a flat disc or a cup (Pezizaceae) or a convex, often stalked, structure (Helvellaceae).

The spores of many ascomycetes are explosively discharged from the asci, a process which is facilitated by their mucilaginous contents and the pressure of the surrounding asci and paraphyses.

The Endomycetales are a small family in which (*Endomyces, Eremascus*) the asci result directly from the conjugation of the gametangia and are thus borne directly on the mycelium (fig. 7). The important family of the yeasts, Saccharomycetaceae, is included in this order These are fungi which, living normally in liquid media, have the form of oval or spherical cells which reproduce by budding Some forms, when grown under certain con-

ditions, can develop true hyphae and thus show their derivation from fungi of normal structure Many genera have a sexual process represented by the conjugation of ordinary cells. The result is the formation of an ascus in which ascospores are formed (*Schizosaccharomyces, Zygosaccharomyces*) In *Saccharomycodes Ludwigii* the ascospores are formed in the ordinary yeast-cells and conjugation takes place between the germinating spores The ordinary yeast cells so produced are thus diploid cells. The beer yeast (*Saccharomyces cerevisiae*) is generally regarded as parthenogenetic. (*See* YEASTS.)

The Exoascaceae is a family of parasitic fungi which grow on the higher plants, often producing malformation of the leaves, fruits, etc. The mycelium may develop in the deeper tissues, but eventually makes its way to the surface and the asci are produced between the epidermal cells, or more frequently they arise from hyphae which lie between the epidermis and the cuticle The cells of the mycelium are binucleate, and in the young ascus the two nuclei fuse and then undergo division, eight spores resulting in the usual manner. In some species (*Taphrina*) the original spores may bud in the ascus and give rise to hundreds of small conidia

When spores are sown in suitable culture fluids they bud after the manner of yeast cells and produce conidia In two species of *Taphrina* it has been shown that these secondary conidia can conjugate in pairs by means of a short tubular process The nucleus from one cell passes into the other and the binucleate cell so formed now puts out a germ-tube. Moreover, when the eight spores from one ascus are carefully isolated and germinated apart, it is found that they fall into two groups, the conidia of one group will not conjugate together but do so readily with any member of the other group They are thus, like many of the Mucorini, heterothallic, and the separation into the two sexes must take place during the divisions in the ascus

The Plectascales include the common saprophytic moulds *Aspergillus* and *Penicillium* of which some species—*Aspergillus*

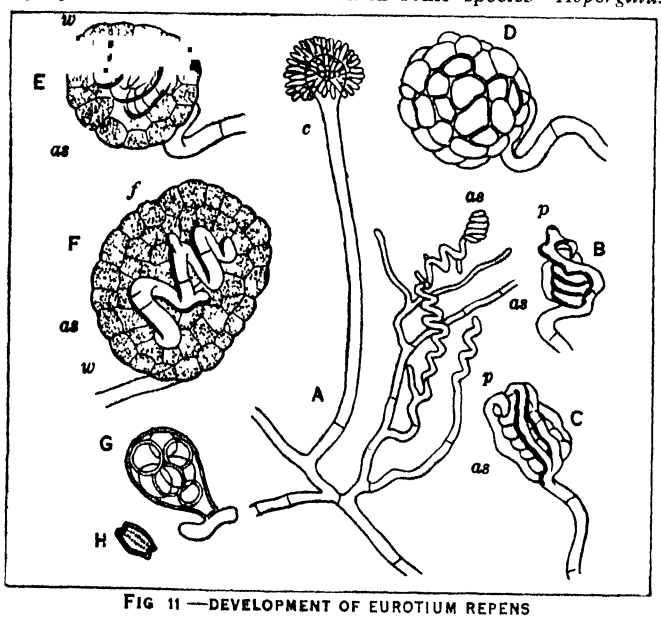


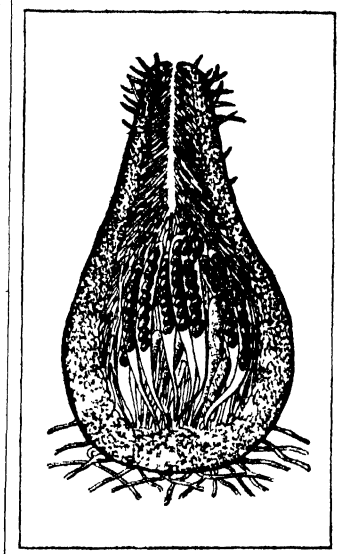
FIG 11 —DEVELOPMENT OF EUROTIUM REPENS

A. Small portion of mycelium with conidiophore (c) and young archicarp (as). B. Spiral archicarp (as) with the antheridium (p). C. The same, beginning to be surrounded by haphae forming perithecium wall. D. Perithecium. E, F. Sections of young perithecia: w. parietal cells, f. pseudo-parenchyma, as. ascogonium. G. An ascus. H. An ascospore

herbariorum, Penicillium crustaceum are the commonest and most ubiquitous of fungi They reproduce themselves by a profuse production of conidia and also by closed (cleistocarpous) perithecia (fig 11).

The Perisporiales are parasitic fungi living epiphytically, *i.e.*, on the surface of their hosts, absorbing food materials by haustoria from the epidermal cells—or sending hyphae through the pores of the stomata into the interior of the host. The Erysiphaceae or mildews are the cause of disease in many cultivated plants, *e.g.*, hop mildew, American gooseberry mildew. They produce conidia in chains and numerous perithecia which bear characteristic appendages. The Perisporiaceae with a similar habit have dark coloured mycelium and are known as sooty moulds

The three orders Hypocreales, Sphaeriales, Dothideales include families which have frequently been grouped together under the names of Pyrenomycetes They have perithecia which, when mature, have a well-defined mouth (fig 12). In some genera the fruit bodies are borne directly on the mycelium (*Sordaria, Chaetomium*) or isolated in the host tissues (*Venturia*) but more often they are borne on a stroma (*Nectria, Cucurbitaria*) or embedded in it (*Epichloe, Claviceps, Valsa*). The stroma may be flat or cushion-shaped, or immersed in the tissues of the host. In the more specialized forms the stroma may show a sterile basal stalk, the perithecia being limited to the upper part, where they may more efficiently distribute their spores (*Xylaria*) The Pyrenomycetes is by far the largest group of the Ascomycetes, a conservative estimate of the number of species being 10,000 Though the majority are saprophytes some well-known diseases of plants are caused by members of this group, *e g.*, canker in fruit trees (*Nectria*), ergot of cereals and other grasses (*Claviceps*), apple and pear scab (*Venturia*), most species of *Cordiceps* are parasites on insects.



FROM STRASBURGER, "LEHRBUCH DER BOTANIK" (GUSTAV FISCHER)

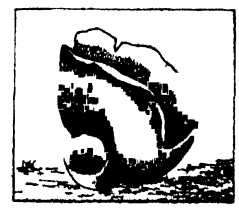
FIG. 12.—PERITHECIUM OF PODOSPORA FIMISEDA IN LONGITUDINAL SECTION

The Pezizales include the forms with apothecia and they provide the largest and most elaborate fruit-bodies among the ascomycetes, *e g*, *Morchella* which may be 10–12 inches in height

In the Pezizaceae—the cup fungi—the apothecium is concave, saucer or cup-shaped, sometimes stalked In the Geoglossaceae and Helvellaceae the ascophores are club-shaped or differentiated into a sterile stalk and fertile head, which may be folded or ridged in various ways to increase the area of the spore-bearing surface (fig 13).

The Tuberales is a small group of fungi which include the well-known truffles (*Tuber* sp). They live underground in the neighbourhood of trees and have been thought to be concerned in the formation of mycorrhizas. The hymenium lines internal chambers in the fruit-bodies

The Laboulbeniales is an order of peculiar fungi, whose manifold structure has been made known by the investigations of Thaxter in America They are minute plants from 1–10 m m in height which grow attached to the bodies of insects, especially beetles. They are dark brown in colour and consist of a basal receptacle which bears appendages, on which are the sexual organs. The female organ is essentially an ascogonium with a trichogyne and is fertilized by male cells or spermatia. The fertilized ascogenic cell (ascogonium) gives rise to a number of asci which are enclosed in a perithecial wall that develops around the female organ. Some species are probably heterothallic (Amorphomyces) but the male and female spores are associated together in the ascus, are shed and germinate together.



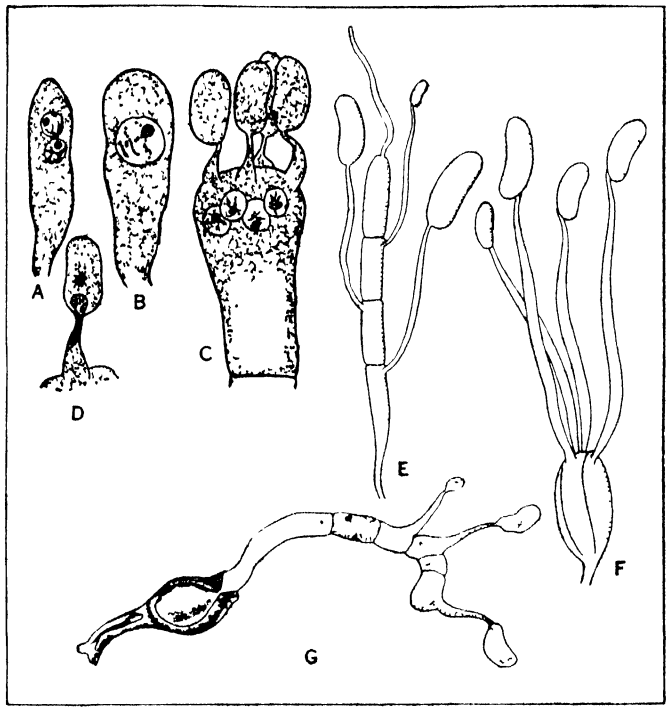
FROM STRASBURGER, "LEHRBUCH DER BOTANIK" (GUSTAV FISCHER)

FIG. 13.—PEZIZA AURANTIACA (AFTER KROMBHOLZ). NAT SIZE

The Basidiomycetes.—The mycelium, like that of the Ascomycetes, is fully segmented, but in the haploid mycelium the segments are uninucleate. They differ from the Ascomycetes in the absence of sexual organs, whose functions are performed by

pseudogamous vegetative fusions The diploid mycelium which results is extensively developed, has a completely independent existence and in the higher forms, is, in fact, the only mycelium which can normally be distinguished.

Though sexual organs are absent the haploid mycelium is often sexually differentiated Heterothallism occurs both in the Uredinales and Ustilaginales, and is widespread in the higher forms In the latter, pseudogamous fusions presumably occur between



FROM (A, B, C, D) W. RUHLAND, "KENNTNISS DER INTERCELLUM KARYOGAMIE OEBER DEN BASIDIOMYCETES (ARTHUR FELIX), (E, F) W G SMITH "BRITISH BASIDIOMYCETES " (G) GWYNNE VAUGHAN AND BARNES "FUNGI" (CAMBRIDGE PRESS)

FIG 14 —(A) ARMILLARIA MELLEA, YOUNG BASIDIUM WITH THE TWO PRIMARY NUCLEI, (B) AFTER FUSION OF THE TWO NUCLEI (HYPHOLOMA APPENDICULATUM), (C) BASIDIUM BEFORE THE FOUR NUCLEI, DERIVED FROM THE SECONDARY NUCLEUS OF THE BASIDIUM, HAVE PASSED INTO THE FOUR BASIDIOSPORES, (D) PASSAGE OF A NUCLEUS THROUGH THE STERIGMA INTO THE BASIDIOSPORE, (E) BASIDIUM AND SPORES (AURICULARIA AURICULA-JUDAE), (F) BASIDIUM AND SPORES, (EXIDIA GLANDULOSA), (G) UROMYCES

hyphae of the mycelia of different kinds, though in only a few cases have these actually been observed Asexual reproduction by conidia and oidia occurs in both types of mycelia.

In the lower families the basidia are borne directly on the diploid mycelium, but in the vast majority of the forms they are borne on fruit bodies or sporophores These are not formed, as in most Ascomycetes, as the immediate result of a sexual process (*see* above) but arise from the diploid mycelium at a time and stage in its development which are determined by physiological factors, such as nutritive conditions, humidity, light, etc The basidium, like the ascus, is the gonotocont In it the reduction of the chromosomes is effected but the daughter cells (usually four) resulting are exogenous, *i e*, borne on short stalks (sterigmata) outside the mother cell (fig 14 d) Two kinds of basidium occur, those characteristic of the Autobasidiomycetes are, like the ascus, undivided (holobasidia). The Protobasidiomycetes have the basidia divided by septa into four cells (phragmobasidia) (fig 14 e). The dividing walls may run transversely, *e g*, Auricularia, or longitudinally as in *Tremella* (fig 14 f). The fertilization which takes place in the young basidium is followed immediately by the reducing divisions and the development of spores, but in the Uredinales and Ustilaginales, after the nuclear fusion, a resting stage, often very prolonged, may intervene This may be accompanied by a thickening of the wall of the mother-cell, which may even become set free from the mycelium as a spore (teleutospore, chlamydospore). These "probasidia" as they may be called, can no longer behave as basidia and produce the spores; they consequently "germinate," that is they produce a short vegetative outgrowth resembling a germ tube (promycelium), which functions as the basidium and bears the basidiospores (sporidia) Thus in these forms the probasidium is concerned with the distribution and perennation of the fungus as well as with the production of the basidiospores (fig 14 g)

The basidiospores may be thin-walled and adapted for immediate germination, and this is the case of the Protobasidiomycetes and in some of the lower families of the Autobasidiomycetes. These thin-walled spores when germinated in water or nutrient solutions may sprout like yeast cells and produce gemmae or secondary conidia In the higher families they are thick-walled and are resting spores In the majority of Basidiomycetes the spores are discharged from the sterigmata, but only for a short distance (0·1—0 2 m m) They are, for the most part, distributed by air currents

Sub Class Protobasidiomycetes The Auriculariales is an order of mostly parasitic forms of which the simpler representatives, *e g*, *Helicobasidium*, bear the basidia scattered on a loosely woven mycelium, but in the more typical forms, *e g*, *Auricularia*, the hyphae, which have gelatinous walls, are compacted to form fruit bodies, often of considerable size The basidia are borne on the upper surface of these fruit bodies and are the terminal portions of hyphae which do not reach the surface, become somewhat wider and divide transversely into four cells From each of these arises a long sterigma which projects above the surface of the thallus and develops a spore at its tip (fig 14 e) The spores can germinate at once and bud off small curved conidia The fruit body is formed throughout of binucleate cells; the origin of this

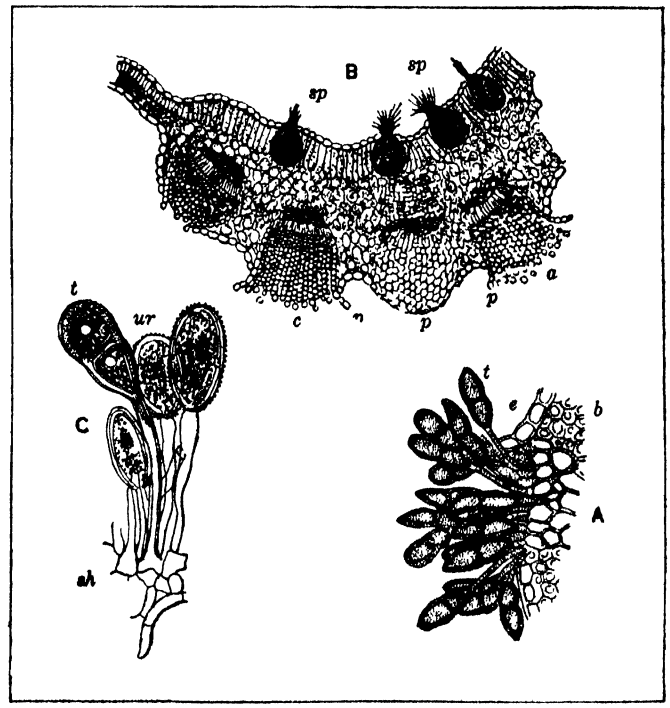


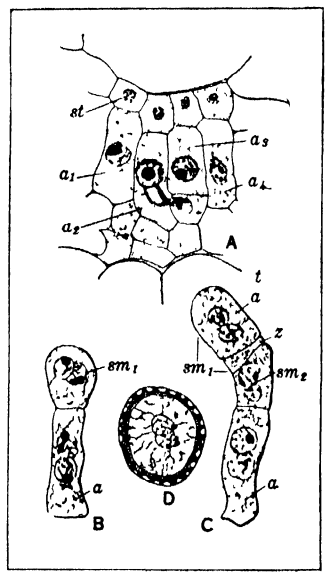
FIG 15 —PUCCINIA GRAMINIS

A Mass of teleutospores: t on a leaf of couch-grass, e. epidermis ruptured, b. sub-epidermal fibres (after De Bary) B. Part of vertical section through leaf of *Berberis vulgaris*, with a aecidium fruits, p peridium, and sp. spermogonia (after Sachs). C. Mass of uredospores (ur), with one teleutospore (t); sh sub-hymenial hyphae (after De Bary)

condition is unknown The Jew's ear (*Auricularia auricula-Judae*) is a well-known representative of this order.

The Uredinales is a large order of parasitic fungi, known as the rusts, which are responsible for the diseases of many of the higher plants—ferns, conifers and flowering plants Both kinds of mycelium, haploid and diploid are parasitic and may be found on the same host (autoecious) or on different hosts (heteroecious), sometimes belonging to widely different families They are intercellular, highly specialised parasites, producing haustoria which penetrate the living cells of the host, and often stimulate the tis-

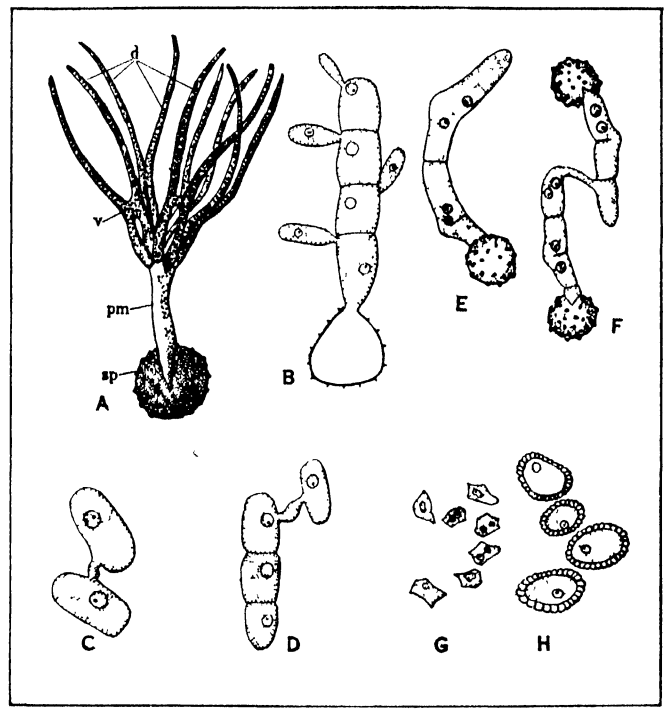
sues to increased growth and the formation of galls They are often short-lived—attacking the leaves of the host and falling with them, but when they extend to the stems of perennial plants they are also perennial No less than five kinds of spore may be produced in the life of one species, viz , aecidiospores, spermatia, uredospores, teleutospores and basidiospores (fig 15) The aecidiospores and spermatia are borne on the haploid mycelium and appear early in the year The first named are borne in fructifications known as aecidia, which are cup-shaped receptacles surrounded and enclosed by an investment (peridium, pseudoperidium), and containing rows of spores, which arise from a layer of cells at the base of the aecidium The spores are binucleate and it has been shown that in the development of the aecidium, the basal cells are formed from uninucleate cells which, either become binucleate by the migration of a nucleus from a neighbouring cell, or, by uniting in pairs, give rise to a fusion cell with two nuclei (fig 16) In either case we have a reduced sexual process by which the diploid generation is initiated, the first products of which are the aecidospores The spermatia are thin-walled cells of small size containing little protoplasm and a relatively large nucleus They are borne in flask-shaped receptacles, the spermogonia As the name indicates, they have been regarded as aberrant male sexual cells This implies the previous existence of female sexual organs provided with some apparatus for the reception of spermatia It has been shown that in certain forms, *e g* , *Phragmidium violaceum*, the fertile cells when young cut off a terminal sterile cell (fig 16) which may well represent the remains of a trichogyne, which in ancestral forms projected above the surface of the host These hypothetical ancestors would thus have a simple female sexual organ comparable with the archicarp of many Ascomycetes The fact that all attempts to bring about infection of the host are by means of the spermatia lends strong support to the view that they are aberrant male cells On the other hand there is evidence that in some species the haploid mycelia are heterothallic and that the conjugation of cells from two different mycelia are involved in the sexual act which precedes the formation of an aecidium It is not without significance that spermogonia in these cases occur on *all* mycelia both (+) and (−) The spermatia are exuded from the spermagonia in drops of sweet fluid, which is sought by flies and other insects Where drops of this liquid with the spermatia are transferred from the spermagonia on one mycelium to those on another sterile mycelium, the formation of aecidia is stated to follow immediately Cytological details are unknown, but these observations, if confirmed and extended, may modify the conception now entertained of the morphological nature of the spermatia both in this and other groups in which they occur



AFTER BLACKMAN IN STRASBURGER "LEHRBUCH DER BOTANIK" (GUSTAV FISCHER)

FIG 16 —PHRAGMIDIUM VIOLACEUM A Portion of young aecidium, st. sterile cell, a fertile cells; at a, the passage of a nucleus from the adjoining cell is seen. B Formation of the first spore-mother-cell (sm), from the basal cell (a) of one of the rows of spores C Further stage in which from sm, the first aecidiospore (a) and the intercalary cell (z) have arisen, sm_2 Second spore-mother-cell D Ripe aecidiospore

The aecidiospores germinate readily on the surface of the appropriate host and the germ tubes enter the tissues by way of the stomata They give rise to a binucleate mycelium and on this in due course appear the uredospores. These are so-called "summer" spores, *i e* , conidia of the diploid mycelium, and can infect fresh hosts and so spread the disease Later in the year and on the same mycelium teleutospores are formed These are typically thick-walled and resting spores The uredospores are binucleate and so are the young teleutospores, but in the latter the two nuclei fuse before their development is completed The teleutospores are thus the probasidia They germinate in due course and give rise to the promycelium—the basidium proper, on which after its division into four cells the four basidiospores, known as sporidia—are produced These are uninucleate and can at once infect the proper host and develop the haploid mycelium This



FROM (B H) E GAUMANN VERGLEICHENDE MORPHOLOGIE DER PILZE' (GUSTAV FISCHER) (A) VINE, 'STUDENT S TEXT BOOK OF BOTANY' (ALLEN & UNWIN)

FIG 17 —(A) GERMINATING RESTING-GINIDIA OF TILLETIA CARIES. (B) GERMINATION OF SMUT PORES (USTILAGO SCABIOSAE), (C, D) COPULATION OF SPROUT CELLS (USTILAGO VIOLACEA) (E, F) GERMINATING AND COPULATING PROMYCELIA (CINTRACTIA MONTAGNEI), (G) YOUNG BINUCLEATE SPORE FUNDAMENTS, (H) MATURE UNINUCLEATE SPORES (USTILAGO HOLOSTEI)

is the life history of one of the most complicated forms, the so-called eu- forms of which the black rust of wheat (*Puccinia graminis*) is an example In this species the host of the haploid mycelium is the common barberry (fig 15) In other species one or more of the spore types may be absent The -opsis forms have no uredospores (*Gymnosporangium* sp) In the brachy- forms the aecidia are absent but the spermogonia are accompanied by sori of uredospores, which in some cases arise as the result of a reduced fertilization, like that already described as taking place at the base of the aecidium These primary uredospores thus appear to be homologous with aecidiospores Other species have neither aecidia (or primary uredospores) nor spermogonia and are known as hemi- forms, there are micro- forms in which teleutospores alone occur In the latter the binucleate condition is established at an early stage—probably by the migration of a nucleus from one cell to another of the haploid mycelium. The most reasonable interpretation of these forms with a shortened life history is that they have been derived from the more complete forms The teleutospore is the spore form almost invariably present and the classification of the family is based largely on its structural peculiarities

The Ustilaginales were regarded by Brefeld as showing a half-way stage in the evolution of the Basidiomycetes from the lower fungi and he placed them in a separate group, the Hemibasidiomycetes The cytology of the group, however, leaves little doubt that they are true Basidiomycetes and form a parallel group to the Uredinales.

They are parasites on grain and fodder plants causing the well-known diseases smut and bunt The mycelium, which is usually binucleate, often develops slowly at first and then grows

rapidly at a particular stage of development of the host and produces its spores, *e.g.*, the smut of wheat (*Ustilago tritici*) attacks the wheat in the flower The grains already infected are sown, the plant develops without external sign of disease and not until the ears are formed does the fungus develop in the flowers, and gives rise to a black powdery mass of spores These chlamydospores are formed from binucleate hyphae which divide into short cells which separate, round themselves off and form the thick-walled chlamydospores. The two nuclei fuse in the spore which is, like the teleutospore of the host, uninucleate (fig 17)

On germination the spores give rise to a promycelium In the Ustilaginaceae the nucleus undergoes two successive divisions as in the Uredinales, and the promycelium (basidium) is divided by transverse walls into four cells These may not form sporidia but may conjugate in pairs by clamp connections or short conjugating tubes (*Ustilago nuda*) (fig 17), or they bud off small sporidia, which sprout like yeast cells and eventually conjugate in pairs (fig 17). The binucleate cells, however formed, can sprout secondary cells or give rise to hyphae, either of which can infect a new host In one species, *Ustilago Zeae*, the mycelium in the host is uninucleate and conjugation takes place at the appropriate time between cells of the hyphae, which then round off and form spores

In the Tilletiaceae, the promycelium remains undivided, eight or more daughter nuclei are formed by division and a whorl of long curved sporidia arise at the tip of the promycelium These fuse together in pairs, and from the fusion cell secondary sporidia may arise (fig 17 a)

The Tremellales are a small family of saprophytic fungi with gelatinous fruit-bodies Their mycelium is binucleate and gives rise to nearly spherical basidia In these the fusion nucleus undergoes the usual divisions and the cell becomes divided by four vertical walls into four daughters from each of which a long sterigma grows up to the surface of the fruit body and develops a spore (fig 14 f)

The general characters of the sub-class Autobasidiomycetes have already been outlined Their basidia are undivided and they

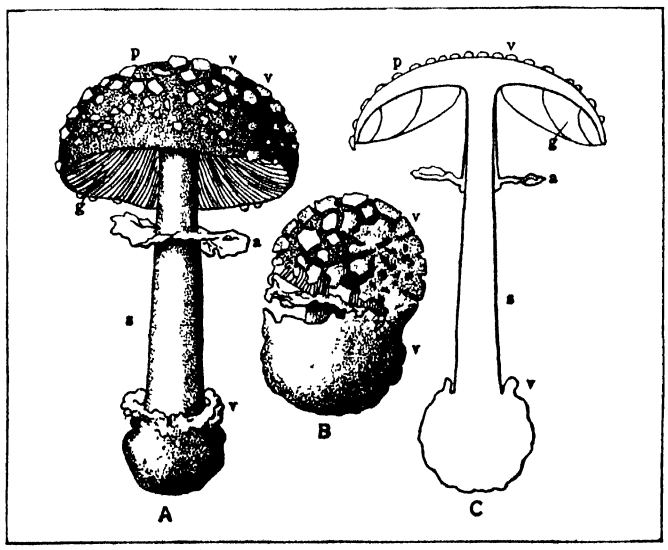
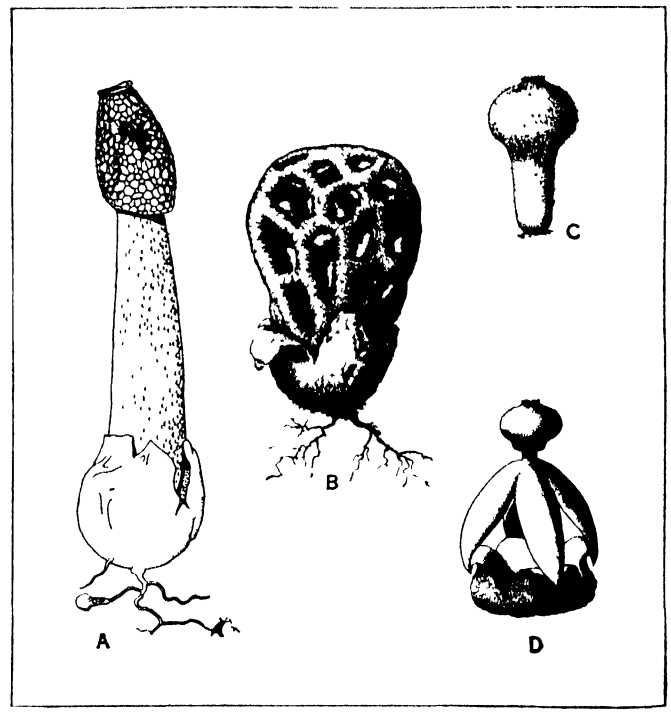


FIG 18 —AMANITA MUSCARIA

A. The young plant. B. Mature plant C. Longitudinal section of mature plant. p the *pileus*, g. the gills, a the *annulus*, or remnant or *velum partiale*, v. remains of *volva*, or *velum universale*, s. the stalk

are typically collected together in a continuous layer, the hymenium, in which are associated with them sterile hyphae or paraphyses In the lower families the hymenium is borne on the surface of the fruit body. This may be a flat crust of indeterminate form and extent or, in species growing on vertical trunks of trees, may be bracket-shaped In this case the hymenium is on the lower surface. A whole series of forms show that the bracket may narrow at its point of attachment and form a stalk and the fruit body is then differentiated into the stalk or stipe and the broad cap or pileus More advanced forms show the central stalk and cap-like pileus characteristic of the common mushroom and its relations the toad-stools A further modification of the hymenium-bearing surface is the development of spines and wrinkles, folds, thin plates (gills) and of pits and tubes, all of which have the effect of increasing manyfold the surface of the



FROM (A) W G SMITH, "BRITISH BASIDIOMYCETES" (B, C, D) E GAUMANN, "VERGLEICHENDE MORPHOLOGIE DER PILZE" (GUSTAV FISCHER)

FIG 19 —(A) MATURE PLANT SHOWING REMAINS OF VEIL (ITHYPHALLUS IMPUDICUS), (B) EXPANDED RECEPTACLE (CLATHRUS CANCELLATUS), (C) LYCOPERDON GEMMATUM, SHOWING EXTERIOR OF FRUCTIFICATION, (D) MATURE FRUCTIFICATION OF GEASTER CORONATUS

hymenium, without correspondingly increasing the size of the sporophore (fig 18).

In the higher families the fruit-body when young is a rounded spherical structure and the hymenial layers are differentiated from the inner tissues In the Agaricales the fruit-body ruptures before the basidia are matured and so exposes the hymenium, but in the Gasteromycetes the opening of the fruit-body is delayed until the spores have been formed In this last-named group the fungus fruit-body is often elaborately constructed and may be formed of fibrous tissue, gelatinous tissue, plectenchyma, etc At maturity a rapid expansion of pseudo-parenchymatous tissue forming the so-called receptaculum may rupture the outer covering and expose the mass of spores, embedded in the mucilaginous remains of the fertile tissue, clinging to its surface (*Ithyphallus impudicus, Clathrus cancellatus,* fig 19)

For further discussion of the symbiotic relations of Fungi with Algae *see* the article LICHENS; for the symbiotic relations of Fungi with the higher plants, especially orchids, heaths and forest trees, *see* the article MYCORRHIZA For the rôle of the parasitic Fungi in plant diseases *see* PLANTS, *Plant Pathology*. *See* also DRY ROT; MUSHROOM, PUFFBALL; SMUT AND BUNT, TRUFFLE; YEAST AND FERMENTATION

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FUNK, FRANZ XAVER VON (1840–1907), German Catholic theologian, was born on Oct. 12, 1840, at Abtsgmünd, and was educated at Tübingen, Rothenburg and Paris. In 1870 he became professor of theology and archaeology at Tübingen, where he died on Feb. 24, 1907.

Funk's most important publications concern the history of the early Church and include *Opera patrum apostolicorum* (2 vols., 1878; 2nd ed., 1901); *Die Echtheit der Ignatianischen Briefe* (1883); *Lehrbuch der kirchengeschichte* (1886; 4th ed., 1902); *Die Apostolischen Konstitutionen* (1891); *Kirchengeschichtliche Abhandlungen und Untersuchungen* (3 vols., 1897–1907); and *Didascalia et Constitutiones Apostolorum* (2 vols., 1905).

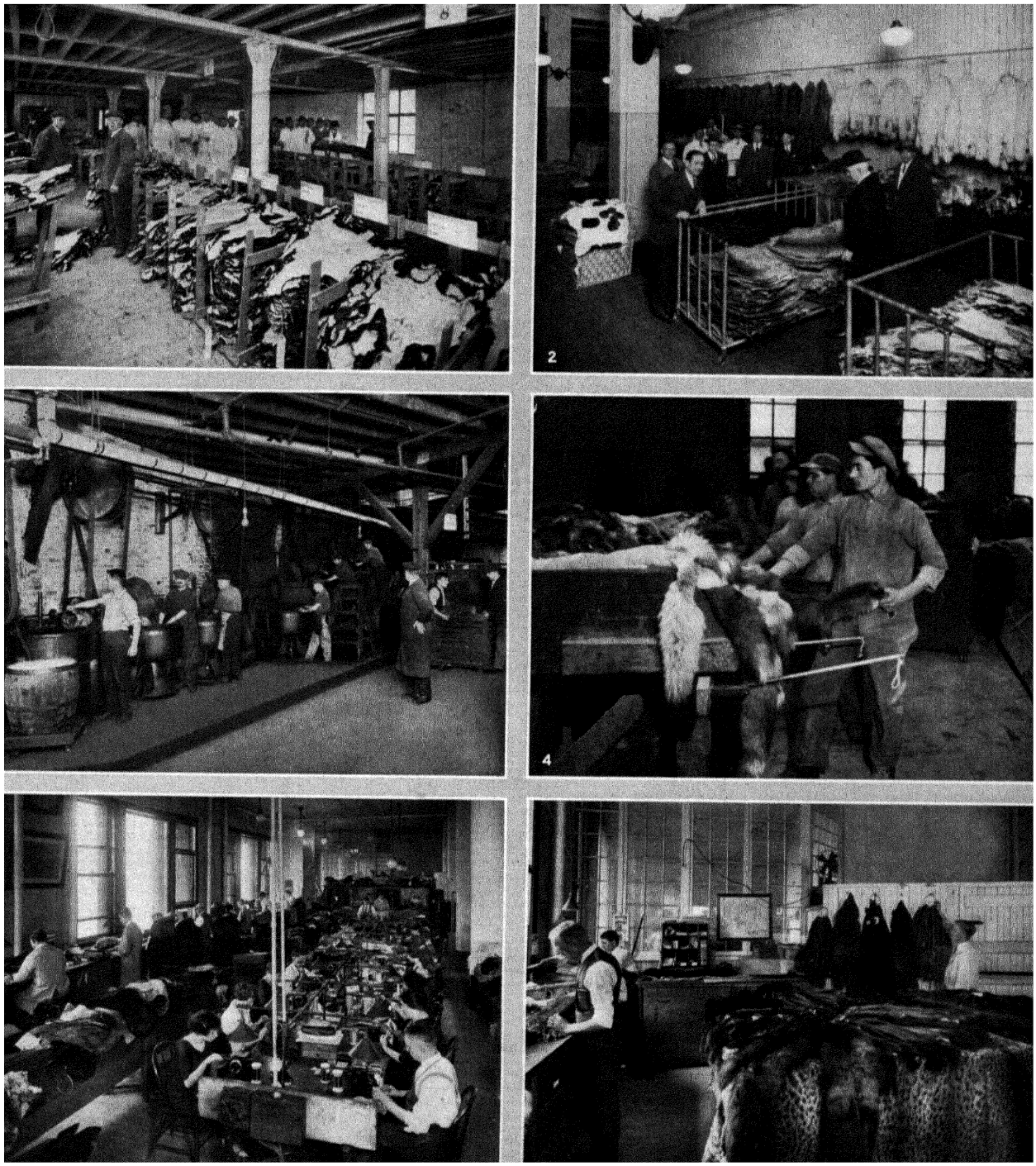
FUNKIA, in botany, a genus of handsome, hardy, herbaceous plants of the family Liliaceae. There are five species, natives of China and Japan. They are tuberous, with broadly ovate or heart-shaped leaves and racemes of white or pale lilac, drooping, funnel-shaped flowers. They are useful for the borders of a shrubbery, lawn or rock-work, or may be grown in pots for the greenhouse. The plants are propagated by dividing the crowns in autumn or when growth begins in spring.

FUNNEL, a vessel shaped like a cone having a small tube at the apex through which powder, liquid, etc., is passed into another vessel with a small opening The term is used in metal-casting of the hole through which the metal is poured into a mould, and in anatomy and zoology of an *infundibulum* or funnel-shaped organ, and generally of any shaft or passage to convey light, air or smoke, *e g*, the chimney of an engine or a steam-boat, or the flue of an ordinary chimney. It is also used of a shaft or channel in rocks, and in the decoying of wild-fowl is applied to the cone-shaped passage leading from a pond and covered with a "funnel-net," into which the birds are decoyed

FUNSTON, FREDERICK (1865–1917), American soldier, was born at New Carlisle, O., on Nov. 9, 1865 When at an early age, his parents moved westward, settling in Kansas in 1881. After some three years' study at the University of Kansas, he worked as a railway conductor and as a newspaper reporter in Kansas City In 1891 he was appointed botanist for the department of agriculture in the Death valley expedition, and two years later he was commissioned to report on the flora of Alaska, where he made extensive explorations, including a journey down the Yukon alone in an open boat. In 1896 he joined the Cuban insurgent army in which he became a lieutenant-colonel. On the outbreak of the Spanish-American War in 1898, he returned to the United States, was appointed colonel of the 20th Kansas Volunteers and sent to the Philippine Islands For his conduct at the battle of Calumpit in 1899, during the Filipino insurrection, he received the Congressional medal of honour and was promoted to brigadier-general of volunteers. For his capture of Aguinaldo (*q v*), the leader of the revolt, he was made brigadier-general in the regular army. As commander of the U S. troops stationed at San Francisco at the time of the earthquake and fire in 1906, he displayed notable promptness and energy in establishing order and organizing relief. Afterwards he saw further service in the Philippine and Hawaiian islands, and in Jan 1914 he was appointed commander of the 2nd Division of the army In April 1914, when the naval forces turned the captured city of Vera Cruz, Mexico, over to the army, Gen Funston became military governor of the city, an office which he discharged humanely and efficiently. He was rewarded with the commission of major-general, and in 1916 was placed in general command of the forces along the Mexican border. In that year he directed the movements of the troops in Mexico in pursuit of Francisco Villa. His death occurred at San Antonio, Tex., on Feb. 13, 1917 He was the author of *Memories of Two Wars* (1911).

FUR, the covering of the skin in certain animals lying alongside another covering called the overhair, or guard-hair The fur is barbed lengthwise, and is soft, silky, downy and inclined to curl. On the living animal the overhair keeps the fur filaments apart, prevents their tendency to mat or felt, and protects them from injury, thus securing to the animal an immunity from cold and storm.

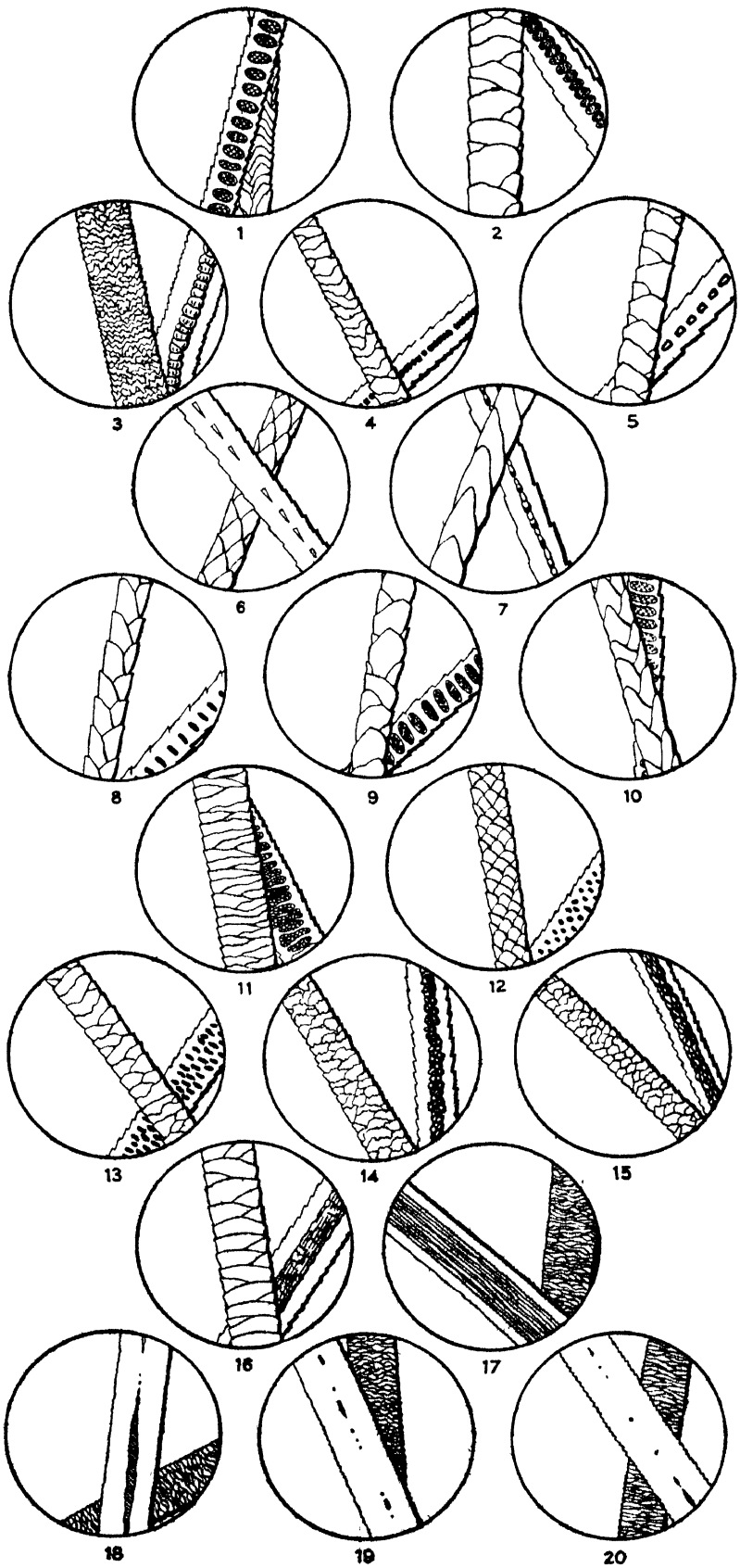
The use of fur as apparel probably dates from the early stages of human history. Primitive man's chief needs in the colder regions of the earth were food and warmth, and it is reasonable to suppose that the use of animal fur for warmth was not long separated from that of animal flesh for food. To the barbarian in his northern forests fur was a necessity, and as such had its value; but it is important to note that in almost every civilization of which history is cognisant fur has also had its value from early times as an ornament or decoration. The Chinese are said to have esteemed it highly 3,500 years ago; the Greek legend of Jason and the Golden Fleece may well have had its origin in some more than usually perilous and fortunate fur trading voyage to the



PHOTOGRAPHS, COPR FUR TRADE REVIEW

THE PREPARATION OF FUR FOR THE MARKET

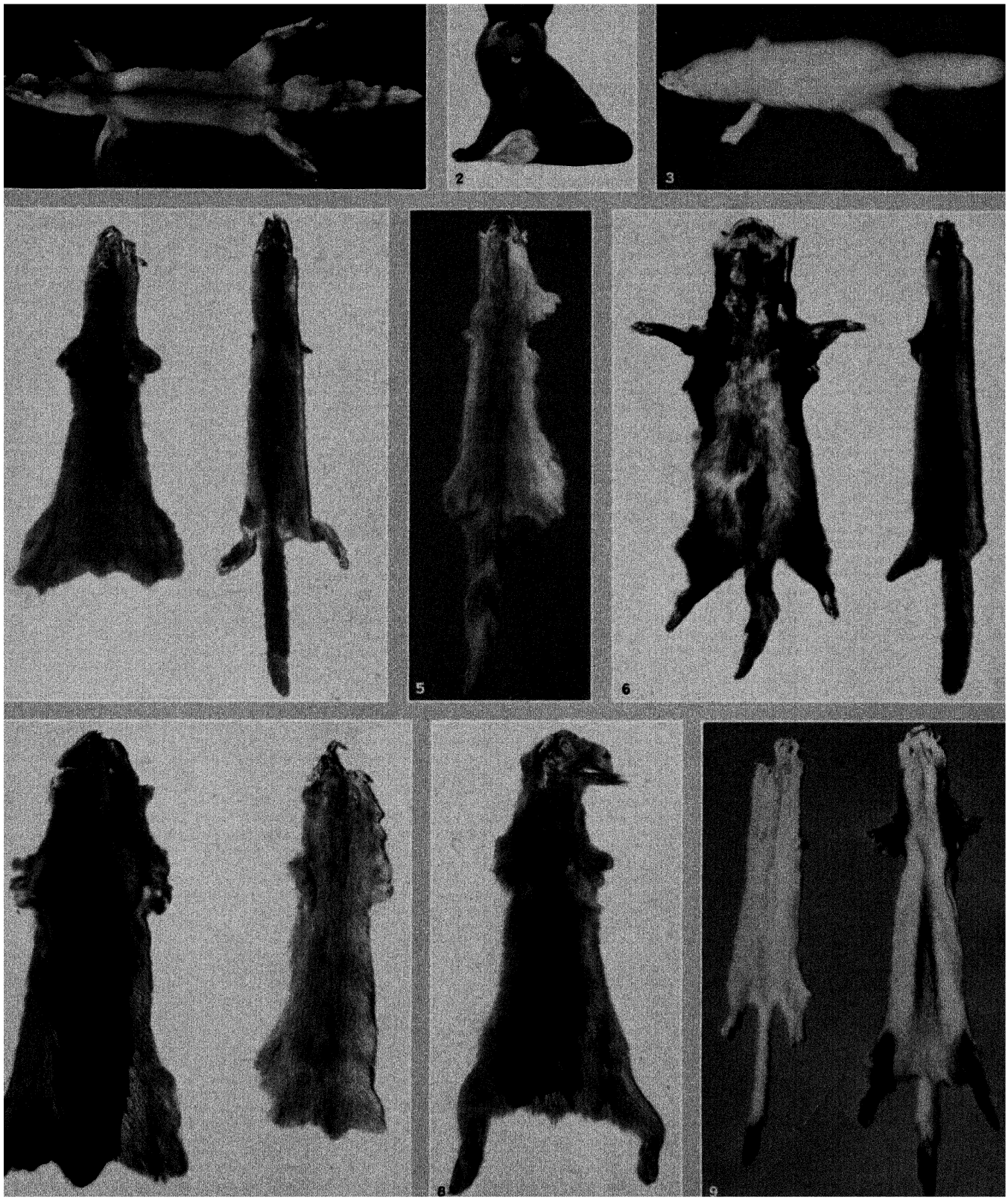
1. Raw fur warehouse, showing skins arranged according to quality, size and place of origin, to be auctioned off in lots without close inspection of each pelt
2. Display room of a New York fur merchant, showing raw fur skins on display, left background, silver fox skins along wall, right background, white fox In the foreground are sorting racks
3. A fur drying plant, showing machines for drying washed furs A perforated pot, containing the wet fur, is revolved in a kettle at high speed to throw off moisture In the background is a machine for softening the pelts
4. Fur dressing plant, showing workers treating raw pelts Flesh is scraped from the pelts after which they are "plucked" and put through processes akin to tanning, before being suitable for use
5. A modern fur factory, showing cutters at left No suitable machinery has been devised for the cutting, which varies with the different pelts At right, machines for sewing skins
6. Skin sorting and matching room in a modern fur factory The correct matching of skins, an operation which requires both taste and skill, is essential in the making of the finer garments



BY COURTESY OF AMERICAN MUSEUM OF NATURAL HISTORY AND OF DR. LEON A. HAUSMAN

FUR AND HAIR UNDER THE MICROSCOPE, SHOWING OUTSIDE VIEW AND LONGITUDINAL SECTION

The magnification is shown by the figure preceded by an *x*. The average diameter of the hairs in μ is shown under the name of the animal. (μ = 1/1000 mm.)



VARIETIES OF FUR

1. Canadian natural red fox, used undyed when colour is satisfactory
2. Silver fox, showing the characteristic white-tipped fur and tail
3. Alaskan natural white fox. This, like other American varieties, is silky and creamy, in contrast to the white, woolly Asiatic variety
4. Left, dyed Russian kolinsky, a variety of marten. Its natural colour is yellow, but it is readily dyed. Right, Canadian mink
5. Chinese (or Shantung) weasel, otherwise called Chinese mink, a pale yellowish-brown fur, usually dyed
6. Left, natural German fitch, a variety larger but less silky than the Russian (*see* fig. 9). Right, eastern American mink, the most valuable variety
7. Chinese or Shantung weasel (*see* fig. 5) dyed for commercial use. Left, male; right, female
8. Dyed Swedish squirrel. Squirrels from many countries are used. The tipped or streaked pelts (which are common) are usually dyed
9. Left, Russian ermine, showing typical winter coat. Right, Russian fitch

Copenhagen there is annually held a sale of Greenland furs.

The Leipzig auctions are of especial importance in connection with Russian furs, for which they provide one of the principal markets. Under the Soviet Government in Russia, the export trade in furs is a state monopoly, and in theory the Russian fur catch is collected by certain state trading organizations which pay the trappers an officially fixed price for the skins. This price, however, is seldom the highest obtainable, and a good deal of private trading, with subsequent smuggling of furs over the frontiers into China and elsewhere, goes on. Nevertheless the greater part of the catch comes eventually into the hands of the appropriate authority, and whatever proportion of it is deemed surplus to domestic requirements is held for export and sold abroad at a convenient time for the account of the Soviet Government

Buyers from all parts of the world attend the fur auctions in London and Leipzig, the great majority of them being either skin merchants, fur brokers and commission agents or manufacturing furriers. The fur broker buys and sells on commission terms for his clients, while the skin merchant buys for his own stock the kinds of furs for which he anticipates a demand Each class of trader is of necessity an expert in raw furs, and the skin merchant can tell not only the exact grade and value of a skin, but often the precise district of its country of origin.

The approximate quantities of certain of the more important furs offered at the London auctions during the year 1927 were as follow. Beaver 51,631, musquash 490,558, red fox 625,198, skunk 1,660,161, Australian opossum 1,677,507, mole 1,961,443, squirrel 1,203,317, fur seals 22,866, American opossum 2,430,746, Persian lamb 970,300, marmot 558,486, nutria 31,211, cross fox 17,270, white hare 1,084,590, mink 120,563, Russian ermine 213,708, stone marten 39,347. With these figures may be compared some for 1913, as follows Red fox 96,395, musquash 3,861,010, Australian opossum 275,600, skunk 863,638, beaver 23,070, fur seal 15,183, mole 1,445,124, squirrel 628,177. Price comparisons have little real significance because fur skins are susceptible of such numerous variations in quality that a common basis is difficult to find The following, however, are of interest the figures given are as a rule the highest price paid for a single skin in the auctions of the year in question Red fox—1913, £5, 1927, £12.5s ; musquash—1913, 4s 6d , 1927, 10s 3d.; Australian opossum—1913, 6s , 1927, 8s , beaver—1913, £3 8s., 1927, £13; skunk—1913, 35s.6d , 1927, 2s

Auctions of Australian and New Zealand rabbit skins are held in London about six times a year, the offerings including both furriers' and hatters' skins The total export of rabbit skins from Australia during the fiscal year 1925–26 was 15,028,304 lb , valued at £2,880,360, of which 5,117,458 lb were consigned to the United Kingdom and 9,270,118 lb to the United States of America During the calendar year 1912 the total export was 9,856,034 lb., valued at £577,050, the United Kingdom receiving 6,034,532 lb and the United States 1,842,052 lb. The United States imported in 1927, 22,069,111 lb. of rabbit, hare and coney skins. The total imports and manufactures of fur for 1926 were $117,416,667; for 1927, $135,573,530. The total exports for 1926 were $23,215,-332 and for 1927, $30,892,985.

Fur Dressing and Fur Dyeing.—Briefly, the function of the fur skin dresser is to make the skin suitable for use in the later stages of the trade, the objects aimed at being the creation of a soft, pliable leather; the removal of superfluous matter from the pelt; and the preservation and enhancement of the natural lustre of the fur. The details of the process vary widely with the nature and condition of the skin treated, but in every instance there are at least four distinct stages, some being comprised of several processes, in the operation First of all there is the preliminary cleaning and softening of the pelt; then "fleshing" (removal of fleshy matter from the skin) and stretching; then "leathering" the formation of a leather on the skin, actually a form of tanning); and then a final cleaning. After each stage, and between many of the intermediate processes, the fur is cleaned, a revolving wooden drum containing sawdust or other suitable material being generally used for this. Separate departments of the fur dresser's art are "unhairing" (the removal of guard-hairs where necessary), shaving, etc.; while the dressing of seal skins is a complicated business presenting features not found in the majority of furs. Though it doubtless originated in a primitive and haphazard manner, modern fur skin dressing is a highly developed scientific process requiring, incidentally, a considerable mechanical equipment.

Fur dyeing is of great antiquity, but may be said to date its modern development from the latter part of the 19th century. Before that date the dyeing of furs was mainly carried out with vegetable or mineral colouring matters. Since then, however, various chemical compounds known as fur bases have come into general use, and have largely superseded the older materials by reason mainly of the ease with which they can be applied. The use of these synthetic compounds has also enabled fur dyers to produce many new colours on furs, and fresh ones are added every year This again has led to the adoption by the fur trade of many skins which in their natural colours would be disdained by the public, but which when well dressed and dyed make most attractive furs Chief among these is rabbit, which, under its trade name of coney, appears in almost innumerable shades, and is one of the most important furs in the world From the cheapness of the skin, dyeing in this instance has brought furs within the reach of millions who could not otherwise afford them Another result of the development of fur dyeing is that the public is enabled to obtain excellent substitutes for furs which are scarce or costly Thus, marmot is dyed to represent the valuable mink, while dyed musquash is widely used in the place of sealskin. The technical side of fur dyeing is a matter upon which great secrecy is maintained. Each dyer has his own processes which are jealously guarded, and though he may achieve the same results as his neighbour it is often by means which are to a large extent different Leipzig is the chief fur dyeing centre of Europe, a position it owes partly to the skill of its workers, but largely to the success of the German chemists in producing dyestuffs. France and Belgium annually dye millions of imported and domestic rabbit skins, and there is a flourishing fur dyeing industry in London which has long been reputed for the excellence of its dyes on sealskins The fur dyeing industry of New York, a large and prosperous one, received a great impetus from the cessation of the supply of Leipzig-dyed furs during the war of 1914–18, and has since developed rapidly

Fur Manufacturing.—Furriery, or the making-up of furs into garments, has progressed from the primitive sewing together of skins to the position of a highly skilled and intricate occupation, and the modern manufacturing furrier often has a good claim to be recognized as an artist in the same sense in which a designer and creator of gowns is so recognized. Design, indeed, plays a large part in furriery, for there are fashions in furs as there are in other articles of dress, a fact which assumes especial importance when it is remembered that fur, from being a masculine prerogative in mediaeval times, has become an almost exclusively feminine article of attire. Paris is the originating centre of most fur fashions, but valuable ideas often come from Vienna, while New York has developed a tradition of its own in fur design. London furriers usually modify Parisian designs to suit their own public. The skill of the manufacturing furrier is exemplified not only in the coat, cloak, stole, tie or other article he produces, but also in the economical use and tasteful combination of the skins that go to make it. The setting of the skins, that is to say, the position of each skin in the garment in relation to its neighbours and to the garment as a whole, is another part of the furrier's work in which there is much scope for taste and ingenuity. The furrier's chief workman is the fur cutter, whose duty it is so to cut the skins for each article that the best possible use is made of them with a minimum of wastage This is a manual operation for which no adequate machinery exists. The working together of furs is done with specially-made sewing machines, usually power driven. Though this operation calls for less skill than fur cutting it is one upon the proper performance of which the appearance and value of the garment depends. In a skilfully sewn fur coat it is generally impossible to detect the seams without blowing the fur apart. Manufacturing furriers may be classified in

three groups. Wholesale manufacturing furriers sell the article they make to wholesale distributing houses or to retail firms; retail manufacturing furriers sell the work they do in their own shops; and in Great Britain chambermasters undertake work for other manufacturing furriers who may find it difficult or inconvenient to do it in their own workrooms

According to the Census of Production for 1924, the total value of the goods made and the work done by the fur trade in Great Britain in that year was £6,562,000, as compared with £1,658,000 in 1907 Of the 1924 figure £5,328,000 represented the selling value of made-up fur goods other than mats and rugs; alterations and repairs to fur goods accounted for £443,000; while the amount received by fur dressers and dyers for work done for the trade was £521,000 Each of these figures is considerably above that for 1907, the most notable increase being in the amount received for alterations and repairs, which was only £21,000 in the earlier year.

The Fur Retailer.—The retail branch of the fur trade is the only one with which the public usually comes into direct contact, its function being the sale of fur garments and articles to whoever wishes to buy them Many fur retailers also undertake to have coats, etc., repaired and remodelled for their customers. Much of the retail business in furs passes through the hands of the drapery and costume trades, but there are also many concerns exclusively interested in the sale of furs The fur retailer, unless a retail manufacturer, obtains his supplies from the wholesale houses or from manufacturing furriers, and his business is to some extent a seasonal one The tendency is, however, for its seasonal nature to become less evident owing to the development of a trade in furs suitable for summer wear It is mainly in connection with their sale to the public that the question of the description of furs arises. The fur trade, using a large variety of skins with many of which the general public is unacquainted, is one in which deception of the purchaser is peculiarly easy; and to protect the public from this certain rules in regard to descriptions have been laid down by the trade associations in most centres Under the American rules, to describe a fur, the correct name of the fur must be the last word of the description; and if any dye or blend is used to give it the appearance of another fur, the word "dyed" or "blended" must be inserted between the name signifying the fur that is imitated and the true name of the fur, as. "Seal-Dyed Muskrat," or "Mink-Dyed Marmot." All furs shaded, blended, tipped, dyed or pointed, must be described as such, as, "Black-Dyed Fox," or "Pointed Fox" Also where the name of any country or district is used, it must be the actual country of the origin of the fur, as, "American Opossum" When the name of a country or place is used to designate a colour, the fact must be indicated as. "Sitka-Dyed Fox" Those in force in London provide that furs shall be described by, and sold under, their recognized trade names; and that where one fur has been dyed to represent another the name of the original fur shall appear in the description. Thus, musquash dyed to represent seal is described as seal-musquash, opossum dyed to represent stone marten as stone marten opossum, etc. Where rabbit is the fur dyed it is described as coney, that being the trade name; as, beaver coney, nutria coney, etc. The regulations as to description in fur trade centres outside the United Kingdom vary considerably.

The Future.—The most serious problem confronting the fur trade of the world is that of raw material supplies, and its future will be powerfully influenced by the solution of, or the failure to solve, this problem The world's consumption of raw furs has increased very considerably since the beginning of the 20th century, and with the use of furs becoming more widespread every year this increase is bound to continue The total number of wild fur-bearing animals, on the other hand, is probably decreasing, this being due not only to the greater demand for their furs, but also to the gradual advance of civilization into regions hitherto open and unsettled. If these tendencies were allowed to operate unchecked a point would be within measurable distance at which grave anxiety as to the future supplies of furs would be justifiable; and in view of this possibility certain tentative precautions have already been taken. In Canada, the United States of America, Australia and elsewhere a policy of conservation of fur resources has been adopted, involving strict regulations as to preserves, close seasons, etc.; and this, though not alone sufficient to solve the problem, is a wise and valuable step. Further aid in its solution is afforded by the ingenuity of the fur dressing and dyeing industry, which, as has already been pointed out, can provide substitutes for many rare skins by reproducing some of their characteristics on skins more plentiful; and it is probable that scientific progress will enable this work to be extended considerably. The problem is also being attacked by the breeding of fur-bearing wild animals in captivity (*see* FUR FARMING). This has already given excellent results, and promises even more important ones No doubt there are certain animals which it would be impossible to breed commercially in such conditions, but this method of securing future fur supplies is certainly a most valuable one. Combined with the conservation of existing fur-bearers, and aided by scientific developments within the trade, it should go far towards providing an adequate and permanent supply of furs for the future.

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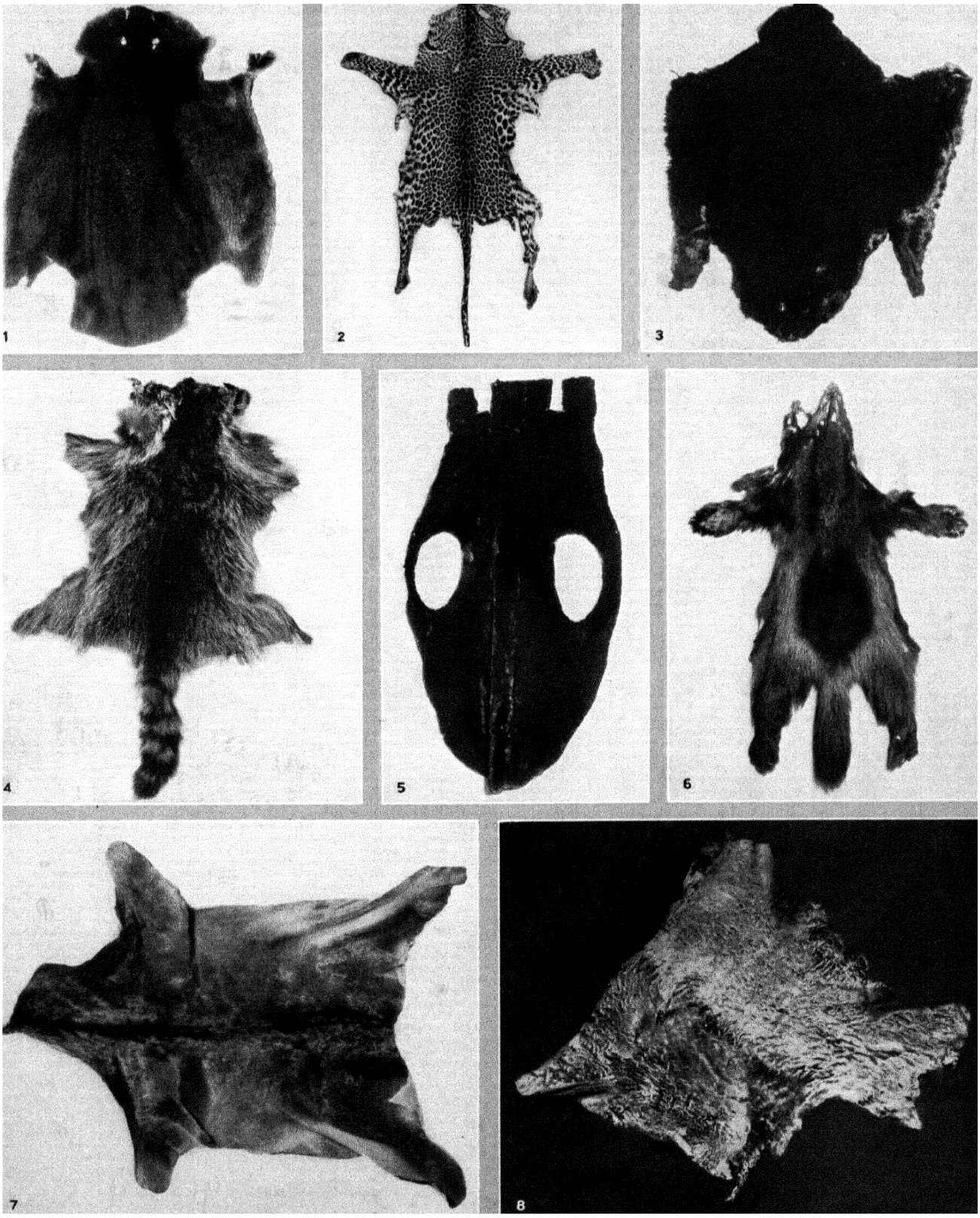
FUR-BEARING ANIMALS (LAND). The classification of animals as fur-bearing and non-fur-bearing has always been arbitrary and with the refinement of modern methods of manipulation of skins the terms are becoming very elastic Roughly speaking, the term fur is applied to skins which have a double coating of hair, a layer of comparatively short, soft, curly, barbed hairs next to the skin, protected by longer, smoother and stiffer hairs which grow up through these and are known as guard-hair or over-hair.

The greater number of species of fur-bearing mammals belong to the Carnivora, Rodentia, Ungulata and Marsupialia. The more important Carnivora are bears, cats, ermines, fishers, fitch, foxes, fur-seals, hair-seals, kolinskis, leopards, lions, lynxes, martens, minks, ocelots, otters, raccoons, sables, skunks, tigers, weasels, wolverines and wolves. The Rodentia include beavers, chinchillas, hamsters, hares, marmots, muskrats, nutrias, rabbits and squirrels The Ungulata provide antelopes, goats, ponies and sheep, and the Marsupialia kangaroos, opossums and wallabies. A few skins of moles and other Insectivora and other varieties are used, but are not very important; and even primates, such as the capuchin monkey, are used for trimmings.

Effects of the Fur Trade.—The modern fashion for furs, which has caused an intensive combing of remote parts of the world for the skins of any mammal suitable for the fur trade, has not been purely arbitrary and artificial. Furs give the maximum warmth with the minimum weight, being surpassed by no artificial or synthetic production. The extensive use of cheaper furs has placed fur wearing apparel within the reach of many who could not formerly afford it. The demands of the fur trade, and the constant pushing out for new sources of supply, have been a compelling influence in the exploration and development of the great northern areas in both hemispheres.

The great revival of the fur trade, beginning at the time of the World War, has led to the extension of new posts at various points along the arctic coasts and islands, the principal incentive being the skin of the white or arctic fox, once little valued, but now one of the prizes of the fur trade. The recent influx of white trappers and traders, into regions inhabited by tribes of primitive Eskimos hitherto barely in touch with civilization, has rapidly reduced the big game and food supply and dislocated the whole mode of life of the indigenous population in a way comparable to the changes produced on Indian life by the destruction of the beaver and the buffalo in earlier times, but on a vastly more rapid scale. The white trapper takes more fur out of a given virgin section than the native does, because first, he uses more efficient traps; second, he is a transient and gets while the getting is good; and third, he



BY COURTESY OF THE WELL TREISTER COMPANY INC

VARIETIES OF FUR

1 Beaver, a rich, soft fur, used in its natural colour
2 Leopard The best is Simolian leopard (African), a deep soft fur
3 Hudson seal (muskrat, plucked, sheared and dyed black)
4. Natural American raccoon, a fur extensively used undyed
5 Alaska seal This fur is always plucked and dyed before use
6 Natural wolverine, a strong, coarse, brown-striped fur
7 Russian pony, pelt of a Russian colt with fairly thick, furry coat
8. American broadtail, "processed" lamb

ometimes resorts to poisons which are very destructive of wild life. The native does not trap more than enough to supply his imited wants and he uses home-made traps. Other reasons for the lecline of wild life are the draining of swamps, deforestation by ire, which takes its toll of animal life, and the necessity for vermin nd predatory animal control by the farmers.

The enormous and increasing pursuit of valuable fur all over the vorld, and the resulting high prices which have virtually become a ounty on the heads of many species, has inevitably resulted in heir decrease and in some cases extinction over much of their ormer range. High prices for fur bring more trappers and fur-raders to the frontiers, thereby reducing the breeding stock and hoking the industry at its source. Some of the greatest operators n the fur industry have come to realize this and have become in-erested in means of conservation, by protecting fur-bearing mam-nals by longer closed seasons, encouraging the establishment of reeding reserves and putting the ban on purchase of furs taken t wrong seasons.

The decrease in the supply of rare furs has increased the demand or inferior furs and for skins formerly not regarded as fur. These re plucked, sheared and dyed to improve their appearance. Ex-ert research chemists are employed to evolve new methods of reating skins and furs, and have produced results which defy all ut experts.

With the rapid increase of the world's population, the area which an be devoted to wild-fur production is becoming smaller. Experi-ients in fur-farming (*q v.*) have been carried on for many years. lthough it is well known that many species can be raised success-ully in captivity, others are not so adaptable For long the only eally extensive development was in the rearing of silver or black oxes, colour phases of the common red fox, but numerous other pecies are also reared in this way

From an early date, Canada has been one of the world's greatest ur-producers In 1680 Charles II of England granted to Prince Rupert and his associates of "The Honourable Governor and Company of Gentlemen Adventurers of England trading into Hud-on's Bay" a charter giving practical monopoly and control over hat is now the northern part of the Dominion of Canada, long nown in literature as the "Fur Countries" This control was ex-rcised by "The Company" until many of its rights were relin-uished at the time of confederation in 1867 The Hudson's Bay Company is still the largest fur-trading establishment in Canada, lthough other companies and individuals are equally free to trade The most highly prized furs are the various kinds of foxes (the hite arctic fox and its colour phase the "blue" fox, and the coloured" foxes, red, cross, silver and black), marten, fisher, eaver, otter, mink and ermine, although the humbler furs, as uskrat, lynx, skunk and badger, swell the fur returns, and in umber make a greater aggregate of value than the choicer furs.

Fur-farming has also developed steadily in the United States nd Alaska. The U S. Government has an experimental fur farm t Saratoga, N Y., and a rabbit experimental fur farm at Fontana, California. The department of agriculture of the Dominion of anada also maintains an experimental fox ranch at Summerside, . E. I. At these stations studies have been made of foods and eeding methods, mating with different strains, diseases of foxes nd parasitic infestation which contribute to produce inferior elts. Much work of this character has also been done in Europe, otably by the French Association of Fur Animal Propagation. The scientific branches of the Union of Socialist Soviet Republics ave also given considerable attention to the fur industry which is o important in that country, and have been conducting intensive tudies and experiments in conservation of fur-bearing mammals n European Russia and in Siberia.

Fluctuations and Periodicity.—While sudden fluctuations n prices may temporarily lead to intensive production in certain reas, swelling the figures, there is a normal and fairly regular eriodic fluctuation in the numbers of certain species due to nat-ral causes. The records of the Hudson's Bay Company fur eturns for the past hundred years are particularly suitable for ata on these fluctuations, as the company was not accustomed o stimulate the production of any particular kind of fur, but took the whole product in trade from the natives, and sold all the furs at annual fur-sales in London, without holding furs over from year to year. Records were also kept showing the periodic increase and decrease of other forms of wild life, as these keenly affected the life of the Indians and other inhabitants of the north, and directly affected the output of furs. In many districts the Indians starved during bad rabbit years, and were unable to trap to advantage during the fur season, while carnivorous mammals which fed on the rabbits diminished in proportion to the rabbits. Hewitt quotes the periods of maximum abundance of the rabbit, according to the Hudson's Bay Company's returns: 1845, 1854, 1857, 1865, 1877, 1888, 1897 and 1905, or in other words in cycles of 9, 3, 8, 12, 11, 9 and 8, giving an average periodic cycle of 8·5 years, which is not far from the popular belief in a seven-year cycle for this animal. For the lynx an average periodic cycle of 9·5 years is given, the lynx becoming most abundant from the year of rabbit abundance to three and four years later. Foxes show a periodic cycle of about 9 5 years, marten of 9·5 years, fisher and mink of 9 7 years each. Wolves and muskrats, which have a wider range of food supply, show slight and irregular periodic fluctuations in numbers. The ultimate causes of the fluctuations in numbers of these fur-bearers are in many cases obscure or unknown. Some of the rodents, as mice, voles, lemmings and rabbits, are very prolific, and when favoured by a combination of friendly circumstances, such as good climatic conditions, abundant food, and scarcity of natural enemies, increase prodigiously until the overcrowding brings on epidemic disease which reduces the numbers to a minimum Many predatory mammals as fox, lynx and marten subsist largely upon these smaller mammals and the periods of abundance of the carnivores depends more or less closely upon the presence of their favourite prey. Mammals which feed upon a mixed diet of insects, fish and vegetable matter, do not show such extremes of variation in numbers Whether the decrease in numbers of the predatory mammals is due to actual starvation, or whether scarcity of food affects their fertility, and whether overfeeding in times of abundance has an adverse effect, are problems which have not been studied sufficiently. Animals which are not directly important as a source of food supply may serve as hosts for internal parasites which are injurious to the welfare of the more valuable species The problems of wild animal life are so varied and interlocking, that the serious and co-operative studies of zoologists, parasitologists, veterinarians and general ecologists, extending over a period of years, are essential to a thorough elucidation of the questions involved.

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See also FUR, FUR SEALS, FUR FARMING. (R. M. A.)

FURETIÈRE, ANTOINE (1619–1688), French scholar and miscellaneous writer, was born in Paris and became abbé of Chalivoy in the diocese of Bourges His satires—*Nouvelle Allégorique, ou histoire des derniers troubles arrivés au royaume d'éloquence* (1658); *Voyage de Mercure* (1653)—won him admission to the French Academy in 1662. When the academicians heard that Furetière was on the point of issuing a dictionary of

the French language, they interfered, alleging that he had used their information, and that they possessed the exclusive privilege of publishing such a book After much bitter recrimination on both sides the offender was expelled in 1685, but he took his revenge in his satire, *Couches de l'académie* (Amsterdam, 1687) Furetière is best known as the author of *Le Roman bourgeois* (1666, ed Fournier and Arselineau, 1854), which ridiculed the fashionable romances of Mlle de Scudéry and of La Calprenède The author contents himself with stringing together a number of episodes and portraits, obviously drawn from life, without much attempt at sequence His *Dictionnaire universel* was posthumously published in 1690 at Rotterdam

FUR FARMING. The keeping and breeding of animals for their fur is one of the oldest occupations The Chinese have farmed goats and dogs for an unknown number of centuries, using the flesh of the animals as food, and their skins, fur or hair covered, according to species, for the purposes of trade; whilst if one considers the sheep as a fur-bearing animal, the inception of fur farming is lost in the mists of antiquity.

Silver Fox Farming.—The growth of this industry, in the modern sense, is due to the practice of a few Canadian trappers of keeping silver foxes, caught out of season and consequently with inferior coats, until their fur became what is known as "prime", *i e*, at its best and fullest This practice, which was carried on in secret and known only to a few, was the means of bringing considerable wealth to the trappers, as the value of a "prime" skin is enhanced out of all proportion to a badly furred specimen The knowledge that men were making fortunes by fox farming gradually spread, and when in the year 1900 a single "farmed" skin fetched £580 at the London Fur Auction Sales, it was recognized that the potentialities of this undertaking were very great indeed Since the pioneers of the industry, Sir Chas Dalton and Mr R T Oulton, first demonstrated the financial possibilities resultant from breeding foxes in captivity, 25 years ago, the industry has made such strides that the Canadian Department of Agriculture have taken it up and have undertaken to operate an experimental farm, established by the Canadian National Silver Fox Breeders Association, at Summerside, Prince Edward Island, there they have constructed a laboratory and installed a staff of veterinary surgeons and chemists with the one view of fostering the industry

The expansion of fox farming really began in 1910; up to this time the idea of the farmers was to sell the skins (known as pelts) only, but such a demand was established for foxes for breeding purposes that in 1911 all available silver foxes were sold alive The cost of a pair of foxes rose from $3,000 in 1910 to $20,000 and even $35,000 in 1913, and extensive gambling took place—even to options on unborn pups! This phase of trade was stopped by the World War; thereafter speculation gave place to solidity and the industry in 1927 was firmly established

The pioneers of fox farming thought at first that conditions approximating as closely as possible to nature, *i e*, large open spaces, would produce the best results, but experiments have proved that pairs of foxes can be successfully kept in pens, with an area of not less than 700 sq ft, always provided that the animals have a kennel to which they can retire

A fox farm consists, then, of a number of wire breeding pens, with a kennel in each, size approximately 35ft x 25ft, with 6ft. between each enclosure, a broad alley, large enough for a cart to pass through, between each double row of pens, a certain quantity of trees and shrubs to afford the animals shelter and seclusion, small portable pens, size 6ft x 6ft x 15ft, each with kennel for transport of the males, storehouses and an isolation hospital the whole (with the exception of the hospital, certainly, and the storehouses, preferably) surrounded by a wire fence

The wire used should be 14 gauge with a mesh of 2in., the outer fence firmly erected, should be 10ft. in height, with a further 2ft sunk in the ground projecting inwards, to prevent the animals burrowing under it, and another 2ft at the top, also extending inwards, to prevent climbing over. This outer fence should be from 25ft to 30ft from the pens There are two most important points to be borne in mind to make a success of fox farming; they are seclusion and sanitation

Seclusion.—The fox is an extraordinarily shy animal, and it is useless to hope for good results if disturbing influences are allowed to bear upon the animals The kennels therefore should have a right-angled entrance, to exclude light, and should consist of a compartment within a compartment; the inner chamber is termed a den and must be so constructed that it can easily be removed for cleansing purposes The den should be 20in square, the outer kennel 2½ft x 5ft, the roof should slope and a ventilation hole 4in square must be cut at either end The inside must be sandpapered smooth to prevent damage to the fur

The farm should be kept as quiet and secluded as possible; anything that tends to irritate the animals, strange faces for instance, should be rigorously excluded, and no farmer should allow strangers in or about the farm between January and June.

Sanitation.—Foxes in the wild state range over an extremely wide area and therefore have not the same chance of coming in contact with the secretions or excretions of other foxes as when penned up in a small enclosure These enclosures therefore must be kept scrupulously clean The sweepings must be burnt, the kennels washed with soap and water and then disinfected, whilst the ground is best sterilized by being scorched

Disease breaking out amongst such valuable animals is a serious matter and extra care in sanitary matters is repaid a thousand-fold Feed pans should be removed after each meal, and both these and water pans should be frequently cleansed in boiling water. foxes have the unpleasant habit of soiling their food and water vessels, and on the principle that prevention is better than cure, it should be put out of their power to do so

Foxes, except during the mating season, do not fight to any extent when in the same enclosure, but if one is removed to an adjacent pen, then trouble begins and the animals try to get at one another through the wires—hence the reason for having the pens 6ft apart

In the wild state the fox is monogamous, but in confinement the male should be removed from the female after mating, as his presence seems to excite the female when she is in pup, with resultant bad effects on the young

In captivity a single male has been successfully mated with four females The mating season is in February and March and the period of gestation about 51 days When the pups are weaned, *i e.*, when two months old, they should be taken from the mother.

The fox resembles the dog in being omnivorous, so that an entirely meat diet is as unfit for the one animal as it is for the other. A quarter pound of meat, bones to gnaw and the vegetable scraps that one gives to a dog, make an ideal diet for the fox The daily ration of a 12lb fox should equal 533 calories (heat units), and summer and winter diets approximating this value are appended herewith.

Summer Diet		
Lean meat or offal	4¾oz	= 133cal
Cereals, cooked (dry weight)....	2⅝oz	= 266cal
Milk	⅓pint	= 132cal
		531cal
Winter Diet		
Fat meat or offal	6½oz	= 267cal.
Fox biscuits	1⅓oz.	= 133cal.
Milk	⅓pint	= 132cal
		532cal.

Milk should be included in the daily ration throughout the year.

A good deal of space has been devoted to silver fox farming, as this branch of the industry is most efficiently organized both in Canada and in Great Britain; the controlling British society is known as the Silver Fox Breeders' Association of Great Britain, and at the second exhibition held at the Crystal Palace in 1927, 89 British-bred foxes were shown.

Other Fur Farms.—In addition to silver fox farms, of which there were 2,517 in Canada on Dec. 30, 1926, there were also 95 mink, 57 raccoon and 43 of various other animals. The industry is also carried on in the United States and farms for mink,

raccoon, skunk, musquash, beaver, deer, blue and silver fox have been established, whilst chinchillas are farmed in the Andes

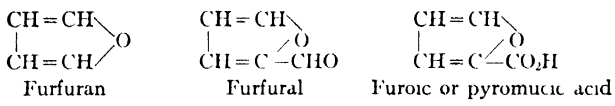
Mention must also be made of the farming of rabbits in Great Britain The controlling organization, known as the Fur Board (Ltd) has been in existence for eight years, has a membership of 1,700 and an output of 45,000 pelts. The skunk and pine marten are also farmed in Great Britain, whilst in certain parts of the country are what may be termed mole farms, *i e*, the ground is not cultivated in any way, but a highly lucrative crop of moles is annually gathered

See W Brumwell, *The Chinchilla Rabbit—Its Culture for Profit* (Watmoughs, Ltd., I lle, Bradford), a full description (popular style) of this branch of fur farming J C Sachs, *Furs and the Fur Trade* (2nd ed 1927) (Pitmans) written in popular style. R G Hodgson, *Raising Beaver* (1924), *Successful Muskrat Farming* (1925)

(J. C. S)

FURFOOZ, a village some 10 m from Dinant in the Ardennes, Belgium Three caves containing prehistoric remains were here excavated in 1872 Of these the *Trou du Frontal* is the most famous In it were found human skeletons with brachycephalic skulls, associated with animal bones, those of the reindeer being particularly plentiful People with anthropological characters, similar to the skulls found at Furfooz, seem to have arrived in central Europe soon after the Ice Age They spread along the Alpine region and adopted the culture of Azilian-Tardenasian folk.

FURFURAN or **FURAN** (Tetrol, tetraphenol), a colourless liquid boiling at 31°/750 mm , slightly soluble in water but miscible in all proportions with alcohol or ether Its specific gravity is 0 9444 at 15° C It occurs in the most volatile portions of pine-wood tar and is prepared synthetically by heating pyromucic or furoic acid at 260–275° C, by the dry distillation of barium or calcium pyromucate (furoate), and by digesting succinic dialdehyde with water at 180° C Furfuran develops an emerald-green coloration on a chip of pine wood moistened with hydrochloric acid It is regarded chemically as a cyclic compound containing four carbon atoms and one oxygen atom



Furfuran Furfural Furoic or pyromucic acid

Furfurol (furfuraldehyde, furfural, or furol), the most important derivative in the furan series, is a colourless liquid which turns brown when exposed to air and light, it boils at 161 7°/ C760 mm , freezes at −36 5° C, its specific gravity is 1 1598 at 20° C It dissolves in water to the extent of 8 3% at 20° C and is also soluble in alcohol and ether. Furfural is obtained from bran, corn cobs, gums, jute, oatmeal, oat hulls and straw when these materials are digested with dilute mineral acids and the consequent mixture is distilled An effective procedure for the manufacture of furfural has been developed Oat hulls, obtainable throughout the year in large quantities (200 ton lots), are subjected to the action of steam and acid in large rotary digesters. The distillate from these digesters has a relatively high furfural content, and is neutralized with lime and distilled in a fractionating still; furfural of 95% purity is thus separated and is refined by further rectification at 160° C. Technical furfural of 98–99% purity is now marketed in considerable quantities Its presence in beer or spirits is detected by the cherry-red coloration developed with aniline acetate or hydrochloride.

Resinous materials are produced by condensing furfural with phenols or aromatic amines A wide variety of moulded products are manufactured from furfural-phenol resins. Furfural and its organic derivatives are solvents for cellulose esters and ethers, and are applicable to the preparation of cellulose ester plastics. Furfural has been used as a substitute for turpentine in varnish manufacture and as a solvent in the lacquer industry. Hydrofuramide ("vulcazol"), the condensation product of furfural and ammonia, is an active indiarubber accelerator. Furfural exhibits the characteristic properties of aldehydes (*q v.*) forming a bisulphite compound, an oxime, and a hydrazone With potassium cyanide furfural polymerizes to furoin (m.p. 135° C), and with aqueous alkali it yields furfuryl alcohol and *furoic acid.* The latter compound, which is also termed pyromucic acid, is prepared either by the dry distillation of mucic acid (*q v*) or by mild oxidation of furfural It is a tasteless, inodorous solid melting at 132° C and has useful germicidal properties Ethyl furoate is a solid melting at 34° C The other esters, including furyl furoate, are fragrant oily liquids useful as solvents for cellulose esters and for paints and varnishes Electrolytic oxidation of furfural leads successively to furoic acid and then to maleic and succinic acids (*E P* , 253, 877)

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FURFUROL, an organic colourless, aromatic, volatile inflammable, oily liquid, which turns brown on exposure to the air ($C_5H_4O_2$ or C_4H_3O CHO) It is obtained by distilling wood, sugar or bran with moderately-concentrated sulphuric acid That it belongs to the general class of aldehydes (*q v*) and is a derivative of furan C_4H_4O, is shown from its structural formula C_4H_3O CHO It is also made from corn cobs, oatmeal, oat hulls, straw, jute and certain gums It can be used as a motor fuel, is used in the lacquer industry and is employed to some extent as a dye base Some of its derivatives are used as accelerators in the manufacture of rubber (*q v*) Recently, furfurol has found extensive use in the manufacture of synthetic resins and moulding compounds, in the preparation of disinfectants and deodorizers, in light-sensitive printing plates, and as a preventive of fermentation in glue and in dextrin paste

FURIES, the Latin translation of Gr Erinyes (*q v*), corresponding to no native idea The resemblance of name caused occasional confusion with the very ancient, but obscure Roman goddess Furrina, worshipped on the Janiculum, whose functions and the derivation of whose name are unknown.

FURLONG, a measure of length, originally the length of a furrow in the "common field" system (from the O. Eng. *furlang, i e*, "furrow-long") (*see* CULTIVATION, LAND TENURE). As the field in this system was generally taken to be a square, 10 acres in extent, and as the acre varied in different districts and at different times, the "furlong" also varied The side of a square containing 10 statute acres is 220 yd or 40 poles, which was the usually accepted length of the furlong. This is also the length of $\frac{1}{8}$ of the statute mile "Furlong" was as early as the 9th century used to translate the Latin *stadium,* $\frac{1}{8}$ of the Roman mile

FURNACE, ELECTRIC: *see* ELECTRIC FURNACE

FURNACE, METALLURGICAL. A contrivance in which metallurgical operations are carried out under the influence of heat derived either from the combustion of fuel or from the heating effect of the electric current The temperature of the furnace may be high as in the case of the open-hearth furnace used in the manufacture of steel, or low, as in several types of calcining kilns, without affecting the accuracy of the definition.

Furnaces vary very much in shape and size and in the complexity of their internal arrangements, but all, with the exception of the electric furnace, consist of two essential parts (a) the fire-box in which the fuel is burnt and (b) the hearth or laboratory in which the actual metallurgical operation is carried out The air necessary for the combustion of the fuel may be introduced under pressure from a fan or some form of blowing engine (in which case the furnace is described as working under forced draught), or it may be drawn into the furnace by a chimney, when the furnace is said to be working under natural draught. All furnaces are equipped with some type of chimney even when it is not used as a draught producer, by which to remove the products of combustion of the fuel and the waste gases from any reaction taking place in the hearth of the furnace In many cases the fuel, instead of being burned in the fire-box of the furnace, is converted into gas in a separate piece of apparatus called a gas-producer and delivered to the furnace in the gaseous state, an arrangement permitting of greater control of combustion.

The classification of furnaces is very difficult, on account of the large number of forms in use and the looseness of the terms used in their description; perhaps the most satisfactory method is to

arrange them, according to the manner in which the charge is heated, in three main groups —(1) Those in which the fuel and substance to be heated are in contact, (2) reverberatory furnaces or those where the substance heated is in contact with the products of combustion but not with the fuel itself, (3) those in which the substance heated is not in contact either with the fuel or with the products of combustion, these being again subdivided as follows

(1a) Shaft furnaces where the height is considerably greater than the diameter
(1b) Hearth furnaces where the height is only a little greater than the diameter
(2a) Roasting and calcining furnaces where the charge is not melted.
(2b) Melting furnaces
(3a) Muffle furnaces, where the heating chamber is fixed and forms part of the furnace structure
(3b) Crucible furnaces, where the heating chamber is moveable and independent of the furnace structure
(3c) Retort furnaces, in which the materials are volatilized and afterwards condensed.

Shaft Furnaces.—It is necessary to subdivide these again into (a) kilns or natural draught furnaces and (b) blast or forced draught furnaces

Shaft furnaces are of very ancient origin, remains in the form of blast pipes have been found in many parts of the world, and native iron-workers in India still use primitive structures of this type In all members of this group the fire-box and hearth are combined to form a single chamber into which the fuel and material to be heated are charged

Kilns.—These are used in cases where a high temperature is not necessary and where the products of the operation are not required in the molten state, as in lime burning and in the calcination of ores Their forms vary according to the specific purpose of which they are to be used, but the vertical shaft is common to all Internally the shaft may have parallel sides, or sides which gradually approach each other in the form of an inverted cone, in cross section they may be circular, elliptical or rectangular The best example of this class of furnace is to be found in the large kilns used in the calcination of iron ores, and of these the Gjers kiln, used extensively in the Cleveland district, may be cited The body consists of a cylindrical shell of wrought iron lined with fire brick and standing on an iron ring supported by cast iron pillars, thus leaving an open space between the bottom of the shell and the floor upon which it stands The furnace is continuous in action, the mixture of ore and fuel being fed in at the top and withdrawn at the bottom, in order to cause the calcined material to pass outwards a cast iron cone is placed on the centre of the floor plates supporting the body of the furnace The bottom of the furnace instead of being open, as in the example just described, may be closed with a step grate and the calcined material withdrawn below the level of the grate

Blast Furnaces.—This type of furnace (*see* illustration under BLAST FURNACE) is extensively used in the smelting of iron, copper and lead ores In general form it resembles a kiln, but differs from it in several details The air is forced into it under pressure, and the charge is tapped in the liquid condition In size and form it varies from the large iron smelting furnace to the small furnace used in lead smelting The early furnace was generally rectangular in section, but this in time, so far as iron smelting is concerned, gave place to a circular one, though the rectangular form is still retained in copper and lead smelting The vertical section on the other hand is subject to considerable variation and is dependent on the nature of the operation carried out in the furnace, if simple fusion is the object as in the foundry cupola the internal cross-section is only slightly smaller at the bottom than at the top, but in ore smelting, where there is a considerable change in volume of the charge as it descends in the furnace, the sides slope inwards towards the bottom of the furnace and generally terminate in a small parallel portion of very much smaller cross-section than the upper part of the furnace In this part called the "well" the reduced metal collects and is tapped off at intervals For further information on this subject *see* IRON, LEAD and COPPER

Hearths.—These resemble blast furnaces in that the air supply is under pressure, and that the fuel and substance to be heated are in contact, but differ from them, as has been stated, in the relation between the height and width, the height in the case of hearth furnaces being not much greater than the width. In general they consist of a shallow chamber lined with refractory or other material unacted upon by the products of the operation; the blast is introduced through one or more twyers or nozzles and impinges either downwards on the charge or in a horizontal direction just under it On account of the method of introducing the blast the atmosphere of the furnace can be made oxidizing or reducing at will, a factor which enables it to be used in a variety of operations Examples of its use under oxidizing conditions are to be found in the Yorkshire Refinery and the Walloon Hearth used in the refining of pig-iron and the production of wrought iron respectively, under reducing conditions in the Catalan Forge which is used for the manufacture of wrought iron direct from the ore, and under combined reducing and oxidizing conditions in the Scotch Hearth for the reduction of lead from galena A familiar example of this type of furnace is also found in the smith's hearth

Reverberatory Furnaces.—Furnaces of this type are very much used in metallurgy and in principle are entirely different from those already described The fuel is burnt in a separate chamber and the hot products of combustion led through another, called the hearth, in which the material to be heated is placed, passing from this to the chimney Between the fire-box and the hearth and again between the hearth and chimney are brickwork ridges called respectively the fire and flue bridges An arched roof covers the whole and is highest over the fire-box end, from there sloping gradually downwards towards the flue bridge, so that the flame may be deflected or reverberated towards the hearth—hence the name The weight of the roof exerts considerable pressure on the side walls, tending to push them outwards, to counteract this it is usual to bind the furnace together with stout iron rods and plates, so arranged that they can be easily adjusted to allow for the expansion of the brickwork as the furnace heats up The hearth is usually carried on a brickwork arch forming a vault under the furnace, but this procedure is sometimes departed from according to the particular process in operation Working doors are provided in the sides or at the ends of the furnace, when the doors are in the sides, the fire-box or boxes and the chimney flues are arranged at the ends, and vice versa, the latter arrangement being very common in the large calciners and roasting furnaces used in non-ferrous metallurgy

Reverberatory furnaces are of two types, according as they are required for low or high temperature operations, in the former case the ratio of the area of the hearth to that of the fire-box is greater than in the latter

Calcining and Roasting Furnaces.—In these the hearth is made of fire-brick set in fire-clay, and is on the same level as the door sills, in order to facilitate the removal of the charge, which is not molten and therefore has to be raked out If noxious gases are given off from the material under treatment a slot is often left in the furnace hearth just inside the doors through which the charge can be raked into the vault below the furnace and there allowed to cool The hearth must not be longer than can be uniformly heated by the flame which fixes it at about 20 ft , the width is usually not greater than 10 ft as the charge has to be turned over continuously and this is about the greatest width which a workman can handle with a rabble The charge may be introduced through the working doors or it may be admitted through hoppers placed in the roof of the furnace. The furnace just described is a simple single hearthed one, but more complex forms are common in which use is made of more than one hearth in the same furnace; these may be placed in line, each hearth being raised a few inches above the succeeding one and the charge raked from one to the other as the operation proceeds, or they may be arranged one above the other the charge being raked through a hole in the upper hearth on to the one immediately below until it finally arrives at the bottom hearth of the furnace. As has been already stated the ore under treatment has to be continuously turned over, and various successful attempts have been made to accomplish this mechanically Thus there are very long calcining furnaces of the O'Hara type in which the ore is turned over and

drawn along the hearth by mechanical rabbles, or the hearth instead of being in a straight line may be curved to form part of a circle as in the Pearce and Brown Horseshoe calciners; again, instead of using rabbles the hearth of the furnace may be made to move as in the Bruckner Cylinder. In this modification of the reverberatory furnace the hearth portion consists of a horizontal iron cylinder lined with fire-brick and resting on rollers. The ore is introduced through doors in the side of the cylinder which are afterwards closed and the cylinder slowly rotated For further information on these mechanical furnaces the reader is referred to COPPER; ZINC and LEAD.

Melting Furnaces.—When designed for melting the furnace arrangement is somewhat different from that already described; the hearth instead of being level and made of fire-brick set in fire-clay is basin shaped, so that the molten charge may collect together and be easily tapped out through an opening in the front wall called the tap-hole The hearth is roughly shaped in fire-brick and over this is laid the working bottom of slag or other refractory material, which must be unacted upon by the molten material in the furnace The tap-hole is kept closed with easily removable material, until it is time to tap the furnace, when it is opened with a pointed bar and the charge run out into a ladle or other receptacle It is necessary in order to preserve the hearth to keep it as cool as possible, and this is accomplished by allowing free circulation of air under it The fire is usually fed from the side and should not be more than 6 ft from front to back, otherwise it will be impossible to distribute the fuel by hand The ratio of the area of the fire-box to that of the hearth varies considerably and is dependent on the temperature required in the furnace Thus in the puddling furnace where a very high temperature is required, the ratio may be as high as 1 2 or 3, whereas in the case of calciners it may be of the order of 1 ·13

It is clear that in the reverberatory furnace the heating effect is entirely due to the flame from the burning fuel and the heated products of combustion; it is therefore necessary to have a flame with a high radiative power, and in this respect the luminous flame from burning coal is probably the most satisfactory A very hot non-luminous flame could be produced from a deep bed of burning coke in the fire-box, but this flame on account of its want of luminosity has very little power of radiation and is on this account very inefficient The most suitable coal for use in this class of furnace is one with moderate caking power and yielding a considerable quantity of gas on distillation thus producing a large luminous flame through the hearth of the furnace.

A very important feature of the reverberatory furnace is its great adaptability, the atmosphere can be made oxidizing or reducing at will If a large excess of air is admitted over the fuel, combustion will be complete and the atmosphere in the furnace strongly oxidizing; on the other hand if the amount of air passing through the furnace is restricted, combustion will be incomplete and the atmosphere in consequence reducing

Another type of furnace belonging to this group is the Steteveldt furnace used in the chloridizing roasting of silver ores. It consists of a vertical shaft kept hot by fires arranged around the bottom; the ore mixed with salt is admitted at the top and allowed to fall down the shaft, and as it is in the form of a sulphide no extra fuel is necessary. The roasting takes place under the influence of the hot products of combustion from the fires at the base as the ore falls down, and the treated ore collects in a hopper at the bottom from which it is withdrawn when cold. (*See* SILVER.)

Muffle, Crucible and Retort Furnaces.—This group is composed of the closed vessel type of furnace, in which the material to be heated is separated from the fuel and from the products of combustion by some form of envelope or closed vessel. The confining vessel is heated either by being placed in the fire or by the flame produced by the burning fuel, the form of the vessel being governed by the nature of the process about to be carried out. If the material undergoing treatment has only to be protected from the products of combustion, and dust carried mechanically by the draught, a muffle furnace is used. This consists of a chamber of brickwork or other suitable material, heated by a fire placed under it, or by the circulation round it of the products of combustion. If actual melting is the object, then a crucible furnace is employed, the material to be melted is placed in a crucible, which in turn is placed in a deep fire and completely surrounded by the burning fuel until the charge is melted, when the crucible is withdrawn from the furnace and the charge poured into a mould of some form or other, as in the manufacture of crucible steel and many other metallic alloys Retort furnaces are used when the charge has to be distilled or sublimed as in the metallurgy of mercury and zinc The best example of this type of furnace is to be found in the Belgian furnace for the reduction of zinc In this the ore to be reduced is placed in fireclay retorts fitted with clay condensers, in which the zinc vapour condenses, any vapour passing out of the condensers being caught in a wrought iron tubular extension to the retort The retorts are arranged in rows in the upper portion of a vertical arched chamber with a fireplace at the base. Furnaces of this type may contain as many as 300 to 400 retorts.

Another type of furnace, not included in the above classification and hence forming a class by itself, is the Bessemer converter, which although it is in principle a blast furnace differs from the type in that it is capable of rotation about a horizontal axis, and also in the fact that the charge is introduced in the liquid condition The heat necessary for the maintenance of the liquid state is derived from the oxidation of certain unwanted elements in the charge, brought about by a powerful stream of air introduced through the side or bottom of the converter This type of furnace is extensively used in the metallurgy of steel and copper (*see* BESSEMER STEEL)

In metallurgical furnaces the greater part of the heat given out by the burning fuel escapes through the chimney, and considerable economies can be effected by using the waste heat for steam raising (by passing the escaping gases through waste heat boilers), or for raising the temperature of the air supply to the furnace The calorific intensity of fuel is very much increased if the air used in burning it has been previously heated, and especially is this the case if the fuel is gaseous.

Two types of recuperators are in general use. The first consists of two chambers filled with brick-work arranged in such a way that the hot gases can circulate freely between the bricks; one of these chambers is fitted in between the out-going end of the furnace and the chimney, the other between the air supply and the fire-grate When the first mentioned chamber has attained a temperature approximating to that of the waste gases it is switched round by a suitable arrangement of valves into the second place, and these reversals are made at such intervals that a steady supply of heated air is maintained for burning the fuel In the second type of recuperator the hot gases from the furnace are made to circulate round pipes which supply air to the fire-grate.

Materials of Furnace Construction.—For the construction of the external portions of furnaces ordinary building materials such as red bricks may be used, but in those parts which are exposed to a high temperature and to the scouring action of slags special materials, capable of withstanding their destructive action, must be employed. These substances, generally described as refractory materials, are divided into three classes—Acid, Neutral and Basic, according to their chemical properties *Acid materials* contain a considerable proportion of silica, and combine readily with basic oxides. Amongst them may be mentioned: flint, ganister, sand, Dinas rock and practically all fire-clays; *Neutral materials* are those in which the acid and basic properties are so balanced that there is little tendency to combine either with basic oxides or silica The most important members of this group are graphite and chromite, while in *basic materials* silica is practically absent and the basic power of the oxides predominant These resist the action of metallic oxides but are readily attacked by silica at high temperatures.

The principles underlying the use of refractories in furnace construction are most clearly exemplified in the open-hearth furnace This is used in the manufacture of steel by the Acid and Basic processes; in the former method the slags produced are very siliceous and would readily attack any basic material with which

they came in contact, in consequence the hearth and banks of the furnace, which do come in contact with the slag must be made of material unattacked under these conditions, viz, siliceous sand fritted together under the intense heat of the furnace In the Basic process the slag is very largely composed of calcium silicates and phosphates carrying large proportions of lime, it is very basic and would rapidly destroy any siliceous matter, hence in this case the hearth and banks must be made of basic material, calcined dolomite being that most generally employed The roof and ports of the furnace which have to withstand high temperature only, are always built of silica brick whether the furnace is acid or basic, but in the construction of the side walls not only the high temperature but the fluxing action of the slag has to be taken into consideration In the Acid process, where the slag is siliceous, side walls must be siliceous also, otherwise serious fluxing will take place which in a very short time will bring about the collapse of the inside walls of the furnace, and for the same reason a basic furnace must have side walls of basic material

The roof as has already been mentioned is always constructed with silica bricks and precautions must be taken in the case of basic furnaces to prevent fluxing at the joint between the roof and side walls Formerly this was done by interposing a course of chromite bricks between them, but later it was discovered that the same result could be achieved by relieving the pressure on the joint, and this latter course is the one most usually followed Refractory materials, according to the part they are to play in furnace construction, may be used in their natural condition or in the form of bricks, in the latter case it is often necessary to add some foreign body to act as a binder, many of the basic refractory materials having little or no binding power

Of the acid materials fire-clay is by far the most important, it is essentially a hydrated silicate of alumina containing an excess of silica and small quantities of lime, soda, potash and oxide of iron The latter elements, with the exception of oxide of iron, when present in quantities greater than a few tenths of 1%, reduce the refractory properties of the clay and render it unsuitable for use at high temperatures The effect of oxide of iron is variable and depends on the conditions prevailing in the furnace If the atmosphere is oxidizing it is converted into ferric oxide, in which form it has no tendency to form a silicate, but if the atmosphere is reducing the ferric oxide is reduced to the ferrous state and this readily combines with silica to form a very fusible slag Fire-clay readily absorbs water and becomes very plastic, in which form it can be moulded into any desired shape, on burning it contracts considerably, and this contraction, though not serious in the case of small bricks, has to be provided against when large slabs are being made This is done by adding a proportion of burnt clay

Ganister, an argillaceous sandstone, is also largely used for lining Bessemer converters When made into bricks the clayey matter, naturally present, is sufficient to act as a binder Ganister bricks are largely used on account of their strength and very refractory nature Some materials containing even more silica than ganister are used for the manufacture of silica bricks When employed in this way they are generally mixed with about 1% of lime as binding material, since they have no cohesive power of their own Among such materials may be mentioned Dinas rock, calcined flints and white sand Silica bricks are weak and friable but capable of withstanding very high temperatures, hence their exclusive use for the roofs of open-hearth furnaces As they expand very much on heating provision must be made to take up this expansion as the furnace heats up Of the neutral materials graphite and chromite are the most frequently used Graphite, which is almost pure carbon, is used with an admixture of clay in the manufacture of crucibles Chromite, a very infusible double oxide of chromium and iron, is mainly used in the form of bricks

Most important amongst the basic refractories are lime, dolomite, magnesite and bauxite Lime is an exceedingly refractory substance, but it has little binding power and readily absorbs water, and its place in furnace construction has been taken by dolomite, a carbonate of lime and magnesia of varying composition For furnace construction it ought not to contain less than 20% magnesia and not more than about 4% ferric oxide and alumina It is first calcined at a high temperature to expel carbon dioxide and render it less liable to deteriorate on exposure to air. It may be used either in the rough ground condition or in the form of bricks, in the former case it is mixed with a small amount of tar, rammed and burnt in position; in the latter, after mixing with tar, it is moulded into bricks under hydraulic pressure and after careful drying fired at a high temperature

Magnesite, a naturally occurring carbonate of magnesia, is used chiefly in the form of bricks, for this purpose it is first calcined at a very high temperature, withdrawn from the calciner, watered, and allowed to weather for a few days; after this it is ground, mixed with tar and moulded into bricks under pressure, then after very slow drying for some weeks these are fired again at a very high temperature The bricks are generally chocolate coloured, on account of the presence of a small amount of oxide of iron which is just sufficient to cause the brick to bind without the addition of any extraneous substance

Bauxite is a hydrated double oxide of iron and alumina, though some samples contain very little iron, when calcined it shrinks considerably, and in this form, after admixture with small percentages of fire-clay, sodium silicate or lime, can be made into bricks Well made bauxite bricks are more refractory than those made of magnesite but do not appear to have come into general use, as yet, for lining open-hearth furnaces

Laboratory and Portable Furnaces.—Most laboratory furnaces now use gas, oil or electricity as the heating medium and the furnaces themselves are small copies of the muffle, tube and crucible types Small portable assay furnaces using coke or coal, and arranged so that they can be used either as muffle or crucible furnaces, are frequently used in places where other methods of heating are not available as in prospecting

In this article only the general principles of furnace construction have been treated Another basis of classification would have been according to the nature of the fuel employed—solid, liquid or gaseous—but this was avoided as being likely to cause confusion, since any one of the furnaces can often be fired by all three kinds of fuel (*see* FUEL) For the electric and open-hearth furnaces, see the articles on these subjects

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(T BA)

FURNARIIDAE: *see* OVENBIRD

FURNEAUX, TOBIAS (1735–1781), English navigator, was born at Swilly, near Plymouth He entered the royal navy, and was employed on the French and African coasts and in the West Indies during the latter part of the Seven Years' War (1760–63) He served as second lieutenant of the "Dolphin" on her voyage round the globe (Aug 1766–May 1768), and commanded the "Adventure" which accompanied Captain Cook on his second voyage On this expedition Furneaux was twice separated from his leader (Feb 8–May 19, 1773; Oct 22, 1773–July 14, 1774, the date of his return to England) On the former occasion he explored a great part of the south and east coasts of Tasmania, and made the earliest British chart of the same. Most of his names here survive, Cook, on his third voyage, named after him the islands in Banks strait, opening into Bass's strait, and the group now known as the Low Archipelago. After the "Adventure" was finally separated from the "Resolution" off New Zealand in Oct. 1773, Furneaux returned home alone, bringing with him Omai of Ulaietea. This first South Sea islander seen in the British Isles returned to his home with Cook in 1776–77. Furneaux was made a captain in 1775, and commanded the "Syren" in the British attack of June 28, 1776, upon Charleston, South Carolina. His successful efforts to introduce domestic animals and potatoes into the South Sea islands are worthy of note.

See J. Hawkesworth, *An Account of the Voyages undertaken . . . by Captain Wallis*, etc. (1773); also T. Furneaux's life by Rev. Henry Furneaux in the *Dictionary of National Biography*

FURNES (Flem *Veurne*), an old-fashioned little town amid the dunes near the coast in West Flanders, Belgium, about 26 m S.W. of Bruges. Pop. (1925) 7,900. It is the centre of a considerable area extending to the French frontier, and its market is an important one for the disposal of corn, stock, hops and dairy produce. During the Norman raids Furnes was destroyed, and the present town was built by Baldwin Bras de Fer, first count of Flanders, about the year 870. In the 14th century the barony of Furnes owned 52 rich villages, but these have all disappeared, partly owing to French invasions down to the end of the 18th century, but chiefly through encroachment of the sea followed by accumulation of sand Furnes contains a Grand Place with many curious old houses and the church of St Walburga, which is a fine survival of the 13th century with some older portions Near Furnes on the seashore is the fashionable bathing place called La Panne On the last Sunday in July the fête of Calvary and the Crucifixion is celebrated. Of all popular festivities in Belgium this is the nearest approach to the old Passion play.

FURNESS, HORACE HOWARD (1833–1912), American Shakespearian scholar, was born in Philadelphia on Nov. 2, 1833, the son of William Henry Furness (1802–96), minister of the First Unitarian church in that city He graduated at Harvard in 1854, and was admitted to the bar in 1859, but soon devoted himself to the study of Shakespeare He accumulated a collection of illustrative material of great richness and extent, and brought out in 1871 the first volume of a new Variorum edition, designed to represent and summarize the conclusions of the best authorities in all languages—textual, critical and annotative The volumes appeared as follows *Romeo and Juliet* (1871); *Macbeth* (1873, revised by his son, 1903), *Hamlet* (2 vol, 1877); *King Lear* (1880); *Othello* (1886), *The Merchant of Venice* (1888); *As You Like It* (1890), *The Tempest* (1892); *A Midsummer Night's Dream* (1895), *The Winter's Tale* (1898); *Much Ado about Nothing* (1899), *Twelfth Night* (1901), *Love's Labour's Lost* (1904); *Antony and Cleopatra* (1907) and *Cymbeline* (1913). For his first volumes he made an independent text, but beginning with *Othello* he used the first folio. Few American scholars have shown such single-hearted devotion to a formidable task and few have so brightened erudition with unvarying gentleness, sanity and humour Furness, made doctor by five leading American and foreign universities, was conservative in his methods, but sound in his judgments. He died at Wallingford (Pa.) on Aug. 13, 1912. His wife, Helen Kate Furness (1837–83), compiled *A Concordance to the Poems of Shakespeare* (1874); and his son and namesake (1865–) was a partner in and successor to his father's work

Dr. Furness's *Letters* were edited by his son in 1922. Among the more notable authors of tributes to him were Agnes Repplier (1912), J. J. Jusserand in *With Americans of Past and Present Days* (1916), and F E. Schelling in *The Nation* (vol xcv.).

FURNESS WITHY AND COMPANY LIMITED, a British shipowning and shipbuilding company, dating originally from 1870 and in 1891 registered as Furness Withy and Company, Limited, with a capital of £700,000 The total issued capital at Dec. 1927 was £4,000,000 ordinary shares and £1,500,000 5% preference shares The shipping companies and kindred businesses acquired or controlled include the Houlder group of companies (comprising Houlder Brothers and Company Ltd., the Houlder Line Ltd., the Empire Transport Company Ltd., the British Empire Steam Navigation Company Ltd.), the Prince Line Ltd, the British and Argentine Steam Navigation Company Ltd., and the Furness Houlder Argentine Lines Ltd., which latter two companies, with the Houlder Line Ltd, operate a fleet of fast refrigerator vessels between South America and Europe. The group of undertakings controlled by Furness Withy and Company Ltd. in 1928 comprised some 40 companies, embracing every phase of the shipping business—insurance, finance, shipbuilding, ship-broking, stevedoring, etc.

The company has chiefly operated cargo liners, but after the acquisition of the Warren Line in 1912 the passenger trade between Liverpool, Newfoundland, Nova Scotia and Boston was developed. With the acquisition of the Quebec Steamship Co. in 1920 and the Trinidad Line in the same year the company became interested in the West Indian passenger trade from New York.

In the early days of the World War the company proposed to the Government that they should charter neutral tonnage to supplement British requisitioned ships, for use in essential services The offer was accepted, and the amount of tonnage chartered and managed by Furness Withy in this manner reached enormous proportions, far in excess of anything that was originally contemplated It is stated with authority that over 500 vessels were chartered for Government account and operated in the Allied cause, the turnover in hire money, etc. running into figures exceeding £100,000,000 per annum. Furness Withy owned the first British steamer fitted with triple expansion engines; the first British built sea-going Diesel-engined vessel, and also the first turbine vessel to cross the Atlantic (L C M)

FURNESS, a district of Lancashire, England, separated from the major portion of the county by Morecambe bay It is bounded by Morecambe bay, the Irish sea, the Duddon estuary, Cumberland and Westmorland Its area is about 250 square miles. It forms the greater part of the Lonsdale parliamentary division of Lancashire and contains the parliamentary and county borough of Barrow-in-Furness Except for a coastal strip the surface is almost entirely hilly The northern half is included in the Lake District, and contains such eminences as the Old Man of Coniston and Wetherlam Apart from the Duddon, the principal rivers are the Leven (which drains Windermere) and the Crake (which drains Lake Coniston) They flow into a common estuary in Morecambe bay Several of the place-names are suffixed with that of the district, as Barrow-in-Furness, Dalton-in-Furness, Broughton-in-Furness Between Duddon estuary and Morecambe bay lies Walney island, 8 m in length, and in the shallow strait between it and the mainland are several smaller islands The south-western part of Furness is rich in iron ore (haematite) which has been worked from early times by the British and Romans, and by the monks of Furness abbey and Conishead priory. It was owing to the existence of this ore that Barrow grew up in the 19th century; at first as a port from which the ore was exported to South Wales, while later furnaces were established on the spot The haematite is also worked at Ulverston, Askam, Dalton and elsewhere, but the furnaces now depend in part upon ore imported from Spain. The district is served by the L M S railway passing the watering place of Grange to Ulverston, Dalton and Barrow, with branches to Lake Side, Windermere and Coniston

Furness has an especial interest on account of its famous abbey, the ruins of which, beautifully situated in a wooded valley, are extensive, and mainly of fine transitional Norman and Early English date. The abbey of Furness, otherwise Furdenesia or the further *nese* (promontory), dedicated to St. Mary, was founded, and built of fine red sandstone in 1127, by monks of the Benedictine order of Savigny In 1124, they had settled at Tulketh, near Preston, but migrated in 1127 to Furness In 1148, the brotherhood joined the Cistercian order. Stephen granted to the monks the lordship of Furness, and his charter was confirmed by Henry I, and subsequent kings The abbot's power throughout the lordship was almost absolute; he had a market and fair at Dalton. The abbey became one of the richest in England and was the largest Cistercian foundation in the kingdom At the Dissolution of the monasteries its revenues alone amounted to between £750 and £800 a year. The abbot was one of the 20 Cistercian abbots summoned to the parliament of 1264, but was not cited after 1330 The abbey founded offshoot houses, the most important being Rushen abbey in the Isle of Man. In 1535 the royal commissioners reported four of its inmates including the abbot, for incontinence; in 1536 the abbot was charged with complicity in the Pilgrimage of Grace; and on April 7, 1537, surrendered the abbey to the king. In 1540, the estates and revenues were annexed to the duchy of Lancaster. About James I.'s reign the site and territories were alienated to the Prestons, from whom they descended to the dukes of Devonshire. Conishead priory, near Ulverston, an Augustinian foundation of the reign of Henry II., has left no remains, but of the priory of Cartmel (1188) the fine

church is still in use It is a cruciform structure of transitional Norman and later dates The chancel contains some superb Jacobean carved oak screens, with stalls of earlier date.

FURNISS, HARRY (1854–1925), British caricaturist and illustrator, was born at Wexford, Ireland, of English and Scottish parents He was educated in Dublin, and in his schooldays edited a *Schoolboy's Punch* in close imitation of the original. He came to London when he was 19, and began to draw for the illustrated papers, being for some years a regular contributor to the *Illustrated London News* His first drawing in *Punch* appeared in 1880, and he joined its staff in 1884 He illustrated Lucy's "Diary of Toby, M.P," in *Punch*, where his political caricatures became a popular feature In *Royal Academy Antics* (1890) he published a volume of caricatures of the work of leading artists He resigned from the staff of *Punch* in 1894, produced for a short time a weekly comic paper *Lika Joko*, and in 1898 began a humorous monthly, *Fair Game*, but these were short-lived Among the numerous books he illustrated were James Payn's *Talk of the Town*, Lewis Carroll's *Sylvie and Bruno*, Gilbert à Beckett's *Comic Blackstone*, G E Farrow's *Wallypug Book*, and his own novel, *Poverty Bay* (1905) *Our Joe, his great Fight* (1903), was a collection of original cartoons. His volume of reminiscences, *Confessions of a Caricaturist* (1901), was followed by *Harry Furniss at Home* (1904). In 1905 he published *How to Draw in Pen and Ink*, and produced the first number of *Harry Furniss's Christmas Annual* Furniss died on Jan 16, 1925.

FURNITURE: *see* INTERIOR DECORATION AND FURNITURE.

FURNITURE MANUFACTURE. Furniture manufacturing is one of the oldest industries. Up to the latter part of the 19th century, the trade was essentially a craft industry. Little of it still survives in that form, even in high-grade work, owing to the introduction of machinery, which is always used for doing the heavier operations of planing and sawing, from the log to the board The extensive use of machinery has enabled furniture to be made at a price to place it within the reach of all classes

The industry is divided into various sections; in many cases individual firms specialize in one particular class of goods. On the other hand, there are some firms which embrace a variety of these divisions The principal classifications are bedroom suites, sideboards, chairs, fancy goods and cabinets, office furniture, wood bedsteads, hall and kitchen furniture, school furniture and upholstery The last division is dealt with under a separate article under that title. (A description of the industry in the United States is given in a section at the end of this article.)

Geographical Distribution.—In the United Kingdom the principal centres of the industry are London, High Wycombe, Birmingham, Manchester, Liverpool, north-east Lancashire, parts of Yorkshire, north-east coast, Nottingham, Bath, Bristol and Barnstaple, and Scotland. The town of High Wycombe is principally engaged in the manufacture of chairs, an industry dating from the time when the windsor chair was first manufactured there, owing to the plentiful supply of beech trees in Buckinghamshire. The Bath area is noted for high-grade furniture The largest individual British firms are situated at Tottenham, London, and Colwick, Nottingham

Machine and Hand Work.—The industry is subdivided into what are known as machine shops and hand shops In the first named, the bulk of the machine work is done on the same premises, and is extensive in its character In the case of the "hand shop," it must not be thought that the furniture is produced entirely by hand On the contrary, a considerable amount is still done by machines, but not done on the premises, the work being sent out to what is termed a trade mill, where a complete range of machines is available, and various operations are performed on the timber for the purpose of lessening the cabinet-maker's task This arrangement is very convenient for small manufacturers who are not in the position to afford the capital cost of laying down an extensive plant. Many of these workers are almost home workers, performing their operations in a part of the house, or in a large shed at the back of it. Cheap furniture made in this class of workshop is sometimes termed garret-made furniture. This process, although wasteful from the point of view of labour in carrying the material backwards and forwards to the trade machine mill, avoids the stand-by losses caused when workshops are too small to keep a machine shop fully occupied.

The principal machinery employed in machine shops consists of swing or pendulum saws, circular rip saws, overhand planers, planing and thicknessing machines, cross-cut circular saws, band saws, fret saws, spindle moulding machines, fourcutter moulding machines, tenoning machines, lathes, dovetailing machines, boring machines and sand-papering machines of various types, such as triple drum, belt, disk, up-and-down, etc.

Cabinet-making.—The chief methods of jointing used by the cabinet-maker are mortising and tenoning and scribing, dovetailing, dowelling, tonguing and grooving and mitring Owing to the modern extensive use of machinery the operations of a cabinet-maker are largely reduced to the fitting and running of drawers, the hanging of doors on hinges or centres, and the general assembly of the main carcass of goods This latter operation, however, is in some works executed in a machine shop, cramping in particular being done by large mechanical cramps, designed to operate in three directions successively—transversely, vertically and longitudinally.

The chair industry is mainly concentrated at High Wycombe. The trade there has developed from the windsor and cheap bedroom chair to high grade reproductions of old styles such as Chippendale, Sheraton, Hepplewhite, etc.

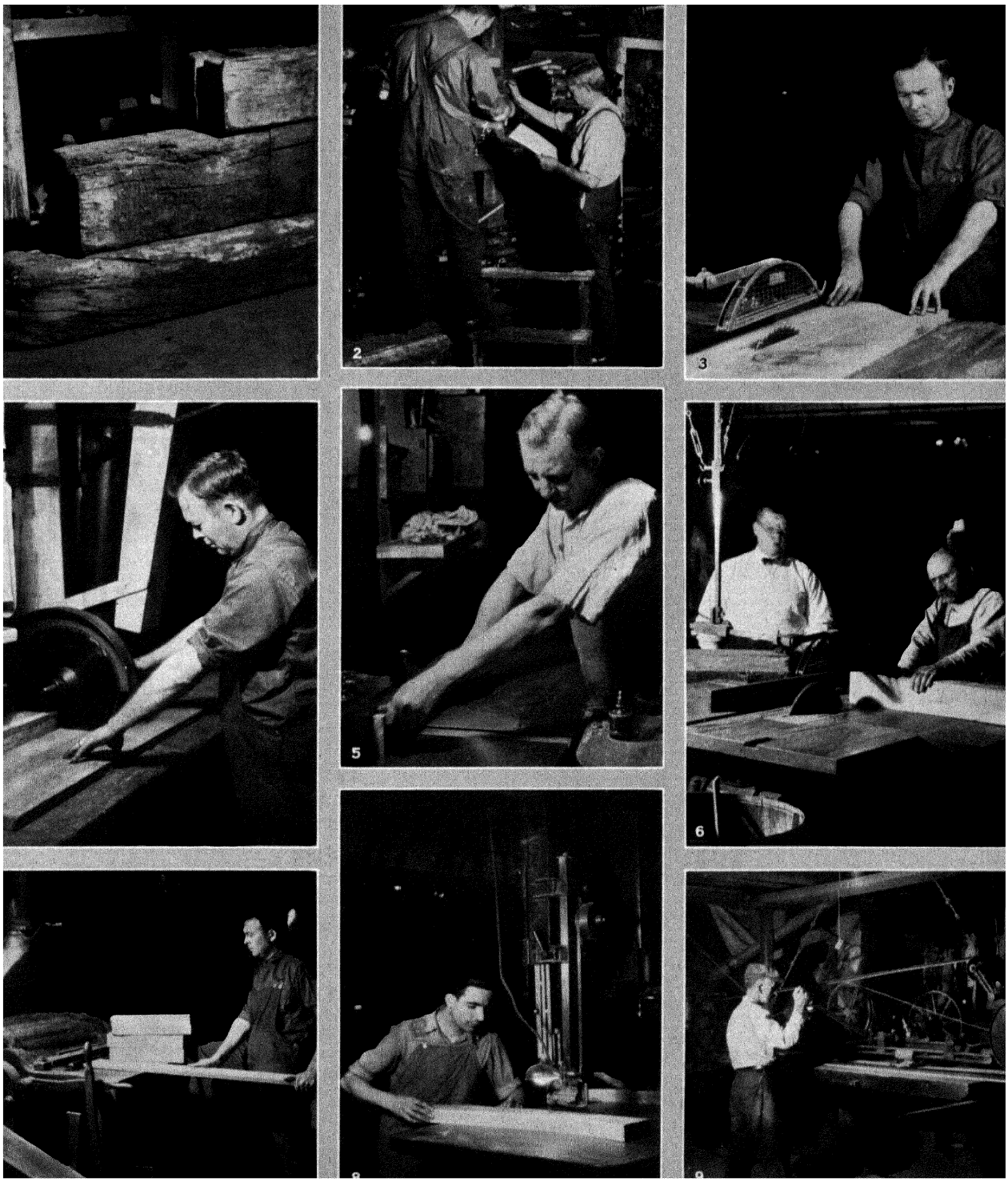
Polishing.—Polishing is divided into French polishing, wax polishing and spray polishing Most woods are usually stained before polishing Stains may be made of water, spirit or oil.

The process of french polishing varies slightly, according to the nature of the wood If it is intended to have what is known as a full polished effect, it is necessary to fill the grain of the wood, full polished being the term used to denote an even smooth surface over all the wood, no open grain showing in its natural state. Various fillers are employed, usually either plaster or what is known as American patent filler. The filler is well rubbed into the grain of the wood, and then allowed to stand a considerable time to harden. If plaster is used, it is usual to oil the whole of the work with linseed oil, to "kill the plaster," *i.e.*, to prevent it looking white and murky, and to give a transparent effect to the subsequent coating of polish

The next process is known as bodying up, and consists in applying a coat of shellac polish (consisting of shellac dissolved in methylated spirits) by means of what is known as a rubber, which consists of a pad of cotton-wool saturated to a suitable extent with shellac polish and covered with a piece of linen rag which acts as a filter and allows the polish to be distributed evenly After a certain amount of work, it is necessary to apply a small amount of linseed oil to the rubber to prevent it from "hanging," that is from dragging the polish off. After this process has been continued for a certain length of time, the work is allowed to stand so that the polish can sink into the wood and harden. The surface is then cut down, as it is termed, either by fine sand-paper or pumice powder. After that, it is again bodied up. Every process is continued in succession according to the degree of finish required. The greater the length of time allowed to elapse between the operations, the safer is the result obtained in permanence and beauty of finish A fortnight or three weeks is by no means an excessive time for these operations to take in high-class work The greatest objection to this process is the difficulty in the use of oil, any excessive amount being subsequently exuded by the polish as sweating. As it is a matter of individual judgment, greatly dependent also on atmospherical conditions and temperature, it is very difficult to get uniformity of working, and consequently the french polishing process cannot be termed absolutely reliable.

Wax polishing is a much simpler process and consists in applying to the wood beeswax and turpentine which has been melted to a suitable consistency and subsequently allowed to get cold A stiff brush is used to ensure that the wax does not remain in the grain of the timber. This is nearly always used for open grain effects. The wood is not filled in this method.

Spray polishing has been introduced for the purpose of using



BY COURTESY OF THE STRATFORDS SHOPS, INC

PREPARATION OF LUMBER IN FURNITURE-MAKING

1 Oak beams from England, estimated to be 400 years old Old wood is frequently used in manufacturing modern copies of antique furniture

2 Selecting seasoned lumber from ware-house, where it has been stored to finish drying

3 Circular ripping-saw This saw, which cuts with the grain of the wood, has forward raking teeth A treadle controls speed

4 Pendulum cross-cut saw It can be swung back and forth from an overhead pivot by a handle attached to the guard

5 Hand-feed planer or facing-machine, of fixed-blade type Used for smoothing the reducing timber

6 Table cross-cut saw The teeth of cross-cutting saws have backward rake as opposed to the forward rake of ripping-saws (*see* fig 3)

7 Planing machine of 4-spindle type, used for planing boards on all four sides at the highest speed (maximum 250–300 ft a minute)

8 Vertical band-saw A band of fine steel, set with teeth, revolves about two large pulleys one above and one below the table. This saw can be raised or lowered as required, and is used for both straight and curved cutting

9 Sand-papering machine of flexible-belt type The belt is pressed down to the material by means of a lever

FURNITURE MANUFACTURE



BY COURTESY OF THE STRATFORDS SHOPS, INC

SHAPING AND CARVING WOOD FOR FURNITURE

1 Saw-table tilted for cutting corners
2 Shaping cutter
3 Dove-tailing machine
4 Workman carving at lathe
5 A machine which carves four chair-tops simultaneously, by the same mechanical process
6 A skilled craftsman in the Stratfords shops, carving by hand
7 Hand carvers at work on furniture detail
8 Jig-saw, a band-saw which can be adjusted to cut in any direction
9 Clamp used in gluing

cellulose lacquers, either nitro-cellulose or cellulose-acetate dissolved in suitable solvents such as acetone, amyl acetate, butyl acetate, with the addition of certain other substances termed plasticesers to prevent excessive brittleness, such as tri-phenol phosphate. Usually in addition there is a certain amount of petrol or benzol in the mixture to facilitate rapid drying It is on account of the rapid drying of these lacquers that it is necessary to spray them on to the wood. To effect this a pistol or gun is used, which works like a scent-spray. Compressed air at about 45 to 70 lb. pressure is used to spray liquid from a jet, the air acting as an atomizer and causing the liquid to be broken up into a fine cloud. When this process is used it is necessary to avoid all use of oil, as that is detrimental to the cellulose compounds. The fact that no oil is used avoids the defects above mentioned in regard to french polishing

Works Organization.—In large works the principal departments are as follows, and the order of working is in the sequence mentioned:

The drawing office produces original ideas or works on the traditional designs and examples of the old cabinet-masters. This section also makes full-size working details, which are then passed over to the works proper, where the job is technically known as "set out," every piece of wood employed in the job being marked out on a board or rod From this, a cutting or works order is made (in U S A termed a stock bill), giving the exact dimensions of each finished piece In some works a duplicate order giving outside dimensions to allow for trimming and shrinking, is also supplied. This order is issued to the timber yard so that the requisite timber can be taken from store and delivered to the machine shop to be cut up in accordance with the instructions.

If the timber has not been purchased as dry timber it is necessary to ensure its being seasoned, either by natural or artificial methods This consists in what is known as sticking, that is, piling the timber board by board or plank by plank, one above the other with a narrow strip of timber placed in between every board cross-wise, at approximately every 18in along the length of the plank or board It is most essential that these sticks be kept vertically over one another as the pile is increased in height, otherwise there is a tendency for the timber to warp or become wavy owing to the pressure on each board not being sustained by the one immediately underneath. Much good timber is often spoiled through careless sticking If the natural method of seasoning is employed, the timber is piled first of all in the open and then subsequently put under cover, or alternatively is put under cover straight away, but so situated that there is a good current of air through the building. If, however, the wood is to be seasoned by an artificial process, it is still sticked, but placed in a drying kiln, usually on specially constructed trolleys which allow it to be easily pushed along from one kiln to another in successive stages The process consists in some suitable method of introducing hot moist air, humidity at the start being at its greatest and gradually being reduced in subsequent stages By this means the outside of the timber is not hardened, but the excess internal moisture of the wood is driven out by the heat, the humidity of the air not being fully at saturation point. As this process is continued, the moisture content of the air is gradually reduced until the whole timber becomes what is known as bone dry. The moisture content of the wood should then be from 6% to 12%

When the timber passes to the machine shop it is first dealt with by the swing or pendulum saw and cross-cut into lengths for all those parts which are required to have all their edges worked upon On the other hand, where long lengths are required, mouldings sometimes are worked in those long lengths to be cut up subsequently, this being a matter of convenience for ease of feeding the machines. All timber which is used for large flat surfaces is then passed over the overhand planers for the purpose of planing "out of wind," as it is termed, that is, ensuring that the whole surface of the timber is uniform, and able to rest on a flat surface without rocking. After that, according to the particular nature of the piece and its ultimate destination in the assembly of the goods to be made, it passes to the various individual machines above mentioned, either for bringing to a definite thickness, or moulding, boring, tenoning, sand-papering, etc.

When the wood has been fully machined, there are two distinct methods employed according to the type of works One is to store these various parts in a special place where they can be drawn upon as required, the other is immediately to assemble the whole of the quantity machined In some shops, a good deal of the work formerly executed by the cabinet-makers is done in either a cabinet or second machine shop, or is passed back after the cabinet-maker has done certain operations. For instance, cramping up various frames such as door frames, glass frames, etc., may be done in the machine shop, or may be done entirely in the cabinet-maker's shop by means of hand cramps instead of cramping machines Then again, drawers may be fitted by hand by the cabinet-maker, or they may be sent back after assembly to be fitted in a drawer-fitting machine

Some firms have so specialized the various processes that there is very little cabinet-maker's work to be done, and the cabinet-maker becomes really an assembler, who only requires a glue pot, a hammer and a screw driver

In the United States a beginning is being made in line assembly on a belt conveyor similar to that used by motor-car manufacturers Nothing like that has been attempted in England, the nearest approach being a system of roller conveyors in the machine shop for ease of movement in shifting the timber

Scientific Research.—Work in this direction has been performed by two separate bodies working in co-operation The Forest Products Research Laboratory has been investigating the ravages of worm in timber work which has proved of great value to the trade Also the Advisory Committee on Timbers of the Imperial Institute, South Kensington, London, has been conducting an exhaustive survey of British empire timbers, many of which, being suitable for furniture construction, have been introduced to the market and should gradually come into extensive use.

Trade Unions.—The principal trade unions, on the operatives' side, are the National Amalgamated Furnishing Trades Association, the Amalgamated Society of Wood-cutting Machinists, the Amalgamated Union of Upholsterers and the Progressive Society of French Polishers.

The first named has endeavoured to embrace all sections of the industry, but is chiefly concerned with cabinet-makers and polishers. The others confine themselves to their particular sections On the employers' side, the principal organizations are the National Federation of Furniture Trades, the London Cabinet and Upholstery Trades Federation, Yorkshire Employers Federation and Master Carvers Association, London. All these bodies except the last embrace both manufacturers and retailers in the industry, although they are divided into separate groups.

The operatives employed in the British industry, and the employers also, may be grouped into two divisions, the one British and the other Jewish. The trade is very largely in the hands of the Jews in many areas, particularly so in London It is unusual to find Jewish workers in British shops, and vice versa.

Raw Materials: Timber.—The chief timbers used are oak, principally American, but also some Russian, Austrian and Japanese; the mahogany used is chiefly Honduras, African and Cuba. Other woods are American walnut, satin walnut or red gum, hazel pine or sap red gum, whitewood, satinwood, beech, Canadian birch and deal and pine and various veneers, some of which are superimposed upon the woods above named.

Apart from timber, which naturally must be the principal raw material, and which is dealt with under a separate article on FURNITURE WOODS, the principal raw material employed in the industry is plywood, which is a manufactured product consisting of three or more separate veneers cemented together with the grain of each layer running at right angles to the previous layer, and which may be veneered with a final layer of some more expensive wood, the core being of cheaper grade timber which readily lends itself to cutting on a rotary veneer lathe Plywood is principally manufactured in Finland, Estonia, Latvia, Germany

and Belgium.

The other principal raw material is glass, of which the bulk is produced in Belgium. Brass-foundry work and locks are chiefly obtained from Birmingham and district. Materials for polishing consist of gums and lacs, the lac coming from India and gums from various tropical countries. Where cellulose is employed for the finishing process, it is largely manufactured in England.

It will be seen that little of the raw material of which furniture is made is British, the bulk being procured from abroad

Furniture Styles.—Styles of furniture in England can be grouped into two categories, period styles and modern. The principal period styles are Tudor, Elizabethan, Charles, Jacobean, William and Mary, Queen Anne, Chippendale, Adams, Sheraton, Hepplewhite, Empire and Georgian In addition to these essentially British styles, there are the well-known Continental styles, Louis XIV , XV. and XVI Of the older Continental styles which influence modern tendencies, may be mentioned Dutch Marquetry and Italian Renaissance

Among modern styles, as from the end of the Victorian era, may be mentioned the quaint art style, and the subsequent versions of the old period styles Modern Jacobean is in no way a true example of old Jacobean furniture, it rather expresses the feeling, or is influenced by the tradition, of that period The same is true of modern examples of so called Sheraton, Chippendale, Adams, etc But many reproductions are manufactured as exact copies of fine old examples

British Furniture Output.—The output of the British furniture trade has been investigated by the official census of production The following figures are returned for the years 1907 and 1924 —

Products	Selling value, 1924	Selling value, 1907
	£	£
Furniture of wood, upholstered or not upholstered	18,129,000	7,338,000
Sofa and chair frames and other parts of furniture	655,000	94,000
Furniture of wood, frames and parts, not separately distinguished	305,000	
Fittings for shops, offices, banks, churches, ships, etc , and architectural woodwork	2,096,000	1,128,000

In considering these figures it should be remembered that there was a great rise in prices between 1907 and 1924, and that it is very difficult, therefore, to compare them with accuracy It is also recorded with regard to the repairs of furniture that there was a selling value of £220,000 in 1907 and of £1,315,000 in 1924.

In the year 1924 the British exports of furniture were valued at £1,317,000, and the net imports at £563,000. In 1927 the British exports of furniture were valued at £1,232,000, while the net imports were valued at £815,000

It is also shown that the number of persons employed in British furniture-making in 1924 was 82,841, of whom 71,238 were recorded as operatives and 11,603 as belonging to the managing, clerical and technical staffs These figures, however, cover, in addition to furniture and cabinet-making, the persons employed in the upholstering, bedding and mattress trades.

BIBLIOGRAPHY —The following works relate chiefly to styles, and are profusely illustrated, showing past examples of period styles: H. Cescinsky, *English Furniture of the Eighteenth Century;* K. W. Clouston, *Chippendale Period in English Furniture;* G. M. Ellwood, *English Furniture and Decoration, 1680–1800;* P. Macquoid and R. Edwards, *Dictionary of English Furniture;* H. P Shapland, *Encyclopaedia of Furniture,* with introduction. The following are technical works: S. Ransome, *Modern Wood-working Machinery;* R. W. Todd, *The Practical Saw Doctor;* H. D. Tiemann, *The Kiln Drying of Lumber;* J. H. Rudd, *Practical Cabinet Making and Draughting;* A. Parkhouse, *Practical Polishing and Staining;* P. Wells and J. Hooper, *Modern Cabinet Work, Furniture and Fitments.* The most extensive list of standard works on Cabinet-Making, Furniture and Furnishings, is inserted in *The Cabinet Maker's Diary,* 1928.

(W. H S.)

UNITED STATES

The classification of the furniture manufacture in the United States is as follows: upholstered furniture; case goods (dining room and bedroom); kitchen (refrigerators, breakfast sets, etc); novelty furniture, reed and fibre porch furniture; wrought cast iron.

Materials.—Metal, reed and glass are used in the manufacture of furniture but wood is in far more general use. The woods chiefly used are white ash, beech, birch, cherry, chestnut, elm, gum, mahogany, maple, oak, sycamore and walnut (*see* FURNITURE WOODS) Of recent years such scarce woods as ebony, amaranth, prima vera, tulipwood, teak, snakewood, rosewood and Ceylon satinwood have come into greater use because of their decorative possibilities

Manufacture and Machinery.—Air-dried lumber is brought in by carloads into the factory yards, where it is so arranged that it may easily be conveyed by small electric trucks to the drying kilns The lumber is carried from the kilns by electric lifts direct to the cutting room The designing room after detailing the item to be manufactured enters a cutting order for the different lengths of lumber, and trucks convey the lumber to the cut-off saws Electric motors blow the refuse of the furniture plant to a central point outside the factory and automatically the shavings, sawdust and cuttings are separated and conveyed or blown to the boilers as fuel. Waste material which is too heavy for the exhaust or blower is carried away by other methods to large revolving cylinders containing powerful knives which cut the refuse into small pieces and then deposit it in a bin

After leaving the cut-off saw the material then proceeds to the straight line ripper, which has an automatic feed This machine removes the edges and rips the boards to a specified width; gluing then follows for the core work The feed jointer operated by three motors is the next machine in line For work requiring gluing, the automatic revolving clamp carrier then follows The pieces to be glued are placed edgewise on plates, which are kept hot by steam coils From the hot plates the work is taken to a revolving single roll glue spreader and then arranged in a clamp carrier This clamp carrier holds the pieces together from 2 to 14 hours.

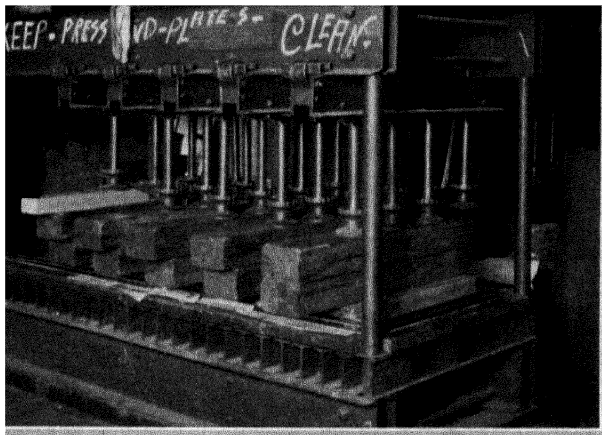
The rail lengths are sent direct to the surfacing machine, where they are planed to the desired width and thickness The mitre saw then cuts the lengths to required size and a boring machine is used to place holes for dowel pins. A shaping machine is used if a special shape for rails and legs is desired

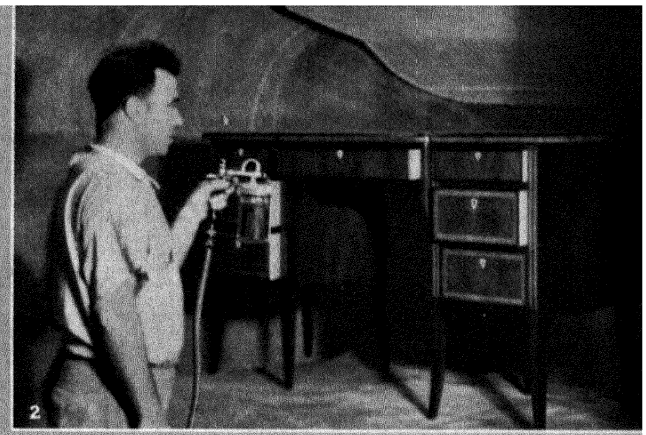
Modern Machines.—The latest method eliminates considerable handling in having the truck loads stopped at the "straitoplane." Here lumber is fed in at one end of the machine and comes out at the other end in boards of standard thickness and size Next is the planer, which removes a thin coating, leaving the board ready for the veneer or sanding room In the veneer room, the veneer clipper is used for cutting the various widths and lengths For matching veneer the taping machine is required which binds and glues. In the final machine room are the moulders which have automatic feeders that are used for making large quantities of the same type of legs Here also are the hand planers, mitre saws, high speed band sawers, double end cut-off saws, jig-saws, shapers and routers as well as dovetailers. Various high-speed boring machines are then in line on this machine floor.

A machine in common usage is the multiple speed carver, operated by electric motors. Four to thirty-six carvings are duplicated at one time under the direction of a single operator The sanding in preparation for finishing is also done by machines. Legs and framing used in furniture are often bent into desired shape. This is done under steam and pressure. Forms and shapes so bent are stronger than when machined, as it entirely eliminates end or cross-grain wood (*see* WOODWORKING MACHINERY).

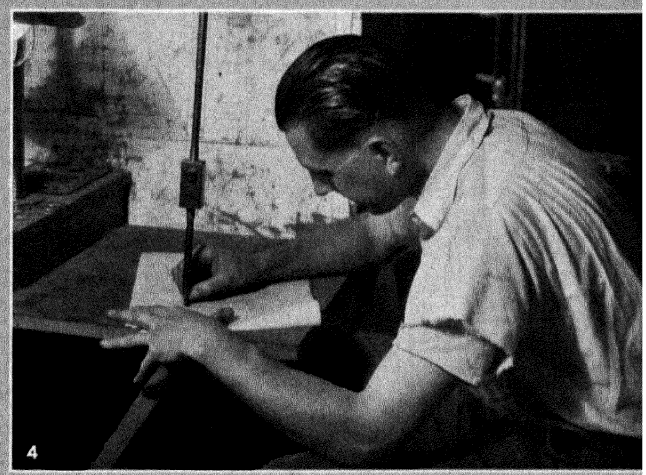
Plywood and Veneer.—Usually the finer grains of woods are used for the outer surface to provide decorative effects. Irregular forms can be made of plywood more readily when glued and pressed into desired shapes. Veneers permit the use of the beautiful grain woods cut from selected logs which are too costly to be used as solid wood. If the board is to be veneered, cross-grained veneer sheets are glued on to the surface of the board and thence taken to a power press, where they are held under hydraulic or motor pressure until perfect adhesion is secured. Then they are placed on the panel dry kiln, and then they undergo the sanding

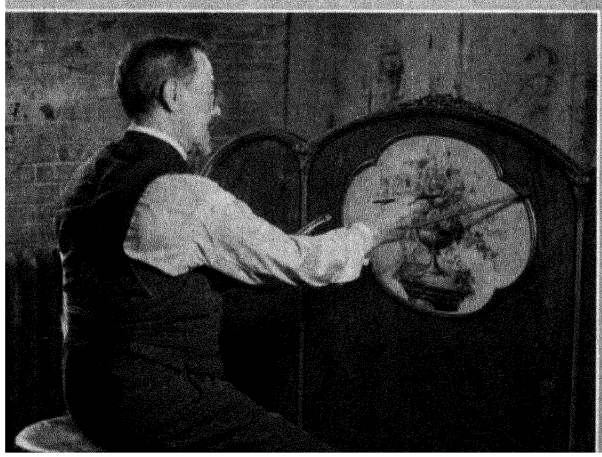
FURNITURE MANUFACTURE

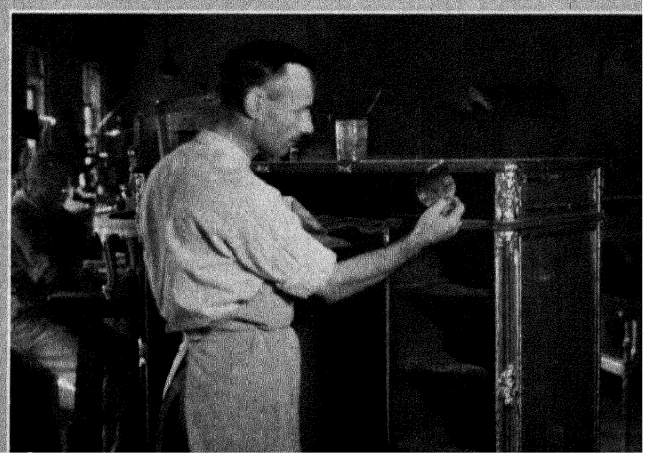












BY COURTESY OF THE STRATFORDS SHOPS, INC

STEPS IN THE MANUFACTURE OF FURNITURE

1 Showing a type of press used in the making of veneered furniture The two pieces of wood—one the base, the other the fine veneer—after being glued together, are laid between two plates upon which pressure can be exerted

2 A workman using the comparatively new method of spray polishing A compressed-air pistol sprays the polish onto the wood in a fine cloud Nitro-cellulose lacquers are most commonly applied in this way

3 An electrically driven "rubber," used in the so-called French method of polishing Oscillating felt pads, moving in a long or short stroke, travel back and forth over the surface to be polished

4 Workman operating a perforating machine for stencils The movable arm ends in a kind of drill or punch which perforates a sheet of paper, metal or fibre

5 Painted decoration applied by hand The craftsman may work from a design copied onto the wood-surface, or in a freehand manner

6. Gilding A gold size is applied to the shellacked surface of the wood, after it has dried, gold-leaf is applied, as shown in the illustration

and finishing processes. Ash, basswood, beech, birch, cedar, cherry, cottonwood, cypress, Douglas fir, elm, gum, maple, mahogany, oak, pine, poplar, spruce, redwood, sycamore and walnut, as well as all the rare woods, are used as veneers (*see* PLYWOOD)

Finishing.—The piece is first sanded with fine sand-paper and stained Stains may be evenly applied with a brush, rags or with a sponge, but a spraying device, according to many manufacturers, is the best method Dipping in a large vat is sometimes resorted to Stains comprise the several classes of water stains, acid stains, spirit stains and oil stains. To fill up the pores of the wood a thin coat or filler is next applied.

After this operation the final finish is given. The *wax finish* is obtained by applying two coats of shellac to the stained piece; sanding; and following with a coat of paste wax, which is rubbed about the surface with sand-paper until it is polished. *Shellac finish* is procured by applying two or three coats of shellac and sanding. When dry, a very fine pumice soap is sprinkled over the surface, upon which is poured rubbing oil that is rubbed with the grain *Varnish finish* is made by coating the object with shellac; then sanding, and applying the desired number of coats of varnish.

Satin finishes are completed by polishing the varnished surfaces with rotten stone and water. *Lacquer finish* is gradually displacing varnish The application is the same as varnish Each successive lacquer coat forms part of the previous coat, whereas the varnish finish is an application of separate coats, one upon the other Crackled finish is the result of applying a fast drying coat over a slower drying one *Polychrome finish* is used only on surfaces having carvings, turnings or flutings After the shellac coat is applied, which generally dries quickly, the basic coat follows, which may be coloured bronze, gold, oil colours or enamel Upon drying, the dominant colour or smutting solution is applied, then wiped off with a cloth in spots to give the "high lighting" effect.

Production.—The U S Department of Commerce census of manufacturers' figures for furniture production are shown in the accompanying table

United States Furniture Industry

Census year	Number of establishments	Wage earners (average number)	Wages	Cost of materials	Value of products
1925	3,235	180,895	$225,200,027	$384,507,648	$868,145,913
1921	3,033	124,311	144,109,075	253,544,635	550,163,554
1919	3,273	140,188	143,111,976	265,555,518	579,650,641
1914	3,324	130,138	73,282,139	123,734,772	270,938,988

The principal furniture manufacturing centres in the United States are Chicago, Ill., New York, N Y , Grand Rapids, Mich , Rockford, Ill , Jamestown, N.Y., High Point, N C. Considerable furniture is also manufactured in the States of Massachusetts, Pennsylvania, Indiana, California and Oregon. (*See* WOODWORKING MACHINERY) (L. KA.)

FURNITURE POLISH. The two varieties in most common use are furniture creams and furniture wax polishes, the quality of the polish differing with the ingredients used in its preparation

Furniture creams are thick milky white liquids, and are made by dissolving beeswax in turpentine by means of steam heat in a double-jacketed pan. The use of steam heat is on account of the dangerous inflammability of turpentine vapour in the presence of a naked light. After the beeswax has thoroughly melted the steam is shut off and a solution of soft soap in hot water is added. The whole mass is then well beaten up to a thick milky emulsion and packed in bottles ready for use. The beeswax may also be replaced, or partially replaced, by other waxes such as Carnauba wax, Japan wax, Ceresine wax, etc. The proportions of 9 oz. of pure beeswax (finely shredded) to 1½pt. of American spirits of turpentine, with the after addition of 1¾pt. of hot water containing 2 oz of soft soap dissolved in it, is considered to make a good mixture.

Furniture wax polishes are made by similarly dissolving beeswax and other waxes in turpentine with the aid of heat, about 1 lb. of wax to 1qt. of turpentine being used. The clear melted liquid is then poured into tins, and on cooling sets hard and is ready for use. The addition of a little wax-soluble aniline dyestuff to the polish when in the liquid state is made in order to give it a more pleasing appearance.

An easily made polish, particularly suitable for cleaning old and dirty furniture is obtained by shaking together 1 part of raw linseed oil, 1 part of turpentine, and 1 part of vinegar.

A polish of good quality is distinguished by its yielding a high gloss that does not smear or take a finger-mark. (*See* FRENCH POLISH.)

FURNITURE WOODS: *see* TIMBER; HARDWOODS

FURNIVALL, FREDERICK JAMES (1825–1910), English philologist and editor, was born at Egham, Surrey, on Feb. 4, 1825, the son of a surgeon. He gave Frederick Denison Maurice valuable assistance in the Christian Socialist movement, and was one of the founders of the Working Men's College, London. During half a century he promoted the study of early English literature, partly by his own work as editor, and partly by the foundation of learned societies, especially the Early English Text Society (1864), the Chaucer, Ballad, New Shakespeare and Wyclif Societies, and at a later period societies for the special study of Browning and Shelley. He edited texts for the Early English Text Society, for the Roxburghe Club and the Rolls Series. His most important work was his "Six-Text" edition of the *Canterbury Tales*. He was the honorary secretary of the Philological Society, and was one of the original promoters of the Oxford *New English Dictionary*. He co-operated with its first editor, Herbert Coleridge, and after his death was for some time principal editor during the preliminary period of the collection of material. Dr. Furnivall was always an enthusiastic oarsman, and till the end kept up his interest in rowing; with John Beesley in 1845 he introduced the new type of narrow sculling boat, and in 1886 started races on the Thames for sculling fours and sculling eights He died on July 2, 1910

See *Frederick James Furnivall: A Volume of Personal Record* (1911)

FURSE, CHARLES WELLINGTON (1868–1904), English painter, born at Staines, son of the Rev C W. Furse, archdeacon of Westminster, was descended collaterally from Sir Joshua Reynolds He entered the Slade school in 1884, winning the Slade scholarship in the following year, and completed his education at Julian's *atelier* in Paris. An important canvas called "Cain" was his first contribution (1888) to the Royal Academy, to the associateship of which he was elected in the year of his death For some years before he had been a regular contributor to the exhibitions of the New English art club He married in Oct 1900 Katherine, daughter of John Addington Symonds. She received the D.B E for her services during the World War and was director of the Women's Royal Naval Service from 1917 to 1919. Among his more famous pictures are: "Diana of the Uplands," "Lord Roberts" and "The Return from the Ride" at the Tate Gallery, London; the four children in "Cubbing with the York and Ainsty," "The Lilac Gown," "Mr. and Mrs. Oliver fishing" and the portrait of Lord Charles Beresford

FURSE, DAME KATHARINE (1875–), D.B.E. (1917), founder of the English V.A D. force, was born at Bristol on Nov 23, 1875, the daughter of the poet and critic John Addington Symonds (*q v*) In 1900 she married the painter Charles Wellington Furse (*q.v.*), who died prematurely in 1904. On the outbreak of war in 1914 Mrs Furse realized the inadequacy of the existing number of nurses to deal with the situation, and in Sept. 1914 she went to France with a number of assistants who formed the nucleus of the V.A.D. force (Voluntary Aid Detachment) In 1915 she returned to England, and the V A D. work was then officially recognized as a department of the Red Cross organization. In 1917 she became director of the W.R.N S In 1922 she was appointed assessor, representing the international organization of Boy Scouts and Girl Guides, on the Child Welfare Committee of the League of Nations Advisory Committee for the Protection and Welfare of Children and Young People.

FUR-SEALS, a little group of marine carnivorous mammals forming the genus *Otaria* of the older naturalists. The fur-seals resort, or once resorted, in vast numbers to crowded "rookeries."

All the islands of the Southern ocean were densely peopled by fur-seals when first discovered, so were Juan Fernandez, the neighbouring Mas-a-Fuero, the Kuriles and the islands in Behring sea On the other side of America, in the Plate estuary, the Lobos islands also have their seal herd The history of nearly all these rookeries is one of wanton waste and rapid extermination At Mas-a-Fuero, 3,000,000 skins are said to have been taken within ten years, but by 1807 the fishery was no longer profitable The South Shetlands were discovered in 1819, within two years 95 vessels had loaded up with sealskins, and to all intents and purposes the rookeries were already exterminated. The only herds which have been more or less cared for, and the only ones which have escaped destruction, are those of the Lobos islands (Uruguay), those of the Pribyloff islands (United States), and, though to a much less extent, those of the Russian Commander islands.

The fur-seal is polygamous as well as gregarious The bulls or *sikatchi*, live to a great age and grow to a great size, far beyond that of the females They arrive on their breeding-places in spring, choose their quarters on the rocky beach, and are joined a few weeks later by the cows (or *matkas*), who come in heavy with young The pups (or *kotik*) are born soon after, and the comparative quiet of the rookery becomes a babel of angry noise. The bulls fight for possession of the cows, each striving to gather and keep a "harem" round him The cows go out to sea to feed, but the bulls never leave their posts and fast throughout the season, they come in fat and vigorous in May, and leave in autumn gaunt, lean and battle-scarred The young males or bachelors (*holloschickie*) keep to themselves, "hauling out" behind the breeding herd Males and females are born in equal numbers, and the economic management of a rookery consists in protecting all females, in leaving the harems undisturbed, and in taking such toll of the young bachelors as to leave enough to take the places of the breeding bulls

The Pribyloff islands, discovered in 1786, passed into the hands of the United States with the Territory of Alaska in 1867, their great rookeries had been wastefully used and ruinously depleted to begin with, but the Russian Government had nursed them back into prosperity for 30 years, till at the time of the purchase they yielded 100,000 skins a year, and did so for some 20 years after But about 1880, pelagic sealing grew up, wherein young and old, males and females were killed without discrimination. This fishery soon showed its injurious effects upon the herd After much arbitration the U S Government in 1911 took the fishery into their own hands, and pelagic sealing was finally abolished, on terms of equitable compensation. Moreover the killing of seals upon the islands was suspended for a number of years The seal-population of the two Pribyloff islands had dwindled down to a bare 200,000 in 1912, it has increased steadily since, according to the official count, and amounted to over 800,000 in 1927 The Commander islands on the Russian side have a different tale to tell The war and then the revolution led to neglect ashore and to piratical raids from the sea; and an expert who had visited these islands in 1897 and came again in 1922 was "dismayed" at the shrunken rookeries

See SEAL FISHERIES, CARNIVORA; also H. W Elliott, "Seal Islands of Alaska," *U S Fish Commission Reports* (1882); D. S. Jordan and others, *Fur Seals and Fur Seal Islands of the North Pacific Ocean* (1898); "Reports by D'Arcy W Thompson and others in *British Parliamentary Papers* (U S) (1897–98); "Report on . the Falkland Islands" (1920), and "Annual Reports" in the *Bulletin of the Bureau of Fisheries, U S A* (D W T)

FÜRST, JULIUS (1805–1873), German orientalist, was born of Jewish parents at Zerkowo in Posen, on May 12, 1805. He was lecturer (1857) and then professor (1864) of Aramaic at Leipzig, where he died on Feb. 9, 1873. Among his writings may be mentioned *Lehrgebaude der aramäischen Idiome* (Leipzig, 1835); *Librorum sacrorum Veteris Testamenti concordantiae Hebraicae atque Chaldaicae* (Leipzig, 1837–40); *Hebräisches und chaldäisches Wörterbuch* (1851, Eng. trans by S Davidson 1867); *Kultur und Literaturgeschichte der Juden in Asien* (1849).

FÜRSTENBERG, the name of two noble houses of Germany.

1. The more important ruled in a mediatized principality in the district of the Black Forest and the Upper Danube, which comprises the countship of Heiligenberg, about 7 m. N. of the Lake of Constance, the landgraviates of Stühlinger and Baar, and the lordships of Jungnau, Trochtelfingen, Hauser and Möskirch or Messkirch. The territory is discontinuous; and lies partly in Baden, partly in Wurttemberg, and partly in the Prussian province of Sigmaringen The relations of the principality with Baden are defined by the treaty of May 1825, and its relations with Württemberg by the royal declaration of 1839 The *Stammort* or ancestral seat of the family is Furstenberg in the Black Forest, but the principal residence of the Furstenbergs is at Donaueschingen.

The family of Furstenberg claims descent from a certain Count Unruoch, a contemporary of Charlemagne, but their authentic pedigree is only traceable to Egino II, count of Urach, who died before 1136. In 1218 his successors built the town and castle of Furstenberg Of the two sons of Egino V. of Urach, Conrad, the elder, inherited the Breisgau and founded the line of the counts of Freiburg, while the younger, Heinrich (1215–1284), received the territories lying in the Kinzigthal and Baar, and from 1250 onward styled himself first lord, then count, of Furstenberg His territories were subsequently divided, though temporarily reunited under Count Friedrich III, whose wife, Anna, heiress of the last count of Wardenberg, brought him the countship of Heiligenberg and lordships of Jungnau and Trochtelfingen in 1534 On Friedrich's death (1559) his territories were divided between his two sons, Joachim and Christof I Of these the former founded the line of Heiligenberg, the latter that of Kinzigthal

In 1909 there were two branches of the princely house of Furstenberg: (1) the main branch, that of Furstenberg-Donaueschingen, the head of which was Prince Maximilian Egon (b 1863), who succeeded his cousin Karl Egon III in 1896, (2) that of Furstenberg-Konigshof, in Bohemia, the head of which was Prince Emil Egon (b 1876), chamberlain and secretary of legation to the Austro-Hungarian embassy in London (1907) The cadet line of the landgraves of Furstenberg is now extinct, its last representative having been the landgrave Joseph Friedrich Ernst of Furstenberg-Weitra (1860–1896), son of the landgrave Ernst (1816–1889) by a morganatic marriage He was not recognized as *ebenburtig* by the family The landgraves of Furstenberg were in 1909 represented only by the landgravines Theresa (b 1839) and Gabrielle (b 1844), daughters of the landgrave Johann Egon (1802–1879)

From the days of Heinrich of Urach, a relative and notable supporter of Rudolph of Habsburg, the Furstenbergs have played a stirring part in Germany history as statesmen, ecclesiastics and notably soldiers There was a popular saying that "the emperor fights no great battle but a Fürstenberg falls" In the Heiligenberg line the following may be more particularly noticed

FRANZ EGON (1625–1682), bishop of Strasbourg, was the elder son of Egon VII, count of Furstenberg (1588–1635), who served with distinction as a Bavarian general in the Thirty Years' War He began life as a soldier in the imperial service, but on the elevation of his friend Maximilian Henry of Bavaria to the electorate of Cologne in 1650, he went to his court and embraced the ecclesiastical career. He soon gained a complete ascendancy over the weak-minded elector, whose Francophile policy he instigated Ecclesiastical preferments were heaped upon him, and in 1663 he became bishop of Strasbourg. On the conclusion of a treaty between the emperor and the elector of Cologne, on May 11, 1674, Franz was deprived of all his preferments in Germany, and was compelled to take refuge in France He was, however, amnestied with his brother William by a special article of the Treaty of Nijmwegen (1679), whereupon he returned to Cologne. He died on April 1, 1682 at Strasbourg.

His brother WILLIAM EGON (1629–1704), bishop of Strasbourg, began his career as a soldier in the French service He went to the court of the elector of Cologne at the same time as Franz Egon, whose policy he shared. In 1672 William was seized by imperial soldiers in the monastery of St Pantaleon at Cologne, hurried off to Vienna and there tried for his life He was saved by the intervention of the papal nuncio, but was kept in prison

till the signature of the Treaty of Nijmwegen (1679). As a reward for his services Louis XIV. appointed him bishop of Strasbourg in succession to his brother in 1682, in 1686 obtained for him from Pope Innocent XI. the cardinal's hat, and in 1688 succeeded in obtaining his election as coadjutor-archbishop of Cologne and successor to the elector Maximilian Henry At the instance of the emperor, however, the pope interposed his veto, the canons followed the papal lead, and, the progress of the Allies against Louis XIV. depriving him of all prospect of success, William Egon retired to France. He died on April 10, 1704 near Paris

In the Stühlingen line the most notable was KARL EGON (1796–1854), prince of Furstenberg, the son of Prince Karl Alois of Fürstenberg, a general in the Austrian service, who was killed at the battle of Loptingen on March 25, 1799 In 1804 he inherited the Swabian principality of Furstenberg and all the possessions of the family except the Moravian estates. By the mediatization of his principality in 1806 the greater part of his vast estates fell under the sovereignty of the grand-duke of Baden. In politics he distinguished himself by a liberalism rare in a great German noble, carrying through by his personal influence with his peers the abolition of tithes and feudal dues and stanchly advocating the freedom of the press His palace of Donaueschingen, with its collections of paintings, engravings and coins, was a centre of culture, where poets, painters and musicians met with princely entertainment. He died on Sept 14, 1869, and was succeeded by his son Karl Egon II (1820–1892), with the death of whose son, Karl Egon III , in 1896, the title and estates passed to Prince Maximilian Egon, head of the cadet line of Furstenberg-Purglitz

See Munich, *Gesch des Hauses und des Landes Furstenberg,* 4 vols (Aix-la-Chapelle, 1829–47); S. Riezler, *Gesch. des furstlichen Hauses Furstenberg bis 1507* (Tubingen, 1883), *Furstenbergisches Urkundenbuch,* ed. S Riezler and F. L Baumann, vols i–vii. (Tübingen, 1877–91), continued *s tit Mitteilungen aus dem fürstlich. Fürstenbergischem Archiv* by Baumann and G Tumbült, 2 vols (*ib.* 1899–1902); Stokvis, *Manuel d'histoire* (Leiden, 1890–1893); *Almanach de Gotha; Allgemeine deutsche Biographie*

2 The second Furstenberg family has its possessions in Westphalia and the country of the Rhine, and takes its name from the castle of Furstenberg on the Ruhr. The two most remarkable men whom it has produced are Franz Friedrich Wilhelm, freiherr von Furstenberg, and Franz Egon, count von Furstenberg-Stammheim. The former (1728–1810) became ultimately vicar-general of the prince-bishop of Munster, and effected a great number of important reforms in the administration of the country, besides doing much for its educational and industrial development. The latter (1797–1859) was an enthusiastic patron of art, who assisted the completion of the Cologne cathedral, and erected the beautiful church of St Apollinaris near Remagen on the Rhine. He was a member of the Prussian Upper House in 1849, collaborated in founding the *Preussisches Wochenblatt,* and was an ardent defender of Catholic interests

FÜRSTENWALDE, a town in the Prussian province of Brandenburg, on the right bank of the Spree, and 28 m. E. of Berlin on the railway to Frankfort-on-Oder. Pop. (1925) 23,334 Fürstenwalde is one of the oldest towns of Brandenburg. From 1385 it was the seat of the bishop of Lebus, whose bishopric was incorporated with the electorate of Brunswick in 1595. The industries are important, including, besides brewing and malting, manufactures of chemicals, boots, organs, stoves, etc., iron founding and wool-weaving.

FÜRTH, a manufacturing town of Germany, in the Republic of Bavaria, at the confluence of the Pegnitz with the Regnitz, 5 m. N.W. from Nuremberg by rail, at the junction of lines to Hof and Würzburg Pop (1885) 35,455; (1925), 73,693 Fürth was founded, according to tradition, by Charlemagne, and was for a time under the burgraves of Nuremberg, but about 1314 it was bequeathed to the see of Bamberg. In 1806 it came into the possession of Bavaria. The old St. Michaeliskirche is a handsome structure; but its chief edifices are the new town hall, with a tower 175 ft. high. Fürth owes its prosperity to the tolerance it meted out to the Jews, who found here an asylum from the oppression under which they suffered in Nuremberg, and who have here a synagogue and a high school. There are besides a wood-carving and an agricultural school. Industries include production of chromolithographs and picture-books, manufacture of mirrors and mirror-frames, bronze and gold-leaf wares, pencils, toys, haberdashery, optical instruments, silver work, turnery, machinery and fancy boxes, and a trade is carried on also in hops, metals, wool and coal. A large annual fair is held at Michaelmas and lasts for 11 days. The earliest railway in Germany was that between Nuremberg and Furth (opened Dec 7, 1835).

FURTWÄNGLER, ADOLF (1853–1907), German archaeologist, was born on June 30, 1853, at Freiburg-im-Breisgau, and died at Athens on Oct 10, 1907 From 1878 to 1879 he was engaged in work on the excavations at Olympia, and in 1884 became professor of archaeology in Berlin, exchanging his chair in 1894 for one at Munich. He conducted the excavations at Aegina and Orchomenos in 1901–03, and was the author of many important works on archaeology, notably *Die antiken Gemmen* (1900), and *Griechische Vasenmalerei,* begun in 1900 with Reichold, and continued by other scholars.

FURTWÄNGLER, WILHELM (1886–), German conductor, was born in Berlin Jan 25, 1886, the son of the archaeologist Adolf Furtwangler (1853–1907) He received his musical education in Munich from Beer-Walbrunn, Rheinberger and Schillings, and then acted as conductor at Zurich. Later he occupied similar positions at Strasbourg, Lubeck, Mannheim, Vienna and Frankfort-on-Main In 1922, on the death of Arthur Nikisch, he became director of the Berlin Philharmonic Orchestra and of the *Gewandhaus* concerts at Leipzig Ranked among the finest conductors in Germany, Furtwängler also gained an international reputation, which was considerably enhanced by his annual concerts in New York

FURZE, GORSE or **WHIN,** botanical name *Ulex,* a genus of thorny papilionaceous shrubs of the family Leguminosae, comprising 20 species, confined to west and central Europe and north-west Africa Common furze, *U. europaeus,* is found on heaths and commons in western Europe from Denmark to Italy and Greece, and in the Canaries and Azores, and is abundant in the British Isles. It grows to a height of 2–6ft., it has hairy stems, and the smaller branches end each in a spine, the leaves, sometimes lanceolate on the lowermost branches, are mostly represented by spines from 2 to 6 lines long, and branching at their base; and the flowers, about three-quarters of an inch in length, have a shaggy, yellowish-olive calyx, with two small ovate bracts at its base, and appear in early spring and late autumn They are yellow and sweet-scented and visited by bees The pods are few-seeded; their crackling as they burst may often be heard in hot weather This species comprises *U. europaeus* proper, which has spreading branches, and strong, many-ridged spines, and *U. strictus* (Irish furze), with erect branches, and slender 4-edged spines. Another British species of furze is *U nanus,* dwarf furze, also a native of Belgium, Spain and the west of France; it is a procumbent plant, less hairy than *U. europaeus,* with smaller and more orange-coloured flowers, which spring from the primary spines, and have a nearly smooth calyx, with minute basal bracts. Furze, or gorse, is sometimes employed for fences.

Notwithstanding its formidable spines, the young shoots yield a palatable and nutritious winter forage for horses and cattle. To fit it for this purpose it must be chopped and bruised to destroy the spines. There are now a variety of machines by which this is done rapidly and efficiently, and which are in use where this kind of forage is used to any extent. The agricultural value of this plant has often been over-rated by writers. In the case of poor, dry soils it does, however, yield much valuable food at a season when green forage is not otherwise to be had It is given to horses and cows in combination with chopped hay or straw

This plant is invaluable in mountain sheep-walks. The rounded form of the furze bushes in such situations shows how diligently the annual growth, as far as it is accessible, is nibbled by the sheep The food and shelter afforded to them in snowstorms by clusters of such bushes is also of much importance. Young plants of whin are so kept down by the sheep that they can seldom attain to a profitable size unless protected by a fence for a few

years In various parts of England it is cut for fuel The ashes contain a large proportion of alkali, and are a good manure, especially for peaty land

FUSARO, LAGO, a lake of Campania, Italy, ½ m west of Baiae, and 1 m south of the acropolis of Cumae It is the ancient *Acherusia palus,* separated from the sea on the west by a line of sandhills It may have been the harbour of Cumae in early antiquity In the 1st century AD an artificial outlet was dug for it at its south end, with a tunnel, under the hill of Torregaveta This hill is covered with the remains of a large villa, which is almost certainly that of Servilius Vatia, described by Seneca There are remains of other villas on the shores of the lake Oyster cultivation is carried on there and there is a hydrobiological station in the former royal *casino* on an island in the lake

FUSE or FUZE, an appliance for firing explosives in blasting operations, military shells, etc (*see* BLASTING and AMMUNITION). The spelling is not governed by authority, but modern convenience has dictated the adoption of the "z" by military engineers as a general rule, in order to distinguish this sense from that of melting by heat (*see* below) The word, according to the *New English Dictionary,* is one of the forms in which the Lat *fusus,* spindle, has been adapted through Romanic into English, the ordinary fuze taking the shape of a spindle-like tube

In electrical engineering a "fuse" (always so spelled) is a safety device, commonly consisting of a strip or wire of easily fusible metal, which melts and thus interrupts the circuit of which it forms part, whenever that circuit, through some accident or derangement, is caused to carry a current larger than that for which it is intended In this sense the word must be connected with *fusus,* the past participle of Lat *fundere,* to pour, whence comes the verb "fuse," to melt by heat

FUSEE: *see* MATCHES

FUSELAGE, the central structure of an aeroplane (*q v*), connecting the wings with the tail surfaces, and containing the

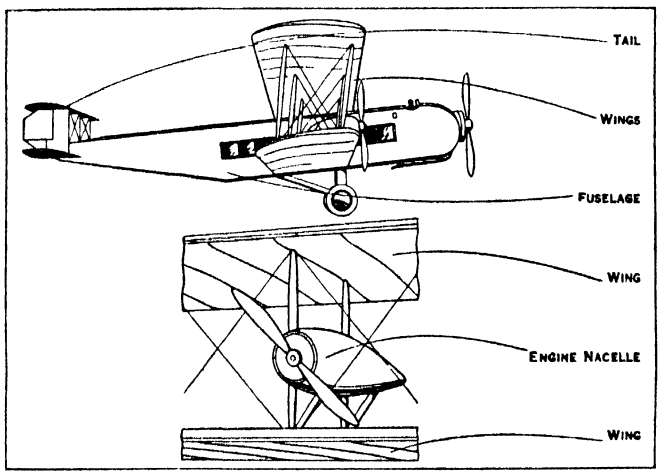


FIG 1—ABOVE, THE FUSELAGE OF A LARGE MULTI-SEATER MACHINE. BELOW, INTER-PLANE MOUNTING OF ENGINE IN NACELLE ON A BIG PLANE

crew, passengers, and sometimes the power plant and fuel "Body" is in general use in a similar sense but includes also both the

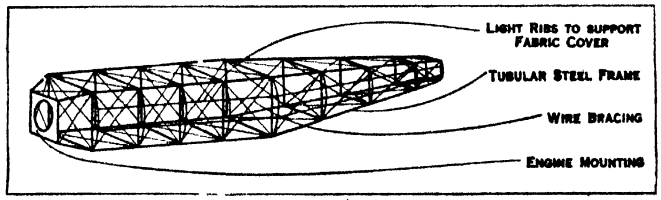


FIG. 2—FUSELAGE OF THE "BRACED" TYPE, WITH FABRIC REMOVED

shorter *nacelle* of the aeroplane with "pusher" air screw, and the *engine nacelle* of the multi-engine aeroplane (*see* fig. 1).

There are two chief forms of fuselage construction In one an underlying braced framework is used (formerly of wood and steel, now generally of metal throughout) with a covering of fabric, the latter kept in a "fair" shape by light supporting ribs (fig 2) The other is on the lines of a boat, comprising a thin continuous skin with strengthening ribs, of wood or of metal throughout (fig 3) Such a scheme has the advantage that cross bulkheads

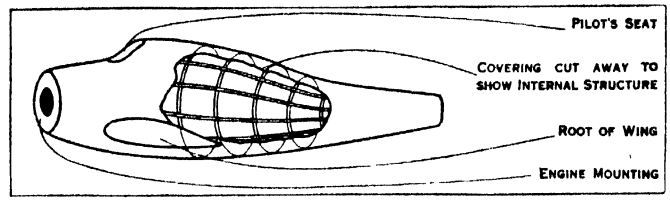


FIG 3—"BOAT-BUILT" FUSELAGE, SHOWING METHOD OF CONSTRUCTION IN EITHER WOOD OR METAL, CONVENIENT WHEN MUCH SPACE IS NEEDED

are not essential, and is therefore convenient when large cabin space is required In practice however the construction of fig 2 can be made sufficiently free from obstructions, and is generally preferred on account of lightness (W S F)

FUSELI, HENRY (1741–1825), Anglo-Swiss painter and author, was born at Zurich on Feb 7, 1741, the son of John Caspar Fussli, painter and lexicographer At the Collegium Curolinum at Zurich he formed a fast friendship with Lavater, and on leaving college both the friends took orders. They were soon forced to leave Zurich on account of the stir raised by the publication of a pamphlet of theirs attacking one of the bailiwicks of Zurich for extortion They travelled via Germany to England, where they arrived at the end of 1763, and where they were well received Fuseli supported himself by writing, but was persuaded by Sir Joshua Reynolds to devote himself to art He visited Rome in 1770, and there made many sketches for the Shakespeare illustrations, which afterwards made his fame He was back in London in 1779, and became a regular exhibitor at the Royal Academy, where he was admitted A R A in 1788 and R A in 1790 In the meantime he had accomplished his most important work, nine pictures on Shakespearean subjects, contributed to Alderman Boydell's Shakespeare gallery A proposal was made to him in 1790 by Johnson, the publisher, to open a Milton gallery This was opened in 1799 with 40 pictures, but was a failure from the artistic point of view In that year Fuseli was appointed professor of painting at the Royal Academy, and his first lecture was delivered in 1801 He died on April 16, 1825

See the *Life* by John Knowles, prefixed to his collected *Works* (1831).

FUSEL OIL, a term applied to a mixture of volatile oily liquids of characteristic odour and taste which arises during the fermentation of potatoes, beetroots, grain, and the "marc" of grapes The amount produced is comparatively small, the proportion being largest in the case of potatoes When such fermented liquors are submitted to distillation the various alcohols present become partially separated, owing to their varying volatilities. Ethyl alcohol (wine spirit) distils over first and the fusel oil containing several other alcohols is then collected in the distillate obtained at temperatures ranging from 105° to 137° C Fusel oil consists mainly of two higher alcohols (*q.v*) distilling between 128° and 132° C; one of these is inactive isoamyl alcohol or isobutylcarbinol, $(CH_3)_2CH\,CH_2{\cdot}CH_2{\cdot}OH$, and the other is active amyl alcohol or secondary butylcarbinol,

$$(C_2H_5)CH\,(CH_3){\cdot}CH_2\,OH;$$

the latter is laevo-rotatory, *i.e.,* rotates the plane of polarized light to the left, and the former is optically inactive. These oily alcohols are partially miscible with water, dissolving in about 40 parts at 14° C. A more volatile constituent of fusel oil, isobutyl alcohol, $(CH_3)_2CH{\cdot}CH_2\,OH$, is found in the distillates boiling between 105° and 120° C; it dissolves in 10 parts of water at 15° C In small doses fusel oil causes thirst and headache; in larger doses it is a convulsive poison.

The amyl alcohols present in fusel oil are largely used in the manufacture of amyl acetate, a fragrant liquid used in flavouring essences (pear oil, etc.), in confectionery and as a solvent in making varnishes, lacquers and artificial leathers having a nitro-

cellulose composition. Fusel oil is used as a solvent for alkaloids and fats; it is employed in the flotation process for separating sulphide ores and is the starting material in a process for synthetic rubber

See the article "Fusel Oil" in Thorpe's *Dictionary of Applied Chemistry*, vol. III. (1922). (G. T. M.)

FUSIBLE METAL, a term applied to certain alloys, generally composed of bismuth, lead and tin, which possess the property of melting at comparatively low temperatures Newton's fusible metal (named after Sir Isaac Newton) contains 50 parts of bismuth, 31 25 of lead and 18 75 of tin, that of Jean Darcet (1725–1801), 50 parts of bismuth with 25 each of lead and tin, and that of Valentin Rose the elder, 50 of bismuth with 28·1 of lead and 24 1 of tin. These melt between 91° and 95°C The addition of cadmium gives still greater fusibility; in Wood's metal, for instance, which is Darcet's metal with half the tin replaced by cadmium, the melting point is lowered to 66°–71°C, while another described by Lipowitz and containing 15 parts of bismuth, eight of lead, four of tin and three of cadmium, softens at about 55° and is completely liquid a little above 60° By the addition of mercury to Darcet's metal the melting point may be reduced so low as 45° These fusible metals have the peculiarity of expanding as they cool, Rose's metal, for instance, remains pasty for a considerable range of temperature below its fusing point, contracts somewhat rapidly from 80° to 55°, expands from 55° to 35°, and contracts again from 35° to 0° For this reason they may be used for taking casts of anatomical specimens or making *clichés* from wood-blocks, the expansion on cooling securing sharp impressions

By suitable modification in the proportions of the components, a series of alloys can be made which melt at various temperatures above the boiling point of water, for example, with eight parts of bismuth, eight of lead and three of tin the melting point is 123°, and with eight of bismuth, 30 of lead and 24 of tin it is 172° With tin and lead only in equal proportions it is 241°. Such alloys are used for making the fusible plugs inserted in the furnace-crowns of steam-boilers, as a safeguard in the event of the water-level being allowed to fall too low When this happens the plug, being no longer covered with water, is heated to such a temperature that it melts and allows the contents of the boiler to escape into the furnace In automatic fire-sprinklers the orifices of the pipes are closed with fusible metal, which melts and liberates the water when, owing to an outbreak of fire in the room, the temperature rises above a predetermined limit.

FUSION. In business and finance, fusion is a term signifying a complete combination of several concerns into one Fusion is accomplished by two methods, by merger and by consolidation When the fusion of two or more business organizations takes place by merger one of them absorbs the other or others, maintaining its own corporate existence under its own charter (amended if necessary), and taking either its own name or that of one of the concerns absorbed All of the concerns to a merger which are absorbed into the remaining one give up their charters and corporate existence

When fusion by consolidation takes place two or more companies organize a *new* company, transfer to it all of their assets, and then dissolve their own respective organizations. In popular usage the terms fusion, merger, consolidation, and several others are often confused and used incorrectly Fusion is the general term embracing both mergers and consolidations If companies *A*, *B* and *C* fuse by merger, two of them, let us say *B* and *C*, will go out of existence and all of their assets will go to build up the enlarged company *A*. If, however, companies *X*, *Y* and *Z* are to be consolidated, *all* of them will go out of existence and their assets will go to form the new company under a new charter.

For Fusion in Physics *see* HEAT.

FÜSSEN, a town of Germany, in the republic of Bavaria, at the foot of the Alps (Tirol), on the Lech, 2,500 ft. above the sea. Pop (1925) 6,215 Rope-making is an important industry. In the castle was signed in 1745 the peace between the elector Maximilian III., Joseph of Bavaria and Maria Theresa Two miles south-east, on the Austrian frontier, is the castle of Hohenschwangau, and a little to the north, that of Neuschwanstein, built by Louis II. of Bavaria

FUST, JOHANN (*c* 1400–1466), early German printer, belonged to a rich and respectable burgher family of Mainz, which is known to have flourished from 1423, and to have held many civil and religious offices Johann Fust appears to have been a money-lender or banker He advanced money to Gutenberg (apparently 800 guilders in 1450, and another 800 in 1452) for carrying on his experiments in printing, and, in 1455, brought a suit against Gutenberg to recover the money he had lent, claiming 2,020 (more correctly 2,026) guilders for principal and interest. It appears that he had not paid in the 300 guilders a year which he had undertaken to furnish for expenses, wages, etc, and, according to Gutenberg, had said that he had no intention of claiming interest The suit was apparently decided in Fust's favour, Nov 6, 1455, in the refectory of the Barefooted Friars of Mainz, when Fust made oath that he himself had borrowed 1,550 guilders and given them to Gutenberg There is no evidence that Fust, as is usually supposed, removed the portion of the printing materials covered by his mortgage to his own house, and carried on printing there with the aid of Peter Schoffer, of Gernsheim (who is known to have been a scriptor at Paris in 1449), to whom, probably about 1455, he gave his only daughter Dyna or Christina in marriage Their first publication was the Psalter, Aug 14, 1457, a folio of 350 pages, the first printed book with a complete date, and remarkable for the beauty of the large initials printed each in two colours, red and blue, from types made in two pieces. The Psalter was reprinted with the same types, 1549 (Aug 29), 1490, 1502 (Schoffer's last publication) and 1516 In addition to the works already mentioned Fust and Schoffer printed. Durandus, *Rationale divinorum officiorum* (1459), folio, 160 leaves; the *Clementine Constitutions*, with the gloss of Johannes Andreae (1460), 51 leaves, *Biblia Sacra Latina* (1462), folio, 2 vols, 242 and 239 leaves, 48 lines to a full page, the Sixth Book of Decretals, with Andreae's gloss, Dec 17, 1465, folio, 141 leaves, Cicero, *De officiis* (1465), 4to, 88 leaves, the first edition of a Latin classic and the first book containing Greek characters, while in the colophon Fust for the first time calls Schoffer "puerum suum"; the same, Feb 4, 1466, *Grammatica rhytmica* (1466), folio, 11 leaves They also printed in 1461–62 several papal bulls, proclamations of Adolf of Nassau, etc.

Fust is said to have gone to Paris in 1466 and to have died of the plague which raged there in August and September He was formerly often confused with the famous magician Dr. Johann Faust, who, though an historical figure, had nothing to do with him (*see* FAUST).

See further the articles GUTENBERG and TYPOGRAPHY.

FUSTEL DE COULANGES, NUMA DENIS (1830–1889), French historian, was born in Paris on March 18, 1830, of Breton descent After studying at the École Normale Supérieure he was sent to the French school at Athens in 1853, directed some excavations in Chios, and wrote an historical account of the island From 1860 to 1870 he was professor of history at the faculty of letters at Strasbourg, where he had a brilliant career as a teacher.

In *La Cité antique* (Strasbourg, 1864; rev ed 1875) he showed forcibly the part played by religion in the political and social evolution of Greece and Rome. Although in making religion the sole factor of this evolution he perverted the historical facts, the book was so consistent throughout, so full of ingenious ideas, and written in so striking a style, that it ranks as one of the masterpieces of the French language in the 19th century

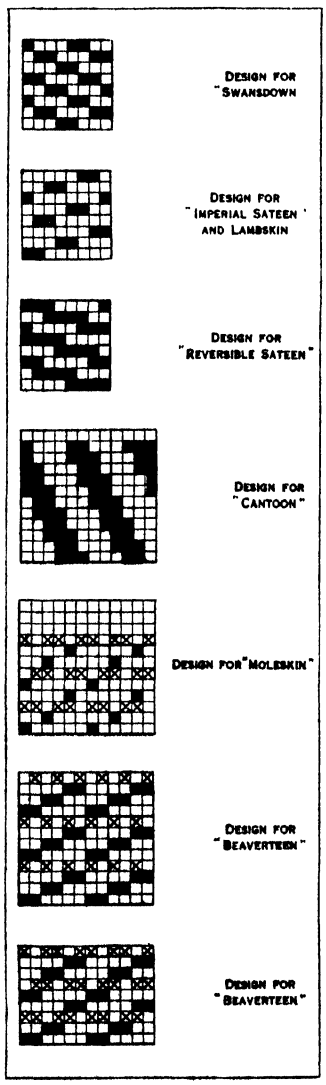
Appointed to a lectureship at the École Normale Supérieure in Feb 1870, to a professorship at the Paris faculty of letters in 1875, to the chair of mediaeval history created for him at the Sorbonne in 1878 and in 1880 to the directorship of the École Normale, he applied himself to the study of the political institutions of ancient France, and, under the influence of the events of 1870–71, to the Germanic invasions under the Roman empire. He maintained that those invasions were not marked by the violent and destructive character usually attributed to them; that the penetration of the German barbarians into Gaul was a slow

process; that the Germans submitted to the imperial administration; that the political institutions of the Merovingians had their origins in the Roman laws at least as much as, if not more than, in German usages; and, consequently, that there was no conquest of Gaul by the Germans This thesis he sustained brilliantly in his *Histoire des institutions politiques de l'ancienne France,* the first volume of which appeared in 1874 As the first volume was keenly attacked in Germany as well as in France, Fustel recast the book entirely. He re-examined all the texts and wrote a number of dissertations, of which, though several (*e g*, those on the Germanic mark and on the *allodium* and *beneficium*) were models of learning and sagacity, all were dominated by his general idea. From this crucible issued an entirely new work, less well arranged than the original, but richer in facts and critical comments The first volume was expanded into three volumes, *La Gaule romaine* (1891), *L'Invasion germanique et la fin de l'empire* (1891) and *La Monarchie franque* (1888), followed by three other volumes, *L'Alleu et le domaine rural pendant l'époque mérovingienne* (1889), *Les Origines du système féodal: le bénéfice et le patronat* (1890) and *Les Transformations de la royauté pendant l'époque carolingienne* (1892) Thus, in six volumes, he had carried the work no farther than the Carolingian period The result of this enormous labour, albeit worthy of a great historian, showed little sense of historical proportion The dissertations not embodied in his great work were collected by himself and (after his death) by his pupil, Camille Jullian, and published as volumes of miscellanies *Recherches sur quelques problèmes d'histoire* (1885), dealing with the Roman colonate, the land system in Normandy, the Germanic mark, and the judiciary organization in the kingdom of the Franks; *Nouvelles recherches sur quelques problèmes d'histoire* (1891), and *Questions historiques* (1893), which contains his paper on Chios and his thesis on Polybius

He died at Massy (Seine-et-Oise) on Sept 12, 1889

See Paul Guiraud, *Fustel de Coulanges* (1896), H d'Arbois de Jubainville, *Deux Manières d'écrire l'histoire critique de Bossuet, d'Augustin Thierry et de Fustel de Coulanges* (1896), P Champion, *Les idées politiques et religieuses de Fustel de Coulanges* (1903)

FUSTIAN, a technical term descriptive of an important class of cotton fabrics comprising several distinctive types and varieties of which "moleskin," corduroy, and velveteen are the three principal types Each of these types also comprises various modifications in respect of the minor details of their construction, such as "beaverteen," "cantoon" or "diagonal," "imperial sateen" or "swansdown," "lambskin" and other varieties Fustian fabrics, with the exception of "swansdown" and velveteen, are firm and compact textures of great strength and durability, adapted for hard wear and chiefly employed in the production of clothing for both sexes These characteristics are obtained by employing warp threads usually of folded yarn and of great strength, in combination with a relatively high rate of picks per inch, of soft-spun single weft



FIGS 1 TO 7 —FUSTIAN DESIGNS

The simplest varieties of fustian fabrics are those known as "imperials," comprising "swansdown," "lambskin" and reversible "sateen," of which the designs showing the weave structures are given in figs 1, 2 and 3 respectively

Swansdown.—Swansdown is based on the five-end weft face satin weave, but with two contiguous warp threads raised together, instead of singly, as indicated in the design, fig. 1 After weaving, these fabrics are submitted to an operation of "perching" or "raising," in order to develop on the face side of the fabric a soft furry "nap" or "down" which characterizes a swansdown fabric and gives it additional warming properties suitable for underclothing and night attire One quality of "swansdown" contains 60 warp threads per inch, of 18's T, and 120 picks per inch, of 20's soft weft of good quality to develop a good "nap"

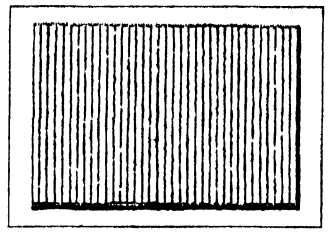


FIG 8 —FINE-RIBBED "THICKSET" CORDUROY FABRIC WOVEN FROM DESIGN IN FIG 9

Imperial Sateen.—Imperial sateen is virtually "swansdown" of stronger and heavier texture and based on the eight-end weft face satin weave structure, but with two contiguous warp threads raised together, as indicated in the design, fig. 2 This weave produces relatively longer weft floats and permits of a greater density of picks being inserted in the fabric When "perched" on the face side, "imperial sateen" is sold as "lambskin," from the long, soft and woolly "nap" It is also sometimes dyed and finished to imitate a light texture of "moleskin" A good quality of "lambskin" contains 46 warp ends of 2/20 s, and 450 picks of 20's weft, per inch; whilst a medium quality of dyed "imperial sateen" contains 68 warp ends of 16's T. and 150 picks of 16's weft, per inch

Reversible imperial is a variation of "imperial sateen" simply by floating the weft equally on both sides of the fabric, as indicated in the design, fig 3, showing the weave structure of this variety of which a good quality contains 62 warp ends of 14's T and 330 picks of 30's weft, per inch

Cantoon.—Cantoon or diagonal is a strong and compact texture produced with fine diagonal cords or ribs of twill running at a low angle of about 18°, and based on the twill weave structure indicated in fig 4 It is usually dyed a fawn or a drab hue, "perched" on the back, and largely employed for men's and ladies' riding and sporting habits. A good quality of "cantoon" contains 54 warp ends of 2/20's, and 400 picks of 20's weft, per inch

Moleskin.—Moleskin is a thicker, stronger, and heavier texture than other varieties of fustian and is more suitable for men's clothing requiring very hard wear and durable qualities, and especially for rough occupations as iron and brass-moulding, navvying, and similar work Moleskin is a semi-compound texture consisting of one series of warp threads and two series of weft, viz., "face" picks and "back" picks (of the same kind of weft) inserted in the ratio of two "face" picks to one "back" pick, uniformly, as indicated in fig 5, showing a design for a "moleskin" fabric which is virtually a stronger and heavier texture of uncut velveteen, as described in a separate article (*q v*) A "moleskin" of good quality contains 38 warp ends of 3/34's and 400 picks of 14's weft, per inch.

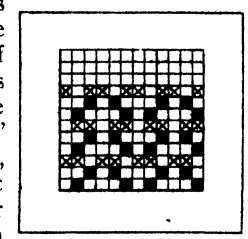


FIG 9 —DESIGN FOR FINE-RIBBED CORDUROY FABRIC Shown in Fig. 8, containing two pile picks to one back pick

Beaverteen is virtually a light texture of "moleskin" which, after weaving, is dyed, printed, and "perched" on the back to produce a short "nap" Two designs for "beaverteen" are given in figs. 6 and 7. The design fig. 6 will produce what is practically a "tabby" back "beaverteen," with three "face" picks to one "back" pick; while the design fig. 7, will produce a fabric with two "face" picks to one "back" pick, and a three-end weft twill back which is better for "perching." A good quality of "beaverteen" contains 32 warp ends of 2/18's, and 280 picks of 18's weft, per inch.

Corduroy and Velveteen.—Unlike other varieties of fustian fabrics, corduroy and velveteen are characterized by having a short plush or velvet weft pile formed on the face of the fabric In corduroy, the pile is formed in a series of more or less crowned ribs or cords of uniform width extending lengthwise of the fabric, in the direction of warp threads, whilst in velveteen, the pile forms an even and level surface In both of these types of fabric the pile surface is developed subsequent to weaving, by submitting the cloth to an operation of "fustian cutting" in which the "face" or "pile" picks of weft are severed, either manually or mechanically, by means of special knife blades or circular discs, thereby causing the severed weft threads to assume a vertical position and thus constitute the tufts of pile which characterize these fabrics

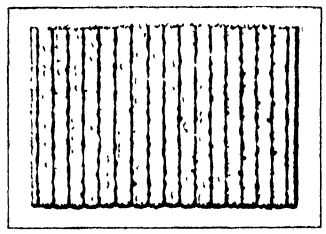


FIG. 10.—CORDUROY FABRIC WITH WIDE RIBS, WOVEN FROM THE DESIGN IN FIG. 11

Corduroy fabrics consist of a foundation texture based on the three-end or four-end twill or other simple weave structure that will ensure sufficient stability in the fabric The cords are usually of uniform width, and sometimes of different width, in the same fabric When the cords are of uniform width, they are formed at regular intervals ranging from three to 16 or 20 warp threads, uniformly, chiefly according to the width of cords required and the style of clothing for which the fabric is intended, as, for example, suits for artisans, or for sporting and riding suits for both men and women

Corduroy fabrics are produced in a variety of different textures, styles and qualities, according to the special purpose for which they are intended The simplest variety, and one of the neatest styles employed for boys' and men's clothing is commonly termed "thickset" corduroy of which an example is illustrated in fig 8 This fabric is constructed with two "pile" picks to one "back" pick, uniformly, in accordance with the design shown in fig 9, which is for a corduroy fabric formed with a three-end twill back, though it may be formed with a "tabby" back The cords in this example recur on the smallest possible number of warp threads, viz , three, with two cords constituting one repeat of the design which, therefore, repeats on six warp threads, as indicated A corduroy fabric constructed with much wider and bolder cords is illustrated in fig 10, of which the design is given in fig 11 This example is based on the four-end 2 x 2 twill foundation texture, with two "pile" picks to one "back" pick, and with the cords recurring at regular intervals of eight warp threads, uniformly, as indicated in the design Corduroy fabrics comprise many other modifications of structure both in respect of their foundation textures and also in the particular manner of intersecting the "pile" picks with the "stitching" or "binding" warp threads that form the cuttings or furrows between the cords but the two examples here given will serve to indicate the general principle of their construction *See* also the article VELVETEEN

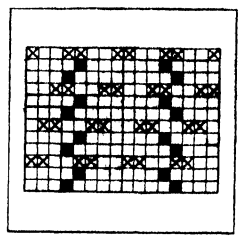


FIG 11.—DESIGN FOR WIDE-RIBBED CORDUROY FABRIC, SHOWN IN FIG 10, CONTAINING TWO PILE PICKS TO ONE BACK PICK

See H Nisbet, *Grammar of Textile Design* (1927). (H. N)

FUSTIC, YELLOW WOOD or **OLD FUSTIC,** is the wood of a large tree (*Chlorophora tinctoria*) of the mulberry family (Moraceae) growing in the West Indies and tropical America The best quality comes from Cuba and the poorer from Jamaica and Brazil It is still employed in the form of extract for wool dyeing, mainly in conjunction with other dyewoods, for the production of browns, olives and compound colours, and for deadening the shade of blacks The mordant mainly in use is bichromate of potash, and the olive yellow thus obtained is fairly fast to light In other respects, the dyeing properties of this wood closely resemble those of Quercitron Bark It contains two colouring matters, *Morin*, $C_{15}H_{10}O_7$, and *Maclurin*, $C_{13}H_{10}O_6$, of which the former is the more important The dye-stuff termed *young fustic*, or Zante fustic and Venetian sumach, is the wood of the smoke tree (*Rhus Cotinus*), a southern European and Asiatic shrub of the Cashew family (Anacardiaceae) (A G P)

FUTURES, contracts which provide for the delivery by the seller to the buyer of some commodity, generally wheat, corn, oats, cotton, coffee, sugar, and so on, or foreign exchange, or certain securities at a specified future date A future is designated by the name of the month at which delivery must be made Thus one buying October cotton, or other commodity, receives a contract providing for the delivery to him of a specified amount of the commodity in the following October Much speculation is carried on in *futures* but the practice is not legally regarded as gambling

FUTURISM: *see* PAINTING

FUX, JOHANN JOSEPH (1660–1741), Austrian musician, was born at Hirtenfeld, Styria In 1690 he was organist at one of the principal churches of Vienna, and in 1698 was appointed by the emperor Leopold I as his "imperial court-composer," with a salary of about £6 a month At the court of Leopold and of his successors Joseph I. and Charles VI., Fux remained for the rest of his life To his various court dignities that of organist at St. Stephen's cathedral was added in 1704. He married the daughter of the Government secretary Schnitzbaum. Fux died at Vienna on Feb 13, 1741 His life, although passed in the great world, was uneventful, and his only troubles arose from the intrigues of his Italian rivals at court The numerous operas which Fux wrote do not differ essentially from the style of the Italian *opera seria* of the time Of greater importance are his sacred compositions, psalms, motets, oratorios and masses, amongst the latter the celebrated *Missa Canonica* which is written in canon throughout As a contrapuntist and musical scholar generally, Fux was unsurpassed by any of his contemporaries, and his great theoretical work, the *Gradus ad Parnassum* (Vienna 1715), written in Latin, long remained by far the most thorough treatment of counterpoint and its various developments, and was translated into most European languages during the 18th century

See Ludwig von Kochel, *J J Fux, Hofcomponist und Hofkapellmeister der Kaiser Leopold I , Joseph I and Karl VI von 1698 bis 1740* (1872) This is based on minute original research and contains a complete catalogue of the composer's numerous works

FYNE, LOCH, inlet of the sea, Argyllshire, Scotland From the head, 6 m above Inveraray, to the mouth on the Sound of Bute, it has a south-westerly and then southerly trend and is 44 m long, its width varying from ¼ m to 6 m On the western side it gives off Lochs Shira, Gair, Gilp (with Ardrishaig, the Crinan Canal and Lochgilphead) and East Tarbert (with Tarbert village) The glens debouching on the lake are Fyne, Shira, Aray, Kinglas and Hell's Glen The coast generally is picturesque and in many parts well wooded All vessels using the Crinan Canal navigate the loch to and from Ardrishaig, and there is daily communication with Glasgow, as far up as Inveraray There are ferries at St Catherine's and Otter, and piers at Tarbert, Ardrishaig, Kilmory, Crarae, Furnace, Inveraray and Strachur. The industries comprise granite quarrying at Furnace, distilling at Ardrishaig and valuable fisheries The "Loch Fyne herrings" are famous

FYRD, the name given to the English militia during the Anglo-Saxon period (*see* ARMY) In early times the ealdorman of the shire was probably charged with the duty of calling out and leading the fyrd, which appears always to have retained a local character, as during the time of the Danish invasions we read of the fyrd of Kent, of Somerset and of Devon It is probable that originally all free landholders were required to attend the fyrd, and exemption from this duty was only very sparingly granted The fyrd was gradually superseded by the gathering of the thegns and their retainers, but it was occasionally called out for defensive purposes even after the Norman Conquest

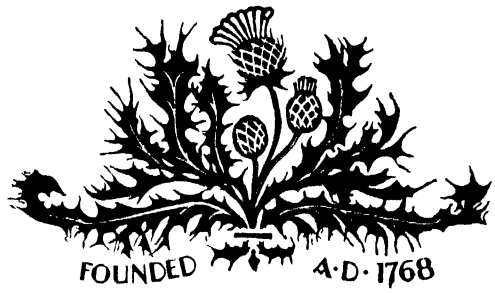
FYT, JOHANNES (1609–1661), Belgian animal painter, was born at Antwerp and christened on Aug 19, 1609 He was registered apprentice to Hans van den Berghe in 1621 At 20 Johannes Fyt entered the gild of St Luke as a master, and from that time till his death in 1661 he produced a vast number of pictures in

which the bold facility of Snyders is united to the powerful effects of Rembrandt There never was such a master of technical processes as Fyt in the rendering of animal life in its most varied forms He was not clever at figures, and he sometimes trusted for these to the co-operation of Cornelius Schut or Willeborts, whilst his architectural backgrounds were sometimes executed by Quellyn "Silenus amongst Fruit and Flowers," in the Harrach collection at Vienna, "Diana and her Nymphs with the Produce of the Chase," in the Belvedere at Vienna, and "Dead Game and Fruit in front of a Triumphal Arch," belonging to Baron von Rothschild at Vienna, are specimens of the co-operation respectively of Schut, Willeborts and Quellyn They are also Fyt's masterpieces The earliest dated work of the master is a cat grabbing at a piece of dead poultry near a hare and birds, belonging to Baron Cetto at Munich, and executed in 1644 The latest is a "Dead Snipe with Ducks," of 1660, sold with the Jager collection at Cologne in 1871 Great power is shown in the bear and boar hunts at Munich and Ravensworth castle and in the "Hunted Roedeer with Dogs in the Water," in the Berlin museum A splendid specimen is the Page and Parrot near a table covered with game, guarded by a dog staring at a monkey, in the Wallace collection, London

FYZABAD, a city, district and division of British India in the United Provinces The city stands on the left bank of the river Gogra, 78 m by rail E of Lucknow Pop. (1921) 51,342 To the east of Fyzabad is the ancient site of Ajodhya (*q.v.*) Fyzabad was founded about 1730 by Sa'adat Ali Khan, the first nawab wazir of Oudh, who built a hunting-lodge here It received its present name in the reign of his successor; and Shuja-ud-daula, the third nawab, laid out a large town and fortified it, and here he was buried It was afterwards the residence of the begums of Oudh On the outbreak of the Mutiny, many of the European women and children were sheltered by one of the great landholders of Oudh, and others were sent to less disturbed parts of the country, but the officers of the Indian garrison were almost all murdered by their own troops Fyzabad is now a station for European as well as for Indian troops, and the headquarters of a brigade There is a government college. Sugar refining and trade in agricultural produce are important

The DISTRICT OF FYZABAD, lying between the two great rivers Gogra and Gumti, has an area of 17 sq m It is entirely alluvial and well wooded, and has a good climate Pop (1921) 1,171,930 Tanda, with a population in 1921 of 18,058, has the largest production of cotton goods in Oudh

The DIVISION OF FYZABAD has an area of 12,101 sq m, and comprises the six districts of Fyzabad, Gonda, Bahraich, Sultanpur, Partabgarh and Bara Banki Pop (1921) 6,599,401



G The history of this letter began with the Latin alphabet The Chalcidic alphabet, from which the Latin derived, represented the voiced velar stop by its third letter *gamma* ⋀ **C** This passed into Latin and was used, in its rounded form, **C**, to represent the same sound in early times, *e g*, in the word **RECEI**, occurring in an early Latin inscription The letter however came to represent the unvoiced velar stop, thus ousting **K** This was probably due to Etruscan influence. To avoid confusion a new letter **G** was differentiated from **C** and used to represent the voiced velar, while **C** henceforward stood for the unvoiced velar only The new letter was placed in the alphabet in the place of Greek Z (zeta) which was not required in the Latin alphabet

The uncial form of the letter in the 6th and 7th centuries was ꞓ or ꞓ. The form with rounded head ꞓ, from which our minuscule *g* is derived, appears first in Latin cursive writing about the beginning of the 7th century taking the place of such earlier forms as . It was standardised in Carolingian as ꝯ The minuscule flat-headed form was adopted by Irish writing of the 6th and 7th centuries, *e g*, ꝫ or ꝫ Such a form had been in use in Latin cursive, *e g*, (5th cent), (late 7th cent), (7th or 8th cent) A form ꝫ appears in Merovingian (pre-Carolingian French) writing in the 8th century, and a descendant of this was adopted into the Carolingian hand, not being entirely ousted by the round-headed form till the 11th century The flat-headed form was adopted by the Early English hand from the Irish, and remained the only form of the letter in use in England until the introduction of Carolingian writing by the Norman scribes in the 12th century Meanwhile certain changes had taken place in the sound represented by the letter. The voiced velar had become palatalised before the front vowels *e* and *i* Thus the flat-headed form of the letter, the only form in use in pre-Norman England, represented the velar before back vowels, the palatal (a sound akin to that heard in German *Tag, Zug*) before front vowels It also stood for the sound now represented by *y* initially before front vowels. In Middle English the palatal stop developed into the sound now represented by *j*, a similar change having taken place in the development of the Latin velar on the continent This sound was therefore introduced to English ears by the Normans, and in the Middle English period we find the two forms of the minuscule letter in use to represent different sounds ꝯ represented the voiced velar (modern "hard" *g*) and the sound of *j*, ꝫ represented the palatal stop (γ) and the sound of *y* As the palatal stop (in such words as *might, high, enough,* etc) disappeared from the language, the use of the flat-headed form was discontinued. It survived in remote parts, and by its similarity to the form of *z* produced confusion with the latter

In modern English the letter represents two sounds: i) the voiced velar, ii) the sound of *j* (dž) before the vowels *e, i,* and *y* in words of Romance origin, *e g gesture, ginger, gymnastics* (contrast *give, gilt*) (B F. C. A)

NAME OF FORM	APPROXIMATE DATE	FORM OF LETTER
PHOENICIAN	BC 1 200	⅂
CRETAN	1,100-900	∧
THERAEAN	700-600	⅂,1
ARCHAIC LATIN	700-500	(G)
ATTIC	600	∧
CORINTHIAN	600	>)
CHALCIDIAN	600	<
IONIC	403	1
ROMAN COLONIAL	PRE CLASSICAL AND CLASSICAL TIMES	ꞓ G
URBAN ROMAN		G
FALISCAN		>
OSCAN		>
UMBRIAN		(ꓘ)
CLASSICAL LATIN AND ONWARDS		G

THE DEVELOPMENT OF THE LETTER G FROM THE PHOENICIAN, THROUGH THE LATIN DOWN TO MODERN FORM

In music, G is the name of the seventh note of the musical alphabet or otherwise the fifth note of the scale of C. It gives its name also to the treble (or violin) clef, the distinguishing sign of which is placed upon the line representing this note in the treble stave To which it may be added that the said sign itself was originally nothing but a capital G which in the course of time has come to assume the conventionalized form which we now have

GA'ALIIN: *see* ARABS

GABARDINE. The term applied in the cloth trade originally to a particular type of water-proofed fabric employed for the manufacture of raincoats, but later as a general description of several varieties of worsted, cotton, silk, and union or mixture fabrics, embodying certain features in common, and chiefly made up into cloaks and over-coats The original material of this name was a union fabric produced from a fine two-fold Botany worsted warp picked with two-fold cotton weft and in which warp and weft threads are in the proportion of two to one, approximately, and the fabric is still essentially of a warp-faced texture developed with a steep warp-face twill weave producing a relatively strong and firm cloth somewhat resembling "whipcord," but of lighter texture "Covert coating" fabrics are virtually gabardines of a

lighter texture suitable for summer wear and for use in hot climates

Owing to the predominance of warp over weft threads in gabardine fabrics, the weft lies entirely at the back and is therefore not visible from the front, a circumstance which allows the use of weft of inferior quality without loss of durability, for the warp surface only is exposed to wear Although all varieties of gabardine fabrics have the same general textural appearance, they vary considerably both in respect of the particular twill weave and in the character, quality and counts of material employed in their construction, as well as in the number of warp threads and picks of weft per inch in the fabric Some gabardine fabrics are produced entirely from cotton yarn The better qualities of these are made from super-grades of combed two-fold warp and weft, while those of coarser texture and inferior quality are made from single yarn both for warp and weft A so-called "voile gabardine" fabric of a more open and much lighter texture is produced entirely of silk (H N)

GABA TEPE, LANDING AT, 1915: *see* DARDANELLES CAMPAIGN

GABBRO, in petrology a group of plutonic basic rocks, holocrystalline and usually rather coarse-grained, consisting essentially of a basic plagioclase felspar and one or more ferro-magnesian minerals (such as augite, hornblende, hypersthene and olivine) The name was given originally in north Italy to certain coarsely crystalline dark green rocks, some of which are true gabbros, while others are serpentines The gabbros are the plutonic or deep-seated representatives of the dolerites and basalts (also of some varieties of andesite) with which they agree closely in mineral composition, but not in minute structure Of their minerals felspar is usually the most abundant, and is principally labradorite and bytownite, though anorthite occurs in some, while oligoclase and orthoclase have been found in others The felspar is sometimes very clear and fresh, its crystals being for the most part short and broad, with rather irregular or rounded outlines, albite and pericline twinning is very frequent Equally characteristic of the gabbros is the alteration of the felspars to cloudy, semi-opaque masses of saussurite These are compact, tough, devoid of cleavage, and have a waxy lustre and usually a greenish-white colour When this substance can be resolved by the microscope it proves to consist usually of zoisite or epidote, with garnet and albite, but mixed with it are also chlorite, amphibole, serpentine, prehnite, sericite, and other minerals The olivine in most cases is altered to green or yellow serpentine, often with bands of dark magnetite granules along its cleavages and cracks Hornblende, when primary, may surround augite or be intergrown with it; it is more frequently secondary Dark-brown biotite, although by no means an important constituent of these rocks, occurs in many of them. Quartz is rare, but is occasionally seen intergrown with felspar as micro-pegmatite Among the accessory minerals may be mentioned apatite, magnetite, ilmenite, picotite and garnet

In a very large number of the rocks of this group the plagioclase felspar has crystallized in large measure before the pyroxene, and is enveloped by it in ophitic manner exactly as occurs in the dolerites When these rocks become fine-grained they pass gradually into ophitic dolerite, only very rarely does olivine enclose felspar in this way A fluxion structure or flow banding also can be observed in some of the rocks of this series, and is characterized by the occurrence of parallel sinuous bands of dark colour, rich in ferro-magnesian minerals, and of lighter shades in which felspars predominate

These basic holocrystalline rocks form a large and numerous class which can be subdivided into many groups according to their mineral composition; if we take it that typical gabbro consists of plagioclase and augite or diallage, norite of plagioclase and hypersthene, and troctolite of plagioclase and olivine, we must add to these olivine-gabbro and olivine-norite in which that mineral occurs in addition to those enumerated above Hornblende-gabbros are distinctly rare, except when the hornblende has been developed from pyroxene by pressure and shearing, but many rocks may be described as hornblende or biotite-bearing gabbro and norite, when they contain these ingredients in addition to the normal plagioclase, augite and hypersthene We may recognize also quartz-gabbro and quartz-norite (containing primary quartz or micropegmatite) and orthoclase-gabbro (with a little orthoclase) The name eucrite has been given to gabbros in which the felspar is mainly anorthite; many of them also contain hypersthene or enstatite and olivine, while allivalites are anorthite-olivine rocks in which the two minerals occur in nearly equal proportions; harrisites have preponderating olivine, anorthite felspar and a little pyroxene In areas of gabbro there are often masses consisting nearly entirely of a single mineral, for example, felspar rocks (anorthosites), augite or hornblende rocks (pyroxenites and hornblendites), and olivine rocks (dunites or peridotites) Segregations of iron ores, such as ilmenite, usually with pyroxene or olivine, occur in association with some gabbro and anorthosite masses

Some gabbros are exceedingly coarse-grained and consist of individual crystals several inches in length, such a type often forms dikes or veins in serpentine or gabbro, and may be called gabbro-pegmatite Still more common is the occurrence of sheared, foliated or schistose forms of gabbro In these the minerals have a parallel arrangement, the felspars are often broken down by pressure into a mosaic of irregular grains, while greenish fibrous or bladed amphibole takes the place of pyroxene and olivine The diallage may be present as rounded or oval crystals around which the crushed felspar has flowed (augen-gabbro), or the whole rock may have a well-foliated structure (hornblende-schists and amphibolites) Very often a mass of normal gabbro with typical igneous character passes at its margins or along localized zones into foliated rocks of this kind, and every transition can be found between the different types Some authors believe that the development of saussurite from felspar is also dependent on pressure rather than on weathering, and an analogous change may affect the olivine, replacing it by talc, chlorite, actinolite and garnet. Rocks showing changes of the latter type have been described from Switzerland under the name allalinites

Rocks of the gabbro group, though not so common nor occurring in so great masses as granites, are exceedingly widespread In Great Britain, for example, there are areas of gabbro in Shetland, Aberdeenshire, and other parts of the Highlands, Ayrshire, the Lizard (Cornwall), Carrock Fell (Cumberland) and St David's (Wales) Most of these occur along with troctolites, norites, serpentine and peridotite In Skye, an interesting group of fresh olivine-gabbros is found in the Cuillin hills, here also peridotites occur and there are sills and dikes of olivine-dolerite, while a great series of basaltic lavas and ash beds marks the site of volcanic outbursts in early Tertiary time In this case it is clearly seen that the gabbros are the deep-seated and slowly crystallized representatives of the basalts which were poured out at the surfaces, and of the dolerites which consolidated in fissures The older gabbros of Britain, such as those of the Lizard, Aberdeenshire and Ayrshire, are often more or less foliated and show a tendency to pass into hornblende-schists and amphibolites. In Germany, gabbros are well known in the Harz Mountains, Saxony, the Odenwald and the Black Forest. Many outcrops of similar rocks have been traced in the northern zones of the Alps, often with serpentine and hornblende-schist They occupy considerable tracts of country in Norway and Sweden, as for instance in the vicinity of Bergen. The Pyrenees, Ligurian Alps, Dauphiné and Tuscany are other European localities for gabbro In Canada, great parts of the eastern portion of the Dominion are formed of gabbros, norite, anorthosite and allied rock types. In the United States gabbros and norites occur near Baltimore and near Peekskill on the Hudson river. Probably the largest mass of basic intrusive rock in the world is the great Duluth gabbro laccolith in Minnesota, which is computed to have a volume of 50 cubic miles As a rule, each of these occurrences contains a diversity of petrographical types, which appear also in certain of the others; but there is often a well-marked individuality about the rocks of the various districts in which gabbros are found

From an economic standpoint gabbros are not of great

importance. They are used locally for building and for road-metal, but are too dark in colour, too tough and difficult to dress, to be popular as building stones, and, though occasionally polished, are not to be compared for beauty with the serpentines and the granites. Segregations of iron ores are found in connection with many of them (Norway and Sweden) and are sometimes mined as sources of the metal, but the ore is often too rich in titanium to be of any value Many great masses of iron pyrites, often copper-bearing, occur in association with rocks having the composition of gabbros, as in Norway and the Urals, and it is an interesting fact that in many cases the masses of sulphide found in association with norites are rich in nickel, as at Sudbury in Ontario and several localities in Norway.

Chemically the gabbros are typical rocks of the basic subdivision and show the characters of that group in the clearest way. They have low silica, much iron and magnesia, and the abundance of lime distinguishes them in a marked fashion from both the granites and the peridotites A few analyses of well-known gabbros are cited here

	SiO_2	TiO_2	Al_2O_3	FeO	Fe_2O_3	MgO	CaO	Na_2O	K_2O	H_2O
I	49 03	1 75	16 18	12 03	1 92	5 38	9 33	1 89	0 81	0 55
II	49 90		16 04		7 81	10 08	14 48	1 69	0 55	1 46
III	45 73		22 10	3 51	0 71	11 16	9 26	2 54	0 34	4 38
IV	46 24		29 85	2 12	1 30	2·41	16 24	1 98	0 18	

I —Gabbro, Radauthal, Harzburg, II —Gabbro, Penig, Saxony; III —Troctolite, Coverack, Cornwall, IV —Anorthosite, mouth of the Seine river, Bad Vermilion lake, Ontario, Canada

(J S. F.)

GABELENTZ, HANS CONON VON DER (1807–1874), German linguist and ethnologist, born at Altenburg on Oct 13, 1807, was the only son of Leopold von der Gabelentz, chancellor and privy-councillor of the duchy of Altenburg. He studied at Leipzig and Göttingen and after 1830 held various public offices He died at Lemnitz, in Saxe-Weimar, on Sept 3, 1874

Gabelentz is said to have learned no fewer than 80 languages, 30 of which he spoke fluently. Immediately after quitting the university, he followed up his Chinese researches by a study of the Finno-Ugrian languages, which resulted in the publication of his *Eléments de la grammaire mandchoue* in 1832. In 1837 he became one of the promoters, and a joint-editor, of the *Zeitschrift fur die Kunde des Morgenlandes*. His works include. *Grundzuge der syrjänischen Grammatik* (1841); a complete edition (with J. Lobe), with translation, glossary and grammar, of Ulfilas's Gothic version of the Bible (1843–46), articles on the languages of the Swahilis, the Samoyedes, the Hazaras, the Aimaks, the Formosans and other widely-separated tribes in the *Zeitschr. d deut. morgenland Gesell.; Beiträge zur Sprachenkunde* (1852) containing Dyak, Dakota, and Kiriri grammars; a *Grammatik u Worterbuch der Kassiasprache* (1857); an edition of the Manchu translations of the Chinese Sse-shu, Shu-king and Shi-king, with a dictionary (1864); and *Die melanesischen Sprachen nach ihrem grammatischen Bau und ihrer Verwandschaft unter sich und mit den malaiisch-polynesischen Sprachen untersucht* (1860–73). The last-named work treats of the language of the Fiji islands, New Hebrides, Loyalty islands, New Caledonia, etc, and shows their radical affinity with the Polynesian class.

GABELLE, a term which, in France, was originally applied to taxes on all commodities, but was gradually limited to the tax on salt. In process of time it became one of the most hated and most grossly unequal taxes in the country, but, though condemned by all supporters of reform, it was not abolished until 1790 First imposed in 1286, in the reign of Philip IV., as a temporary expedient, it was made a permanent tax by Charles V. Repressive as a state monopoly, it was made doubly so from the fact that the government obliged every individual above the age of eight years to purchase weekly a minimum amount of salt at a fixed price. When first instituted, it was levied uniformly on all the provinces in France, but for the greater part of its history the price varied in different provinces. There were five distinct groups of provinces, classified as follows: (*a*) the *Pays de grandes gabelles*, in which the tax was heaviest, (*b*) the *Pays de petites gabelles*, which paid a tax of about half the rate of the former; (*c*) the *Pays de salines*, in which the tax was levied on the salt extracted from the salt marshes; (*d*) the *Pays rédimés*, which had purchased redemption in 1549; and (*e*) the *Pays exempts*, which had stipulated for exemption on entering into union with the kingdom of France *Greniers à sel* (dating from 1342) were established in each province, and to these all salt had to be taken by the producer on penalty of confiscation The *grenier* fixed the price which it paid for the salt and then sold it to retail dealers at a higher rate

See Necker, *Compte rendu* (1781); J J. Clamagéran, *Histoire de l'impôt en France* (1876); A. Gasquet, *Précis des institutions politiques de l'ancienne France* (1885).

GABELSBERGER, FRANZ XAVER (1789–1849), inventor of the German system of stenography, was born on Feb. 9, 1789, at Munich His system was tested at the first session of the Bavarian estates in 1819, and he was placed in charge of the stenographic reports of the Bavarian Chamber His system is explained in his *Anleitung zur deutschen Redezeichenkunst oder Stenographie* (1834, new ed. 1900), and *Neuen Vervollkommungen der deutschen Redezeichenkunst* (1843; new ed 1904) (*see* SHORTHAND· *Foreign Shorthand Systems*). Gabelsberger also invented a calculating machine

See A. K Stubenrauch, *Gabelsberger und der deutsche Geist* (1924), and J G. Schwaebl, *Erinnerungen an Gabelsberger* (1925).

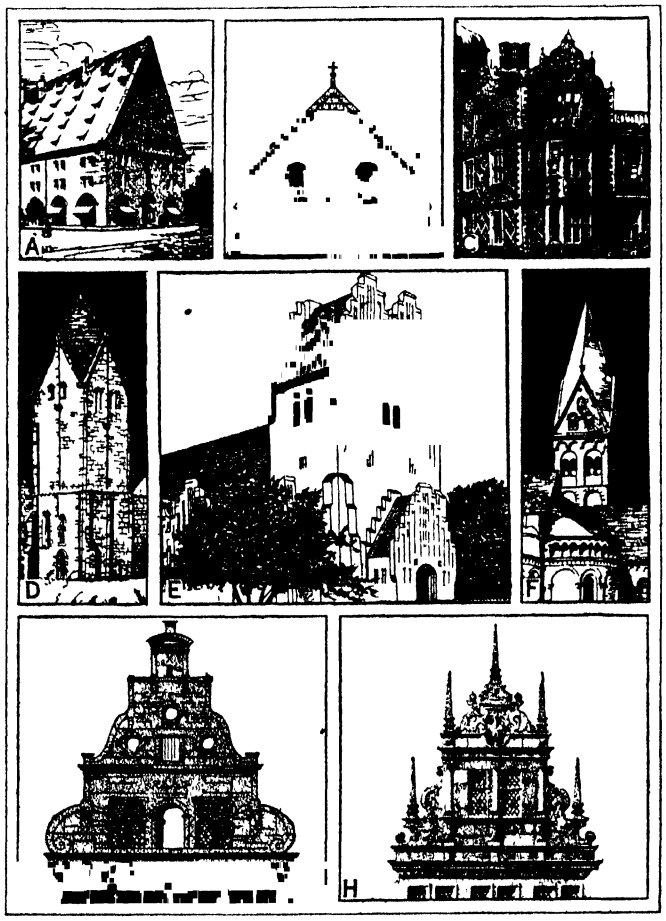
GABERDINE or **GABARDINE,** any long, loose overgarment, reaching to the feet and girt round the waist. It was commonly worn in the middle ages by pilgrims, beggars and almsmen. The Jews, conservatively attached to the loose and flowing garments of the East, continued to wear the long upper garment to which the name "gaberdine" could be applied, long after it had ceased to be worn by Gentiles

GABES, a town of Tunisia, at the head of the gulf of the same name, and 70 m by sea S W of Sfax, with which it is connected by rail. It occupies the site of the Tacape of the Romans and consists of an open port and European quarter and several small Arab towns built in an oasis of date palms This oasis is copiously watered by a stream called the Wad Gades. The European quarter is situated on the right bank of the Wad near its mouth, and adjacent are the Arab towns of Jara and Menzel The houses of the native towns are built largely of dressed stones and broken columns from the ruins of Tacape. Gabes is the chief town of a civil jurisdiction. The population of the oasis is about 20,000, including some 1,500 Europeans. There is a considerable export trade in dates

GABII, an ancient city of Latium, 12 m. E. of Rome, on the Via Praenestina, which was in early times known as the Via Gabina Its early history is obscure, though its importance was considerable; but we only hear of it again in the 1st century B C. as a small and insignificant place, though its desolation is no doubt exaggerated by the poets. Its baths were well known, and Hadrian, who was responsible for much of the renewed prosperity of the small towns of Latium, appears to have been a very liberal patron, building a senate-house and an aqueduct. Its bishops continue to be mentioned in ecclesiastical documents till the end of the 9th century. The primitive city was on the eastern bank of the lake, the citadel being now marked by the ruins of the mediaeval fortress of Castiglione, while the Roman town extended farther to the south The most conspicuous relic of the latter is a ruined temple, generally attributed to Juno, probably belonging to 250–200 B.C. To the east of the temple lay the Forum, where excavations were made by Gavin Hamilton in 1792. All the objects found were placed in the Villa Borghese, but many of them were carried off to Paris by Napoleon after his conquest of Italy in 1797, and are in the Louvre.

See E. Q. Visconti, *Monumenti Gabini della Villa Pinciana* (Rome, 1797, and Milan, 1835); T. Ashby in *Papers of the British School at Rome*, i. 180 *seq*; G. Pinza in *Bull Com.* (1903), 321 *seq.* for archaeological information. (T. A.)

GABINIUS, AULUS, Roman statesman and general, and supporter of Pompey In 67 B C, when tribune of the people, he brought forward the *Lex Gabinia,* conferring upon Pompey the command in the war against the Mediterranean pirates, with absolute control over that sea and the coasts for 50m inland By other measures of Gabinius loans of money to foreign ambassadors in Rome were made non-actionable (as a check on the corruption of the senate) and the senate was ordered to give audience to foreign envoys on certain fixed days (1st of Feb–1st of March). In 58 he was elected consul, not without suspicion of bribery During his term of office he helped Clodius to send Cicero into exile In 57 Gabinius went as proconsul to Syria On his arrival he reinstated Hyrcanus in the high-priesthood at Jerusalem, suppressed revolts, introduced important changes in the government of Judaea, and rebuilt several towns During his absence in Egypt, whither he had been sent by Pompey, without the consent of the senate, to restore Ptolemy Auletes to his kingdom, Syria was devastated by robbers, and an insurrection had arisen against Hyrcanus With some difficulty Gabinius restored order, and in 54 handed over the province to his successor, M Licinius Crassus The tax-farming interests, which had suffered from the disorders, had him impeached on his return Gabinius went into exile, and his property was confiscated After the outbreak of the civil war, he was recalled by Caesar in 49, and entered his service, but took



A BY COURTESY OF GERMAN STATE RAILWAYS; B FROM VIOLLET LE DUC, "DICTIONNAIRE DE L ARCHITECTURE FRANCAISE", D, F, & H FROM BANISTER FLETCHER, "HISTORY OF ARCHITECTURE ON THE COMPARATIVE METHOD"

GABLES. A, GERMAN, B, FRENCH, C & D, ENGLISH, E, DANISH, F, GERMAN, G, BELGIAN, H, GERMAN

no active part against Pompey He died on service in Dalmatia against M Octavius in 48 or early 47

See Dio Cassius xxxvi. 23–36, xxxviii. 13. 30, xxxix. 55–63, Plutarch, *Pompey,* 25. 48, Josephus, *Antiq* xiv 4–6; Appian, *Illyrica,* 12, *Bell Civ* ii 24 59, Cicero, *ad Att* vi 2, *ad Q Fratrem,* ii 13, *Post reditum in senatu,* 4–8, *Pro lege Manilia,* 17, 18, 19; exhaustive article by Bahr in Ersch and Gruber's *Allgemeine Encyclopadie;* and monograph by G. Stocchi, *Aulo Gabinio e i suoi processi* (1892).

GABLE, the upper part of the end-walls of a building covered by a roof that slopes down from the centre to each side; hence the gable is always pointed in general form and usually triangular. In cases like the gambrel roof (*q.v.*) where the roof is in two slopes on each side, the gable becomes pentagonal In classic work, where the slopes are low and where a cornice is continued across the end-walls connecting the eaves, the gable is called a pediment (*q v*) The architectural treatment of the gable results from the effort to find a beautiful solution to the problem of keeping water out of the intersection of walls and roof This was done either by carrying the roof out over the top of the end-walls and finishing it with a moulding, sloping cornices or a projecting, bracketed board known as a bargeboard (*q v*), or by carrying up the end-walls above the roof level and capping them with a water-proof coping or cap The former method is general in wooden buildings, and in those of small size or little architectural formality, the latter in larger and more monumental masonry structures, particularly in the Gothic and early Renaissance styles In north and west Europe, where roofs of steep pitch are general, gables are often richly decorated and finished at the top with a series of steps or fantastic breaks often curved, and in the Renaissance period further ornamented with obelisks, urns, statues and scrolls, as in the town-hall of Bremen (1609), the Friedrichsbau at Heidelberg castle (*c* 1590), or the town-hall of Antwerp (1561) In England, stepped and curved sided gables are common during the Elizabethan and Jacobean periods, as in many of the colleges of Oxford and Cambridge, more complicated forms rich with scrolls and strap work are used as decorations for wall coverings, as in Wollaton hall, Nottingham (last quarter of the 16th century)

During the Gothic period gables were decorated with crockets (*q v*) and finials (*q v*), and sometimes, especially from the 14th century on, with tracery Gables were also used purely as decoration, without roofs behind, the French flamboyant churches are unusually rich with examples of pierced and traceried gables, very similar to those of the porch of St Maclou at Rouen (begun 1432)

Gables are important features in the architecture of China and Japan (*see* CHINESE ARCHITECTURE, JAPANESE ARCHITECTURE). In north China and Japan, gables follow the roof slope and are ornamented with rich projecting roof tiles, grotesque animals at the ridge and eaves, and occasionally with surface patterns In south China stepped gables are more common

GABLET, diminutive of gable (*q v*), in architecture, a small gable, especially if used for decorative purposes, or to form the upper termination of a buttress In many cases Gothic buttress offsets take the form of gablets Gablets are frequently decorated with finials (*q v*) and are sometimes crocketed (ornamented with a row of projecting knobs, usually of foliage) In all the late Gothic styles gablets are used with great profusion and treated with lavishness and variety; always steep in slope, their sides are often curved, sometimes concave and sometimes with that double curve known as the ogee (*q v.*).

GABLONZ: *see* JABLONEC NAD NISON.

GABORIAU, EMILE (1833–1873), French novelist, was born at Saujon (Charente Inférieure) He became secretary to Paul Féval, and, after publishing some novels and miscellaneous writings, found his real gift in *L'Affaire Lerouge* (1866), a detective novel which was published in the *Pays* and at once made his reputation The story was produced on the stage in 1872 A long series of detective novels, which are classics in their kind, followed Among them are *Le Crime d'Orcival* (1867), *Monsieur Lecoq* (1869), *La Vie infernale* (1870), *Les Esclaves de Paris* (1869), *L'Argent des autres* (1874) Gaboriau died in Paris on Sept. 28, 1873.

GABRIEL, in the Bible, the heavenly messenger (*see* ANGEL) sent to Daniel to explain the vision of the ram and the he-goat, and to communicate the prediction of the Seventy Weeks (Dan. viii 16, ix 21). He was also employed to announce the birth of John the Baptist to Zacharias, and that of the Messiah to the Virgin Mary (Luke i. 19, 26). Because he stood in the divine presence (*see* Luke i. 19; Rev. viii. 2; and *cf.* Tobit xii. 15), both Jewish and Christian writers generally speak of him as an arch-

angel In the *Book of Enoch* "the four great archangels" are Michael, Uriel, Suriel (Raphael), and Gabriel

GABRIELINO. This extinct Shoshonean group of California Indians inhabited Santa Catalina island; named from the Franciscan mission of San Gabriel They numbered about 5,000 They shared their arts with the adjoining Chumash of Santa Barbara channel and had developed a religion with named gods. A form of this, referring to the supreme deity Chungichnish, and making use of *Datura* as a vision-producing narcotic, continued to spread to neighbouring tribes until after 1850.

GABRIEL HOUNDS, a spectral pack supposed in the North of England to foretell death by their yelping at night The legend is that they are the souls of unbaptized children wandering through the air till the day of judgment. They are also sometimes called Gabriel or Gabble Ratchet

See Joseph Lucas, *Studies in Nidderdale* (1882), pp 156–157.

GABRIELI, a family of great Italian musicians of the 16th century, of whom ANDREA and his nephew and pupil GIOVANNI were the most important

ANDREA GABRIELI (*c* 1510–1586), Venetian composer and teacher, was born in Venice, in the quarter called Canareggio, about 1510 He became a pupil of the Flemish master Willaert, maestro di cappella at St Mark's In 1566 he succeeded Merulo as second organist of St Mark's and was later appointed first organist, a post which he held until his death in 1586 Willaert, who had settled in Venice in 1527, was the virtual founder of the new Venetian school, for it was under his pupils Andrea Gabrieli and Joseffo Zarlino that Italian music began to free itself from the supremacy of the Netherland masters, which had been unshaken for nearly a century The rambling "Ricercar" for organ was given form and meaning by the two Gabrielis, in whose hands it finally became the "canzone alle francese," the first canzoni for organ being those written by Andrea in 1571 The canzone form was also adopted for combinations of strings or other instruments Another form associated with Andrea is the Toccata, which was the earliest form of virtuoso composition for organ Andrea enjoyed great fame as a teacher. His most celebrated pupils were his nephew Giovanni and Leo Hassler

His works include *Psalmi Davidici, qui poenitentiales nuncupantur, tum omnis generis instrumentorum, tum ad vocis modulationum accomodati sex vocum* (Venice 1583); *Sacrae cantiones quinque vocum, liber primus* (1565), *Madrigali, lib 1 a 5* (1566), *lib 2 a 5, 6 & 8* (1570); *Missarum sex vocum, lib primus* (1572), *Canzoni alla francese per l'organo* (1571), *Madrigali a 6 v* (1574); a 3 v. (1575); *Cantiones ecclesiasticae* (1576), *Canti concerti a 6, 7, 8, 10 e 16 v* (incl 10 pieces by Giovanni) 1587, Choruses for *Oedipus tyrannus* (printed 1588), *Mascherate* (1601); a *Missa brevis* and motets in Proske's *Musica divina;* 6 vocal pieces in Torchi's *Arte musicale in Italia* vol ii., and 4 organ pieces in vol iii ; and organ compositions, printed with Giovanni's, in 3 vols of *Ricercari* (1593–96) A Ricercar in 8 parts has been published by Dr Riemann (Augener). *See* Eitner: *Quellenlexikon;* Spemann: *Goldenes Buch der Musik*

GIOVANNI GABRIELI (1557–1612?), nephew and pupil of Andrea, was born in Venice in 1557 He became first organist of St Mark's in 1585 His monument in San Stefano gives the date of his death as Aug 12, 1613, but this may be a mistake for 1612 as his post was filled on Aug. 12 of that year He was a brilliant contrapuntist and, like his uncle, became a celebrated teacher Heinrich Schütz, Alois Grani and Michael Praetorius were the most famous of his pupils. He experimented boldly with new combinations of instruments, new forms and new harmonies New editions of some of his organ works appear in Ritter's *Zur Geschichte des Orgelspieles* (1884) and J v. Wassilievski's *Gesch. d. Instrumentalmusik im 16 Jahrhundert* (1878).

See Karl v. Winterfeld: *Johannes Gabrieli und sein Zeitalter* in 3 vols. (1834) of which one vol. contains mus. examples

GABRILOWITSCH, OSSIP (1878–), pianist and conductor, was born in St. Petersburg (now Leningrad), on Feb. 7, 1878. He studied music at the Imperial Conservatoire in that city in the class of Tolstov and under the personal supervision of Anton Rubinstein, winning the Rubinstein prize in 1894. Later he continued his studies under Leschetizky in Vienna. At 18 he toured in Germany, Austria and England In 1900 he toured the United States, and again in 1902, 1907–08. He married Mark Twain's daughter, Clara Clemens, the singer, in 1909 After having conducted in Munich and Vienna he became conductor of the Detroit symphony orchestra in 1918

GABROVO, a town of Bulgaria, situated on the upper Yantra, in the northern foothills of the Balkan mountains, on a branch of the Transbalkan railway from Stara Zagora to Trnovo Pop (1926), 10,516. It is the centre of the textile and tannery industry The old gabled wooden houses along the Yantra are particularly fine specimens of Balkan architecture, and the Turkish bridge is also famous The first Bulgarian national school was opened in 1835 at Gabrovo, which thus became to some extent the cradle of the national resurrection About 10 miles away is the Sokol monastery, beautifully situated on a wooden cliff

GABUN, a district on the west coast of Africa, one of the colonies forming French Equatorial Africa (*q v*). It derives its name from the settlements on the Gabun river or Rio de Gabão The Gabun, in reality an estuary of the sea, lies immediately north of the equator At the entrance, between Cape Joinville or Santa Clara on the north and Cape Pangara or Sandy Point on the south, it is about 10 m wide It is 7 m broad for 40 m inland, when it contracts into what is known as the Rio Olambo, which is not more than 2 or 3 m wide Several rivers, of which the Komo is the chief, discharge into the estuary The Gabun was discovered by Portuguese navigators at the end of the 15th century, and was named from its fanciful resemblance to a *gabão* or cabin. Libreville, on the estuary near its mouth, the capital of Gabun colony, was founded by the French in 1849

GACE BRULÉ (d *c* 1220), French *trouvère,* was a native of Champagne It has generally been asserted that he taught Thibaut of Champagne the art of verse, an assumption which is based on a statement in the *Chroniques de Saint-Denis* "Si fist entre lui [Thibaut] et Gace Brué les plus belles chançons et les plus délitables et melodieuses qui onque fussent oies" This has been taken as evidence of collaboration between the two poets The passage will bear the interpretation that with those of Gace the songs of Thibaut were the best hitherto known Paulin Paris, in the *Histoire littéraire de la France* (vol xxiii), quotes a number of facts that fix an earlier date for Gace's songs Gace is the author of the earliest known *jeu parti.* The interlocutors are Gace and a count of Brittany who is identified with Geoffrey of Brittany, son of Henry II of England Gace appears to have been banished from Champagne and to have found refuge in Brittany A deed dated 1212 attests a contract between Gatho Bruslé (Gace Brulé) and the Templars for a piece of land in Dreux It seems most probable that Gace died before 1220, at the latest in 1225

See Gédéon Busken Huet, *Chansons de Gace Brulé,* edited for the Société des Anciens Textes Français (1902), with an exhaustive introduction Dante quotes a song by Gace, *Ire d'amor qui en mon cuer repaire,* which he attributes erroneously to Thibaut of Navarre (*De vulgari eloquentia,* p. 151, ed P. Rajna, Florence, 1895).

GACHARD, LOUIS PROSPER (1800–1885), Belgian man of letters, was born in Paris on Mar. 12, 1800. He entered the administration of the royal archives in 1826, and was appointed director-general, a post which he held for 55 years. Gachard died at Brussels on Dec 24, 1885 Among his best known works are: *Don Carlos et Philippe II.* (1867), *Etudes et notices historiques concernant l'histoire des Pays-Bas* (1863), *Histoire de la Belgique au commencement du XVIIIe siècle* (1880), *Histoire politique et diplomatique de P P Rubens* (1877), all published at Brussels.

GAD, a Semitic name. 1. A god of fortune, originally, perhaps, Aramaean, whose name occurs not infrequently in compound place names The god himself is mentioned in Is. lxv. 11 (R V.).

2 The name of a seer at the court of David, 1 Sam. xxii 5, xxiv , 1 Chron xxix. 25, 2 Chron xxix. 25

3 An Israelite tribe claiming descent from Jacob and Zilpah, Leah's maid

The name is now generally supposed to be that of the god (1), but the traditional derivation is that which connects it

with a word meaning "a raiding troop" (*cf.* Gen xlix. 19) The territory of Gad lay to the east of Jordan, between Manasseh (Machir) and Reuben, and the more usual term for this district is Gilead. From Jud v. 17, where Gilead is condemned for not following Barak, we gather that this name might be used for the tribe as well as for its territory Gad is mentioned in the inscription of Mesha, and it is noteworthy that by this time Reuben has entirely disappeared, having been absorbed, apparently, partly by Gad and partly by Moab Gad belonged nominally to the northern kingdom of Israel, but was liable to be raided from the desert, while it was also exposed to attack from the Syrians of Damascus in the north and from Moab in the south; hence the control exercised by the court of Samaria was uncertain and irregular

GADAG or **GARAG,** a town of British India, in the Dharwar district of Bombay, 43 m E. of Dharwar town Pop (1921) 41,208 It is an important railway junction on the Madras and Southern Mahratta system, with trade in cotton and silk and cotton stuffs, factories for ginning and pressing cotton, and a spinning and weaving mill The town contains temples exhibiting fine carving, with inscriptions from as early as the 10th century

GADARA, an ancient city of Trans-Jordan, a member of the Decapolis, capital of Peraea (so at least Josephus), and political centre of the district of Gadaris It is now represented by the group of ruins, Umm Kēs, which are spread over the summit of a hill 1,193 ft high and about 6 m S E of the southern end of the Sea of Galilee "There could hardly be found a second point in this part of 'Ajlūn which combines so perfectly the advantages due to a magnificent soil and a commanding position"

Although the Mishna asserts that it was fortified by Joshua, Gadara was probably of Greek origin and it certainly maintained a religious interest in Zeus It first appears in history as a place which fell to Antiochus the Great after his victory over Scopas at Paneas (Bānias). Alexander Jannaeus took it after 10 months siege (*c* 100 B C) Pompey restored it (64–63 B C) and Augustus gifted it to Herod the Great (30 B C) During the Jewish revolt Vespasian took possession of the city, the inhabitants pulling down the walls as an earnest of peace. Josephus knew it as a "place of strength with many rich citizens" and during the time of the Antonines it was adorned with buildings of some magnificence. There exist to-day the remains of three large theatres, a basilica, a temple, a colonnaded street, a reservoir, the city wall, and an aqueduct which brought water from the Hauran On the eastern side of the site there is a large necropolis with rock-hewn tomb-chambers (many with stone doors), which some of the modern inhabitants use as dwellings, together with numerous carved sarcophagi

About 3 m. to the north beside the river Yarmuk (Hieromax) are the celebrated hot springs and baths of Amatha described by Eusebius and Strabo "To Gadara the pleasure-loving Romans, after having enjoyed the restorative effects of the hot springs, retired for refreshment, enjoying the cooler heights of the city and solacing their leisure with the plays performed in the theatres" From its leisured populace it produced many fine litterateurs; Philodemus, the Epicurean and epigrammatist; Meleager the anthologist; Menippus the satirist; Theodorus the rhetorican, and others

The healing of the demoniac in the Gospel narrative has nothing to do with Gadara, but is rather to be associated with Kersa on the eastern shore of the Sea of Galilee

See C Warren in *Hastings Dictionary of the Bible;* G Schumacher, *Northern 'Ajlūn* (1890), G A Smith, *Hast Geog. of the Holy Land* (1895). (E. Ro.)

GADDI, the name of a famous Florentine family, some of whose members—father, son and two grandsons in the 13th and 14th century—were artists. A third grandson, Zanobi (d 1400) was a banker and ambassador of Florence to Venice. He laid the foundation of a large fortune and placed the family in a highly distinguished position from which sprang cardinals, statesmen and literary men The art collection of the Gaddi family was rich in drawings, manuscripts and gems

1. Gaddo Gaddi, Florentine painter and mosaicist, according to Vasari, died in 1312 at the age of 73; but according to older records he was still alive in 1330. Vasari states that he was a friend of Cimabue and Giotto and ascribes to him works very different in style (the mosaics inside the portico of S. Maria Maggiore in Rome, which are very much restored, and the mosaics representing the Coronation of the Virgin inside the portal of the cathedral at Florence)

2 Taddeo Gaddi (*c.* 1300–1366) son of Gaddo, was born in Florence According to Cennino he worked under Giotto for 24 years, being that master's most distinguished pupil. His most important works are the frescoes in the Baroncelli chapel in S Croce in Florence, representing incidents in the legend of the Virgin On the ceiling of the same chapel are the "Eight Virtues," and on the funeral monument the "Virgin and Child between four Prophets" In the refectory at the same church is a "Last Supper," which reveals the master at the height of his powers (*c.* 1350) Other frescoes by Taddeo are at Ognisanti in Florence, in the church of San Miniato, and in the choir of San Francesco at Pisa There are two altar-pieces signed by Taddeo representing the Madonna, one, dated 1334, is in the Museum at Berlin, the other, dated 1355 was removed from Poggibonsi to the Uffizi Other works which are generally ascribed to the master are Two large altar-pieces of the "Madonna with Saints," one at S. Felicita in Florence, the other at San Giovanni Fuoricivitas at Pistoia (1353), and two small triptychs at the Strasbourg and Naples Museums. There is a "Madonna with Saints" at the Metropolitan Museum in New York and a Madonna in the collection of F L Babbot at Brooklyn A series of paintings, partly scenes from the life of St. Francis, executed for the presses in S Croce and now divided between the Florentine Academy and the Berlin museum, have also been attributed to the master Taddeo Gaddi's art did not rise to Giotto's monumental simplicity and dramatic expression, but developed on independent lines with a tendency towards realism.

3 Agnolo Gaddi, was the son and pupil of Taddeo. The date of his birth has been given as 1326, but 1350 is probably nearer the mark He died in Florence in Oct. 1396 In 1369 he was called to Rome to assist in painting frescoes in the Vatican (now lost). In the years 1380, 1383, 1386, he carried out designs for statuary in the Loggia dei Lanzi He also did some work for the cathedral His most important paintings are the frescoes in S. Croce in Florence, "representing every circumstance of the discovery of the cross, a work which certainly displays considerable facility, but very little force of design, the colouring only being tolerably well done," as Vasari says

4 Giovanni Gaddi, brother of Agnolo, was a painter of promise, a pupil of his brother He died young in 1383

Bibliography—G. Vasari, *Vite de pillori,* etc, ed G Milanesi (1878–85), C Frey, *Loggia dei Lanzi* (1885) and *Il Codice Magliabecchiano* (1897); J A. Crowe and G. B. Cavalcaselle, *A history of painting in Italy* ed Douglas (1903); O Sirén, *Giotto and some of his Followers* (1917); B. G. Vitzthum and W F. Volbach, *Die Malerei und Plastik des Mittelalters* (1924) On the Gaddi collections *see* Aurelio Gotti *Le galerie di Firenze* (1875).

GADE, NIELS VILHELM (1817–1890), Danish composer, was born at Copenhagen, on Feb 22, 1817, his father being a musical instrument maker Though he studied the violin under Wexschall, and theory under Weyse and Berggreen, he was largely self-taught. In 1840 his *Aladdin* and his overture of *Ossian* attracted attention, and in 1841 his *Nachklänge aus Ossian* overture gained the local musical society's prize, the judges being Spohr and Schneider. A further stipend from the king enabled him to go to Leipzig and Italy. In 1844 Gade conducted the Gewandhaus concerts in Leipzig during Mendelssohn's absence, and on the latter's death became chief conductor. In 1848, on the outbreak of the Holstein War, he returned to Copenhagen, where he was appointed organist and conductor of the Musik-Verein. In 1852 he married a daughter of the composer J. P. E Hartmann. He became court conductor in 1861, and was pensioned in 1876—the year in which he visited Birmingham to conduct his *Crusaders.* This work, and the *Frühlingsfantasie,* the *Erlkönigs Tochter, Frühlingsbotschaft* and *Psyche* (written for Birmingham in 1882) enjoyed great popularity. Of his eight symphonies the best are the first and fourth A friend of Mendelssohn and of Schubert, Gade

was a romanticist, whose music owes much to Scandinavian folk-song. He died at Copenhagen on Dec. 21, 1890

See W Behrend, *Niels W. Gade* (Leipzig, 1917); C. Kjerulf, *Niels W. Gade, Hans Liv og Kunst* (Copenhagen, 1917).

GADIDAE, a family of fishes including the cod, whiting haddock, etc., inhabiting the waters of the northern hemisphere (*See* FISH, COD, WHITING.)

GADOLINIUM is a metallic element belonging to the rare-earth group (symbol Gd, atomic number 64, atomic weight 157 3) The early history of this element is in a rather confused state Marignac in 1880 obtained a new earth in an impure condition and termed it Y_α and then in 1886 he gave it the name it now bears Pure gadolinium salts were obtained by Demarçay in 1900 It occurs in many minerals, some varieties of Norwegian ytterspar being quite rich sources, other common sources are gadolinite, samarskite, monazite. It is best separated from other members of the group by first crystallizing the double magnesium nitrates. The most soluble portion of these nitrates is then converted to the bromates and further fractionally crystallized Gadolinium gives a white oxide and colourless salts, the simple nitrate being the least soluble of the rare-earth series; in solution these give absorption bands in the ultra violet While gadolinium is far from common, it is not as rare as is generally believed (*See* RARE EARTHS) (C. J)

GADSDEN, JAMES (1788–1858), American soldier and diplomat, was born at Charleston, S C, on the 15th of May 1788, the grandson of Christopher Gadsden After graduating at Yale in 1806, he became a merchant in his native city, and in the war of 1812 served in the regular U S Army as a lieutenant of engineers In 1818 he served against the Seminole Indians, with the rank of captain, as aide on the staff of Gen Andrew Jackson In October 1820 he became inspector general of the Southern Division, with the rank of colonel, and as such assisted in the establishment of posts in Florida after its acquisition He was adjutant general from August, 1821 to March, 1822, when he left the army and became a planter in Florida As Federal commissioner he superintended in 1823 the removal of the Seminole Indians to South Florida, and in 1832 negotiated with them a treaty which provided for their removal to what is now the state of Oklahoma; they, however, refused to move, hostilities again broke out, and in the second Seminole War (1836) Gadsden was quartermaster-general of the Florida Volunteers Returning to South Carolina he became a rice planter and president of the South Carolina railway In 1853 President Franklin Pierce appointed him minister to Mexico, with which country he negotiated the so-called "Gadsden treaty" (signed Dec 30, 1853), which gave to the United States freedom of transit for mails, merchandise and troops across the Isthmus of Tehuantepec, and provided for a readjustment of the boundary established by the treaty of Guadalupe Hidalgo, the United States acquiring 45,535sq m of land, since known as the "Gadsden Purchase," in what is now New Mexico and Arizona In addition, the provision of the treaty of Guadalupe Hidalgo which bound the United States to prevent incursions of Indians from the United States into Mexico and to restore Mexican prisoners captured by such Indians was abrogated, and for these considerations the United States paid to Mexico the sum of $10,000,000 Ratifications of the treaty, slightly modified by the Senate, were exchanged on June 30, 1854. Gadsden died at Charleston, S.C., Dec. 25, 1858

GADSDEN, a rapidly growing city of Etowah county, Alabama, U S A., on the Coosa river, 65m. N E of Birmingham, Ala. It is on Federal highway 11, and is served by the Louisville and Nashville, the Nashville, Chattanooga and St Louis, the Southern and the Tennessee, Alabama and Georgia railways, and by numerous motor bus lines. The population was 14,737 in 1920 (29% negroes) and was estimated locally at over 24,000 in 1928 Gadsden is in the iron and coal region of Alabama, and has abundant hydro-electric power from the Coosa river. The city has a large trade in lumber, cotton and grain, and is an important manufacturing centre, with an annual output valued at $32,500,000 Among its products are iron and steel, cotton yarns, sashes and doors Gadsden was founded about 1860 and incorporated as a city in 1871 In the decade 1900–10 the population increased from 4,282 to 10,557 (147%).

GADWALL, the common name of the duck *Anas strepera* Its habits and distribution are very similar to those of the common wild duck (*see* DUCK), but, save in India, where it is abundant during the cold weather, it is hardly anywhere so numerous Its small head, flat back, elongated form and elevated stern render it easily recognizable In coloration the two sexes are almost equally sombre; but the drake exhibits chestnut upper wing-coverts Both resemble the female of the mallard in colour, but the white secondary quills form one of the most readily perceived characters of the species. The gadwall is increasing as a breeding species in Britain It has been always esteemed for the table The gadwall is found throughout the greater part of North America, but is uncommon in the Northeastern States, though occasionally seen near New York city

GAEKWAR (gah'ĭk-war), the family name of the Mahratta rulers of Baroda (*q v*), in India, which has been made by the English into a dynastic title. It is derived from the vernacular word for the cow, but it is a mistake to suppose that the family are of the cowherd caste, they belong to the upper class of Mahrattas proper, sometimes claiming a Rajput origin

GAELIC LANGUAGE. The term Gaelic in its widest sense is used almost synonymously with Celtic and one hears of Irish Gaelic, Scottish Gaelic, etc The Scottish Gaelic is the form of Goidelic speech which was introduced into Scotland by the Dalriadic Scots from Ireland There are important divergences in phonetics and inflections between Irish and Scottish Gaelic; Scottish Gaelic has given up the nasal mutation (or eclipse), *e.g.*, Scottish *or bò*, "our cow," Irish *ar m-bó*, Scottish *mantêr* "of the countries," Irish *na d-tìr* In some Gaelic speaking areas, however (Skye and the Outer Isles), the mutations have been partly restored *See* further CELTIC LANGUAGES.

GAELIC LITERATURE: see IRISH LITERATURE *Gaelic;* SCOTTISH LITERATURE *Gaelic*

GAETA, a seaport and episcopal see of Lazio, Italy, province of Rome (anc *Caietae Portus*), 5 m by rail west of Formia (*q v*) Pop (1921) 6,393, town; 18,096, commune It occupies a lower projecting point of the promontory which forms the south-west extremity of the Bay of Gaeta The tomb of Munatius Plancus, on the summit of the promontory (*see* CAIETAE PORTUS), is now a naval signal station The harbour, well sheltered except on the east, is entirely a naval station To the north-west is the suburb of Elena Above the town is a castle erected by the Angevin kings, and strengthened at various periods The cathedral of St Erasmus (S Elmo), consecrated in 1106, has a fine campanile begun in 860 and completed in 1279, and a nave and four aisles; the interior has, however, been modernized Opposite the door of the cathedral is a candelabrum with interesting sculptures of the end of the 13th century Behind the high altar of the cathedral is the banner sent by Pope Pius V to Don John of Austria, the victor of Lepanto The constable of Bourbon, who fell in the sack of Rome of 1527, is buried here Close to the church of La Trinità is the Montagna Spaccata, where a vertical fissure from 6 to 15 ft wide runs right down to the sea-level Over the chasm is a chapel *del Crocefisso,* the mountain having split, it is said, at the death of Christ

During the break-up of the Roman empire, Gaeta, like Amalfi and Naples, would seem to have established itself as a practically independent port and to have carried on a thriving trade with the Levant Its history, however, is obscure until, in 839, it appears as a lordship ruled by hereditary *hypati* or consuls According to tradition, the Caetani or Gaetani family (*q v*) is descended from these *hypati.* In 844 the town fell into the hands of the Arabs, but four years later they were driven out with help supplied by Pope Leo IV In 875 Pope John VIII gave it to the count of Capua as a fief of the Holy See, which had long claimed jurisdiction over it In 877, however, the *hypatus* John (Ioannes) II succeeded in recovering the lordship, which he established as a duchy under the suzerainty of the East Roman emperors. In the 11th century the duchy fell into the hands of the Norman counts of Aversa, afterwards princes of Capua, and in 1135 it was

annexed to his kingdom by Roger of Sicily Its fortifications were strengthened in the 15th century On the 30th of September 1707 it was stormed, after a three months' siege, by the Austrians under Daun, and on the 6th of August 1734 it was taken, after a siege of four months, by French, Spanish and Sardinian troops The fortifications were again strengthened, and in 1799 it was temporarily occupied by the French On the 18th of July 1806 it was captured, after an heroic defence, by the French under Masséna; and on the 18th of July 1815 it capitulated, after a three months' siege, to the Austrians In November 1848 Pope Pius IX, after his flight in disguise from Rome, found a refuge at Gaeta, where he remained till the 4th of September, 1849 In 1860, it was the scene of the last stand of Francis II of Naples (*q v*) against the forces of United Italy (T A)

See G Caetani, *Caietanorum Genealogia* (Perugia, 1920), Rocca S Casciano, 1, II (1927), *Epistolarium Honorati Caetani, ib* (1927), *Domus Caietana Regesta Chartarum ib*, 1, II (1922–26), for the history of the family.

GAETANI or **CAETANI,** the name of the oldest of the Roman princely families which played a great part in history They are of Longobard origin, and the founder of the house is said to be Dominus Constantinus Cagetanus, who flourished in the 10th century, but the family had no great importance until the election of Benedetto Gaetani to the papacy as Boniface VIII in 1294, when they at once became the most notable in the city

At present (in 1928) there are two lines. (1) Gaetani, princes of Teano and dukes of Sermoneta, founded by Giacobello Gaetani, whose grandson, Guglielmo Gaetani, was granted the duchy of Sermoneta by Pius III in 1503, the marquisate of Cisterna being conferred on the family by Sixtus V in 1585 In 1642, Francesco, the 7th duke of Sermoneta, acquired by marriage the county of Caserta, which was exchanged for the principality of Teano in 1750 The present head of the house, Onorato Gaetani, 14th duke of Sermoneta, 4th prince of Teano, duke of San Marco, marquis of Cisterna, etc, is a senator of the kingdom of Italy, and was minister for foreign affairs for a short time (2) Gaetani dell' Aquila d'Aragona, princes of Piedimonte and dukes of Laurenzana, founded by Onorato Gaetani dell' Aquila, count of Fondi, Traetto, Alife and Morcone, lord of Piedimonte and Gioia, in 1454 The additional surname of Aragona was assumed after the marriage of Onorato Gaetani, duke of Traetto (d 1529), with Lucrezia of Aragon, natural daughter of King Ferdinand I of Naples The duchy of Laurenzana, in the kingdom of Naples, was acquired by Alfonso Gaetani by his marriage in 1606 with Giulia di Ruggiero, duchess of Laurenzana The lordship of Piedimonte was raised to a principality in 1715 The present head of the house is Nicola Gaetani dell' Aquila d'Aragona (b 1857), 7th prince of Piedimonte and 12th duke of Laurenzana

See A. von Reumont, *Geschichte der Stadt Rom* (1868), F. Gregorovius, *Geschichte der Stadt Rom* (Stuttgart, 1872), and S A Guarneri, *Cenni storici-biografici-genealogici dei Gaetani* (1904).

GAETULIA, a district in the north of Africa, which in the usage of Roman writers comprised the wandering tribes of the southern slopes of Mount Aures and the Atlas, as far as the Atlantic, and the oases in the northern part of the Sahara They were distinguished from the Negro people to the south, and belonged to the Berber race which formed the population of Numidia (q v.) The tribes to be found there at the present day are probably of the same race, and retain the same wandering habits They were noted for the rearing of horses, were clad in skins, lived on flesh and milk, and the only manufacture connected with their name is that of purple dye

For bibliography *see* AFRICA, ROMAN.

GAFFNEY, a town of South Carolina, U S A, 20m N E of Spartanburg, on Federal highway 29 and the Southern railway; the county seat of Gaffney county The population was 5,065 in 1920 (25% negro) and was estimated locally at 11,000 in 1928 It has large cotton mills, with a total (1928) of over 5,300 looms and 185,000 spindles, and is the seat of Limestone college for women (established 1845) The town was founded about 1872 and incorporated in 1874

GAGE, LYMAN JUDSON (1836–1927), American financier, was born at De Ruyter, Madison county, N.Y., on June 28, 1836 At the age of 17 he became a bank clerk In 1855 he removed to Chicago, served for three years as bookkeeper in a planing-mill, and in 1858 entered the banking house of the Merchant's Loan and Trust Company, of which he was cashier in 1861–68 Afterwards he became successively assistant cashier (1868), vice president (1882) and president (1891) of the First National Bank of Chicago He was chosen in 1892 president of the board of directors of the World's Columbian Exposition From March 1897 until Jan 1902 he was secretary of the Treasury in the cabinets successively of Presidents McKinley and Roosevelt From April 1902 until 1906 he was president of the United States Trust Company in New York city. He died on Jan. 26, 1927

GAGE, THOMAS (1721–1787), British general and governor of Massachusetts, second son of the first Viscount Gage, entered the army in 1741 and saw service in Flanders and in the campaign of Culloden, becoming lieutenant-colonel in the 44th foot in March 1751 In 1754 he served in America, and he took part in the following year in General Braddock's disastrous expedition. In 1758 he became colonel of a new regiment and served in Amherst's operations against Montreal He was made governor of Montreal, and promoted major-general in 1761, and in 1763 succeeded Amherst in the command of the British forces in America, in 1770 he was made a lieutenant-general In 1774 he was appointed governor of Massachusetts, and in that capacity was entrusted with carrying into effect the Boston Port Act The difficulties which surrounded him in the execution of his office at this time of the gravest unrest culminated in 1775, and the action of April 19 at Lexington initiated the American War of Independence After the battle of Bunker Hill, Gage was superseded by Howe, and returned to England He became general in 1782, and died on April 2, 1787

GAGE, a pledge, something deposited as security for the performance of an agreement A particular form of "gage" was the glove or gauntlet thrown down as a challenge to a combat, and as a "pledge" that the parties would appear on the field; hence the common phrase "to throw down the gage of defiance" for any challenge (*See* GLOVE and WAGER)

GAGER, CHARLES STUART (1872–), American botanist, was born on Dec 23, 1872, at Norwich, N Y, and educated at Syracuse (A B, 1895) and Cornell (Ph D, 1902) universities He was professor of biological sciences and physiography at New York State Normal college, 1897–1905, director of laboratories, New York Botanical Garden, 1906–08, and professor of botany at the University of Missouri, 1908–10. In 1910 he became director of the Brooklyn Botanic Garden, and in this position rose rapidly to a position of leadership in the field of botanical education and administration in the United States Since 1912 he has edited the *Brooklyn Botanic Garden Record.* From 1918 to 1925 he was a member of the editorial board of *Botanical Abstracts.* He became business manager of *American Journal of Botany* in 1914, also of *Ecology* in 1920, and of *Genetics* in 1922.

Besides numerous papers and addresses in scientific and educational journals he has published *Errors in Science Teaching* (1901); *Effects of the Rays of Radium on Plants* (1908); *Fundamentals of Botany* (1916); *Heredity and Evolution of Plants* (1920); *The Relation between Science and Theology* (1925); *General Botany with Special Reference to its Economic Aspects* (1926).

GAGERN, HANS CHRISTOPH ERNST, BARON VON (1766–1852), German statesman and political writer, was born at Kleinniedesheim, near Worms, on Jan. 25, 1766. After studying law at the universities of Leipzig and Gottingen, he entered the service of the prince of Nassau-Weilburg He was the prince's envoy at Paris until 1811, and in 1812 he took part in the abortive attempt to excite a second insurrection against Napoleon in Tirol He joined the headquarters of the Prussian army (1813), and became a member of the board of administration for north Germany In 1814 he was appointed administrator of the Orange principalities; and, when the prince of Orange became king of the Netherlands, Baron Gagern became his prime minister In 1815 he repre-

sented him at the congress of Vienna, and obtained for the Netherlands a considerable augmentation of territory. From 1816 to 1818 he was Luxemburg envoy at the German diet, but was recalled, at the instance of Metternich, owing to his too independent advocacy of state constitutions In 1820 he retired with a pension to his estate at Hornau, near Hochst, in Hesse-Darmstadt, where he died on Oct. 22, 1852. Baron von Gagern wrote some historical works, but the best known is his autobiography, *Mein Antheil an der Politik, 5 vols* (Stuttgart and Leipzig, 1823–1845).

Of Hans Christoph von Gagern's sons three attained considerable eminence:—

FRIEDRICH BALDUIN, Freiherr von Gagern (1794–1848), the eldest, took service in the Austrian army, fought in the Russian campaign of 1812, and at Dresden, Kulm and Leipzig He then entered the Dutch service, took part in the campaigns of 1815, and, after studying another year at Heidelberg, was member for Luxemburg of the military commission of the German federal diet (1824, 1825) In 1830 and 1831 he took part in the Dutch campaign in Belgium, and in 1844, was sent on a military mission to the Dutch East Indies In 1847 he was appointed governor at the Hague, and commandant in South Holland In the spring of 1848 he commanded the Baden forces against the insurgent "free companies" (*Freischaaren*) At Kandern, on April 20, he was mortally wounded His *Life*, in 3 vols (Heidelberg and Leipzig, 1856–1857), was written by his brother Heinrich von Gagern

HEINRICH, Freiherr von Gagern (1799–1880), the third son, fought at Waterloo in the Nassau contingent After the war, he studied law at Heidelberg, Gottingen, Jena and Geneva As a student he had been a member of the *Burschenschaft*, and he now threw himself into open opposition to the unconstitutional spirit of the Hessian government, and was dismissed from the state service in 1833 Henceforth he lived in retirement at Monsheim until the February revolution of 1848 and its echoes in Germany recalled him to active political life At the Heidelberg meeting and the preliminary convention (*Vorparlament*) of Frankfort he deeply impressed the assemblies, and when the German national parliament met (May 18), he was elected its first president He was mainly instrumental in imposing the principle of a united empire with a common parliament, and in carrying the election of the Archduke John as regent On Dec 15, when Schmerling and the Austrian members had left the cabinet, Gagern became head of the imperial ministry, and on the 18th he introduced a programme (known as the *Gagernsche Programm*) according to which Austria was to be excluded from the new federal state, but bound to it by a treaty of union After a severe struggle this proposal was accepted, but on May 20 Gagern and his friends resigned He died at Darmstadt on May 22, 1880

MAXIMILIAN, Freiherr von Gagern (1810–1889), the youngest son, was a member of the German national parliament in 1848 Throughout the revolutionary years he supported his brother's policy, and, after the collapse of the national movement, returned to the service of the duchy of Nassau In 1855 he entered the Austrian service in the department of foreign affairs. In 1871 he retired, and in 1881 was nominated a life member of the Upper Chamber (*Herrenhaus*) He died at Vienna on Oct. 17, 1889

See *Allgemeine deutsche Biographie*, Band viii., p. 301, etc. (1878) and Band xlix, p. 654 (1904).

GAG LAWS, a series of laws passed by the United States Congress of 1836 in direct violation of the First Amendment to the Federal constitution, which provided for the right to petition in matters connected with the abolition of slavery. This report formed one of the most dramatic incidents of American history. The first "Gag rule" passed in 1836, called the Pinckney resolution, provided that all petitions relating to slavery should be put forward without reference to committee or being printed; the substance of this was subsequently adopted and passed by succeeding sessions of congress in the Patton Resolution of Dec., 1837, the Atherton Resolution in 1838, the Twenty-first Rule in 1840, and subsequently till repealed.

The President of the United States, John Quincy Adams led the opposition for their rescindment and the laws were finally abolished in 1844. *See* ADAMS, JOHN QUINCY and HALE, JOHN PARKER

GAHANBAR, festivals of the ancient Avesta calendar celebrated by the Parsees at six seasons of the year which correspond with the six periods of creation. (1) *Maidhyozaremaya* (midspring), (2) *Maidhyoshema* (midsummer), (3) *Paitishahya* (creation of the earth), (4) *Ayathrema* (creation of plants), (5) *Maidhyarya* (winter solstice), (6) *Hamaspathmaedha* (festival of sacrifices)

GAHNITE, or zinc spinel, $ZnO\,Al_2O_3$, a rather rare mineral found at Franklin Furnace, N J , and in Norway. along with other zinc ores (*See* FRANKLINITE)

GAILLAC, town, south-western France, capital of an arrondissement in the department of Tarn, on the right bank of the Tarn, 15 m W. of Albi on the railway from that city to Toulouse Pop (1926) 4,921 Gaillac grew up round the Benedictine abbey of St Michel, founded in the 10th century The churches of St Michel and St Pierre, both dating from the 13th and 14th centuries, have little architectural importance The Maison Yversen, of the Renaissance, is remarkable for the rich carving of its doors The public institutions include the sub-prefecture and a tribunal of first instance Industries include the manufacture of bricks and tiles and there is a considerable trade in grain, flour, vegetables, dried plums, anise, coriander, etc , and in wine, the white and red wines having a high reputation

GAINE, in architecture, a support, usually taking the place of a column or pilaster, and consisting of a lower form, rectangular in section and tapering downwards, and the upper portion made by a human head, shoulders and bust, either male or female Frequently the whole is topped by a capital often pseudo-Ionic in form, with large side volutes or spirals The gaine first appears as a minor decorative motive in the stucco work of the middle 16th century work in Italy Later it was used architecturally, flanking doors, windows and niches, especially in the fantastic baroque work common in the villas and during the late 17th century. The gaine form was an especial favourite in the Renaissance work of Germany, Belgium and Holland, and owing to Flemish influence, it was much used in the Jacobean work of England.

GAINESVILLE, a city in the interior of Florida, U S.A., 70m S W. of Jacksonville; the county seat of Alachua county. It is served by the Atlantic Coast Line, the Jacksonville, Gainesville and Gulf and the Seaboard Air Line railways. The population in 1925 (State census) was 8,466 (40% negroes) and in 1928 it was estimated locally at 13,000 (19% negroes) Gainesville is a shipping point for garden produce, citrus and other fruits, and other agricultural products; the centre of the new tung-oil industry of America, with over 1,000,000 Chinese tung trees, a health and pleasure resort, and the seat of the University of Florida, opened at Lake City in 1905 and moved in 1906 to its present site (953 acres). The Florida Agricultural college (opened in 1884 at Lake City) and the Florida Agricultural Experiment station (established 1887) are part of the university. There are many points of natural beauty and interest in the vicinity, including the Alachua Sink, Payne's Prairie, Newman's Lake and the Devil's Millhopper, and 15m. west of the city are rich phosphate mines. Gainesville is in the midst of the famous Seminole country. It was settled about 1850, named after Gen E. P. Gaines, incorporated as a town in 1869, and as a city in 1907.

GAINESVILLE, a city of Georgia, U S A , 54m. N E. of Atlanta, near the Chattahoochee river, the county seat of Hall county. It is on Federal highways 19 and 129, and is served by the Gainesville and Northwestern, the Gainesville Midland and the Southern railways. The population was 6,272 in 1920 (24% negroes) and was estimated locally at 15,000 (18% negroes) in 1928. The city lies at an altitude of 1,300ft in the foot-hills of the Blue Ridge, and there are mineral springs in the vicinity. Its manufacturing industries include cotton mills with 2,700 looms and 128,000 spindles in 1928. It is the seat of Riverside military academy, and of Brenau college for women (Baptist), founded in 1878 as the Georgia Baptist seminary. Gainesville was settled about 1818 and incorporated as a city in 1821

GAINESVILLE, a city of Texas, U.S.A., 65m N of Fort Worth and Dallas, near the Red river; the county-seat of Cooke

county It is on Federal highway 77, and is served by the Missouri-Kansas-Texas and the Santa Fe railways The population was 8,648 in 1920. The Muenster oilfield is 17m. W , and the region produces cotton, grain and live stock The city is an important shipping point, and has an oil refinery and various other manufacturing industries The State training school for girls is located here Gainesville was settled about 1851, and named after Gen Edmund Pendleton Gaines (1777–1849), who commanded the department of the south-west during the Mexican War It was chartered as a city in 1879

GAINSBOROUGH, THOMAS (1727–1788), English painter, one of the first and greatest masters of the English school, was born at Sudbury, Suffolk, in the spring of 1727 His father was a woollencrape maker in that town. Thomas was the youngest of nine children At 14 years old he had sketched every fine tree and picturesque cottage near his home and had persuaded his father to let him go to London, where he had instruction in etching from Hubert Gravelot and studied at the academy in St Martin's lane, under Francis Hayman After his return to Sudbury in 1745 he married Margaret Burr, the sister of a man employed by Gainsborough's father as a traveller, and at the age of 20 he became a householder at Ipswich Here he painted portraits and landscapes and he spent his leisure hours in a musical club He numbered among his friends Joshua Kirby, president of the Society of Artists, and Philip Thicknesse, then governor of the Landquart fort near by, who was to be his first biographer It was Thicknesse's merit to have discovered Gainsborough He encouraged him by commissions and recommendations to his friends, and it was on his advice that Gainsborough, in 1759, went to Bath, then the general resort of wealth and fashion Here, in the midst of England's finest society, the artist expanded to the full His studio in the circus was thronged with visitors At Wilton and other country seats of his patrons he had opportunities of studying the masterpieces of his beloved Vandyck, and he contributed both portraits and landscapes to the annual exhibition in London He haunted the greenroom of Palmer's theatre and painted the portraits of many actors His house harboured many musicians of various nationalities and he learned to play the viola-da-gamba, the harp, the hautboy and the violoncello

In 1774, having attained a position of prosperity, he went to London and settled at Schomberg House, Pall Mall He had not been there many months before he received a summons to the palace He painted George III eight times and also portrayed the queen and other members of the royal family. Sheridan, Burke, Johnson, Franklin, Canning, Pitt, Lady Mary Wortley-Montagu, Mrs Siddons, Clive, Blackstone, Hurd were among those who sat to him. In 1768 he was elected one of the original 36 members of the Royal Academy; and he sent both landscapes and portraits to the annual exhibitions until 1783, when being dissatisfied with the position assigned to his portrait of the three princesses, he withdrew that and his other pictures After his secession he arranged an exhibition in his own house, not successfully He died on Aug 2, 1788, and was buried at Kew The Royal Academy possesses a fine example of a self portrait of the artist and the National Gallery has a good likeness of him by Zoffany.

Sir Joshua Reynolds made a true prophecy when he said, soon after Gainsborough's death, "Should England ever become so fruitful in talent that we can venture to speak of an English school, then will Gainsborough's name be handed down to posterity as one of the first " What distinguished him from Reynolds was his greater independence of the old masters For while Reynolds had studied the classical art of Italy, Gainsborough in his rural seclusion had developed mainly by the study of nature, although in his earlier days he made a practice of copying works by Vandyck, Rembrandt, Wynants, Velasquez and Murillo Perhaps his art was most akin to that of Watteau Gainsborough began his landscape painting under Dutch influences His early landscapes, painted in Suffolk, were executed with laborious Dutch minuteness The spirit of Wynants is evident in the landscape at the National Gallery of Ireland The "Cornard Wood" (*c* 1753) in the National Gallery, London, and the "Sunset" in the Tate Gallery show Dutch influence. During his stay in Bath he experienced the impact of Rubens and of Vandyck and he achieved the romantic beauty of such works as "the Watering Place" (*c.* 1775) in the Tate gallery; "the Cottage Door" (*c.* 1777) in the collection of the duke of Westminster; "the Market Car" and "the Bridge" (1777) in the National Gallery The landscapes which Gainsborough painted at Bath, with their low brown tones and rich impasto, are his finest He was among the first English artists who represented the scenery of their own native land, thus breaking with the tradition followed by his predecessors and contemporaries, of painting imaginary Italian scenery in the style of Claude le Lorrain

After his move to London, Gainsborough's landscapes were mostly painted from memory, his style became somewhat conventional and the trees were generalized into masses of feathery greenery The artist is said to have admitted to George III that he preferred landscape painting to portraiture and he complained that he was compelled to earn his living by painting portraits as he could not sell his landscapes. On his first visit to Gainsborough at Ipswich Thicknesse criticized his early portraits ("Admiral Vernon," painted *c* 1749, in the National Portrait Gallery, and "the Painter's Two Daughters," in the National Gallery in London) as being stiffly painted, but he was charmed with his little landscapes and drawings for "these were works of fancy and gave him infinite delight " To the artist's mature period in Bath belong "Sir Charles Holte," Birmingham Art gallery, "the duke of Northumberland," Dublin gallery, "Mrs. Sheridan" and "Mrs. Tickell," Dulwich gallery, "Garrick," Christ Church, Oxford; the "Blue Boy" (Master Buttall), now in the Huntington collection in California, and "the Hon Mrs Graham," National gallery, Edinburgh The following are representative of his later period when he had reached perfect freedom in execution:—"The earl and the countess of Spencer" and the "Duchess of Devonshire," at Althorp, "Mrs Siddons," "Dr Ralph Schomberg," "the Baillie Family" in the National Gallery, "the Morning Walk," "Mrs Sheridan," in the collection of Lord Rothschild, "the Pink Boy," with Baron Ferd de Rothschild, "the Mall," "the Miss Linleys" at Dulwich, "Orpin, the Parish Clerk," in the Tate Gallery

Gainsborough's portraits are painted in clear and transparent tone, in a colour scheme where blue and green predominate, with the same fluttering touch which he had acquired in sketching trees and skies He often placed his figures against a landscape background which harmonized with the sentiment animating the sitter He may indeed fairly be accounted as a forerunner of Impressionism although he was ignorant of the scientific theories and analytic qualities which inspired that movement His work is the expression of a poet and musician

Gainsborough painted some 500 pictures; he etched some 18 plates, three in aquatint, there is a representative collection of his drawings at the British Museum Important exhibitions of his works were held at the Gallery of the British Institution in 1814 and at the Grosvenor gallery in 1885 His portrait of "Elizabeth, duchess of Devonshire" was mysteriously stolen in London in 1876, immediately after it had been purchased by Messrs. Agnew. The picture was taken to New York and to Chicago, and in April 1901 it was traced by American detectives working for Messrs. Agnew; it was then sold to J Pierpont Morgan, Sr.

See P. Thicknesse, *Sketch of the Life and Paintings of Thomas Gainsborough* (1788), and *Memoirs and Anecdotes* (1788–91); J. Reynolds, *Discourses*, A. Cunningham, *Lives of the most eminent British Painters* (1829), T W Fulcher, *Life of T Gainsborough* (1850); G W. Brock-Arnold, *Thomas Gainsborough* (1889); Sir M. Conway, *Artistic Development of Reynolds and Gainsborough* (1886); Sir W. Armstrong, *T Gainsborough* (1898 and 1904); Mrs Arthur Bell, *T. Gainsborough* (1902); Lord R. Gower, *T. Gainsborough* (1903), and *Drawings of Gainsborough* (1906); also the works by G Pauli in Germany (1904 and 1909); by J. Greig (1909); and W. T. Whitley (1915). (I. A R.)

GAINSBOROUGH, market town, Lincolnshire, England; on the right (E) bank of the Trent Pop of urban district (1921) 19,687. It is served by the L.N E R., by which it is 16 m. N W of Lincoln. Gainsborough (*Gegnesburh*) was probably inhabited by the Saxons on account of the fishing in the Trent. The *Saxon Chronicle* states that in 1013 the Danish king Sweyn

landed here and subjugated the inhabitants. Gainsborough was probably a borough by prescription, for mention is made of burghal tenure in 1280 Mention is made in 1204 of a Wednesday market, but there is no extant grant before 1258, when Henry III. granted a Tuesday market to William de Valence, earl of Pembroke, who also obtained from Edward I. in 1291 licence for an annual fair on All Saints' Day, and the seven preceding and eight following days. In 1243 Henry III granted to John Talbot licence for a yearly fair on the eve, day and morrow of St. James the Apostle. Queen Elizabeth in 1592 granted to Thomas Lord Burgh two fairs, to begin on Easter Monday and on Oct 9, each lasting three days Charles I in 1635–36 extended the duration of each to nine days The Tuesday market is still held, and the fair days are Tuesday and Wednesday in Easter-week, and the Tuesday and Wednesday after Oct 20 The parish church of All Saints is classic of the 18th century, excepting the Perpendicular tower The Old Hall, of the 15th century, enlarged in the 16th, forms three sides of a quadrangle, partially timber-framed, but having a beautiful oriel window and other parts of stone. There is also a Tudor tower of brick Gainsborough possesses a grammar school (founded in 1589 by a charter of Queen Elizabeth) There is a large carrying trade by water on the Trent and neighbouring canals Shipbuilding and iron-founding are carried on, also manufactures of linseed cake, and agricultural machinery

GAIRDNER, JAMES (1828–1912), English historian, son of John Gairdner, M D , was born in Edinburgh on March 22, 1828 Educated in his native city, he entered the Public Record Office in London in 1846, becoming assistant keeper of the public records (1859–93) He died at Pinner, Middlesex, on Nov 4, 1912 Gairdner's valuable contributions to English history relate chiefly to the reigns of Richard III , Henry VII and Henry VIII For the "Rolls Series" he edited *Letters and Papers illustrative of the Reigns of Richard III and Henry VII* (1861–63), and *Memorials of Henry VII* (1858), and he succeeded J S. Brewer in editing the *Letters and Papers,* foreign and domestic, of the reign of Henry VIII (1862–1910), being responsible for the volumes issued between 1880 and 1910 He edited the *Paston Letters* (1872–75, and again 1896) His other works include monographs on *Richard III* (1878, new and enlarged edition, 1898), and on *Henry VII.* (1889, and subsequently); *The Houses of Lancaster and York* (1874, and other editions); *The English Church in the 16th century* (1902); *Lollardy and the Reformation in England* (4 vols , 1908–13), completed by J W Hunt

See obituary notice of Gairdner in the *Times* for Nov 6, 1912; also J. W Hunt's preface to Gairdner's *Lollardy and the Reformation in England* (1908).

GAIRDNER LAKE: *see* AUSTRALIA

GAIRLOCH, see loch, village and parish in the west of the county of Ross and Cromarty, Scotland Pop of parish (1921) 2,776 The parish covers a large district on the coast, and stretches inland beyond the farther banks of Loch Maree, the whole of which lies within its bounds It also includes the islands of Dry and Horisdale in the loch, and Ewe in Loch Ewe Formerly an appanage of the earldom of Ross, Gairloch has belonged to the Mackenzies since the end of the 15th century

GAISERIC or GENSERIC (*c.* 390–477), king of the Vandals, son of King Godegisel (d 406) and king on the death of his brother Gonderic in 428 In 428 or 429 he led a host of Vandals from Spain into Roman Africa, and took Mauretania, and later Hippo Having pillaged and conquered almost the whole of Roman Africa, the Vandal king concluded a treaty with the emperor Valentinian III in 435, by which he retained his conquests This peace was broken, and in Oct 439 he captured Carthage, which he made the capital of his kingdom. In 455 he plundered Rome and returned to Africa laden with spoil. Among his captives was the empress Eudoxia, who is said to have invited the Vandals into Italy The Romans made two unsuccessful attempts to avenge themselves, one by the Western emperor, Majorianus, in 460, and the other by the Eastern emperor, Leo I., eight years later. Gaiseric brought Sicily, Sardinia, Corsica and the Balearic Islands under his rule, and even extended his conquests into Thrace, Egypt and Asia Minor Having made peace with the Eastern emperor Zeno in 476, he died on Jan. 25, 477. Gaiseric was a cruel and cunning man, possessing great military talents and superior mental gifts. Though the effect of his victories was afterwards neutralized by the successes of Belisarius, his name long remained the glory of the Vandals. (*See* VANDALS)

See also T Hodgkin, *Italy and Her Invaders,* vol. ii (1892); E Gibbon, *Decline and Fall of the Roman Empire* (ed J. B Bury, 1896–1900), L. Schmidt, *Geschichte der Vandalen* (Leipzig, 1901), and F. Martroye, *Genseric, La Conquête vandale en Afrique* (1907).

GAIUS, a celebrated Roman jurist Of his personal history very little is known It is impossible to discover even his full name, Gaius or Caius being merely the personal name (praenomen) so common in Rome His works were composed between the years 130 and 180, at the time when the Roman empire was most prosperous, and its government the best Most probably Gaius lived in some provincial town, and hence we find no contemporary notices of his life or works After his death, however, his writings were recognized as authoritative, and the emperor Valentinian named him, along with Papinian, Ulpian, Modestinus and Paulus, as one of the five jurists whose opinions were to be followed by judicial officers in deciding cases The works of these jurists accordingly became most important sources of Roman law.

Besides the *Institutes,* which are a complete exposition of the elements of Roman law, Gaius was the author of a treatise on the *Edicts of the Magistrates,* of *Commentaries on the Twelve Tables,* and on the important *Lex Papia Poppaea,* and several other works. His interest in the antiquities of Roman law makes his work valuable to the historian of early institutions. In the disputes between the two schools of Roman jurists he generally attached himself to that of the Sabinians, who were said to be followers of Ateius Capito, of whose life we have some account in the *Annals* of Tacitus, and to advocate a strict adherence as far as possible to ancient rules, and to resist innovation Many quotations from the works of Gaius occur in the *Digest* of Justinian, and so acquired a permanent place in the system of Roman law; while a comparison of the *Institutes* of Justinian with those of Gaius shows that the whole method and arrangement of the later work were copied from that of the earlier, and very numerous passages are word for word the same

Unfortunately the work was lost to modern scholars, until, in 1816, a manuscript was discovered by B G. Niebuhr in the chapter library of Verona, in which certain of the works of St. Jerome were written over some earlier writings, which proved to be the lost work of Gaius The greater part of the palimpsest has, however, been deciphered and the text is now fairly complete. This discovery elucidated portions of the history of Roman law which had previously been obscure

The *Institutes* of Gaius are divided into four books—the first treating of persons and the differences of the status they may occupy in the eye of the law, the second of things, and the modes in which rights over them may be acquired, including the law relating to wills, the third of intestate succession and of obligations; the fourth of actions and their forms.

There are several carefully prepared editions of the *Institutes,* starting from that of Goschen (1820), down to that of Studemund and Kruger (1900) The most complete English edition is that of E Poste, which includes beside the text an English translation and copious commentary (1885) A comparison of the early forms of actions mentioned by Gaius with those used by other primitive societies will be found in Sir H Maine's *Early Institutions* (1875) cap. 9. For further information *see* ROMAN LAW.

GAIUS: *see* CALIGULA.

GALAGO, the name of the long-tailed African lemur-like Primates (*q v*); classed with the lorises and pottos in the *Lorissiformes.* They are characterized by the great elongation of the upper portion of the feet (tarsus) and the power of folding the large ears. They pass the day in sleep, but are active at night, feeding on fruits, insects and small birds. When they descend to the ground they sit upright, and move about by jumping with their hindlegs like jerboas. They are pretty little animals, varying from the size of a small cat to less than that of a rat, with large eyes and ears, soft woolly fur, and long tails There are

several species, of which *G. crassicaudatus* from Mozambique is the largest.

GALANGAL, formerly written "galingale," and sometimes "garingal," *rhizoma galanga,* a drug, now obsolete, tasting like mingled ginger and pepper. Lesser galangal root, the galangal of commerce, is the dried rhizome of *Alpinia officinarum,* a plant of the natural family Zingiberaceae, growing in the Chinese island of Hainan, where it is cultivated, and closely allied to *Alpinia calcarata,* the rhizome of which is sold in the bazaars of some parts of India as a sort of galangal. Its stems are about 4ft. long and its light-green leaves are slender, lanceolate and pungent, the flowers are white with red veins and in simple racemes, the roots form dense masses, sometimes more than a foot in diameter, and the rhizomes grow horizontally, and are ¾in. in thickness.

GALÁPAGOS ISLANDS, an archipelago in the Pacific, consisting of 12 large and several hundred small islands on the equator, 500 m. due W. of Ecuador, to which country they belong. They were discovered by the Spaniards early in the 16th century, but only three islands have ever been utilized, these chiefly as convict stations. At various times they have been visited by British ships of war, New England whalers, pirates, buccaneers and numerous scientific expeditions. Charles Darwin, when on the voyage of the Beagle, obtained from the insular forms of Galápagos finches valuable data for his "Origin of Species." The English names of the major islands are Albemarle, Indefatigable, James, Narborough, Charles, Chatham, Hood, Barrington, Duncan, Tower, Bindelow and Abington. Albemarle is irregular in shape but most of the others are roughly circular, with a single high crater in the centre. Albemarle is the largest, 75 m. in length, and in 1925 broke into eruption. Since then the craters of Narborough have been active. The shores of the islands are low, while in the interior, craters may rise to an extreme height of 5,000 feet. The coast shows an alternation of dense mangroves, beaches of white sand and rugged cliffs of grey lava. Very little rain falls near the sea, where the vegetation is semi-desert, chiefly cactus and thorn-trees. The luxuriance increases on the uplands where the moisture becomes more general. The Antarctic Humboldt current keeps the temperature of the surrounding water well below equatorial average.

The name is derived from the Spanish *galápago,* a tortoise, and refers to the giant forms which have evolved on the islands. Some of these have reached a length of 4 ft. or more, weighing nearly 400 lb., and individuals perhaps attain an age of 300 to 400 years, making them the oldest living animals on the earth. In past years almost every island had its peculiar species of tortoise, but they are now on the verge of extinction. This has been due to the carrying away of thousands, by whalers, for food, to the slaughter of great numbers for their oil and the wholesale devouring of eggs and young by wild dogs and pigs. A remarkable fact about the Galápagos fauna is the large proportion of forms peculiar to the islands, namely, 37% of all the species of shore fish, 40% of the plants and 96% of the reptiles. But the amount of zoological work remaining to be done is indicated by a collection of moths brought back by one of the most recent expeditions, of which half of the 52 species were new to science.

The virtual absence of mankind since the times of the buccaneers has resulted in a remarkable absence of fear on the part of all forms of native animal life. In fact the only really wild creatures are the dogs, cats, pigs, goats and donkeys which have been wrecked or intentionally left on the islands in past years. The sea-lions, which are abundant and astonishingly tame, are of southern derivation, doubtless via the Humboldt current. Besides small lizards and snakes there are two large iguana-like lizards, one marine and feeding on algae, and both showing many primitive characters. Fifteen species of giant tortoises formerly inhabited the islands and 85 kinds of birds have been recorded. Of special interest are the flamingos which breed on James island, and the flightless cormorants with diminutive wings which are found only near Albemarle; but it is doubtful if there are more than half a hundred of these adult cormorants left in existence to-day. The small black finches exhibit amazing variation, some having bills heavier and thicker than a grosbeak's, while in others the mandibles are as slender as those of a warbler.

The dominant theory of the formation of these islands, first sponsored by Darwin, is that they have always been isolated both from one another and from the mainland, the gradual stocking being by accidental arrivals. Important evidence is accumulating, however, that at one time the submerged plateau which connects the archipelago with Central America was dry land. For instance, except for the penguins (which even to-day could easily swim from Peru along the Antarctic Humboldt current) every species of native bird shows closer relations with Central than with South America, and much the same is true of other groups such as the shore fish and land plants, while the nearest relations of the giant tortoises are found fossil in Cuba. If the stocking of the Galápagos with living creatures had been by adventitious arrivals, they could only have come by the southern current which turns westward at the latitude of Peru. There seems little doubt that the archipelago was at one time a single island. Furthermore, the presence of five forms of tortoises on Albemarle hints that formerly this island was more deeply submerged, so that only its five major craters were above water. The results of the many scientific expeditions which have visited the islands are indicated in the accompanying selected bibliography. The most recent are those sent out by the New York Zoological Society, two under the direction of William Beebe and the last under C. H. Townsend. The latter was successful in bringing back over 200 tortoises from Albemarle for distribution to various favourable situations, where efforts will be made to breed them and save the race from extinction.

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GALASHIELS, municipal burgh and parish, Selkirkshire, Scotland. Pop. (1921) 12,946. It is on Gala Water, within a short distance of its junction with the Tweed, 33½ m. S.S.E. of Edinburgh by the L.N.E.R. The town stretches for more than 2 m. along both banks of the river, the mills and factories occupying the valley by the stream, the better houses the higher ground on either side. The town is under a provost, bailies and council. The woollen manufactures, dating from the close of the 16th century, are important, though now mainly confined to the weaving of tweeds. Other industries are hosiery manufacture and tanning. Galashiels was originally a village built for accommodation of pilgrims to Melrose abbey (4 m. E. by S.), and was created into a burgh of barony in 1599. The Catrail or Picts' Work begins near the town and passes immediately to the west. Clovenfords, 3½ m. W., is noted for the large Tweed vineries. Two miles farther W. by S. is Ashestiel, where Sir Walter Scott resided from 1804 to 1812, wrote his most famous poems, and began *Waverley.*

GALATIA. I. In the strict sense this is the name applied to a large inland district of Asia Minor occupied by Gaulish tribes in the 3rd century B.C. It was bounded on the north by Bithynia and Paphlagonia, west by Phrygia, south by Lycaonia and Cappadocia, east by Pontus.

Galatia is part of the great central plateau of Asia Minor, here ranging from 2,000 to 3,000ft. above sea-level, and falls geographically into two parts separated by the Halys (*Kizil Irmak*), a small eastern district lying chiefly in the basin of the Delije Irmak, the principal affluent of the Halys, and a large western region drained by the Sangarius (Sakaria) and its tributaries. On the north side Galatia consists of a series of plains with

fairly fertile soil, lying between bare hills But the greater part is a stretch of barren, undulating uplands, intersected by tiny streams and passing gradually into the vast level waste of treeless plain that runs south to Lycaonia; these uplands are little cultivated but afford pasturage for large flocks of sheep and goats

The Gaulish invaders appeared in Asia Minor in 278–277 B C They numbered 20,000 of which only one-half were fighting men, not long after their arrival we find them divided into three tribes, Trocmi, Tolistoboii and Tectosages They had split off from the army which invaded Greece under Brennus in 279 B C, and crossed over to Asia at the invitation of Nicomedes I of Bithynia, who required help in his struggle against his brother For about 46 years they were the scourge of the western half of Asia Minor, ravaging the country without any serious check, until Attalus I, king of Pergamum, inflicted several severe defeats upon them, and about 232 B C forced them to settle permanently in the region to which they gave their name In the settlement of 64 B C Galatia became a client-state of the Roman empire, and three chiefs were appointed, one for each tribe But this arrangement soon gave way before the ambition of the chief Deiotarus (*q v*), the contemporary of Cicero and Caesar, who was recognized by the Romans as king of Galatia On the death of the third king, Amyntas, in 25 B C, Galatia was incorporated by Augustus in the Roman empire, and few of the provinces were more enthusiastically loyal

The population of Galatia was not entirely Gallic Before the arrival of the Gauls, western Galatia up to the Halys was inhabited by Phrygians, and eastern Galatia by Cappadocians and other native races This native population remained, and constituted the majority of the inhabitants of the rural parts and almost the sole inhabitants of the towns They were left in possession of two-thirds of the land (Caesar, *B G* i 31) on condition of paying part of the produce to their new lords, and agriculture and commerce with all the arts and crafts remained in their hands They ranked as "Galatians" equally with their overlords, and it was from their numbers that the "Galatian" slaves were drawn The conquerors, who were few in number, formed a small military aristocracy, living not in the towns, but in fortified villages, where the chiefs in their castles kept up a barbaric state, surrounded by their tribesmen With the decline of their warlike vigour they began gradually to mix with the natives and to adopt their religion the amalgamation was accelerated under Roman influence and ultimately became complete, but they gave to the mixed race a distinctive tone and spirit, and long retained their national characteristics and social customs, as well as their language (which continued in use, side by side with Greek, in the 4th century A D) In the 1st century, when St. Paul made his missionary journeys, even the towns Ancyra (mod Angora), Pessinus and Tavium (where Gauls were few) were not hellenized, while the rural population was unaffected by Greek civilization Hellenic ways and modes of thought begin to appear in the towns only in the later 2nd century In the rustic parts a knowledge of Greek begins to spread in the 3rd century; but only in the 4th and 5th centuries, after the transference of the centre of government to Constantinople placed Galatia on the highway of imperial communication, was Hellenism in its Christian form gradually diffused over the country. (*See* also Ancyra; Pessinus; Gordium)

II The Roman province of Galatia, constituted 25 B C, included the greater part of the country ruled by Amyntas, viz, Galatia Proper, part of Phrygia towards Pisidia (Apollonia, Antioch and Iconium), Pisidia, part of Lycaonia (including Lystra and Derbe) and Isauria For nearly 100 years it was the frontier province, and the changes in its boundaries are an epitome of the Roman advance to the Euphrates Under Diocletian's reorganization Galatia was divided, about 295, into two parts, and the name retained for the northern After suffering from Persian and Arabic raids, Galatia was conquered by the Seljuk Turks in the 11th century and passed to the Ottoman Turks in the middle of the 14th.

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GALATIANS, EPISTLE TO THE, one of the New Testament books. "The churches of Galatia," to whom this vigorous letter is written, had been founded by the apostle Paul himself. On his mission he had been broken down by illness (iv 13), but his preaching had proved effective, he had been enthusiastically received by the natives, and the result had been an enthusiastic start of Christianity in the local communities "You did run well" (v 7), he confesses But something happened to damp the initial ardour This appears to have been not only inner discord but a tendency towards 'legalism' on the part of the members Hence, on a second visit, the apostle had to speak firmly and frankly In some quarters this appears to have given offence, but it was not ineffective The departure from the apostle's teaching had not gone very far as yet It was only later that he heard of the danger of a relapse, owing to the influence of some agitators, who persuaded the Galatians that the apostle was not really authorised, that his gospel required to be supplemented by closer adherence to the Jewish code, that ritual and even circumcision were needful to a full Christian life, as the primitive and original apostles taught In other words, the Galatians were induced to believe that the sole valid charter to privileges in the Messianic order of Christ lay in observance of the Jewish law, which remained obligatory upon all converts, even on those who came over from paganism (iii 6–9, 16, vi 12–16, i 6–9) These intruders belonged to the Jewish Christian party in the primitive Church, they feared deeply that the ethical interests of the Church would be compromised if the Jewish law were dropped, and also their sympathies were with the party of James, as reflected in the story of Acts xv Apparently they were headed by some leading individual (v 10), who unsettled the minds of the Galatian Christians The news of this defection took Paul by surprise. Unable for some reason to revisit the churches, he sent them this sharp and searching remonstrance Things had not yet gone too far, only a few had been circumcised, their founder considered that it was still possible to arrest the downward course, to counteract the intrigues of his opponents, and to recall the Galatians to the true principles of Christianity as he had inculcated them on his original visit Such was the occasion which called forth this pungent letter

The address is unusually bare—"to the churches of Galatia"—, and Paul does not associate anyone with himself Even the "we" in i. 8, 9 is the singular reference to himself. Whoever may have been with him on the original mission, he concentrates attention on his own personal character and credentials, since it had been on these that his opponents had turned their fire, in the hope of discrediting his influence. There is no word of commendation, as is frequent in his other epistles; he plunges into (i 6–ii 21) personal vindication of his apostolic independence and authority Indeed here, as at the close (vi 17), the apostle "stands before us like an ancient general who bares his breast before his mutinous legions, and shows them the scars of the wounds that proclaim him not unworthy to be called Imperator" (Hausrath's *History of New Testament Times*, iii, 181f). The vindication is developed negatively and postively, to meet the charges brought by his critics He traces back his apostolate to the direct revelation by which he had been converted (i 15f), shows how he was no upstart eccentric but in line with the twelve apostles, whom he had consulted, and from whom he had received a full recognition of his vocation Indeed, he describes how (ii 11f) he had once to recall Peter himself to the true line of the gospel So far from Peter being set up as the standard by which Paul was to be measured—an argument evidently used by his opponents—, the rock-apostle had at Antioch to be reproved by Paul for failing to adhere to the right position

Such is the first of the three parts of the letter. The closing monologue on the incompatibility of the Mosaic law with the Christian gospel (ii. 15–21) starts him on the second phase of

his argument (iii 1–v 12), *i e*, on the alternatives of Faith and Law Personal allusions still recur, for he is writing a letter, not an abstract treatise; but the main current of thought flows along exposition of the inherent vitality of faith, faith being described as the dominating principle which, implicit already in Abraham, has come to flower under the Spirit of Christ, with an ethical authority of its own The much-vaunted Law is shown to have been a provisional episode; the real purpose of God culminates in the gospel of Christ as a message of filial confidence and freedom (iii 29f) His opponents claimed that only Christians who became circumcised were really sons of Abraham, Paul insists that believers are sons of Abraham by their faith, not by any obedience to the Law, which came after Abraham A passionate outburst then follows, in which, employing some rabbinic methods of exegesis, he seeks to establish the absolute supremacy of spiritual Christianity over legalism as the religion of faith and freedom, applying this to the situation of the Galatians themselves

The third part of the letter (v 13f) is a description of the moral responsibilities of this faith, in order to remove any misconceptions

THE EPILOGUE

The epilogue (vi. 11f) consists of a number of abrupt, emphatic sentences, which reiterate the message of the letter This epilogue is written in his own hand-writing The Authorised English version renders the verse, "Ye see how large a letter I have written to you with mine own hand," as though Paul meant the entire letter But the aorist is epistolary, at the close of a letter, and means what now follows Taking the pen from his amanuensis, he dictates the paragraph, as in 1 Corinthians, xvi. 21–24 "See what big letters I make, when I write to you in my own hand" (ver 11) Evidently the Galatians were intended to see the autograph, and to contrast the writing of the secretary, to whom he had been up till now dictating, and his own calligraphy, "the handwriting of the amanuensis was probably cursive, and the autograph signature of St Paul the stiff, heavy uncials of a manual labourer" (Deissmann, *Light from the Ancient East*, 1927, p. 174) Some have taken this allusion as referring to the whole of the letter (so Chrysostom and Augustine, for example), but with Jerome we are safe in believing that it refers to the closing paragraph alone, and that he wrote these words for the sake of emphasis An autograph conclusion to an ancient letter was not uncommon, sometimes for the sake of assuring the recipients that the letter was genuine. This may be the case in 2 Thessalonians iii. 17–18. Here it is less likely Nor is it probable that the apostle inserted this postscript in his own handwriting because he felt an ironical playfulness at the end, wishing to make the Galatians realise that, after the sterner notes of the earlier chapters, he was now prepared to treat them as children, "playfully hinting that surely the large letters will touch their hearts" (Deissmann, *Bible Studies*, pp 346f). The tone of the counsels is too urgent for this interpretation

The identification of these "churches of Galatia" depends largely on the view taken of the two passages in Acts where Galatia is mentioned In xvi 6 Paul, Silas and Timotheus "went through Phrygia and the region of Galatia"; in xviii. 23 Paul goes from Antioch on a tour "right through the country of Galatia and Phrygia, strengthening the disciples" As in the former passage we learn next that the missioners were attempting to enter Bithynia, it is natural to suppose that by Galatia is meant the northern district south of Bithynia and east of Mysia, where the inhabitants were ethnologically Galatians These would be the two visits mentioned in the epistle The inhabitants of the southern part of the province were Galatians only politically; their leading towns were Antioch, Iconium, Lystra, and Derbe Critics who demur to the apostle evangelising so distant a territory as North Galatia prefer to make the letter written to the South Galatians, in which case, of course, it may be earlier than on the North Galatian theory, for the visit mentioned in xviii. 23 would be subsequent to the composition of the letter. The problem raised by this difficulty involves not only geographical problems but the whole question of the identity of the incidents described in Gal. ii. 1–10 with Acts xi 28f or xv These intricate data will be found discussed, in favour of the North Galatian theory, by Schmiedel in the *Encyclopaedia Biblica* (1592–1616), and by Sir William Ramsay in Hastings's *Dictionary of the Bible* (ii. 81f) on the other side, as well as by modern editors like Rendall and Burton. A succinct statement of both sides is given by G W Wade in *New Testament History* (1922, pp 264–273). The present writer sees no reason to depart from the position he advocated in his *Introduction to the N T Literature* (3rd ed, 1918, pp 83–107), viz, that the letter was intended for the Christian churches of north Galatia, that Gal ii 1–10 and Acts xv. are descriptions of the same crisis, and that the letter was written sometime after the date mentioned in Acts xviii 23, perhaps from Ephesus (Acts xix 1–10), when he was on the point of starting for Corinth, or even from Greece, *i e*, from Corinth The situation presupposed on this view is as follows After the settlement at the Council of Jerusalem (Acts xv), which involved a temporary check to the conservative party of Jewish Christians, they revived their energies not only at Antioch (Gal ii 12f) but further afield; they adroitly carried their countermission into districts where people were less well acquainted with what had transpired at Jerusalem and Antioch The disturbance in the Galatian churches was therefore a recrudescence of the earlier movement against Gentile Christianity as Paul preached it, and these reactionaries took advantage of his absence in order to undermine his authority, the burning question being as at Jerusalem the question of circumcision, which carried with it an acknowledgement of the validity of the Law for all Christians It is now recognised that north Galatia, though remote, did not lie off the natural route of the apostle, that the country was not void of sufficient education to enable the natives to understand what he wrote, *e g*, on Roman law, and that, so far as our knowledge goes, the allusions to Greek customs would have been as intelligible to northern Galatians as to southern

The authenticity of the letter is beyond reasonable doubt; it is a mere curiosity of criticism that during last century some disputed its authorship, or even attempted to disentangle a genuine nucleus from later additions Traces of it soon occur in the second century literature of the Church, from Justin Martyr and Marcion onwards Marcion indeed seems to have put it first among the Pauline letters, but this was due to its importance as an anti-Jewish document, not to any independent knowledge of its chronological position in the apostle's life. The early Church naturally valued it chiefly as an apostolic religious document, which powerfully stated the essentials of the faith Such was indeed the reason why it appealed to Luther in a later age Modern scholars have done justice to its revelation of the personality of Paul himself in his rush and eagerness of feeling, in his concern for his churches, and in his eagerness to defend his own character, since opponents were striking at his converts through that At several points, notably at this, it is right with Jowett to observe the resemblance between Galatians and Second Corinthians "In both there is the same sensitiveness in the Apostle to the behaviour of his converts to himself, the same earnestness about the points of difference, the same remembrance of his own 'infirmity' while he was yet with them, the same consciousness of the precarious basis on which his own authority rested in the existing state of the two Churches. Abruptness of style is characteristic of both; the excitement of feeling seems to clog the current of ideas" Only, the Galatian Christians had not vexed him by personal misconduct towards himself, as the Corinthians had He was distressed by the religious lapse of the Galatians, not by their rudeness and insubordination. Hence Galatians is a letter of remonstrance on higher grounds than Second Corinthians. Unluckily in neither case do we know its effect.

BIBLIOGRAPHY.—The most adequate editions in English, based on the Greek text, are by C. J. Ellicott (4th edition, 1867), J. B. Lightfoot (11th edition, 1892), Alford (3rd edition, 1862), F Rendall (in *Expositor's Greek Testament*, 1903), A L Williams (*Cambridge Greek Testament*, 1910), and Burton (*International Critical Commentary*, 1921), the last-named being the fullest and finest in the language. The following commentaries are based on the English text—Sanday (in Ellicott's *Commentary*, 1879), B. Jowett (3rd edition, 1894), and C W Emmet (London, 1912). Particular value attaches to the editions of Lightfoot and Jowett for their subsidiary

essays, whilst Sir W. M. Ramsay's *Historical Commentary on Galatians* (1899) throws a flood of light upon many archaeological items from the standpoint of the South Galatian hypothesis The best French edition is by P Lagrange (Paris, 2nd edition, 1926). In German the most up-to-date editions are those by R. A Lipsius (*Hand-Commentar,* 1892), Sieffert (in Meyer, 1809), and Lietzmann (in his *NT Handbuch,* 1910), with Theodor Zahn's edition in his *Commentar* (2nd edition, 1907) Zahn and Lightfoot give useful summaries of the patristic work The religious thought of the epistle is expounded lucidly by writers like C Holsten (*das Evangelium Paulus,* Teil I. 1889), A B. Bruce (*St Paul's Conception of Christianity,* 1894, pp 49–70), Professor G. G Findlay (*Expositor's Bible*), W. M. MacGregor (*Christian Freedom,* 1914), and A W F Blunt (edition in *Clarendon Bible,* 1925), W S Wood's *Studies in St Paul's Epistle to the Galatians* (1887) criticizes Lightfoot, and the South Galatian hypothesis is presented ably by Douglass Round (*The Date of St. Paul's Epistle to the Galatians,* 1906) and by E H Askwith (*Epistle to the Galatians, its Date and Destination,* 1899). The general criticism of the epistle may be studied in works like those of Sabatier (*The Apostle Paul,* pp 187ff), B W Bacon's *Story of St Paul* (pp 116f), and Kirsopp Lake's *The Earlier Epistles of St Paul,* as well as in Lutgert's *Gesetz und Geist* (1919) *See* further under PAUL.

(J MOF)

GALATZ, a city of Rumania, capital of the department of Covurlui, on the left bank of the river Danube, 90 m W by N. of its mouth at Sulina Pop (1928) 154,000, including many Jews The Danube is joined by the Seret 3 m S W of Galatz, and by the Pruth 10 m E Galatz is built on a slight eminence among the marshes which line the intervening shore and form, beside the western bank of the Pruth, the wide but shallow mere called Lake Bratych (*Brateşul*) It is the seat of the Rumanian III Army Corps, the Rumanian naval school, the bishopric of the Lower Danube, a prefecture, and the international commission for the control of the Danube (*q v*), the main Danubian shipping companies, and 3 Chambers of Commerce It contains a cathedral and many other churches, St Mary's Church contains the tomb of Mazeppa Galatz is connected by rail with Braila and Bucharest and the main Moldavian system It has an important industry, manufacturing candles, wire, nails, soap, buttons and chemical products, it also possesses many saw-mills, paste-mills, flour-mills, roperies and petroleum refineries It is the chief Rumanian port of entry for imports, and the chief port of export for timber, while in grain it comes second to Braila

GALAXY, properly the MILKY WAY, from the Greek name γαλαξίας, *sc* κύκλος, from γάλα, milk, *cf* the Lat *via lactea* The word is more generally employed in its figurative or transferred sense, to describe a gathering of brilliant or distinguished persons or objects

The Galactic Plane, or plane of the Milky Way, is frequently used as a reference plane in studies of the structure of the stellar system, since the distribution of the different classes of stars is found to be strongly related to it The North Galactic Pole is approximately in R A. 12^h 40^m, Dec $+28°$ Positions are expressed in galactic latitude and longitude, the latter being reckoned from the ascending node of the galactic plane on the equator

GALBA, SERVIUS SULPICIUS, Roman emperor (June A D. 68 to Jan 69), born near Terracina, on Dec 24, 5 B C He came of a noble family and was a man of great wealth, but unconnected either by birth or by adoption with the first six Caesars In his early years it is said that both Augustus and Tiberius prophesied his future eminence (Tacitus, *Annals,* vi 20; Suetonius, *Galba,* 4) Praetor in 20, and consul in 33, he acquired a well-merited reputation in the provinces of Gaul, Germany, Africa and Spain On the death of Caligula, he refused the invitation of his friends to make a bid for empire, and loyally served Claudius For the first half of Nero's reign he lived in retirement, till, in 61, the emperor gave him the province of Hispania Tarraconensis In the spring of 68 Galba was informed of Nero's intention to put him to death, and of the insurrection of Iulius Vindex in Gaul. He was at first inclined to follow the example of Vindex, but the defeat and suicide of the latter renewed his hesitation. When news came that Nero had been killed and the praetorians had declared for him, he marched to Rome. At first he was welcomed by the senate and the party of order, but he was never popular with the soldiers or the people He incurred the hatred of the praetorians by scornfully refusing to pay them the reward promised in his name, and disgusted the mob by his meanness and dislike of display. Otho's successful conspiracy followed Galba was murdered by some cavalry near the Lacus Curtius Tacitus rightly says that all would have pronounced him worthy of empire if he had never been emperor (*"omnium consensu capax imperii nisi imperasset"*)

See his life by Plutarch and Suetonius; Tacitus, *Histories,* i 7–49, Dio Cassius lxiii 23-lxiv 6, B W Henderson, *Civil War and Rebellion in the Roman Empire, A D 69–70* (1908); W A. Spooner, *On the Characters of Galba, Otho and Vitellius* in Introd to his edition (1891) of the *Histories* of Tacitus

GALBANUM, a gum-resin, the product of *Ferula galbaniflua,* indigenous to Persia It occurs usually in irregular, more or less translucent and shining lumps, or occasionally in separate tears, of a light-brown, yellowish or greenish-yellow colour, and has a bitter taste, a musky odour, and a specific gravity of 1 212 It contains about 8% of terpene, 65% of a resin which contains sulphur, 20% of gum; and a very small quantity of the colourless crystalline substance *umbelliferone,* $C_9H_6O_3$ Galbanum is one of the oldest of drugs In Exodus xxx 34 it is mentioned as a sweet spice Hippocrates employed it in medicine, and Pliny (Nat Hist , xxiv 13) ascribes to it extraordinary curative powers Its use in medicine is obsolescent

GALBULIDAE: *see* JACAMAR

GALE, ZONA (1874–), American author, was born at Portage, Wis , on Aug 26, 1874 After her graduation from the University of Wisconsin, she did newspaper work in Milwaukee, and in 1901 joined the staff of the *New York World* After 1904 she gave her full time to writing, publishing among other books *The Loves of Pelleas and Etarre* (1907), *Friendship Village* (1908), *Birth* (1918), *Miss Lulu Bett* (1920), *The Secret Way,* verse (1921), *Faint Perfume* (1923), *Preface to a Life* (1926) The publication of *Miss Lulu Bett* first directed interest to her as a promising novelist of the new realistic school, and she was awarded a Pulitzer prize for her play, *Miss Lulu Bett,* dramatized from the book, and produced in New York in 1920

GALE. 1 A wind of considerable power, appreciably stronger than a breeze, but not severe enough to be called a storm In nautical language it is usually combined with some qualifying word, as "half a gale," a "stiff gale " In poetical and figurative language "gale" is often used in a pleasant sense, as in "favouring gale"; in America, it is used in a slang sense for boisterous or excited behaviour

2 The payment of rent, customs or duty at regular intervals; a "hanging gale" is an arrear of rent left over after each successive "gale" or rent day The term survives in the Forest of Dean, for leases granted to the "free miners" of the forest

3 The popular name of a plant, *Myrica Gale,* also known as the sweet gale or gaul, sweet willow, bog or Dutch myrtle

GALEN (*c.* A D 130–*c* 200), 1 Greek physician, was born in Pergamum (*q.v.*), the capital of Mysia in Asia Minor, a city renowned for its magnificent library, the creation of the Attalid Kings He is sometimes wrongly spoken of as Claudius Galen, but the cognomen Claudius has no authenticity and is a result of a misunderstanding on the part of Renaissance scholars. From his earliest years Galen was familiar with the Platonic, Peripatetic, Stoic and Epicurean schools of thought He began the study of medicine in 146, and two years later went to Smyrna to attend the lectures of Pelops, a celebrated physician In search of knowledge he roamed through Greece, Cilicia, Phoenicia, Palestine, Crete, Cyprus and finally visited the famous medical school at Alexandria (*q v.*). Settling at Rome in 164, Galen became acquainted with some of the highest officers of the state, among them the consul Boethus, Severus the future emperor, and the uncle of Lucius Many of these eminent people attended his lectures and demonstrations Galen used an unsparing pen against medical sects, the methodists, dogmatists, pneumatists and empirics, then flourishing in Rome, and thus provoked the hostility of his professional brethren. He belonged to no particular school, though in philosophy he favoured Aristotelianism. Later he left Rome for Pergamum, but was recalled by the emperor Marcus Aurelius (*q.v*) for service in the Germanic wars This he managed to evade, returning to Rome to look after the health of the

youthful Commodus, heir of Marcus Aurelius. Little is known of the rest of his life Apparently he was in Rome during the fire of 191, when many of his works were burnt, and he was still lecturing in the reign of Pertinax He probably died in Sicily in AD 200

Galen was the author of some 500 treatises written in clear Attic Greek In his *De Libris propriis* he mentions 124 purely philosophical treatises, which include commentaries on the *Categories* and *Analytics* of Aristotle, and on the *Timaeus* and *Philebus* of Plato He wrote five treatises on Ancient Comedy which are lost Only an insignificant fraction remains of his non-medical works Of the surviving medical works 98 are held to be genuine, 19 doubtful, 45 spurious, and 19 are merely fragments (H Choulant, *Bucherkunde fur die Aeltere Medizin,* 1841, pp 100–112)

Galen may be regarded as the founder of experimental physiology, and after Hippocrates, as the most distinguished physician of antiquity To Hippocrates he acknowledges his deep obligations in practical medicine, and he is equally frank about his indebtedness to the Alexandrian anatomists

Researches in Anatomy.—Galen's anatomical investigations were unrivalled in antiquity for their fullness and accuracy He was an indefatigable dissector, describing only what he actually saw He dissected apes and lower animals, though much that is relevant to the human body is incorporated in his works As a specimen of his accuracy it may be mentioned that he recognised the lacteal vessels, and described the ducts of the lingual and submaxillary glands, though of their function he was unaware Many structures, by which the names of 16th and 17th century anatomists eponymously linger, were observed by Galen, *e g* , the aqueduct of Sylvius and the *foramen ovale* (le trou Botal) The mode of closure of the latter Galen describes in language hardly since excelled

Researches in Physiology.—Galen's physiological investigations were revolutionary He knew of insensible perspiration, he ligatured the recurrent laryngeal nerve, he performed section of the spinal cord at various levels and observed the resulting sensory and motor disturbances and incontinence He correctly interpreted the effect of cutting above the origin of the phrenic nerve He described the heart with its three layers of fibres, which he hesitated to call muscle The reasons for his reluctance are greatly to his credit Thus, firstly, he noted that the cardiac substance presented characteristics different from those of ordinary muscle, as, for instance, in that its action was independent of volition, and, secondly, he recorded that section of its nerve supply was not followed by cessation of its activities The valves of the heart are accurately described by him, and it is probable that he knew of the anastomosis of the vessels One of his greatest contributions was the demonstration that the arteries contain blood, and not air as the Alexandrian school had taught for over four hundred years He partially grasped the principle of the lesser circulation, as Harvey (*q v*) pointed out Galen described aneurism, differentiating the traumatic from the dilated variety and he was also familiar with the use of the catheter His facile teleology led him, however, to some strange errors Among them was the elaborate hypothesis which he formulated concerning the *pneumata* or spirits, to the influence of which he attributes many vital processes He is also the author, or at least the propagator, of the fateful theory that the septum of the heart was pierced by imperceptible foramina, through which some of the blood was supposed to exude from the right into the left ventricle.

Monotheistic Views.—Apart from his medical work Galen occupies a position of considerable interest in the history of both religion and philosophy He was a firm believer in God as the supreme creator of the universe in all its parts He had set himself to prove that the bodily organs are in such perfect relation to the functions to which they minister that it is impossible to imagine any better arrangement Thus, following the Aristotelian principle that Nature makes naught in vain; he develops the problem of final causes along definite lines These lines amount to determinism with God as determiner The peculiar feature of Galen's doctrine, however, is neither his determinism nor his monotheism, both of which were familiar to the thinkers of the day, but his extraordinary claim that God's purposes could be elicited in great detail from the examination of his works. This comes out most strikingly, perhaps, in his famous description of the hand, contained in his treatise *On the Uses of the Parts of the Body of Man*

In several places in his works Galen mentions both Judaism and Christianity, though without much respect In the great anatomical work under discussion he explains that in his belief God always works by law, and that it is just for this reason that natural law reveals him, and he adds that "in this matter our view . differs from that of Moses " It seems very probable that he had read some books of the Bible His position can thus be summed up as intermediate between Stoicism and Christianity On the one hand he accepted the natural law of the Stoic philosophy, but rejected its astrological corollary. On the other hand he accepted the divine guide and architect of the universe which corresponded to the Christian scheme, but rejected all idea of miracle

Influence on Logic.—Galen is held to have had a certain influence on the development of logic He was, however, simply purveying the ordinary Peripatetic doctrines of his day Nevertheless he is of some importance as the carrier or transmitter of these doctrines by reason of the avidity with which his medical works were read during the middle ages He is thus in some sense responsible for both scholastic methods and scholastic philosophy His chief philosophical influence is, however, to be traced in the mediaeval doctrine of *pneuma* and the resulting conception of the nature of life.

Galen's monotheism no doubt contributed to his popularity in the ages that followed him Nevertheless nearly all writings were lost to western Europe after the break-up of the Roman empire They were, however, translated into Arabic and about the 11th century the *Methodus Medendi,* and the *Ars Parva* or so-called *Microtegni,* were recovered in Latin versions from Arabic sources The fifteenth century saw the effective completion of the Galenic canon in Greek by humanist scholars Latin translations were studied in the medical schools until the dawn of the 19th century

BIBLIOGRAPHY —The standard edition of Galen is still that of C G Kuhn in 20 (22) volumes, Leipzig (1821–33). A critical edition is being produced in the *Corpus Scriptorum Graecorum,* of which several fascicules have appeared A French translation of the important anatomical and physiological writings is that of C Daremberg (2 vols, Paris 1854) A section of the *De anatomicis administrandis,* of which the Greek original is lost, is edited with German translation by M Simon *Sieben Bucher der Anatomie des Galen* (2 vols, Leipzig 1906) The only work on Galen available in English is *On the Natural Faculties,* by A Brock (1916)

On the philosophy of Galen there is little in English Reference may be made to C Singer in *Religion, Science and Reality* (edited by Joseph Needham 1926), and R O Moon, *Relation of Medicine to Philosophy* (1909) Other works are Iwan Muller, *Galeni libellus quo demonstratur optimam medicum esse Philosophum* (Erlangen, 1875), C Kalbfleisch, *Galeni Institutio logica* (Leipzig, 1896), I Zimmermann, *Material zur Wurdigung Galens als Geschichtsschreiben der Medizin, Forscher und Commentator* (1902). A bibliography of recent work on Galen is given by Ernest Kind in the *Jahresbericht uber die Fortschritte der klassischen Altertumswissenschaft,* vol 180 (Leipzig, 1919) A list of the mss of Galen has been prepared by H. Diels, *Die Handschriften der antiken Aerzte* (1905) (J S P)

GALENA, a city near the north-west corner of Illinois, U S A , on the Galena river, 4m from the Mississippi; the county seat of Jo Daviess county It is on Federal highway 20, and is served by the Burlington, the Chicago and North Western, and the Illinois Central railways. The population was 4,742 in 1920 (92% native white) It is built on rocky limestone bluffs, rising abruptly on either side of the river, and the parallel streets, on different levels, are connected by flights of steps. Lead and zinc are mined in the vicinity, and the city has smelters, reduction works, iron foundries, marble and stone works and a glove factory Galena was originally a trading post, called by the French "La Pointe," and by the English "Fevre River," as the river had been named after a French trader, Le Fevre, who had been responsible for the first settlement in the area. In 1826 the town was laid out and named after the deposits of sulphide of lead that had been discovered. It was incorporated in 1835. Ulysses S. Grant was living in Galena when the Civil War broke out

GALENA, a city of Cherokee county, Kansas, U S.A , in the south-eastern corner of the State, on Short creek, near Spring river. It is on Federal highway 73E, and is served by the Frisco and the Missouri-Kansas-Texas railways. The population in 1925 (State census) was 4,786. It is in the midst of lead and zinc deposits which were discovered in 1877. The city has stamping and smelting works and concentration plants After the discovery of the minerals, rival companies founded Galena, south of the creek, and Empire city, north of it. Galena was incorporated in 1877. Its population reached 10,155 in 1900, and in 1907 Empire city was annexed to it. The workings here have reached a considerable depth, and in recent years many workers have moved to the newer mines at Picher, Okla., 15m. S W

GALENA, lead sulphide (PbS), the chief ore of lead. The mineral was mentioned by Pliny under this name, and it is sometimes now known as lead-glance (Ger. *Bleiglanz*). It crystallizes in the cubic system, and well-developed crystals are of common occurrence; the usual form is the cube or the cubo-octahedron. An important character, and one by which the mineral may always be recognized, is the perfect cubical cleavage, on which the lustre is brilliant and metallic. The colour of the mineral and of its streak is lead-grey; it is opaque; the hardness is $2\frac{1}{2}$ and the specific gravity 7·5 Large masses with a coarse or fine granular structure are of common occurrence; the fractured surfaces of such masses present a spangled appearance owing to the numerous bright cleavages.

The formula PbS corresponds with lead 86 6 and sulphur 13 4%. The mineral nearly always contains a small amount of silver, and sometimes antimony, arsenic, copper, gold, selenium, etc. Argentiferous galena is an important source of silver; this is present in amounts rarely exceeding 0·1%, equal to about 30 oz per ton Since argentite (Ag_2S) is isomorphous with galena, it is probable that the silver isomorphously replaces lead, but it is to be noted that native silver has been detected as an enclosure in galena.

Galena is of wide distribution, and occurs usually in metalliferous veins traversing crystalline rocks, clay-slates and limestones, and also as pockets in limestones It is often associated with blende and pyrites, and with calcite, fluorspar, quartz, barytes, chalybite and pearlspar as gangue minerals; in the upper oxidized parts of the deposits cerussite and anglesite occur as alteration products The mineral has occasionally been observed as a recent formation replacing organic matter, such as wood, and it is sometimes found in beds of coal. In the lead-mining districts of Derbyshire and the north of England the ore occurs as veins and flats in the Carboniferous Limestone series, whilst in Cornwall the veins traverse clay-slates. In the Upper Mississippi lead region of Missouri, Illinois, Iowa and Wisconsin the ore fills large cavities or chambers in limestone.

Galena is met with at all places where lead is mined; of localities which have yielded finely crystallized specimens the following may be selected for mention: Derbyshire, Alston in Cumberland, Laxey in the Isle of Man (where crystals measuring almost a foot across have been found), Neudorf in the Harz, Rossie, N.Y., and Joplin, Missouri. Good crystals have also been obtained as a furnace product. (L. J. S)

GALEOPITHECUS and **GALEOPTERUS,** the scientific names of the two species of Colugo (*q.v.*) or Cobego, commonly known as flying-lemurs and alone representing the family *Galeopteridae* of the Insectivora (*q.v.*). The characters of the family are as follows: Herbivorous, climbing, unguiculate mammals, provided with a very extensive flying-membrane, and having the dental formula $i.\frac{2}{2}$, $c.\frac{0}{1}$, $p.\frac{3}{3}$, $m.\frac{3}{3}$, total 34. The lower incisors are directed forwards and have a comb-like structure of their crowns, while the outermost of these teeth and the canines are double-rooted, being in these respects, taken together, quite unlike those of all other mammals; the cheek-teeth have numerous sharp cusps; and there is the normal replacement of milk-molars by premolars. In the skull the orbit is surrounded by bone, and the tympanic has a bulla and an ossified external meatus. The ulna and fibula are to some extent inclined backwards; the carpus has a scapho-lunar; and the feet are five-toed. The hemispheres of the brain are short and but slightly convoluted; the stomach is simple; there is a large caecum; the testes are received into inguinal pouches; the uterus is two-horned; the placenta is discoidal, and there are two pairs of pectoral teats. A single offspring is produced at a birth.

There are two well-marked species, *Galeopterus temminckii*, ranging from Burma, Siam and the Malay Peninsula to Borneo, Sumatra and Java, and *Galeopithecus volans*, of the Philippine group. The former, which is nearly 2 ft. in total length, is distinguished by its larger upper incisors, shorter ears and smaller skull. In both species not only are the long and slender limbs connected by a broad integumentary expansion extending outwards from the sides of the neck and body, but there is also a web between the fingers and toes reaching as far as the base of the claws; and the hind-limbs are further connected by a similar expansion passing outwards along the back of the feet to the base of the claws, and, inwardly, involving the long tail to the tip, forming a true interfemoral membrane, as in bats.

GALERIUS (GALERIUS VALERIUS MAXIMIANUS), Roman emperor from AD. 305 to 311, was born near Sardica in Thrace. He served with distinction as a soldier under Aurelian and Probus, and in 293 was designated Caesar along with Constantius Chlorus. In 305, on the abdication of Diocletian and Maximianus, he at once assumed the title of Augustus, with Constantius his former colleague, and having procured the promotion to the rank of Caesar of Flavius Valerius Severus, a faithful servant, and Daia (Maximinus), his nephew, he hoped on the death of Constantius to become sole master of the Roman world. This scheme, however, was defeated by the sudden elevation of Constantine at Eboracum (York) on the death of his father, and by the action of Maximianus and Maxentius in Italy. In 307 he elevated his friend Licinius to the rank of Augustus, and devoted the remaining years of his life "to the enjoyment of pleasure and to the execution of some works of public utility." It was at his instance that the first of the celebrated edicts of persecution against the Christians was published, on Feb. 24, 303, and this policy of repression was maintained by him until the appearance of the general edict of toleration (311), issued in his own name and in those of Licinius and Constantine. He died in May 311.

See Zosimus ii. 8–11; Zonaras xii. 31–34, Eutropius ix. 24, x. 1.

GALESBURG, a city of western Illinois, U S A , 163m S W. of Chicago; the county seat of Knox county. It is on Federal highways 34 and 124, has a municipal airport, and is served by the Burlington, the Rock Island, and the Santa Fe railways The population was 23,834 in 1920 (84% native white), and was estimated locally at over 29,000 in 1928. It is the general trade centre of a rich agricultural region, and one of the leading horse and mule markets in the country; the largest division headquarters of the Burlington Route; an important manufacturing centre, and the seat of Knox college (1837; co-educational since 1849) and Lombard college (1851). Clay, coal, sand and gravel abound within a few miles. The Burlington employs more than 3,000 persons in its machine and repair shops, steel-car factories, icing stations, coal chutes, store department, hump switching-yards, tie-treating plant and other departments. It has its own water supply, from three beautiful artificial lakes near the city. There are some 60 other manufacturing establishments in the city, making a great variety of products, notably paving brick, butter, oil burners, engines and boilers, farm gates and many other agricultural necessities. The aggregate factory output within the city limits in 1925 was valued at $12,407,572.

Galesburg and Knox college were founded by a colonization society, formed by the Rev. George Washington Gale (1789–1862), a Presbyterian preacher of Whitestown, N.Y., to promote Christian education and to counteract the pro-slavery influences in Illinois. The society bought from the United States, at $1.25 per acre, half a township in the "Military Tract" of western Illinois, where lands had been set aside for the veterans of the War of 1812. The members individually then bought the land, from themselves as a society, at $5.00 per acre, thus creating a fund for establishing the college and for other public purposes. The first settlers arrived in 1836, and the college was chartered in 1837, as

Knox Manual Labor college. The city was incorporated in 1857. It was an important "station" on the "Underground Railroad"

GALGACUS, or perhaps rather CALGĀCUS, a Caledonian chief who led the tribes of North Britain against the invading Roman army under Cn Iulius Agricola about AD 85 and was defeated at the battle of Mons Graupius (Tac. *Agric* 29).

GALIANI, FERDINANDO (1728–1787), Italian economist, was born at Chieti on Dec. 2, 1728, and educated for the Church at Naples and Rome He occupied various official positions In his *Trattato della Moneta* (1750) he evolved a theory of value and a conception of utility, which to some extent anticipates the work of Jevons and Menger, while in *Dialoghi sul Commercio dei Grani* (Paris, 1770) he made important contributions to the theory of international trade Though tinged with mercantilistic doctrines, this latter work has been considered the most notable treatise of that period on practical economics Galiani also won a reputation as a wit, which he sustained in his work *Raccolte in Morte del Boia* (1750). He died on Oct 30, 1787.

See A Marghieri, *L'Abbate Galiani* (1878); and Viesseux, *L'Archivio Storico* (Florence, 1878) containing his correspondence with Tanucci.

GALICIA. Galicia is the name applied to that portion of Poland lying on the northern slopes of the Carpathians, which constituted an Austrian *Kronland* between the years 1772 and 1918 The area was then 30,299 sq m, the population (1910) 7,980,477 Of these, 4,672,500 were given as Poles, 3,208,092 as Ruthenian or Ukrainian The linguistic frontier between these two races ran roughly north and south of Przemyl, east of which town 72% of the population was Ruthenian The majority of the urban population, especially in the east, is Jewish

The early history of west Galicia is that of Poland (*q v*) In the east, an independent Ruthenian principality of Halicz appears in the 11th century. It grew in importance with the decay of Kiev, whence many refugees emigrated to Galicia In the 12th century Galicia, under its prince Osmomysl, was one of the chief principalities of Russia Many towns were founded, and much trade passed through Lemberg (Lvov), from Asia and the Black sea to Europe. Galicia failed, however, to achieve stability, largely owing to the character of its own nobles, who are described as rebellious to their king and tyrannical to their serfs It was alternately allied and at war with the neighbouring principality of Lodomeria; and Poland, Hungary and Novgorod intrigued for possession of both districts Hungary became master for short periods in 1190 and 1215, but the powerful native dynasty founded by Roman of Lodomeria (d 1205) retained its independence Roman's son, Daniel (1205–64), was one of the strongest princes of eastern Europe, and was even crowned by a Papal Legate, temporarily deserting the Orthodox Church In 1223, however, he lost his eastern provinces to the Mongols, who overran and ruined all Galicia in 1241. In 1324 the Romanov line died out, and Casimir of Poland occupied Galicia in 1340, Lodomeria in 1366. On his death both provinces again came under Hungary, but reverted to Poland in 1372 Under the Jagellion kings prosperity revived, to sink again when the world trade routes changed. The Ruthenian nobles adopted the Catholic faith and the Polish tongue, the Ruthenian nationality surviving only among the serfs, who were as wild and backward as any in Europe, and lived in almost unrelieved misery, despite the natural wealth of the soil. Galicia was repeatedly harassed by Cossacks, Tatars and Turks, and disorganized by the anarchy of the Polish State

At the partitions of Poland, Galicia (including Lodomeria) was assigned to Austria, for the first time in 1772, definitively, with a slightly altered frontier in 1814, Cracow becoming an independent republic Austrian rule introduced many improvements, but progress was slow The Polish revolution of 1830 affected Galicia little, but Austria allowed legions to be formed here, and sheltered refugees from Russian Poland. In 1846, however, widespread and almost unconcealed preparations for revolution, to break out in mid-February, were made by the Polish nobles. The danger for Austria was averted by a rising of the Polish (not Ruthenian) peasants, whom disastrous floods had reduced to great misery The peasants massacred a number of nobles in the Tarnów district. The revolt soon broke down, but as it had been largely directed from Cracow, Metternich took this pretext of incorporating the city in Galicia, as from Nov. 11, 1846.

In 1848 the Austrian Government countered the revolutionary movement among the Polish nobles by winning the peasants through land reforms, and the Governor of Galicia, Count Stadion also for the first time encouraged the Ruthenians and won their support against the Poles A period of centralized bureaucratic rule followed, during which Galicia was divided, on roughly ethnographical lines, into first three, and later two administrative districts; but the Polish nobles supported the Hungarian in their demand for decentralization, and after the Hungarian "Ausgleich" of 1867, Galicia, thanks to the efforts of Count Goluchowski, obtained more liberty than any other Austrian province. Under a special minister for Galicia, the Poles enjoyed *de facto* home rule and a free hand against the Ruthenians, Galicia being reunited into a single province with Polish as the official language. In return, the Poles formed the chief support of the successive Austrian Governments, and took a large part in directing Austrian policy, the Polish irridenta in Galicia never being serious. Besides being the largest Austrian province, Galicia was now acquiring great importance owing to the discovery and exploitation of its oil fields, although these were mainly in Jewish hands and the provincial budget to the last was subsidized from the Austrian treasury; the strategic importance was also great, and was probably the main reason why the Austrian Government never yielded to the wish of the German nationalists to give Galicia an independent status within the monarchy. The Ruthenian national movement made slow progress, discouraged by Poles and Austrians alike, while Russia gave it no support, for fear of awaking a national movement in the Ukraine. Leaders were lacking, and the movement itself divided.

The Neo-Slav movement had by 1910 laid the foundations for a reconciliation between Poles and Russians The Galician Poles ceased to be safe supporters of the Austrian Government, which in return reverted to the idea of encouraging the "loyal" Ruthenians; but this new development was cut short by the war of 1914 The Central Powers were obliged to grant the Poles wider independence, and to promise them still more; and by 1918 Galicia was virtually independent of Austria. The Poles renounced allegiance to Austria in Oct 1918, claiming all Galicia for the new Polish state. The Ruthenians, however, who had also been promised greater liberty after the Peace of Brest-Litovsk, also claimed the right to self-determination, and in November formed a Government under Dr Petrushievicz in Lemberg, this being recognized by the liquidating Austrian Government. The Poles occupied Lemberg (Nov. 5), and the Ruthenian Government retired finally to Vienna. The Ruthenian troops joined the Ukrainian army of Petlura; the latter marched against the Poles and claimed East Galicia for the Ukrainian Republic—a claim first recognized, but later disallowed by Petrushievicz. Fighting continued throughout 1919. On May 8, 1919, the supreme council assigned West Galicia to Poland, and on June 24 allowed East Galicia the right of self-determination, while authorizing the continued Polish occupation In December it announced that East Galicia should be granted autonomy under a Polish protectorate for 25 years, after which the League of Nations was to decide on its future. Petlura had meanwhile abandoned his claim to Galicia in return for recognition by Poland in the Ukraine; but he was overthrown by the Soviet troops, who continued the struggle with Poland until the treaties of Riga (Oct. 12, 1920, and March 18, 1921) finally reaffirmed the old Galician frontier. The Ruthenian Governments, of which there were many, were quite helpless, from lack of funds and internal dissension Finding their repeated appeals ignored, some of them made terms with Soviet Russia, which carried on a lively agitation in East Galicia, some were reconciled to Poland, a few abandoned politics. Poland continued to treat East Galicia as an integral part of herself, and it was recognized as such by the Council of Ambassadors on March 14, 1923 Under her minority legislation, Poland subsequently accorded her Ruthenian population a limited degree of self-government, and the active agitation against her rule diminished

(C. A M.)

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GALICIA (the ancient *Gallaecia* or *Callaecia*, Καλλαικία or Καλαικία), a captaincy-general, and formerly a kingdom, countship and province, in the north-western angle of Spain; bounded on the north by the Bay of Biscay, east by Leon and Asturias, south by Portugal and west by the Atlantic ocean Pop (1920) 2,124,244; area, 11,254 sq m In 1833 Galicia was divided for administrative purposes into the provinces of Corunna, Lugo, Orense and Pontevedra The high land north of the headwaters of the Miño forms the sole connecting link between the Cantabrians properly so-called and the mountains of central and western Galicia. The average elevation of the province is considerable, and the maximum height (6,593 ft) is reached in the Peña Trevinca on the eastern border of Orense

The principal river is the Miño (Portuguese *Minho;* Lat *Minius;* so named, it is said, from the *minium* or vermilion found in its bed) Rising near Mondoñedo, within 25 m of the northern coast, the Miño enters the Atlantic near the port of Guardia, after a course of 170 m south and south-west Of its numerous affluents the most important is the Sil Among other rivers having a westerly direction may be mentioned the Tambre, the Ulla and the Lerez or Ler, which falls into the Atlantic by estuaries or *rias* called respectively Ria de Muros y Noya, Ria de Arosa and Ria de Pontevedra.

Gallaecia, the country of the Galaeci, *Callaici* or *Gallaici*, seems to have been very imperfectly known to the earlier geographers. According to Eratosthenes (276–196 B.C.) the entire population of the peninsula were at one time called *Galatae* The region properly called by their name, bounded on the south by the Douro and on the east by the Navia, was first entered by the Roman legions under Decius Junius Brutus in 137–136 B.C. (Livy lv, lvi, *Epit*), but the final subjugation cannot be placed earlier than the time of Augustus (31 B.C.–A.D. 14)

The coast-line of Galicia, extending to about 240 m, is everywhere bold and deeply indented, presenting a large number of secure harbours, and in this respect forming a marked contrast to the neighbouring province. The Eo, which bounds Galicia on the east, has a deep estuary, the Rivadeo or Ribadeo, which is a good harbour. Vivero bay and the Ria del Barquero y Váres are of a similar character; while the harbour of Ferrol is an important naval station. On the opposite side of Betanzos bay (the μέγας λιμήν or *Portus Magnus* of the ancients) is the great port of Corunna or Coruña The principal port on the western coast is that formed by the deep and sheltered bay of Vigo, but there are also some good roadsteads at Corcubion, at Marin and at Carril

The rainfall is exceptionally heavy, and snow lies on some of the high ground for a considerable portion of the year Much timber is grown on the high lands, and the rich valley pastures support large herds of cattle, while the abundance of oaks and chestnuts favours the rearing of swine. In the lowland districts good crops of maize, wheat, barley, oats and rye, as well as of turnips and potatoes, are obtained. The *dehesas* or moorlands abound in game, and fish are plentiful in all the streams The mineral resources of the province, which are considerable, were known to some extent to the ancients Strabo (*c* 63 B.C.–A.D. 21) speaks of its gold and tin, and Pliny (A.D. 23–79) mentions the *gemma Gallaica*, a precious stone Galicia is also remarkable for the number of its sulphur and other warm springs, the most important of which are those at Lugo and Orense

The largest town in Galicia is Corunna (*q.v.*); Santiago de Compostela is the ancient capital and an archiepiscopal see; Lugo, Tuy, Mondoñedo and Orense are bishoprics.

See Annette B. Meakin, *Galicia, the Switzerland of Spain* (London, 1909); A. F. G. Bell, *Spanish Galicia* (London, 1922)

GALIGNANI, GIOVANNI ANTONIO (1752–1821), newspaper publisher, was born at Brescia, Italy. After living some time in London, he went to Paris, where he started in 1800 an English library, and in 1808 a monthly publication, the *Repertory of English Literature*. In 1814 he began to publish, in Paris, *Galignani's Messenger*, a daily paper in English aiming at the promotion of good feeling between England and France. From 1884 until 1904, when it was discontinued it was published as the *Daily Messenger*

GALILEE, a Roman province of Palestine, bounded on the south by Samaria and Carmel, on the east by Jordan, on the north by the river Leontes (Litāni), and on the west by the Mediterranean It has a maximum length of 60 m. and a breadth of 30 Galilee represents a relatively low, but detached, continuation of the Lebanon ranges The basic formation of its hills is limestone, and on this the vulcanism of a later geological age has superimposed extensively a layer of lava whose crumbling has produced a soil remarkable for its fertility. The province was divided into two districts, Upper and Lower, reflecting a change in the configuration of the land distinct enough in nature, but not easy to recognize on the map. The dividing line is a ridge running east and west, reaching the Jordan valley at a point midway between Lake Huleh and the Sea of Galilee.

Upper Galilee is the northern district and is in substance a broad mountain range up-tilted towards the Sea of Galilee. The eastern slopes dominating the Jordan valley are abrupt and rise to a height of 2,800 feet On the west, the descent towards the sea and the plain of Acre is more gradual. In the southern part of the district the rocky range of Jebel Jarmuk reaches a height of 3,900 feet The whole region is well watered The height of the mountains causes a relatively heavy rainfall, and springs abound Hence the valleys are full of vegetation and the mountain slopes are clothed on the west with small oaks, and on the east with scrub The occasional level stretches and gentler slopes are covered with fertile grain fields Upper Galilee was proverbially famous for its fine olives and vines "It is easier," says the Talmud, "to raise a legion of olives in Galilee than to bring up a child in Palestine." Safed, the chief town, has a population of 18,000, of whom one half are Jews. It suffered severely in the earthquake of 1837, when 4,000 of its inhabitants perished

Lower Galilee is the southern district of the province. Its highest hills are not more than 1,800 ft Across the province, at its southern end, stretches the plain of Esdraelon (also called Jezreel) Triangular in shape it is drained by the river Kishon which, springing from the Gilboa hills, winds through the plain. For the most part a dry torrent bed in the height of summer, it becomes almost impassable at times during the rains, as when the hosts of Sisera were discomfited on its banks and "the River Kishon swept them away, that ancient river, the River Kishon." The eastern end of the plain forms the chief gateway to Palestine from regions beyond Jordan The whole of Lower Galilee is well supplied with water Springs abound in eastern Esdraelon, Wady-el-Melek and in the plain El-Buttauf. The great plains of Galilee, Esdraelon, El-Buttauf and the plateau of Sahel el-Ahma, are exceedingly fertile, producing wheat, cotton, maize, sesame, tobacco, millet and a variety of vegetables The principal towns are Nazareth (*q.v.*), Tiberias (*q.v.*); Seffuriyeh (Sepphoris), a rival to Tiberias as capital and for a short period the abode of the Sanhedrin when it first transferred to Galilee; Jenin (En-Gannim), on the southern edge of the plain of Esdraelon; Jezreel (*q.v.*), now a poor village (Zer 'in) but once a royal residence, situated on Mt Gilboa; Endūr (Endor, *q.v.*); Nein (Nain, the scene of one of Christ's miracles); Lejjūn (the Legio of the Romans), now identified with ancient Megiddo, on the west side of the plain, where the mighty empires of Egypt and Hattiland met in a famous conflict in the 15th century B.C.; Jefāt, a town amongst the hills north of El-Buttauf, the Jotapata which Josephus so vigorously defended against Vespasian; Kefr Kenna (*q.v.*) probably Cana of Galilee, and Kānā, 6 m north of it, another suggested identification with Cana

Galilee of old was a highly prosperous land peopled by bold and hardy hillmen, who knew how to defend their homes, as, indeed, they had often occasion to do, since "they were encompassed with so many nations of foreigners" Josephus (*Bell Jud.* iii. 3, 2), who in his capacity of military governor of the Galilees, knew the country well, gives an interesting account of the people

and the land of his time. "The Galileans are inured to war from their infancy, and have been always very numerous; nor hath the country ever been destitute of men of courage, nor wanted a numerous set of them; for their soil is universally rich and fruitful and full of the plantations of trees of all sorts . and no part of it lies idle Moreover, the cities lie here very thick, and the very many villages are full of people" The Galilee of to-day is not so prosperous nor so populous as in the days of Josephus, but faith in its future is not wanting Within recent years 16 Jewish colonies have been established by Jewish organizations within its borders

History.—The name (in origin, a "circle" or "circuit") was in early times loosely applied In Isaiah (ix 1) the full name of the district is given as "Galilee of the Gentiles," viz , the Phoenicians, Syrians and Aramaeans, who hemmed it in In 1 Kings (xv 29) it is the name of a district whose population was deported by Tiglath Pileser The fortunes of the tribe, with its loose and varying territorial connections, interested the Hebrew more than the political history of a rigidly delimited district Hence Galilee can hardly be said to have, as a whole, a history The return of the Jews from captivity concentrated re-awakened national interest and prestige at Jerusalem, and Galilee was frowned upon and left to the hybrid race evolved from the mingling of the Jewish residue and fresh Assyrian colonization The date of Galilee's reconquest for the Israelites is uncertain, but it is generally ascribed to John Hyrcanus, and the sturdy race which peopled its hills and valleys soon developed a fervid patriotism and nationalistic spirit The contempt of the metropolitan for the Galilean provincial was probably intensified by the latter's uncouth speech, emphasized by his inability to pronounce some of the Hebrew consonants The jibe "Out of Galilee cometh no prophet" (although Deborah, Jonah, Elisha and perhaps Hosea were Galileans) is not so much a reflection on the religious and cultural interest of the Galilean as a reflection of the biased and prejudiced mind of the metropolitan We cannot forget that it was amongst the hills of Galilee and by its sea that Christianity was shaped and developed In the Persian period too, the Mandaean religion took final shape in lone Galilee

Galilee was moulded into a province by the Romans and became a tetrarchate governed by members of the Herod family Galilee was the land of Christ's childhood and the chief centre of his ministry In the neighbourhood of its great lake some of his chief discourses were uttered, and the scenes and incidents of its landscape inspired his parables When the destruction of Jerusalem left the Rabbinic Schools homeless they sought refuge in despised Galilee, and Safed and Tiberias (*q v*) became their chief centres It is in Galilee that the remains of ancient synagogues are found, and within its confines lie buried many Jewish doctors and philosophers whose tombs are still venerated

Archaeology.—In Galilee there are relics of the Stone Age in dolmens and menhirs Rock-cut tombs and wine presses, remains of Byzantine monasteries, the churches and fortresses of Crusading times bring archaeological interest down to a more recent time A discovery of particular interest, furnishing a link with Palaeolithic man, was that made in a Galilean cave in 1925 In a cave in the Wady el 'Amūd, a valley abutting on the plain of Gennesareth, were unearthed portions of a human skull of the Neanderthal species The fragments consist of nearly the whole of the frontal bone, the right zygomatic bone, and the right half of the sphenoid bone

In 1927 Professor Garstang announced the discovery in the Huleh basin of a large permanent camp, about 1,000 metres in length and 400 across, at a point about 3½ m west of the point where the Jordan leaves the lake Occupation throughout the three phases of the Bronze Age is indicated, and an identification with Hazor, Jabin's royal city, has been suggested

The great Galilean field of excavation, however, is the Plain of Esdraelon At Tell-Husn (Beisān, *q v*) extensive excavations are being carried out with important results At Ta'annak (the Taanach of Judges v. 19), the walls were laid bare, traces of child sacrifice discovered, and several cuneiform tablets of the Amarna period unearthed. Excavations are proceeding at Megiddo, on the western border of the plain, and the soundings made at Tell Harbaj in the plain of Acre, near to its junction with the plain of Esdraelon make it reasonably certain that it, rather than Hārithīyeh, is the site of Harosheth of the Gentiles Of great interest are the ancient synagogues, of which about a dozen have been discovered at ancient sites, such as Capernaum (*q v*), Kerāzeh, Kefr Bir'im, Irbid, Meirūn, and elsewhere. The architecture is generally held to be a peculiar and debased imitation of the classical style associated with the 2nd century A.D.

Crusading fortresses were spread over the land in the 12th century as outposts of the kingdom of Jerusalem Torou (Tibnīn), on the summit of the mountains of Upper Galilee, Bēauvoir (Kaukab el-Hawa), south-west of the Sea of Galilee, Chateau Neuf (Hunīn), above Huleh lake, Belfort (Esh-Shakif), on the north bank of the Litāni, Montfort (Kala'at el-Kurn), north-east of Acre, and the castle at Bāniās formed a strong chain of frontier fortresses

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GALILEE, an architectural term used of a certain kind of porch (*q v*) or chapel

GALILEE, SEA OF, a lake in Palestine through which flows the river Jordan It is 14 m long, 6 m broad, has a superficial area of 112 sq m and lies 680 ft below the level of the Mediterranean sea Its maximum depth is 150 ft The excessive depth which Lortet believed he had discovered at the northern end of the lake has been disproved The shape of the lake has been likened to a harp or a pear In the Old Testament it is known as the Sea of Chinnereth or Chinneroth In the books of the Maccabees and Josephus it is named Gennesar, in the Gospels it is usually the Sea of Galilee Once it is called the Lake of Gennesaret (Luke v 1), and twice the Sea of Tiberias (John vi 1, xxi 1), a name which has survived in the modern *Bahr Tabarīyeh*

The sea of Galilee lies in the great Jordan valley trough-fault During the Pluvial period almost the whole of this depression was occupied by a great inland sea extending from Huleh to a point 40 m beyond the present southern limit of the Dead sea Late in geological time the lava which flowed from the volcanoes amongst the southern Galilean hills into the depression combined with lava which flowed down the Yarmuk valley to the east, as well as with the silt washed down later to cause a blockage behind which the waters of the Jordan were pent to form a lake

The hills which close in upon the sea on the south-west side recede from the shore towards the north to form a great natural amphitheatre with the Plain of Gennesareth as arena On the east the plateau of Jaulan presents its steep and heavily-scored side towards the lake Yet, unlike the Dead sea, there is between the water's edge and the foot of the hills a clear passage all round the lake The Jordan enters it on the north, emerging from a narrow gorge and having on its left bank the marshy plain of El-Batihah. On the north-western shore is the plain of El-Ghuweir, generally supposed to be the plain of Gennesareth whose wonderful fertility is so glowingly described by Josephus It is a land which "supplies men with the principal fruits, with grapes and figs continually, during ten months of the year, and the rest of the fruits as they become ripe together through the whole year" (*Bell Jud* iii. 10 8) The plain, which is to-day covered with rank grass and bushes, has been purchased by the Jews and may be expected to recover some of its former glory. North of El-Ghuweir are several warm springs of moderate temperature At Hamath (Emmaus), a short distance south of Tiberias, are seven hot springs the largest of which has a temperature of 137° F. The lake is well stocked with fish of the genera *Chromis, Barbus, Capoeta, Discognathus, Nemachilus, Blennius* and *Clarias*. There is a close affinity between the fish of Galilee and those of the East African lakes and streams. The *Chromis Simonis,* according to popular belief, is the fish from

which Peter took the piece of money (Matt xviii. 27). Bird life is abundant. Grebes of all kinds, gulls and pelicans frequent the lake. On its shores are to be found tortoises and mud-turtles, crayfish and sandhoppers. Twenty-six boats and 115 men are engaged in fishing the lake.

The hills surrounding the sea are brown and bare in the summer-time but in the spring are clothed with vegetation. Oleander brakes flourish round the lake and the tall papyrus plant is found on the north shore Set deep amongst hills and consequently subject to sudden squalls and violent storms, which develop rapidly, sailing on the lake is not unattended with risk The best view of the lake is obtained from the top of the hills on its western shore The absence of boats from its waters and the lack of industry on its shores tinge the scene with melancholy. In the days of Josephus the lake was alive with craft; populous towns and villages throbbing with life were clustered on its coasts. On a day when nature is herself gloomy, the sense of desolation and dreariness pierces to the very soul of the onlooker; but to the view of the lake glistening and sparkling in the sun, the soul leaps joyous, and the vision of what was calls into being an attractive vision of what may yet be

Archaeology.—The principal sites of archaeological interest in the area of the lake are (1) *Kerāzeh* (Chorazin) 2 m from the north shore in a wady of the same name Its ruins include a notable synagogue built with black basalt (2) *Tell-Hūm* (Capernaum, *q v*) on the lake shore south of Kerāzeh with the remains of an early synagogue and possibly a church (3) *Khān Minyeh,* with extensive ruins at the north end of the plain of Gennesareth Its identification with Bethsaida is suggested (4) *Tell 'Ureimeh,* between Khān Minyeh and Tell-Hūm, the site of an Amorite city whose name has been forgotten (5) *Mejdel* (Magdala), south of the plain of Gennesareth with rock-cut tombs (6) *Tabariyeh* (Tiberias) with remains of the mediaeval period. (7) *Khirbet Kerak* at the south-west corner of the lake with a ruined citadel and traces of a large and important town It has been generally identified with Tarichеae but more recently an identification with the Beth-Yerah of the Talmud, called by the Greeks Philoteria, has been advocated (8) *Sinn en-Nabreh* (Sennabris), near to Kerak where Vespasian fixed his camp in his advance from the south on Tarichеae and Tiberias (9) *Khirbet Susieh,* on the eastern shore, identified with Hippos one of the cities of the Decapolis (10) *Kal 'at el-Husn,* opposite Tiberias, exhibiting ruins of a city that was walled, broken sarcophagi and rock-cut tombs, suggested identification with the Gamala of Josephus (11) *Fīk,* about 2 m E of Kal 'at el-Husn, a large village with ruins of ancient buildings, identified by Eusebius with Aphek. (12) *Khirbet Kersa,* opposite Mejdel, the Gerasa or Gergesa of the 4th century The *Wady el-'Amūd,* where the "Galilee skull" was found, opens on to the plain of Gennesareth (*See* GALILEE) Dolmans and other stone erections have been found at *'Ain Tābigha* and *Khān Jubb Yusif.*

See P. Karge, *Prahistorische Denkmäler am Westufer des Gennesaret Sees* (1914); L. Sukenik, *Journal Pal Orient Soc.* 2 (1922) 101 *seq.* (Kerak-Beth-Yerah). For other literature *see under* GALILEE

(E. Ro)

GALILEO GALILEI (1564–1642), Italian astronomer and experimental philosopher, was born at Pisa on Feb 15, 1564 He came of a noble but impoverished Florentine family; his father Vincenzio Galilei was a competent mathematician and an able musician. Galileo received his early education at the monastery of Vallombrosa, near Florence Here he studied Greek, Latin and logic but showed a distaste for the science he was taught He acquired a reputation for intellectual aptitude as well as for mechanical invention In 1581 his father sent him to the University of Pisa to study medicine

Galileo was endowed with many natural gifts; he was a skilful musician and showed a taste for painting and it seemed possible that he might develop in any direction determined by choice or by chance.

The Pendulum and Velocities.—In 1581, while watching a lamp set swinging in the cathedral of Pisa, he observed that, whatever the range of its oscillations, they were invariably executed in equal times. The experimental verification of this fact led him to the important discovery of the isochronism of the pendulum. He applied the new principle to the timing of the human pulse. Up to this time he was entirely ignorant of mathematics, his father having carefully held him aloof from a study which he rightly apprehended would lead to his total alienation from that of medicine Accident, however, frustrated this purpose. A lesson in geometry which he overheard by chance awakened his interest, and with his father's reluctant permission he began to study mathematics and science. In 1585 he was withdrawn from the university, through lack of means, before he had taken a degree, and returned to Florence. He lectured to the Florentine Academy and in 1586 he published an essay descriptive of his invention of the hydrostatic balance, which rapidly made his name known throughout Italy At the request of his first patron, the Marchese Guidubaldo del Monte of Pesaro, a man equally eminent in science and influential through family connections, he wrote, in 1588, a treatise on the centre of gravity in solids, which obtained for him the honourable though not lucrative post of mathematical lecturer at the Pisan university During the ensuing two years (1589–91) he carried on that remarkable series of experiments by which he established the first principles of dynamics From the Leaning Tower of Pisa he afforded to all the professors and students of the university ocular demonstration that bodies of different weights fall with the same velocities He also showed that the path of a projectile is a parabola His sarcasm roused the anger of men holding different views He became unpopular, resigned his professorship and withdrew to Florence in 1591

In the following year he was appointed to the chair of mathematics at Padua He remained here until 1610; his appointment was three times renewed and his salary continually increased

Researches with the Telescope.—Galileo seems, at an early period of his life, to have adopted the Copernican theory of the solar system, but was deterred from avowing his opinions—as is proved by his letter to Kepler of Aug 4, 1597—by the fear of ridicule rather than of persecution A rumour of the invention of the telescope (*q v*) which reached Venice in June 1609, sufficed to set Galileo on the track, and he succeeded in producing a telescope of threefold magnifying power. Upon this first attempt he rapidly improved, until he attained to a power of 32, and his instruments, of which he manufactured hundreds with his own hands, were soon in request in every part of Europe. This form of telescope, which is known by his name, is used for opera-glasses. Galileo began to make observations with his telescope and published the *Sidereus Nuncius* in 1610. He observed the mountainous configuration of the moon and he showed that the Milky Way was a collection of lesser stars An important discovery was that of Jupiter's satellites, first seen by Galileo on Jan 7, 1610, and by him named *Sidera Medicea,* in honour of the grand duke of Tuscany, Cosimo II , who had been his pupil and was about to become his employer This was a strong confirmation of the Corpernican theory which was triumphantly received by its advocates. Later he observed what appeared to him as the triple form of Saturn, the phases of Venus and sun spots

In Sept. 1610 Galileo finally abandoned Padua for Florence. His researches with the telescope had been rewarded by the Venetian senate with the appointment for life to his professorship, at a high salary He was also appointed as philosopher and mathematician extraordinary to the grand duke of Tuscany This sinecure presented him with an increased opportunity of continuing his scientific labours.

DISCOVERIES AND HERESIES

In 1611 Galileo visited Rome, and exhibited the telescopic wonders of the heavens to the most eminent personages at the pontifical court. Encouraged by the flattering reception accorded to him, he ventured, in his *Letters on the Solar Spots,* printed at Rome in 1613, to take up a more decided position with regard to the Copernican theory Galileo's brilliant researches, enhanced by his formidable dialectic and enthusiastic zeal, drew the attention of the authorities to the discrepancies between the new view of the solar system and certain passages in the Scriptures.

Although he had no desire to raise the theological issue, it must be admitted that, the discussion once set on foot, he threw himself into it with characteristic impetuosity, and thus helped to precipitate a decision which it was in his interest to avert. Not only did Galileo explain adverse texts but he tried to produce scriptural confirmation of the Copernican system. The agitation against him increased and in 1615 he received a semi-official warning to avoid theology and limit himself to physical reasoning In Feb. 1616 the consulting theologians of the Holy Office characterized the proposition that the sun is immovable in the centre of the world and that the earth has a diurnal motion of rotation as heretical Shortly afterwards Galileo was admonished by the pope, Paul V, not to "hold, teach or defend" the condemned doctrine. This injunction he promised to obey

Galileo returned to Florence three months later, not ill-pleased, as his letters testify, with the result of his visit to Rome. For seven years, during which he led a life of studious retirement at Bellosguardo, near Florence, he maintained an almost unbroken silence At the end of that time he appeared in public with his *Saggiatore,* in which he dealt with the nature of comets His views were erroneous, since he held comets to be mere atmospheric emanations reflecting sunlight after the fashion of a halo or a rainbow The *Saggiatore* was printed at Rome in Oct. 1623 by the Academy of the Lincei, of which Galileo was a member, with a dedication to the new pope, Urban VIII, and notwithstanding some passages containing a covert defence of Copernican opinions, was received with acclamation by ecclesiastical no less than by scientific authorities

Ecclesiastical Censure.—Everything seemed now to promise a close of unbroken prosperity to Galileo's career He tried, unsuccessfully, to obtain the revocation of the decree of 1616 Yet there seemed reason to expect that it would at least be interpreted in a liberal spirit, and Galileo's friends encouraged his imprudent confidence Thus, in the full anticipation of added renown, and without any misgiving as to ulterior consequences, Galileo set himself, on his return to Florence, to complete his famous but ill-starred work, the *Dialogo dei due massimi sistemi del mondo* Finished in 1630, it was not until Jan 1632 that it emerged from the presses of Landini at Florence A tumult of applause from every part of Europe followed its publication; and it would be difficult to find in any language a book in which animation and elegance of style are so happily combined with strength and clearness of scientific exposition

It was at once evident that the whole tenor of this remarkable work was in flagrant contradiction with the edict passed 16 years before its publication, as well as with the author's personal pledge of conformity to it The theological censures which the book did not fail to incur were not slow in making themselves felt Towards the end of August the sale was prohibited; on Oct 1 the author was cited to Rome by the Inquisition He pleaded his age and infirm health, but no excuse was admitted. At length, on Feb. 13, 1633, he arrived at Rome where he was detained but treated with indulgence He was finally examined by the Inquisition on June 21 under menace of torture which was not carried out and which it was never intended to execute. The following day Galileo recanted and was sentenced to incarceration at the pleasure of the tribunal, and by way of penance was enjoined to recite once a week for three years the seven penitential psalms This sentence was signed by seven cardinals, but did not receive the customary papal ratification. The legend according to which Galileo, rising from his knees after repeating the formula of abjuration, stamped on the ground, and exclaimed, *"Eppur si muove!"* is, as may readily be supposed, entirely apocryphal. Its earliest ascertained appearance is in the Abbé Irailli's *Querelles littéraires* (vol. iii, p 49, 1761).

Galileo remained in the custody of the Inquisition from the 21st to the 24th of June, on which day he was relegated to the Villa Medici on the Trinità de Monti. Thence, on July 6, he was permitted to depart for Siena, where he spent several months in the house of the archbishop, Ascanio Piccolomini, one of his numerous and trusty friends

It was not until December that his earnest desire of returning to Florence was realized, and the remaining eight years of his life were spent in his villa at Arcetri, in the strict seclusion which was the prescribed condition of his comparative freedom.

His prodigious mental activity continued undiminished to the last In 1636 he completed his *Dialoghi delle nuove scienze,* in which he recapitulated the results of his early experiments and mature meditations on the principles of mechanics. This in many respects his most valuable work was printed by the Elzevirs at Leyden in 1638, and excited admiration equally universal and more lasting than that accorded to his astronomical treatises. His last telescopic discovery—that of the moon's diurnal and monthly librations—was made in 1637, only a few months before he became blind But the fire of his genius was not even yet extinct He continued his scientific correspondence with unbroken interest and undiminished acumen; he thought out the application of the pendulum to the regulation of clockwork, which Huygens successfully realized 15 years later, and he was engaged in dictating to his disciples, Viviani and Torricelli, his latest ideas on the theory of impact when he was seized with the slow fever which resulted in his death on Jan 8, 1642.

VALUE OF HIS WORK

The direct services of permanent value which Galileo rendered to astronomy are virtually summed up in his telescopic discoveries To the theoretical perfection of the science he contributed little or nothing The circumstance, however, which most seriously detracts from his scientific reputation is his neglect of the discoveries made during his lifetime by Kepler, the greatest of his contemporaries His name is nevertheless justly associated with a vast extension of the bounds of the visible universe, and his telescopic observations are a standing monument to his ability Within two years of their first discovery, he had constructed approximately accurate tables of the revolutions of Jupiter's satellites, and he proposed their frequent eclipses as a means of determining longitudes, not only on land, but at sea The idea, though ingenious, has been found of little practical utility at sea His observations on sun spots are noteworthy for their accuracy and the deductions he drew from them with regard to the rotation of the sun and the revolution of the earth.

The idea of a universal force of gravitation seems to have hovered on the borders of this great man's mind, without ever fully entering it More valid instances of the anticipation of modern discoveries may be found in his prevision that a small annual parallax would eventually be found for some of the fixed stars, and that extra-Saturnian planets would at some future time be ascertained to exist, and in his conviction that light travels with a measurable although, in relation to terrestrial distances, infinite velocity Although Galileo discovered, in 1610, a means of adapting his telescope to the examination of minute objects, he did not become acquainted with the compound microscope until 1624 when he saw one of Drebbel's instruments in Rome, and, with characteristic ingenuity, immediately introduced some material improvements into its construction.

The most substantial part of his work consisted undoubtedly in his contributions towards the establishment of mechanics as a science Some valuable but isolated facts and theorems had been previously discovered and proved, but it was he who first clearly grasped the idea of force as a mechanical agent. The interdependence of motion and force was not indeed formulated into definite laws by Galileo, but his writings on dynamics are everywhere suggestive of those laws, and his solutions of dynamical problems involve their recognition. In this branch of science he paved the way for Newton The extraordinary advances made by him were owing to his happy method of applying mathematical analysis to physical problems

The method which was peculiarly his consisted in the combination of experiment with calculation—in the transformation of the concrete into the abstract, and the assiduous comparison of results This was applied to the investigation of the laws of falling bodies, of equilibrium and motion on an inclined plane and of the motion of a projectile. The latter, together with his definition of momentum and other parts of his work, implied a knowledge of the laws of motion as later stated by Newton,

but Galileo did not enunciate these laws in a definite form. In his *Discorso intorno alle cose che stanno su l'acqua*, published in 1612, he used the principle of virtual velocities to demonstrate the more elementary theorems of hydrostatics, deducing from it the equilibrium of fluid in a siphon, and worked out the conditions for the flotation of solid bodies in a liquid He also constructed an elementary form of thermometer.

The first complete edition of Galileo's writings was published at Florence (1842–56), in 16 vols., under the supervision of Eugenio Albèri. Besides the works already enumerated, it contained the *Sermones de motu gravium* composed at Pisa between 1589 and 1591, his letters to his friends, with many of their replies, as well as several of the essays of his scientific opponents, his laudatory comments on the *Orlando Furioso*, and depreciatory notes on the *Gerusalemme Liberata*, some stanzas and sonnets of no great merit, together with the sketch of a comedy; finally, a reprint of Viviani's *Life*, with valuable notes and corrections The original documents from the archives of the Inquisition, relating to the events of 1616 and 1633, recovered from Paris in 1846 by the efforts of Count Rossi, and now in the Vatican library, were to a limited extent made public by Monsignor Marino-Marini in 1850, and more unreservedly by M Henri de l'Épinois, in an essay entitled "Galilée, son procès, sa condemnation," published in 1867 in the *Revue des questions historiques*. He was followed by Karl von Gebler, who, in an able and exhaustive but somewhat prejudiced work, *Galileo Galilei und die römische Curie* (Stuttgart, 1876), sought to impeach the authenticity of a document of prime importance in the trial of 1633 He was victoriously answered by Domenico Berti, in *Il Processo originale di Galileo Galilei* (1876), and by M. de l'Épinois, with *Les pièces du procès de Galilée* (1877). The touching letters of Galileo's eldest daughter, Sister Maria Celeste, to her father were printed in 1864 by Carlo Arduini, in a publication entitled *La Primogenita di Galileo Galilei*

The issue of a "national edition" of the Works of Galileo, in 20 large volumes, was begun at Florence in 1890 It includes a mass of previously inedited correspondence and other documents, collected by the indefatigable director, Antonio Favaro, among whose numerous publications on Galilean subjects may be mentioned *Galileo e lo studio di Padova* (2 vols., 1883); *Scampoli Galileani* (12 series, 1886–97); *Nuovi Studi Galileani* (1891), *Galileo Galilei e Suor Maria Celeste* (1891) *See* also Th Henri Martin, *Galilée, les droits de la science et la méthode des sciences physiques* (1868), *Private Life of Galileo* (by Mrs Olney, 1870), J J Fahie, *Galileo, his Life and Work* (1903); J A C Oudemans and J Bosscha, *Galilée et Marius* (1903) The relations of Galileo to the church are temperately and ably discussed by F R Wegg-Prosser in *Galileo and his Judges* (1889), and in two articles published in the *American Catholic Quarterly* for April and July 1901. "La questione Copernicana dal primo al secondo processo di Galileo," *Civiltà cattolica*, anno 78 Vol 2, p 229–242, 331–345, 521–534, Vol 3, p 228–242 (Roma, 1927) (A M C; X)

GALION, a city of Crawford county, O., U.S.A., 75m S.W. of Cleveland, at an altitude of 1,165 feet It is on Federal highway 30 and is served by the Big Four and the Erie railways and by electric inter-urban lines The population was 7,374 in 1920 (94% native white) There are large railroad shops here and various manufacturing industries Galion was laid out in 1831, incorporated as a borough in 1840 and chartered as a city in 1878

GALIUM, a genus of plants of the madder family (Rubiaceae), comprising 250 species of world-wide distribution, mostly slender herbs Of these, 10 species are found in Great Britain and about 60 in North America Well-known examples are *G Aparine* (cleavers, goose-grass), *G boreale* (northern bedstraw), *G verum* (lady's bedstraw) and *G Mollugo* (hedge bedstraw, baby's-breath) *See* CLEAVERS; RUBIACEAE.

GALL, FRANZ JOSEPH (1758–1828), anatomist, physiologist and founder of phrenology (*q.v.*), was born at Tiefenbrunn near Pforzheim, Baden, on March 9, 1758 He studied at Baden, Strasbourg and Vienna, where in 1785 he began to practise as a physician Gall gradually reached the conviction that the talents and dispositions of men are dependent upon the functions of the brain, and that they may be inferred with precision from the external appearances of the skull In 1791 appeared his *Philosophisch-nedicinische Untersuchungen über Natur u. Kunst im kranken u. gesunden Zustande des Menschen*. His phrenological lectures in Vienna begun in 1796 met with increasing success until in 1802 they were interdicted by the Government as dangerous to religion. In 1823 Gall made an unsuccessful attempt to lecture in London. He died in Paris on Aug. 22, 1828. (*See* PHRENOLOGY)

See C. Blondel, *La Psycho-Physiologie de Gall* (1914).

GALL, the secretion of the liver known as "bile," the term being also used of the pear-shaped *diverticulum* of the bile-duct, which forms a reservoir for the bile, more generally known as the "gall-bladder" (*see* LIVER). From the extreme bitterness of the secretion, "gall," like the Lat *fel*, is used for anything extremely bitter, whether actually or metaphorically.

"Gall," meaning a sore or painful swelling, especially on a horse, may be derived from an early use of the word as meaning "poison." But in Romanic languages, the Fr. *galle*, Sp. *agalla*, a wind-gall or puffy distension of the synovial bursa on the fetlock joint of a horse, is derived from the Lat *galla*, oak-apple, from which comes the English "gall," meaning an excrescence on trees caused by certain insects. (*See* GALLS.)

GALLABAT or GALABAT, called by the Abyssinians Matemma, a town of the Anglo-Egyptian Sudan, in 13° N. 36° 12′ E It is built at the foot of a steep slope, on the left bank of a tributary of the Atbara. Gallabat lies 90 m. W. by N. of Gondar, the capital of Amhara, and being on the main route from Sennar to Abyssinia, is a trade centre of some importance. Pop. about 3,000

GALLAIT, LOUIS (1810–1887), Belgian painter, was born at Tournay, Hainaut, on May 9, 1810. He studied at Tournay under Hennequin, and at Antwerp under Van Brée He then settled in Paris, sending from there to the Belgian salons a series of important historical pictures. He was then urged to return to Brussels, where the latter half of his life was spent, and where he died on Nov 20, 1887. Among his most famous works are: "The Abdication of Charles V." (1841), in the Brussels gallery; "The Last Honours paid to Counts Egmont and Horn by the Corporations of the Town of Brussels," now at Tournay; "The Death of Egmont," in the Berlin gallery; and the "Coronation of Baudouin, Emperor of Constantinople," painted for Versailles. Other pictures are in the Brussels gallery

See Teichlin, *Louis Gallait und die Malerei in Deutschland* (1853); C Lemonnier, *Histoire des beaux-arts en Belgique* (1881); J. Dujardin, *L'Art flamand* (1899)

GALLAND, ANTOINE (1646–1715), French Orientalist and archaeologist and first European translator of the *Arabian Nights*, was born on April 4, 1646, at Rollot (Somme). After working on a catalogue of the Oriental manuscripts at the Sorbonne, he made between 1670 and 1680 several visits to the Levant, studying historical monuments and inscriptions, and was made "antiquary to the King" While living at Caen he began the publication (12 vols., 1704–1717) of *Les mille et une nuits*, which is still the standard French translation. In 1701 Galland had been admitted into the Academy of Inscriptions, and in 1709 was appointed to the chair of Arabic in the Collège de France.

BIBLIOGRAPHY.—Besides a number of archaeological works, especially in the department of numismatics, he published a compilation from the Arabic, Persian and Turkish, entitled *Paroles remarquables, bons mots et maximes des orientaux* (1694, Eng. trans 1795); and a translation from an Arabic manuscript, *De l'origine et du progrès du café* (1699) His *Contes et fables indiennes de Bidpai et de Lokman* was published (1724) after his death Among his numerous unpublished mss. are a translation of the Koran and a *Histoire générale des empereurs turcs*. See *Journal d'A. G. pendant son séjour à Constantinople, 1672–1673*, ed C Schefer (1881); and *Journal parisien d'A. Galland, 1708–1715*, with his *Autobiography, 1646–1715* (1919).

GALLARATE, a town of Lombardy, Italy, in the province of Varese, 25 m. N.W. of Milan by rail. Pop. (1921), 9,577 (town), 21,894 (commune) The town is of mediaeval origin. It is remarkable for its textile factories Nearly a tenth of all Italian looms are to be found in and around it, producing annually from 70,000 to 80,000 metres of cotton cloth It is also the centre of the machine embroidery trade

GALLAS, MATTHIAS, COUNT OF CAMPO, DUKE OF LUCERA (1584–1647), Austrian soldier, first saw service in Flanders, and in Savoy with the Spaniards, and subsequently joined the forces of the Catholic League as captain On the general outbreak of hostilities in Germany, he distinguished himself, at Stadtlohn (1623) and elsewhere. In 1630 he was serving as *General-Feldwachtmeister* under Collalto in Italy, and was mainly instrumental in the capture of Mantua. Made count of the Empire for this service, he returned to Germany for the campaign against Gustavus Adolphus, covered Bohemia against the Swedes in 1631–1632, and served at the Alte Veste and also at Lützen

against Bernhard of Saxe-Weimar, rising to be lieutenant-general in the Emperor's own army. He was one of the chief conspirators against Wallenstein, and after the tragedy of Eger was appointed to the command of the army which Wallenstein had formed and led. At Nordlingen (Aug 23, 1634) in which the army of Sweden was almost annihilated, Gallas commanded the victorious Imperialists In northern Germany, where he commanded against the Swedish general Banér in 1637 and 1638, and in later crises he was unsuccessful He resigned his command, and died in 1647 at Vienna His army had earned a reputation as the most cruel and rapacious force even in the Thirty Years' War, and his *Merode Bruder* have survived in the word *marauder*.



BY COURTESY OF MARTIN JOHNSON AFRICAN EXPEDITION CORPORATION

BORAN CHIEF OF THE GALLAS TRIBE

GALLAS, or more correctly GALLA, a powerful Hamitic people of eastern Africa, scattered over the central parts of Abyssinia to the neighbourhood of the river Sabaki in Kenya Colony. The name "Galla" or "Gala" appears to be an Abyssinian nickname, unknown to the people, who call themselves *Ilm' Orma*, "sons of men" or "sons of Orma," an eponymous hero. In Shoa (Abyssinia) the word is connected with the river Gála in Guragie, on the banks of which a great battle is said to have been fought between the Galla and the Abyssinians. Arnaud d'Abbadie says that the Abyssinian Muslims recount that, when summoned by the Prophet's messenger to adopt Islam, the chief of the Galla said "No,"—in Arabic *kāl* (or *gāl*) *la*,—and the Prophet on hearing this said, "Then let their very name imply their denial of the Faith."

They appear to have occupied the southern part of their present territory since the 16th century. The tribes near Mount Kenya are stated to go on periodical pilgrimages to the mountain, making offerings to it as if to their mother. As a geographical term Galla-land is now used mainly to denote the south-central regions of the Abyssinian empire, the country in which the Galla are numerically strongest There is no sharp dividing line between the territory occupied respectively by the Galla and by the Somali

The Galla are members of the eastern Hamitic family with their neighbours, the Somali, the Afars (Danakil) and the Abyssinians There is a strain of Negro blood in the Galla, who are "a wonderfully handsome race, with high foreheads, brown skins and soft wavy hair quite different from the wool of the Bantus" As a rule their features are quite European Their colour is dark brown, but many of the northern Galla are of a coffee and milk tint They are fine nosed with long heads

The Galla are for the most part nomadic pastoralists, though in Abyssinia they have some agricultural settlements Their dwellings, circles of rough stones, roofed with grasses, are generally built under trees Their wealth consists chiefly in cattle and horses The ordinary food consists of flesh, blood, milk, butter and honey A rude system of bee-keeping is in vogue, and the husband who fails to furnish his wife with a sufficient supply of honey may be excluded from all conjugal rights In the south monogamy is the rule, but in the north the number of a man's wives is limited only by his wealth Marriage forms are numerous. The dual organization into exogamous moieties is a special feature Each tribe has its chief, who is the only merchant for his people, but in all public concerns must take advice of the fathers of families in council. In general they worship a supreme god Waka, and the subordinate god and goddess Oglieh and Atetieh, whose favour is secured by sacrifices of oxen and sheep. They say that at a certain time of the year Waka leaves them and goes to attend to the wants of their enemies the Somali, whom also he has created Some have been converted to Mohammedanism and are very bigoted In the north, under Abyssinian rule, a kind of superficial Christianization has taken place, but to all practical intents paganism is still in force. The serpent is worshipped, the northern Galla believing that he is the author of the human race. There is a belief in were-wolves (*buda*), and the northern Galla have sorcerers who terrorize the people Though cruel in war, all Galla respect their pledged word. They are armed with a lance, a two-edged knife, and a shield of buffalo or rhinoceros hide.

Among the more important tribes in the south (the name in each instance being compounded with Galla) are the Ramatta, the Kukatta, the Baõle, the Aurova, the Wadjole, the Ilani, the Arrar and the Kanigo Galla, the Borani, a very powerful tribe, may be considered to mark the division between north and south, and in the north we find the Amoro, the Jarso, the Toolama, the Wollo, the Ambassil, the Aijjo, and the Azobo Galla

See C T Beke, "On the Origin of the Gallas," in *Trans. of Brit Assoc* (1847), J. Ludwig Krapf, *Travels in Eastern Africa* (1860), and *Vocabulary of the Galla Language* (London, 1842), Arnaud d'Abbadie, *Douze Ans dans la Haute-Éthiopie* (1868), Ph Paulitschke, *Ethnographie Nord-Ost-Afrikas; Die geistige Kultur der Dan'akil, Galla u Somâl* (Berlin, 1896), P M de Salviac, *Les Galla* (Paris, 1901), E C Foot, *A Galla-English Dictionary* (Cambridge, 1913), A. W Hodson and C H Walker, *An Elementary and Practical Grammar of the Galla Language* (1922).

GALLATIN, ALBERT (1761–1849), American statesman, was born in Geneva, Switzerland, on Jan. 29, 1761, of an old and noble family His father died in 1765, his mother five years later, and he was cared for by his grandparents and by a Mlle Pictet, an intimate friend of his mother In 1779 he graduated with honour from the college in Geneva, and, giving up fortune and social position, slipped away from home and embarked for America despite the wishes of his relatives In July 1780 Gallatin and his friend Henri Serre (d 1784) landed in Massachusetts and entered business; but, conditions in the country being unsettled, they failed For a time Gallatin taught French in Harvard college, then removed to the backwoods of Pennsylvania and Virginia, where he engaged in land speculation

Beginning his service in Congress in Dec 1795, Gallatin immediately made himself a conspicuous figure and before his first term was over became the Federalists' most dangerous opponent in Congress, and they attacked him not only politically but personally, for at this time they were opposed to the French Revolution and so resented Gallatin's ancestry Gallatin became the financier of his party and succeeded in inaugurating the committee on finance, which is now the ways and means committee, and fought for his cardinal doctrines of simplicity and economy in government In debate (1796) over the Jay Treaty he defended the constitutional right of the House to consider treaties, admitting that the President and Senate had the right to make treaties, but maintaining that the House could refuse to pass the finances to carry them out. When in May 1797 President Adams asked for appropriations for war because of France's refusal to receive American ambassadors, Gallatin struggled successfully to keep down appropriations and to prevent the three United States frigates from being equipped for sea. He continued his opposition to a strong navy, the mainspring of Washington's foreign policy, and in the following year helped to defeat a resolution for the preparation of 16 armed vessels and a declaration of war against France He also opposed (Jan 1798) commercial treaties and diplomatic intercourse, maintaining that all political intercourse should be gradually given up, and commercial intercourse protected by the consular system

The greatest period of Gallatin's career in Congress was in 1798, when, after the publication of the famous X Y.Z. despatches had inflamed the people against France and given the Federalists control of the Government, he was attacked as a French agent, and Jefferson believed that the Sedition bill was intended to drive him from office. However, the strong measures of the Federalists shocked the country, and the Republicans carried the elections of 1800. Gallatin led his party in the contest in the House of Representatives, which elected Jefferson over Burr.

When Jefferson became President (1801) he made James Madison secretary of State and Gallatin secretary of the Treasury. Gallatin made few changes in Hamilton's arrangements, but he did seek for simplicity of Government and the extinction of the

public debt. He preferred to bribe the Barbary pirates to spending the money to subdue them, wished to avoid commercial warfare at all costs, and thought that (1803) the Government should seize east Louisiana and west Florida Despite the fact that he could not reduce naval expenditures as he wished, he achieved his goal and, despite the Louisiana Purchase (1803), reduced the public debt by $14,260,000 within six years and acquired a surplus. However, relations with Europe became strained and in Dec. 1807 Jefferson put into execution the embargo, though Gallatin, recognizing the consequences, declared, "I prefer war to a permanent embargo," and reported that a continuous embargo would necessitate a loan while war would not The embargo proved futile and was repealed (1809) in favour of the non-intercourse act, after causing a deficiency in the Treasury, and Jefferson retired to be succeeded by Madison

Madison had regarded Gallatin as his successor as secretary of State, but a cabal in the Senate opposed him and Gallatin was left as secretary of the Treasury The cabal continued to attack him, and in addition he lost the support of Pennsylvania and of the House.

In June 1812 war was declared against England This shattered Gallatin's cherished schemes, for he believed war was fatal to prosperity and progress, like Jefferson, he had thought Government could be carried on upon *a priori* principles, resting on the assumed perfectness of human nature However, he put the finances in the best order he could, and set himself to attain an early peace With this end in view he grasped at the proffered mediation of Russia, and with Madison's permission sailed with James A Bayard for Europe in May 1813 without resigning as secretary of the Treasury Great Britain refused to negotiate through Russia, and in addition Gallatin heard that the Senate had refused to confirm his appointment because he was still secretary of the Treasury He sent in his resignation and worked unofficially until his second appointment was confirmed In the meantime Great Britain had expressed its willingness to proceed with direct negotiations The English and American commissioners finally met at Ghent, Gallatin, Bayard and John Quincy Adams, who was minister to Russia, being supplemented by Jonathan Russel and Henry Clay In the tedious discussions which followed, Gallatin played the leading part, preserving peace among his colleagues and establishing a reputation as a diplomatist He refused to push the American claim to Florida, but stood firmly on other points with his colleagues Peace rewarded them; the treaty was signed on Dec 24, 1814 After visiting Geneva for the first time since his boyhood, and assisting in negotiating a commercial convention (1815) with England by which discriminating duties were abolished, Gallatin returned to America in July 1815

While still in Europe he had been asked by Madison to become minister to France, this appointment he accepted in Jan, 1816, and adhered to his acceptance in spite of his being asked in April 1816 to serve once more as secretary of the Treasury He remained in France for the next seven years, and in 1818 assisted Richard Rush, then United States minister in London, in negotiating a commercial convention.

In June 1823 he returned to the United States, where he found himself in the bitter struggle then in progress for the Presidency. His favourite candidate was his personal friend, William H Crawford, with whom he consented in May 1824 to stand for the vice-presidency The contest was bitter and full of intrigue Martin Van Buren, then in the Crawford interest, came to the conclusion that Gallatin, by his foreign origin, weakened the ticket, and in October Gallatin retired from the contest The election was thrown into the House, and resulted in the choice of John Quincy Adams, who in 1826 drew Gallatin from his retirement and sent him as minister to England, where he avoided an open breach on the delicate question of the north-east boundary of the United States by referring it to the arbitration of the king of the Netherlands. In Nov. 1827 he once more returned to the United States and bade farewell to public life.

Taking up his residence in New York, he was in 1832–39 president of the National Bank (afterwards the Gallatin Bank) of New York. By writing his *Synopsis of the Indian Tribes within the United States East of the Rocky Mountains and in the British and Russian Possessions in North America* (1836), and by founding the American Ethnological Society of New York in 1842, he earned the title of "Father of American Ethnology" He died in Astoria, L I, on Aug 12, 1849

BIBLIOGRAPHY—*The Writings of Albert Gallatin*, edited by Henry Adams, as published at Philadelphia in 1879 With this was published an excellent biography, *The Life of Albert Gallatin*, also by Henry Adams, another good biography is John Austin Stevens' "Albert Gallatin" (Boston, 1884) in the *American Statesmen* series *See* also *The Diary of James Gallatin* (1915), vol iii of *The American Secretaries of State* (Bemis ed, 1927); L M. Sear's *Jefferson and the Embargo* (Durham, N.C, 1927), H W. Temperley's *The Foreign Policy of Canning* (1925), *The Cambridge History of British Foreign Policy* (vol iii), edited by A W Ward and G P Gooch.

GALLAUDET, THOMAS HOPKINS (1787–1851), American educator of the deaf and dumb, was born in Philadelphia, Pa, of French Huguenot ancestry, on Dec. 10, 1787. He graduated at Yale in 1805, was a tutor there, studied theology at Andover, but determined to devote his life to the education of deaf-mutes. He visited Europe and studied the methods of the abbé Sicard in Paris, and of Thomas Braidwood and his successor Joseph Watson in Great Britain Returning to the United States in 1816, he established at Hartford, Conn, a school for deaf-mutes, in support of which Congress, largely through the influence of Henry Clay, made a land grant Gallaudet presided over the school with great success until ill-health compelled him to retire in 1830 It was the first institution of the sort in the United States He died at Hartford on Sept 10, 1851

His son, THOMAS GALLAUDET (1822–1902), was born in Hartford, on June 3, 1822 After graduating at Trinity college in 1842, he entered the Protestant Episcopal ministry, settled in New York city, and there, in 1852, organized St Anne's Episcopal church, where he conducted services for deaf-mutes In 1872 he became general manager of the church mission to deaf-mutes, and in 1885 founded the Gallaudet home for deaf-mutes, near Poughkeepsie, New York He died on Aug 27, 1902

Another son, EDWARD MINER GALLAUDET (1837–1917), was born at Hartford, Conn, on Feb 5, 1837, and graduated at Trinity college in 1856 After teaching for a year in the institution founded by his father at Hartford, he organized and took charge of the Columbia Institution for the deaf and dumb in Washington, District of Columbia This institution was the first to furnish actual collegiate education for deaf-mutes After 1911 Gallaudet was president emeritus of the college He died on Sept 26, 1917.

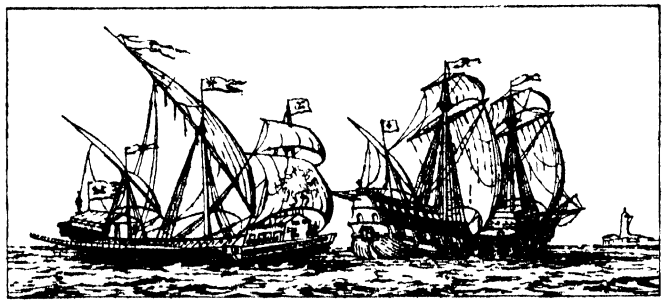
BIBLIOGRAPHY—Henry Barnard (1852), Heman Humphrey (1857) and E M Gallaudet (1888) have all written biographies of Thomas Hopkins Gallaudet, the last being the best For his son Thomas *see A Memorial Tribute* (1902)

GALLE or POINT DE GALLE, a town and port of Ceylon on the south-west coast Galle is hardly noticed in the native chronicles before 1267, and Ibn Batuta, in the middle of the 14th century, distinctly states that Kali—that is, Galle—was a *small* town It was not till the period of Portuguese occupation that it rose to importance The opening of the Suez canal in 1869, and the construction of a breakwater at Colombo, leading to the transfer of the mail and most of the commercial steamers to the capital of the island, seriously diminished the prosperity of Galle The export trade is chiefly represented by coco-nut oil, rubber, coir yarn, fibre, rope and tea. Both the export and import trade for the district, however, now chiefly passes through Colombo. Pop. (1921) 39,073.

GALLEN-KALLELA, AKSELI VALDEMAR (1865–), Finnish painter, was born on April 26, 1865, at Pori. He established himself in 1884 in Paris He is best known for his symbolic scenes from the Kalevala, for his landscapes, especially snow scenes, and for some admirable portraits, notably one of Gorki. He also executed work in black and white His illustrations to *Seitsemän Veljestä*, by Aleksis Kivi (1906–07), are well composed and imaginative.

GALLEON, the name formerly given to large ships of war used by the Spaniards, having three or four decks armed with batteries The name was in later times applied to Spanish merchant vessels.

GALLEY, a long single or half-decked vessel of war, with low free-board, propelled primarily by oars or sweeps, but also having masts for sails The word is used generally to refer to the ancient war vessels of Greece and Rome of various types, whose chief propelling power was the oar or sweep, but its more specific application is to the mediaeval war vessel which survived in the navies of the Mediterranean sea-powers after the general



FROM "DON JUAN DE AUSTRIA ALS ADMIRAL DER HEILIGEN LIGA UND DIE SCHLACHT BEI LEPANTO"

GALLEASS AND GALLEON, ILLUSTRATING THEIR DIFFERENCES

A galleass was first a large galley and then became a sailing ship, while a galleon, standing high out of the water and having several decks, was used by the Spaniards to transport treasure from their colonies

adoption of the larger many-decked ship of war, propelled solely by sail-power. Lepanto (1571) was the last great naval battle in which the galley played the principal part It became the custom among the Mediterranean powers to sentence condemned criminals to row in the war galleys of the state Traces of this in France can be found as early as 1532, but the first legislative enactment is in the *Ordonnance d'Orléans* of 1561 In 1564 Charles IX forbade the sentencing of prisoners to the galleys for less than ten years. The galley-slaves were branded with the letters GAL At the end of the reign of Louis XIV. the use of the galley for war purposes had practically ceased, but the corps of the galleys was not incorporated with the navy till 1748. The headquarters of the galleys and of the convict rowers (*galériens*) was at Marseilles. The majority of these latter were brought to Toulon, the others were sent to Rochefort and Brest, where they were used for work in the arsenal. At Toulon the convicts remained in chains on the galleys, which were moored as hulks in the harbour Shore prisons were, however, provided for them, known as *bagnes,* baths, a name given to such penal establishments first by the Italians (*bagno*), and said to have been derived from the prison at Constantinople situated close by or attached to the great baths there The name *galérien* was still given to all convicts, though the galleys had been abandoned, and it was not till the French Revolution that the hated name with all it signified was changed to *forçat.* In Spain *galera* is still used for a criminal condemned to penal servitude (*See* also SHIP)

The word "galley" is also applied to an oblong receptacle or tray, usually of brass, but sometimes of wood or zinc, having upright sides and used to hold type which has been set. Galleys vary in width and length depending upon the use to which they are put. One form, known as a slice galley, has a sliding bottom. The word is also used elliptically for a proof from type on a galley (in full a galley proof)

A vivid account of the life of galley-slaves in France is given in Jean Marteilhes's *Memoirs of a Protestant,* translated by Oliver Goldsmith (new edition, 1895), which describes the experiences of one of the Huguenots who suffered after the revocation of the edict of Nantes.

GALLIA CISALPINA, that portion of northern Italy north of Liguria and Umbria and south of the Alps which was inhabited by various Celtic and other peoples, of whom the Celts were in continual hostility to Rome and rendered assistance to Hannibal In early times it was bounded on the south by Liguria and the Aesis; Sulla readjusted the boundaries and in Caesar's time the south-east boundary was the Rubicon (*See* Mommsen, *Hist. of Rome,* Eng. trans., bk. iv. c. 10) For the early Celtic and other peoples and the later history of the district *see* ITALY: *Ancient,* and ROME: *History, Ancient*

GALLIARD. An old dance tune of lively character, characteristic of 16th and 17th century music, forming a contrast to the stately pavan which generally preceded it.

GALLIC ACID, the *acidum gallicum* of pharmacy, was discovered by K W. Scheele. It occurs in sumach, dividivi, Chinese tea, pomegranate, root-bark and gall-nuts, being present in the last of these to the extent of 3%. A paste of powdered gall-nuts and water is allowed to remain exposed to air for several weeks at 20–25° C, the mould on the surface of the material being removed from time to time. The tannins present are slowly decomposed by the moulds (*Penicillium glaucum* and *Aspergillus niger*), and a more rapid and quantitative hydrolysis is effected by the use of a pure culture of *Aspergillus gallomyces* Finally the paste is boiled with water, and the hot, filtered solution, on cooling, yields crude gallic acid, which is purified by recrystallization from boiling water The acid is soluble in 100 parts of cold and three parts of boiling water from which it crystallizes in silky needles or prisms containing water (1 mol. H_2O) of crystallization, it loses this water at 120° C and melts at 222–224° C. When heated to higher temperatures it loses carbon dioxide and yields pyrogallol or pyrogallic acid, the well known photographic developer It is inodorous but has an astringent and acidic taste With ferric salts it gives a deep blue colour, and with ferrous salts, on exposure to air it furnishes blue-black ferrosoferric gallate. (*See* INK)

Gallic acid has the formula $(HO)_3C_6H_2{\cdot}CO_2H$, and is 3·4 5 trihydroxybenzoic acid It is used in the manufacture of several colouring matters, anthragallol, anthracene brown, gallocyanine, galloflavin, gallamin blue. Methyl gallate (m p 202° C) is employed in the production of prune (*See* DYES, SYNTHETIC) Basic bismuth gallate, $C_7H_3O_5Bi,H_2O$, obtained from gallic acid and bismuth nitrate in presence of potassium nitrate and acetic acid, is a crystalline yellow powder, used as an inodorous antiseptic under the name *dermatol* in substitution for iodoform

(G T. M)

GALLICANISM, a name for various theories maintaining that both the church and the state in France had ecclesiastical rights of their own, independent and exclusive of the jurisdiction of the pope These theories were developed in opposition to ultramontanism (*q v*). As regards the church, it was held that infallible authority was committed to pope and bishops jointly; the pope decided in the first instance, but his judgments must be tacitly or expressly confirmed by the bishops before they had the force of law And as regards the state, Gallicanism goes back to the protests raised against the theocratic pretensions of the mediaeval popes They claimed that they, as vicars of Christ, had the right to interfere in the temporal concerns of princes, and even to depose sovereigns of whom they disapproved. Gallicanism answered that kings held their power directly of God; hence their temporal concerns lay altogether outside the jurisdiction of the pope. During the troubles of the Reformation era, when the papal deposing power threatened to become a reality, the Gallican theory became of great importance It was incorporated by Bossuet in a solemn Declaration of the French Clergy, made in 1682. This document lays down (1) that the temporal sovereignty of kings is independent of the pope; (2) that a general council is above the pope; (3) that the ancient liberties of the Gallican Church are sacred; (4) that the infallible teaching authority of the church belongs to pope and bishops jointly This declaration led to a violent quarrel with Rome, and was officially withdrawn in 1693, though its doctrines continued to be largely held In 1802 Napoleon contented himself by embodying Bossuet's declaration textually in a statute. Long before his time, however, the issue had been narrowed down to determining exactly how far the pope should be allowed to interfere in French ecclesiastical affairs Down to the repeal of the Concordat in 1905 all French governments continued to uphold two of the ancient "Gallican Liberties" The secular courts took cognizance of ecclesiastical affairs whenever the law of the land was alleged to have been broken; and papal bulls were not allowed to be published without the leave of the state. *See* FEBRONIANISM; ULTRAMONTANISM.

GALLI-CURCI, AMELITA (1889–), Italian-American coloratura soprano, was born at Milan, Italy, on Nov. 18,

1889, of Italian and Spanish parentage After a general education in the schools of Milan she entered the Royal Conservatory in the same city and studied piano and harmony As a vocalist, however, she was self-taught Her operatic début was at Rome in 1909 as Gilda in Verdi's *Rigoletto* She later toured the smaller cities in Italy, appeared at Barcelona and Madrid in Spain, and had several successful seasons in South America, Cuba and Mexico Her fame in these countries was immediate, but she was almost unknown in the United States when in 1916 she was engaged by the Chicago Opera Association. Her Chicago début on Nov. 18, 1916, was again as Gilda in *Rigoletto*. She was re-engaged for four seasons. On Jan. 27, 1918, she appeared for the first time in New York city in the title rôle of Meyerbeer's *Dinorah* at the Lexington opera house She joined the Metropolitan Opera Company in 1921, opening the season that year as Violetta in *La Traviata* Besides the rôles mentioned her favourite repertoire includes the rôles of Juliette in *Romeo et Juliette*, Lucia in *Lucia de Lammermoor*, Mimi in *La Bohème* and Leila in Bizet's *Pearl Fishers* Her voice reaches astonishing heights with tone smooth, warm and well rounded. It is also a voice of great fluency, enabling its owner to sing many intricate rôles with simplicity and naturalness

See autobiographical articles in *The Ladies Home Journal* (Feb, Mar. and May, 1924).

GALLIENI, JOSEPH SIMON (1849–1916), French general and statesman, is immortalized by his vital share in the strategically decisive victory of the Marne (*q v*) He was born at Saint-Béat, Haute-Garonne, on April 24, 1849 He left the military academy of Saint-Cyr in July 1870 as second lieutenant in the marines, becoming lieutenant in 1873 and captain in 1878 He saw service in the Franco-German War, and from 1877 to 1881 took an important part in the explorations and military expeditions by which the French dominion was extended in the basin of the upper Niger In March 1881 he obtained a treaty from Ahmadu, almany of Segu, giving the French exclusive rights of commerce on the upper Niger, for which he received the gold medal of the Société de Geographie From 1883 to 1886 Gallieni was stationed at Martinique. On June 24, 1886 he became lieutenant colonel, and on Dec 20, governor of Upper Senegal He obtained several successes against Ahmadu in 1887, and compelled Samory to agree to a treaty abandoning the left bank of the Niger (*See* SENEGAL *History*). In 1888 he was made an officer of the Legion of Honour In 1891 he was promoted colonel, and from 1893 to 1895 he commanded the second military division of Tongking

In 1896 Madagascar was made a French colony, and Gallieni was appointed resident-general (afterwards governor-general) and commander-in-chief He completed the subjugation of the island, which was in revolt against the French He also destroyed the political supremacy of the Hovas and restored the autonomy of the other tribes The application of the French customs, and other similar measures disastrous to British and American trade, were matters for which Gallieni was not wholly responsible His policy was directed to the development of the economic resources of the island and was conciliatory towards the non-French European population. He also secured for the Protestants religious liberty. In 1905, when he resigned the governorship, Madagascar enjoyed peace and considerable prosperity In 1906 General Gallieni was appointed to command the XIV Army Corps and the military government of Lyons.

Gallieni had reached the age limit for retirement in April 1914, but was retained on the active list without duty, and on mobilization in 1914 he was notified that in case of need he would be the successor of the commander-in-chief Joffre—who had been appointed on his recommendation. On Aug 26, in face of the imminent approach of the invading German armies, he was appointed military governor of Paris He took energetic steps for the defence of the capital, abandoned by the government, and in addition to the garrison Maunoury's VI. Army was placed under his control. Visualizing his rôle as one not merely of passive defence, his close watch on the German armies, and his military intuition, led him to see and seize the opportunity for a counterstroke. From air information received during Sept 3, Gallieni concluded that the German forces marching on Paris had inclined to the south-east, thus offering him an exposed flank. He convinced Joffre first of the opportunity, and ultimately that the attack ought to be made on the line of the Ourcq north of the Marne On the night of Sept 4 Joffre issued orders for a general counter-offensive on Sept 6 The outcome was the retreat of the right wing and with it the turning of the tide of the war These events are described under *Marne, First Battle of*, and *World War* Controversy has raged over the distribution of credit for this achievement, but it is at least indisputable that the first perception of the opportunity and the initiative to seize it were Gallieni's. With the German retreat the operations passed out of the zone over which Gallieni held command.

Joffre showed no haste to offer Gallieni a more active command, but on Oct 29, 1915 he became minister of war in Briand's cabinet. In this office he sought to bring about reforms in the administration and higher command, while defending Joffre against the growing storm of criticism The German attack on Verdun (*q v*), however, revealed a serious failure of foresight on the part of the higher command Gallieni then proposed an extensive scheme of reorganization for the better co-ordination of the whole war-effort of France In the military sphere this involved a clearer separation between the strategical direction and the administration of resources, and to implement it Joffre was to be brought back to Paris as commander-in-chief of all the French armies while de Castelnau (*q v.*) was placed in executive command of the field armies on the western front. Finding that his colleagues in the Cabinet shrank from the risk of causing a political crisis, Gallieni resigned, ostensibly for reasons of ill-health, on March 16, 1916 The pretext was, in part, justified, for in order to fit himself for active service he underwent an operation—without taking the preliminary rest that had been prescribed The first operation was not successful and after a second he died at Versailles on May 27, 1916 His body was given a state funeral, and lay for a time under the dome of the Invalides He was buried at St Raphael. On April 21, 1921 the dignity of marshal of France was conferred on him posthumously

He published *Mission d'exploration du Haut-Niger, 1879–1881* (1885), *Deux Campagnes au Sudan français* (1891); *Trois Colonnes au Tonkin* (1899), *Rapport d'ensemble sur la situation générale de Madagascar* (1899), and *Neuf ans à Madagascar* (1908).

GALLIENUS, PUBLIUS LICINIUS EGNATIUS, Roman emperor from A.D. 260 to 268, son of the emperor Valerian, was born about 218. From 253 to 260 he reigned conjointly with his father, during which time he gave proof of military ability. But when his father was taken prisoner by Shapur I. of Persia, in 260, Gallienus made no effort to obtain his release, or to withstand the incursions of the invaders who threatened the empire from all sides. He deprived the senators of their military and provincial commands, which were transferred to equites. During his reign the empire was ravaged by a pestilence, and the chief cities of Greece were sacked by the Goths His generals rebelled against him in almost every province of the empire, and this period of Roman history came to be called the reign of the Thirty Tyrants. Gallienus was killed at Mediolanum by his own soldiers while besieging Aureolus, who was proclaimed emperor by the Illyrian legions His sons Valerianus and Saloninus predeceased him.

Life by Trebellius Pollio in *Script. Hist. Aug.*; on coins *see* articles in *Numism. Zeit.* (1908) and *Riv. ital. d. num.* (1908).

GALLIERA, MARIE, DUCHESS OF (1812–1888), daughter of the Marquis di Brignola, a Sardinian, was born in Ghent and died in Paris on Dec 9, 1888. She married the railway contractor, Rafael Ferrari (d. 1876) upon whom the pope conferred the title of duke of Galliera. The duchess acquired notoriety by her colossal gifts of money to Paris and to Genoa. She bequeathed her palatial residence in Paris to the Austrian-Hungarian embassy.

GALLIFFET, GASTON ALEXANDRE AUGUSTE, MARQUIS DE, Prince de Martignes (1830–1909), French general, was born in Paris on Jan 23, 1830. He entered the army in 1848; served with distinction at the siege of Sevastopol in 1855, in the Italian campaign of 1859, and in Algeria in 1860, after which for

a time he served on the personal staff of the emperor Napoleon III He displayed great gallantry as a captain at the siege and storm of Puebla, in Mexico, in 1863, when he was severely wounded He went again to Algeria in 1864, took part in expeditions against the Arabs, returned to Mexico as lieutenant-colonel, and, after winning further distinction, became, in 1867, colonel of the 3rd Chasseurs d'Afrique. In the Franco-German War of 1870–71 he commanded this regiment in the Army of the Rhine, until promoted to be general of brigade on Aug 30 At the battle of Sedan he led the brigade of Chasseurs d'Afrique in the heroic charge of Gen Marguerittе's cavalry division, which extorted the admiration of the old king of Prussia Made prisoner of war at the capitulation, he returned to France during the siege of Paris by the French army of Versailles, and commanded a brigade against the Communists In the suppression of the Commune he earned a reputation for severity, which, throughout his later career, and in all his efforts to improve the French army, made him the object of unceasing attacks in the press and the Chamber of Deputies In 1872 he took command of the Batna subdivision of Algeria, and commanded an expedition against El Golea, surmounting great difficulties in a rapid march across the desert, and inflicting severe chastisement on the revolted tribes Promoted general of division in 1875, he successively commanded the 15th Infantry Division at Dijon, the IX Army Corps at Tours, and in 1882 the XII. Army Corps at Limoges In 1885 he became a member of the Conseil Supérieur de la Guerre He retired from the active list in 1894. Galliffet was war minister (June 22, 1899–May 29, 1900) in M Waldeck-Rousseau's cabinet. He died on July 8, 1909

See L. Thomas, *Le général Galliffet* (1910).

GALLIFORMES, an order of birds, comprising the game-birds (*see* ORNITHOLOGY, PHEASANT, PARTRIDGE, GROUSE, FOWL, PEACOCK, etc).

GALLINULE, the name applied to several aquatic birds of the family *Rallidae,* especially to two North American species, the purple gallinule (*Ionornis martinicus*), which ranges over tropical and sub-tropical America north to Illinois and South Carolina, and the Florida gallinule (*Gallinula galeata*), which breeds north to Maine, Quebec and central California, wintering from southern California and the Gulf States southwards Both species are about 13in. long and resemble the moorhen (*q.v*) in appearance and habits

GALLIO, IUNIUS ANNAEUS (originally LUCIUS ANNAEUS NOVATUS), son of the rhetorician L Annaeus Seneca and the elder brother of L Annaeus Seneca the philosopher, was born at Corduba (Cordova) about the beginning of the Christian era. At Rome he was adopted by L Iunius Gallio, a rhetorician Both Seneca and Statius speak of his charm of disposition It is probable that he was banished to Corsica with his brother, and that both returned to Rome when Agrippina selected Seneca to be tutor to Nero For a few years Gallio was proconsul of the newly constituted senatorial province of Achaea During his tenure of office (in A D 53) he dismissed the charge brought by the Jews against the apostle Paul (Acts xviii) His behaviour on this occasion ("But Gallio cared for none of these things") shows the impartial attitude of the Roman officials towards Christianity in its early days He survived his brother Seneca, but was subsequently put to death by order of Nero (in 65) or committed suicide.

Tacitus, *Annals,* xv. 73, Dio Cassius lx. 35, lxii. 25; Sir W M. Ramsay, *St Paul the Traveller,* pp. 257–261; art. in Hastings' *Dict. of the Bible* (H. Cowan).

GALLIPOLI (anc *Callipolis*), seaport town and episcopal see of Apulia, Italy, province of Lecce, 31 m S by W of Lecce by rail, 46 ft. above sea-level. Pop town, 8,019; commune, 12,715. It is situated on a rocky island in the Gulf of Taranto but is united to the mainland by a bridge, protected by a castle constructed by Charles I. of Anjou. The handsome cathedral dates from 1629

See G. Gigli, *Gallipoli, Otranto e dintorni* (Bergamo, Arti Grafiche, 1912), well illustrated.

GALLIPOLI (Turk. *Gelibolu,* anc. Καλλίπολις), a seaport and city of European Turkey, in the vilayet of Adrianople; at the north-western extremity of the Dardanelles, on a narrow peninsula 132 m. W.S.W. of Constantinople, and 90 m. S of Adrianople, in 40° 24′ N. and 26° 40′ 30″ E Pop (1905) about 25,000 Nearly opposite is Lapsaki on the Asiatic side of the channel, which is here about 2 m wide Gallipoli is still largely in ruins as a result of bombardment during the war of 1914–1918. There are several mosques, none of them remarkable, and many interesting Roman and Byzantine remains, especially a magazine of the emperor Justinian (483–565), a square castle and tower attributed to Bayezid I (1389–1403), and some tumuli on the south, popularly called the tombs of the Thracian kings It has two good harbours From its position as the key of the Dardanelles, it was occupied by the allied French and British armies in 1854 Then the isthmus a few miles north of the town, between it and Bulair, was fortified with strong earthworks by English and French engineers, mainly on the lines of the old works constructed in 1357 These fortifications were renewed and enlarged in January 1878, on the Russians threatening to take possession of Constantinople The peninsula thus isolated by the fortified positions has the Gulf of Saros on the N W , and extends some 50 m S.W The guns of Gallipoli commanded the Dardanelles just before the strait joins the Sea of Marmora

The district (*sanjak*) of Gallipoli is exceedingly fertile and well adapted for agriculture It has about 100,000 inhabitants, and comprises four *kazas* (cantons), namely (1) Maidos, (2) Keshan, lying inland north of Gallipoli, near which are lignite mines, (3) Myriofyto; and (4) Sharkeui (Peristeri) on the coast of the Sea of Marmora Copper ore and petroleum are worked at Sharkeui, and the neighbourhood formerly produced wine that was highly esteemed and largely exported to France for blending The line of railway between Adrianople and the Aegean Sea has been prejudicial to the transit trade of Gallipoli Steamers to and from Constantinople call regularly In 1904 the total value of the exports was £80,000 Live stock, principally sheep, pass through Gallipoli in transit to Constantinople and Smyrna

For an account of the Gallipoli campaign in the World War, *see* DARDANELLES CAMPAIGN

GALLIPOLIS, a city of southern Ohio, U S A , on the Ohio river, 100m. S E of Columbus, the county seat of Gallia county. It is served by the Hocking Valley, the New York Central, and (at Gallipolis, West Virginia) the Baltimore and Ohio railways and by river steamers The population was 6,070 in 1920 (90% native white) The city is a shipping and trading centre for a rich agricultural and coal-mining region, and it has sundry manufacturing industries A U.S Marine hospital and a State hospital for epileptics are situated there Gallipolis was settled in 1790 by colonists from France, who had received worthless deeds to lands in Ohio from the Scioto Land company. This company arranged in 1787 with the Ohio company for the use of 4,000,000ac , on which the Ohio company merely had an option Its unbusiness-like methods and the dishonesty of its agents in France caused its collapse in 1790 Meanwhile 150,000ac had been sold in France to prospective colonists, who in Oct 1790, after a detention of two months at Alexandria, Va , arrived on the site of Gallipolis In 1794 the attorney-general of the United States decided that all rights in the 4,000,000ac were legally vested in the Ohio company, and in 1795 the Ohio company sold to the French settlers at $1 25 an acre the land they occupied and adjacent improved lots, and the United States granted to them 24,000ac in the southern part of what is now Scioto county. Gallipolis was incorporated as a village in 1842, as a city in 1865.

GALLITZIN, DEMETRIUS AUGUSTINE (1770–1840), American Roman Catholic priest, called "The Apostle of the Alleghanies," was born at The Hague on Dec. 22, 1770 His father, Dimitri Alexeievich Gallitzin, Russian ambassador to Holland, was an intimate friend of Voltaire and a follower of Diderot; so, too, for many years was his mother, until a severe illness in 1786 led her back to the Roman Catholic church, in which she had been reared. At the age of 17 he, too, became a member of that church Dismissed from the Austrian service after the assassination of the king of Sweden, he gave up the military or diplomatic career planned by his father and set out to complete

his education by travel. In 1792 he arrived in Baltimore (Md), where he decided to enter the priesthood. After engaging in mission work in Maryland and Pennsylvania, in 1799 he planned a settlement in what is now Cambria county (Pa), and bought up much land, which he gave or sold at low prices to Catholic immigrants, spending $150,000 or more in the purchase of about 20,000 ac in a spot singularly ill suited for such an enterprise. His disinheritance by the emperor of Russia because of his religion caused him to lose his half of the estate, save for some money sent by his sister, and he was soon deeply in debt Consequently when Gallitzin was suggested for the see of Philadelphia in 1814, Bishop Carroll gave as an objection Gallitzin's "great load of debt rashly, though for excellent and charitable purposes, contracted" Gallitzin died at Loretto, a settlement he had founded, on May 6, 1840. Among his parishioners he was a great power for good. It is said that at his death there were 10,000 members of his church in the district, where 40 years before he had found a scant dozen One of the villages he founded bears his name Among his controversial pamphlets are. *A Defence of Catholic Principles* (1816); *Letter to a Protestant Friend on the Holy Scriptures* (1820); *Appeal to the Protestant Public* (1834); and *Six Letters of Advice* (1834), in reply to attacks on the Catholic Church by a Presbyterian synod

Bibliography —Sarah M Brownson, *Life of D A Gallitzin, Prince and Priest* (1873), a brief summary of his life by A A Lambing in *American Catholic Records* (Pittsburgh, Oct , 1886, pp 58–68), and a good bibliography by Thomas C Middleton in *The Gallitzin Memorandum Book*, in *American Catholic Historical Society in Philadelphia, Records*, vol iv p 32 *seq* For further bibliography see *Catholic Encyclopaedia.*

GALLIUM, a metallic element of steel-grey colour melting at 30 15° C and boiling at about 1700° C Owing to these properties it has been recommended as a thermometer liquid for high temperatures (S Boyer, 1926). Gallium (symbol Ga, atomic number 31, atomic weight 69 9), contracts on melting—the specific gravity in the solid state is 5 885 and in the liquid 6 081. It was discovered in 1875 through its spectrum (violet lines λ 4172 and 4033) in a specimen of zinc blende of Pieerefitte (Haute Pyrenees) by Lecoq de Boisbaudran Its chief physical and chemical properties had been predicted six years previously by D I Mendeléeff, who attributed certain qualities to an undiscovered element, eka-aluminium, which coincided with those actually possessed by gallium. It is one of the scarcest of elements although widely distributed through nature in minute quantities, occurring especially in many zinc blendes and bauxites, the black blende of Bensberg containing 0 0016% gallium

Gallium accumulates in the final residues of the distillation of zinc spelters from Bartlesville, Oklahoma The alloy containing gallium, indium and zinc is converted into anhydrous chlorides, and gallium trichloride, being by far the most volatile chloride present, is purified from the others by distillation (L M Dennis and J A Bridgman, 1918) From its ores gallium is extracted by dissolving in aqua regia, and after removal of acid other metals are precipitated by metallic zinc, whereas only after prolonged boiling with this metal is a basic gallium salt deposited. This process is repeated, and finally metallic gallium is isolated by electroylsis of an alkaline solution of its salts (de Boisbaudran, 1877)

Metallic gallium dissolves only slowly in nitric acid but more readily in hydrochloric acid, aqua regia or aqueous caustic potash. In these respects it shows its relationship to aluminium. It forms a well-defined oxide, Ga_2O_3, infusible at a red heat; the corresponding hydroxide, $Ga(OH)_3$ is amphoteric, like aluminium hydroxide, dissolving either in acids or in aqueous alkalis De-Boisbaudran recorded two chlorides, $GaCl_2$ and $GaCl_3$; the latter is a crystalline, hygroscopic solid melting at 75·5° C and boiling at 210–215° C.

Gallium sulphate, $Ga_2(SO_4)_3$, forms well-defined alums with the sulphates of ammonium, potassium, rubidium and caesium having the general formula $R^1Ga(SO_4)_2,12H_2O$ where $R^1=NH_4$ or an alkali metal. (*See* Alum)

Gallium acetylacetone, $Ga(C_5H_7O_2)_2$, prepared by the interaction of acetylacetone and freshly precipitated gallium hydroxide, separates from chloroform or acetone in acicular or tabular crystals and melts at 194°–195° C. It sublimes under reduced pressure with partial decomposition and exhibits isomorphous relationships with the acetylacetones of indium, aluminium and iron (G. T. Morgan, H D K Drew and T V Barker, 1921).

Gallium aluminium alloys are suggested for optical mirrors and as cathodes in metal vapour lamps. In a monochromatic lamp a gallium-cadmium alloy produces a pure red light

Bibliography —J. W Mellor, *A Comprehensive Treatise on Inorganic Chemistry*, vol v (1924), B. S. Hopkins, *Chemistry of the Rarer Elements* (1923) (G T. M)

GALLON, an English measure of capacity, usually of liquids, but also used as a dry measure for corn. A gallon contains four quarts The word was adapted from an O.Nor.Fr *galon,* Central Fr. *jalon* and was Latinized as *galo* and *galona.* It appears to be connected with the modern French *jale,* a bowl, but the ultimate origin is unknown; it has been referred without much plausibility to Gr γαυλός, a milk pail The British imperial gallon of four quarts contains 277 274 cu in The old English wine gallon of 231 cu in. capacity is the standard gallon of the United States.

GALLOWAY, JOSEPH (1731–1803), American lawyer and politician, was born in West River, Md , in 1731 He early removed to Philadelphia, where he acquired a high standing as a lawyer From 1756 until 1774 (except in 1764) he was one of the most influential members of the Pennsylvania assembly, over which he presided in 1766–73 With the approach of the crisis in the relations between Great Britain and the American colonies he adopted a conservative course, and, while recognizing the justice of many of the colonial complaints, discouraged radical action and advocated a compromise As a member of the first Continental Congress, he introduced (Sept 28, 1774) a "Plan of a Proposed Union between Great Britain and the Colonies," and it is for this chiefly that he is remembered The measure was debated at length, was advocated by such influential members as John Jay and James Duane of New York and Edward Rutledge of South Carolina, and was eventually defeated only by the vote of six colonies to five. Galloway declined a second election to Congress in 1775, joined the British army at New Brunswick, N J , in December, 1776, advised the British to attack Philadelphia by the Delaware, and during the British occupation of Philadelphia (1777–78) was superintendent of the port In Oct 1778 he went to England, where he remained until his death on Aug 29, 1803 After he left America his property, valued at £40,000, was confiscated by the Pennsylvania assembly, a loss for which he received a partial recompense in the form of a small parliamentary pension He was one of the clearest thinkers and ablest political writers among the American Loyalists

Among his pamphlets are *A Candid Examination of the Mutual Claims of Great Britain and the Colonies* (1775), *Cool Thoughts on the Consequences to Great Britain of American Independence* (1780), and *The Claim of the American Loyalists Reviewed and Maintained upon Incontrovertible Principles of Law and Justice* (1788)

See Thomas Balch (Ed), *The Examination of Joseph Galloway by a Committee of the House of Commons* (Philadelphia, 1855); Ernest H. Baldwin, *Joseph Galloway, the Loyalist Politician* (New Haven, 1903), and M. C Tyler, *Literary History of the American Revolution* (1897).

GALLOWAY, a district in south-west Scotland, comprising the counties of Kirkcudbright and Wigtown It was the *Novantia* of the Romans, and till the end of the 12th century included Carrick, now the southern division of Ayrshire Though the designation has not been adopted civilly, its use historically and locally has been long established Thus the Bruces were lords of Galloway, and the title of earl of Galloway (created 1623) is now held by a branch of the Stewarts Galloway also gives its name to a famous indigenous breed of black hornless cattle

GALLOWS or **GIBBET:** *see* Capital Punishment; Hanging.

GALLS. This term may be applied to any excrescences caused in plants or animals by the action of living animals, usually insects In animals, galls may be produced under the skin of mammals or birds by acarids or by dipterous insects The term, however, is mostly confined to vegetable excrescences of a particular type.

Accepting the definition of Lacaze-Authiers they comprise "all abnormal vegetable productions developed on plants by the action of animals, more particularly by insects, whatever may be their form, bulk or situation"

History.—The hypertrophies of plant tissues known as galls have been known from early times Theophrastus (372–286 B.C.) referred to the gall-nuts as an article of trade and to the superior quality of those from Syria. The nature of galls was, however unknown until recent times It was naturally assumed that they arose spontaneously, *i.e.*, directly from the plant, without the intervention of any other animal or plant. John Evelyn, the diarist states in his *Sylva* (published 1664): "Pliny affirms that the Galls break out all together in one *Night*, about the beginning of *June*, and arrive to their full growth in one Day." Evelyn was familiar with the oak galls of commerce imported for their tannin content but he did not realize that the oaks in England bore numerous galls of different kinds—80–100 kinds are known The association of insects with most galls appears to have been discovered by Martin Lister (1630–1712) who was physician to Queen Anne. Malpighi (1620–1694) the physician and botanist seems to have been the first to deal systematically with galls, publishing a treatise entitled *De Gallis* which dealt with the galls of Italy and Sicily. In England, Dr. Derham, Canon of Windsor, seems to have been the first to take up the study of galls, he refers to Malpighi's work in his Boyle Lectures given in 1711 and 1712.



FROM (A TO D) SWANTON, "BRITISH PLANT GALLS" (METHUEN & CO., LTD.); (E) CONNOLD, "PLANT GALLS OF GREAT BRITAIN" (ADLARD & SON, LTD.)

VARIOUS PLANT GALLS CAUSED BY THE ATTACK OF INSECTS

A. Gall on speedwell caused by fly Perrisia B. Turgent of willow with leaves galled by fly (another species of Perrisia). C. Leaf of black poplar galled by aphid (Pemphiquius). D. Leaf of oak galled by gall wasp (Dryophanta). E. Various types of oak galls caused by gall wasp (Cynips)

Nature.—Galls arise from the abnormal development of merismatic tissue of the plant as a result of an abnormal stimulus The stimulus is caused by an animal parasite The parasite is usually an insect which lays an egg in the plant tissue but some galls are due to the action of eelworms (nematodes). The stimulus causing the abnormal development of the plant cells may be due in some cases to a chemical substance injected by the insect but in many cases, as in those of the wasps producing oak galls, gall formation is due to the action of the larva developing from the eggs; in this the movements of the larva probably play a part It must be borne in mind that the gall is the result of the interaction of two living organisms, the plant and the parasite. It is true that the gall is built up out of the tissues of the plant, but its special form and structure depends on the nature of the animal The interaction is made clear from the fact that the same plant attacked by different insects will produce very different galls In fact the differences between galls on the same plant may be the best means of distinguishing the insects, as in the case of gall-gnats of the willow, where ten different species attack *Salix humilis*, the insects being almost impossible to distinguish in the fully grown state except by the galls they produce.

Form.—Galls are very variable in form and size but very constant for the special insect and special host plant concerned Often the galls are entirely different from the structure on which they have developed or which they have replaced Commonly, however, the tissues outside the larval chamber enclosing the insect, *i.e.*, tissues which give the gall its distinctive form, indicate the special organ (leaf, etc.) from which the gall has developed. In the gall known as "Robin's pincushion" or "bedeguar" (produced by the action of the female gall-wasp, *Rhodites rosae*, on a leaf or bud in spring) the moss-like covering represents rudimentary leaves, consisting of fibro-vascular bundles with very little parenchyma between. Other galls represent in the case of the oak the arrested acorn. The size of the galls produced by insects varies enormously, some may be only a millimetre ($\frac{1}{24}$ inch) or two in length while those on the roots of old oak trees may reach the size of a man's fist. Many of the various galls are brightly coloured

Classification.—The most satisfactory classification is that by the insects which cause them and the plant on which they are produced Different types can however be distinguished by their external appearance and internal structure. Most of them are unilocular or monothalomous (containing but one chamber or cell), while others are plurilocular (polythalamous), *i.e.*, many-celled and contain a number of insects. The ordinary oak galls produced by the attack of a wasp (*Cynips*) on a leaf bud of oak are unilocular Following mainly Kerner and Oliver and Swanton (*see* Bibliography) galls may be distinguished as the *simple* and *compound*. The simple galls are produced from a single plant organ such as a leaf. These may again be distinguished as (1) *felt galls* where the epidermal cells become hypertrophied and grow into hair-like projections, and (2) *mantle galls* where a chamber is developed round the insect Mantle galls may further be distinguished as *scroll galls* (where the leaf or petiole becomes rolled and thickened), *pocket galls* (where a pocket or excavated chamber is produced) and *covering galls* (where the insect is covered in by the over-arching of tissues but the tissues do not fuse where they meet, and finally shrivel and leave a slit for the escape of the insect). The simple galls also include (3) the *solid* or *tubercular galls* of which the well known spherical marble gall on the oak is a good example, and the root galls. In addition there are *compound galls* in the growth of which several organs of the plant are concerned. These may be (1) *bud-like galls* which may arise from modified foliage buds or modified flower buds, (2) *galls at the base of shoots*, where the upper part of the shoot continues a normal growth beyond the gall; (3) *rosette galls* which may be developed either in the foliage or the floral region.

Causal Agents.—As already stated insects are the chief agents while eelworms play a part, fungi not being properly included. Of the insects the classes concerned may be Hymenoptera (wasps and sawflies), Coleoptera (beetles), Lepidoptera (moths), Diptera (flies), as well as Hemiptera (aphides), and Acari (mites). The eelworms (Nematoda) belong to such genera as *Heterodera* and *Tylenchus* Among the Hymenoptera (*q.v.*), the group *Cynipideae* (gall-wasps) are best known as gall producers The members of this group (e.g., *Cynips, Andricus, Biorrhiza, Rhodites*), have received more attention as gall producers than any other insects. This is partly due to the fact that they are responsible for many of the galls so commonly found on the oak but also to the fact that many of the insects show alternation of generation, *i.e.*, the young produced do not resemble their parents but their grandparents, and with these two different generations different galls may be associated. In the case, for example, of *Biorrhiza pallida* the female gall-wasp pricks the oak bud and lays its eggs therein with the result that the familiar gall known as "oak-apple" is produced From this gall the wasps emerge in July, the males winged and the females wingless or with rudimentary wings only The female, who is smaller than her parents, crawls down the oak trunk, reaches the ground, and then pierces the roots of the oak producing the other type of gall, the root gall. In other cases the same organ (leaf or bud) may be attacked in each case but different galls are produced. The gall-wasps are small insects with straight antennae and a compressed and usually very short abdomen with the second or second and third segments greatly developed, the rest concealing the partially coiled ovipositor. The transformation from the egg through the larval state to the imago (the perfect insect) takes place in the gall, the imago boring its way out of the gall usually in the autumn. Among the galls produced by *Cynips* and its allies are the "oak-apple" or "oak sponge" produced by *Andricus terminalis*, the currant or berry galls of

Spatheguster baccarum and the "oak spangles" of *Neurotenes lenticularis* The marble galls or "Devonshire woody galls" of oak buds which often destroy the leading shoots of young oak trees are produced by *Cynips Kollari.* They were first introduced into Devonshire about 1847 and after a time spread widely The large purplish Mecca or Bassorah galls produced by *Cynips insana* have been regarded by some as the Dead Sea fruit, mad apple or apples of Sodom alluded to by Josephus and others, but more probably the fruit referred to is that of a species of *Asclepias*

Oak galls or gall nuts (produced by cynips) were once a valuable article of commerce (for ink making, etc)—they may contain as much as 70% of tannin. The "blue," "black" or "green" galls still contain the insect; the inferior "white" galls are lighter coloured and are gathered after the insect has escaped

The saw-flies (also members of the Hymenoptera) so named on account of the saw-like nature of the egg depositing apparatus (the ovipositor) produce galls on willow, rose and other plants; on the willow, bud galls, stem galls and leaf galls are all produced The red, oval or kidney shaped swellings on the blade of the willow leaf are perhaps the best known saw-fly galls in Great Britain Of beetles (Coleoptera) in spite of their large numbers (150,000 or more species) only a very few are responsible for plant galls Gorse and vetches may be attacked, and also the toadflax (*Linaria vulgaris*) *Ceuthorhynchus sulcicollis* attacks the underground portions of various plants (turnips, swedes, cabbages, etc) of the family Cruciferae The swellings produced are sometimes confused with the malformations due to the disease, "finger and toe," caused by a fungus *Plasmodiophora brassicae*

Galls caused by moths (Lepidoptera) are also infrequent and not of great economic importance *Rhyacionia resinella* produces a gall upon *Pinus silvestus,* destroying the terminal bud and thus retarding the growth of the tree Among the flies (Diptera) those which cause galls belong mostly to the gall midges (Cecidiomyidae) *Spiraea ulmaria* (meadowsweet) and *S. filipendula* are attacked by *Perrisia ulmariae,* the galls appearing as small, glabrous, light green pustules, over 200 have been counted on one leaf The germander speedwell (*Veronica Chamaedrys*) and the nettle (*Urtica*) are "galled" by species of *Perrissia,* as are also willows On willows a number of galls are also produced by species of *Rhabdophaga* The frit-fly (*Oscinis frit*) causes the new shoots of cereals and pasture grasses to become swollen and distorted The ash, maple, hornbeam, oak, grape-vine, alder, gooseberry, blackberry, pine, juniper, thistle and fennel are also galled by insects of this class Among the order of Hemiptera, the Aphidae (green fly), the Psyllidae (plant lice) and the Coccidae (scale insects and mealy bugs) all include forms which are gall producers. The majority of these belong to the first class Aphidae the members of which are generally known as "blight" or "green-fly." Of the galls produced by aphids the best known are probably those found on the spruce fir (*Abies excelsa*), resembling immature cones in size and shape They are sometimes called "pineapple" galls and are due to species of *Chermes.* The galls develop near one end of a twig and are large and plurilocular containing in some cases as many as twenty-five cavities; a single gall may contain 2,000 insects The mites belonging to the order Acari of the class Arachnida (which includes the spiders and scorpions) are responsible for a number of galls. The gall-formers have only two pairs of legs, no eyes and belong to the group Vermiformia; they are very minute and are easily developed The mite-galls are nearly always characterized by a felt of hairs which develop in association with the gall by the abnormal growth of the epidermal cells of the leaf attacked. These galls are mostly caused by species of the genus *Eriophyes;* they are found on the sycamore, pear, plum, ash, alder, vine, mulberry, etc. Those on the sycamore leaf due to *Eriophyes macrorrhynchus* are very common in Great Britain in June and July, and several hundred may be found on a single leaf. They are small, elongated outgrowths, about 2 mm broad by 3 mm. long, tapering somewhat at the free end They are bright red in colour with a tuft of hairs at the base and also bearing hairs in the hollow cavity and at the aperture of the gall; they are borne on the upper surface of the leaf The gall-mite, *Eriophyes ribis* causes "big-bud" in black currants and is a serious pest, while *Eriophyes pyri* is the pear leaf blister mite.

Among the order Nematoda the genera *Heterodera, Tylenchus* and *Aphelenchus* (belonging to the family Anguillulidae, to the members of which the term eelworms is applied) cause galls Either the aerial or underground parts may be attacked A number of the infections are of economic importance.

Guest Flies.—The insect galls often contain, besides the larva of the insect responsible for the gall, so called *inquilines* or lodgers They feed on the substance of the gall and so deprive the normal "householder" of part of the food supplies and frequently kill off the rightful owner There are also definite parasites (generally small Hymenoptera belonging to the family Chalcididae) which kill and devour not only the primary occupant of the gall but also the "guest flies " Derham, who has been already referred to, recognized in the early years of the 18th century that galls may contain interlopers His quaint language may be quoted "I apprehend we see many vermicules towards the outsides of many oak-apples, which I guess were not what the primitive insects laid up in the germ from which the oak-apple had its rise, but from some supervenient additional insects laid in after the apple was grown, and whilst it was tender and soft " The presence of different classes of insects within the same gall renders investigation very difficult

Fungi.—A number of fungi cause marked malformations of the portions of the host plant attacked. For example, *Synchytrium endobioticum* causes wart-like outgrowths of the potato, *Plasmodiophora brassicae* swellings on turnip and cabbage roots. In these cases, however, the tissue of the outgrowth is usually penetrated by the fungus so they are hardly comparable to the insects galls, where the abnormal tissue is purely vegetable in nature and grows round the insect responsible for the malformation A few cases which are sometimes confused with true galls may be mentioned Cultivated plums, the sloe and the wild cherry may show a condition in which the fruit is swollen and deformed; this is known as "bladder plum" and is due to the attack of a fungus, *Exoascus pruni,* belonging to the class Ascomycetes (*see* FUNGI) The so-called witches' brooms (*q.v.*), are found on various trees and are sometimes mistaken for galls; they are conspicuous as groups of short, generally unhealthy twigs with reduced leaves, the branches of the "broom" growing upward. On birch these brooms may be caused by the fungus *Exoascus turgidus* though they may also be caused by a mite of the genus *Eriophyes.* Those on cherry are due to *Exoascus cerasi,* and those on silver fir are due to the attack of a rust fungus *Melanosporella elatina.* The large succulent often reddish swellings found on the leaves of the cowberry (*Vaccinium Vitis-idaea*) and the cranberry (*Oxycoccus quadri-petalus*) and the still larger ones on species of *Rhodendron* are due to fungi belonging to the genus *Exobasidium* (*see* FUNGI)

For further details *see* A. Kerner von Marilaun, *Natural History of Plants,* Vol. II. (trans, F W. Oliver, London, 1894), N Adler and C Straton, *Alternating Generations. A Biological Study of Oak Galls and Gall Flies* (London, 1894), E T Connold, *British Vegetable Galls* (London, 1901), *British Oak Galls* (London, 1908); *Plant Galls of Great Britain* (London, 1909), E. Kuster, *Die Gallen des Pflanzen* (Leipzig, 1911), E W Swanton, *British Plant Galls* (London, 1912). (V. H. B)

GALLUP, a town of north-western New Mexico, U.S.A., on the main line of the Santa Fe, and on Federal highways 66 and 666; the county seat of McKinley county It has a municipal airport, Moses Field The population was 3,920 in 1920, and was estimated locally at 5,500 in 1928. Gallup lies 6,503ft above sea-level, in a valley bordered by fantastically coloured cliffs. Coal-mining is the principal industry. It is a trading centre for the Navajo and Zuni Indians. The Navajo reservation is north of the city, 40m. south is Zuni, one of the largest pueblos in the south-west, and one of the famous seven cities of Cibola, sought by Coronado South-east of Gallup is the Fort Wingate Military reservation and the Charles H. Burke Indian school. The town was settled about 1880 and was incorporated in 1891

GALLUPPI, PASQUALE (1770–1846), Italian philosopher, was born at Tropea, in Calabria. He was professor of

logic and metaphysics at Naples Galluppi's works, which have importance in the history of Italian philosophy, include. *Sull' analisi e sulla sintesi* (1807), *Letters filosofiche* (1827); *Saggio filosofico sulla critica della conoscenza* (1819–32), *Filosofia della volontà* (1832–42, incomplete), *Considerazioni filosofiche sull' idealismo trascendentale* (1841), a memoir on the system of Fichte; *Storia della filosofia* (i 1842)

See L Ferri, *Essai sur l'histoire de la philosophie en Italie au XIXe siècle* (1869), V Lastrucci, *Pasquale Galluppi Studio critico* (Florence, 1890), and G Gentile, *Dal Genovesi al Galluppi* (1903)

GALLUS, CORNELIUS (*c* 70–26 B C), Roman poet, orator and politician, was born of humble parents at Forum Iulii (*Fréjus*) At an early age he removed to Rome, where he was taught by the same master as Virgil and Varius Rufus Virgil, who dedicated one of his eclogues (x) to him, was much indebted to the influence of Gallus for the restoration of his estate Nothing by him has survived, the fragments of the four poems attributed to him (first published by Aldus Manutius in 1590 and printed in A Riese's *Anthologia Latina,* 1869) are generally regarded as a forgery

See C Volker, *De C. Galli vita et scriptis* (1840–44), A Nicolas, *De la vie et des ouvrages de C Gallus* (1851), an exhaustive monograph An inscription found at Philae (published 1896) records the Egyptian exploits, *see* M Schanz, *Geschichte der romischen Litteratur,* and Plessis, *Poesie latine* (1909) *See* also R S Conway, *New Studies of a Great Inheritance* (1923), *The Fall of Gallus*

GALLUS, GAIUS SULPICIUS, Roman general, statesman and orator Under Lucius Aemilius Paulus, his intimate friend, he commanded the 2nd legion in the campaign against Perseus, king of Macedonia, and predicted an eclipse of the moon on the night before the battle of Pydna (168 B C) On his return from Macedonia he was elected consul (166), and in the same year subdued the Ligurians In 164 he was sent as ambassador to Greece and Asia, where he held a meeting at Sardis to investigate the charges brought against Eumenes of Pergamum by the representatives of various cities of Asia Minor Gallus was a man of great learning, an excellent Greek scholar, and in his later years a student of astronomy, on which he is quoted by Pliny

See Livy xliv 37, *Epit* 46, Polybius xxxi 9, 10, Cicero, *Brutus,* 20, *De officus,* i 6, *De senectute,* 14, Pliny, *Nat Hist* ii 9

GALLUS, G. VIBIUS TREBONIANUS, Roman emperor A D 251–253 or 4, held a command in the army that opposed the first invasion of the Goths in 251, and, according to a possibly inaccurate tradition, contributed by his treachery to the disaster that followed, in which Decius and Herennius were killed Gallus was then elected emperor, and made peace with the invaders, who kept their plunder and were offered a tribute to bribe them not to return, it is the disgrace with which this treaty covered his name that makes the tradition of his earlier conduct suspect A year later fresh hordes arrived, but were routed by Aemilianus whom his troops proclaimed emperor Gallus went to meet him, but was defeated and killed at Interamna

See Zonaras XII 20 *seq ;* Zosimus I 23, 28, Eutropius IX 5, Victor, *De Caes* 30, Jordanes, *De Reb Get* 19

GALOIS, ÉVARISTE (1811–1832), French mathematician, was born on Oct 25, 1811, and killed in a duel on May 31, 1832 His principal work was on the resolubility of algebraic equations by radicals To him is also due the notion of a group of substitutions (*see* ALGEBRA, EQUATIONS, THEORY OF, also GROUPS)

See the introd by C F Picard to his *Oeuvres mathématiques* (1897).

GALOP, a spirited dance of German origin in 2–4 time It was introduced into Paris in 1829 and subsequently became a favourite dance of the Victorian era

GALOSH. The galosh or golosh was originally a wooden shoe or clog, but later came to mean an overshoe (*cf* R Holme, *Armoury,* 1688 "Galloshios are false shooes, or covers for shooes"). The word is adapted from the French *galoche,* from Low Lat *galopedium,* a wooden shoe

GALSTON, police burgh, parish and manufacturing town, Ayrshire, Scotland Pop (1921) 4,977 It is situated on the Irvine, 5 m. E by S. of Kilmarnock, with a station on the L.M S R The manufactures include weaving and lace and hosiery making, and coal is worked in the vicinity

GALSWORTHY, JOHN (1867–), British playwright and novelist, was born at Coombe, Surrey, on Aug. 14, 1867. Educated at Harrow and New college, Oxford, he was called to the bar in 1890, but devoted himself to literature His first novel, *Jocelyn,* appeared in 1898, but he attracted wider attention in 1904 with *The Island Pharisees,* and *The Man of Property* (1906) The latter was the first novel of the sequence to be known as *The Forsyte Saga,* the others being *The Indian Summer of a Forsyte* (1918), *In Chancery* (1920), *Awakening* (1920), and *To Let* (1921) As a detailed picture of upper middle-class society during the later Victorian and Edwardian eras, the sequence is a remarkable achievement That picture was supplemented by the greater number of Galsworthy's other novels, of which it is the characteristic social setting, among them *The Country House* (1907), *Fraternity* (1909), *The Patrician* (1911), *The Freelands* (1915) In 1924 Galsworthy published *The White Monkey,* the first volume of a new trilogy which endeavoured to do for London after the War what *The Forsyte Saga* had accomplished for a generation with more certain standards Soames Forsyte appears in all three of the new series—*The Silver Spoon* (1926) and *Swan Song* (1928) being the other two—and his death in *Swan Song* gives a climax which is not successful in diverting the critic's attention from the rather erratic form of the trilogy Galsworthy's sympathy with youth and beauty is tenderly displayed in *The Silver Spoon,* but the new world was too much for him, and much of all three books betrays passing reactions of an observer in a changing world rather than deeper reflections on human nature Galsworthy also wrote *The Dark Flower* (1913) and many short stories, of varying merit, but often equal to his best work (collected as *Caravan,* 1925), essays on current social and moral questions, marked by liberal and humane feeling, and a commentary on the extravagances of war time, *The Burning Spear*

As a dramatist also, Galsworthy enjoyed a deserved fame His plays, for the most part, are based on ethical or social problems and are marked by a scrupulously judicial effort to display the opposing points of view typified by his characters Some have partaken too much of this scrupulousness to be counted as having an essentially dramatic quality, but at their best Galsworthy's plays reflect a keen sense of dramatic values He was the first English dramatist of importance to adopt a strictly natural style of dialogue, in strong contrast to the laboured, rather stagey style favoured by Pinero and the dialectically over-charged manner of Bernard Shaw. In consequence his plays do not read so well, and unless acted by players of exceptional gifts, they are too easily infected by the commonplace, prosaic quality which is so characteristic of the spoken English of his day, especially the spoken English of the inarticulate upper and upper-middle class which figure largely in his theatre In *Escape* (1926) Galsworthy experimented in a technique suggested by the cinematography He succeeded in showing that a play could easily excel a film in interest and excitement, but not in persuading us that the drama had anything to learn from the devices of Hollywood Among the plays should be noted *The Silver Box* (1906), *Joy* (1907), *Strife* (1909), *Justice* (1910), *The Pigeon* (1912), *The Eldest Son* (1912), *The Fugitive* (1913), *The Skin Game* (1920), *Loyalties* (1922), *The Forest* (1924)

See S Kaye-Smith, *John Galsworthy* (1916); André Chevrillon, *Trois Etudes Anglaises* (1924); L Schalit, *John Galsworthy* (1928)

GALT, SIR ALEXANDER TILLOCH (1817–1893), Canadian statesman, was the youngest son of John Galt, the author Born in London on Sept 6, 1817, he emigrated to Sherbrooke in Canada in 1835, where he entered the service of the British American Land Company, of which he rose to be chief commissioner. Later he was one of the contractors for extending the Grand Trunk railway westward from Toronto In 1849 he became Liberal member for the county of Sherbrooke, but opposed the chief measure of his party, the Rebellion Losses Bill, and signed a manifesto in favour of union with the United States, believing that in no other way could Protestant and Anglo-Saxon ascendancy over the Roman Catholic French majority in his native province be maintained. In the same year he retired from parliament but re-entered it in 1853, and was till 1872 the

chief representative of the English-speaking Protestants of Quebec province.

On the fall of the Brown-Dorion administration in 1858 he was called on to form a ministry, but declined and became finance minister under Sir John Macdonald and Sir George Cartier on condition that the federation of the British North American provinces should become a part of their programme From 1858–62 and 1864–67 he was finance minister, he introduced the decimal system of currency and adopted a policy of protection to Canadian manufactures. To his diplomacy was due the coalition in 1864 between Macdonald, Brown and Cartier, which carried the federation of the British North American provinces, and throughout the three years of negotiation which followed his was one of the chief influences.

He became finance minister in the first Dominion ministry, but resigned on Nov. 4, 1867 After his retirement he gave intermittent support to the administration of Sir John Macdonald, but advocated independence as the final destiny of Canada In 1871 he was again offered the ministry of finance on condition of abandoning these views, but declined In 1877 he was the Canadian nominee on the Anglo-American fisheries commission at Halifax, and rendered brilliant service In 1880–83 he was Canadian high commissioner to Great Britain During this period he advocated imperial federation He was Canadian delegate at the Paris Monetary Conference of 1881, and to the International Exhibition of Fisheries in 1883 From this date till his death on Sept 19, 1893, he lived in retirement No Canadian statesman had sounder or more abundant ideas, but a certain intellectual fickleness made him always a somewhat untrustworthy colleague in political life (W L G)

GALT, JOHN (1779–1839), Scottish novelist, was born at Irvine, Ayrshire, and educated in his native town and at Greenock In 1804 he settled in London Charged with a commission from a merchant firm to find methods of evading the Berlin and Milan decrees, he was travelling in the Mediterranean when he met Byron and Hobhouse at Gibraltar. He travelled with Byron to Malta, and met him again at Athens In 1814 he visited France and Holland on similar business for a Glasgow firm In 1826 he went to America as secretary of the Canada Land company Galt opened up a road between Lakes Huron and Erie through the forest country, and founded Guelph in Upper Canada. The town of Galt was named after him But, though his work was successful, he returned home practically a ruined man All his life he had been a voluminous writer, and he now devoted himself entirely to literature The last years of his life were spent at Greenock, where he died on April 11, 1839

His masterpieces are *The Ayrshire Legatees* (1820), *The Annals of the Parish* (1821), *Sir Andrew Wylie* (1822), *The Provost* (1822), *The Entail* (1823) and *Lawrie Todd* (1830) *The Ayrshire Legatees* gives, in the form of letters, the adventures of the Rev Dr Pringle and his family in London The letters are made the excuse for endless tea-parties and meetings of kirk-session in the rural parish of Garnock. *The Annals of the Parish* are told by the Rev Micah Balwhidder, Galt's finest character This work (which existed in ms. before *Waverley* was published) is a humorous and truthful picture of the old-fashioned Scottish pastor and the life of a country parish. In *Lawrie Todd* the life of a Canadian settler is depicted with considerable imaginative power.

BIBLIOGRAPHY —The best of Galt's novels were reprinted in Blackwood's *Standard Novels* (1841), to vol. 1. of which his friend, Dr Moir, prefixed a memoir. Several of the novels have appeared in later editions. *See* also G. B S. Douglas, *The Blackwood Group* (1897), R. K. Gordon, *John Galt* (Toronto, 1920; bibl); W Roughead, Introduction to *A Rich Man and other Stories*, by John Galt (1925).

GALTON, SIR FRANCIS (1822–1911), English anthropologist, was born on Feb. 16, 1822, at Birmingham and received his education at Birmingham hospital, at King's college, London, and at Trinity college, Cambridge. During 1845–46 he travelled in the Sudan, and in 1850 explored Damaraland and the Ovampo country in South-West Africa, publishing on his return, *An Explorer in Tropical South Africa* (1853, 2nd ed. 1889) and *Art of Travel* (1855) A visit to the north of Spain in 1860 was described in *Vacation Tourists*.

Galton then turned to meteorology. His *Meteorographica* (1863) was the first serious attempt to chart the weather on an extensive scale, and in it also the author first established the existence and theory of anticyclones About this time, Galton, inspired by his cousin's *Origin of Species* (1859), began to study anthropology, heredity and the application of statistics to human attributes. In a series of remarkable publications, he laid the foundation of the science of eugenics For the improvement of mankind, he advocated the furthering of the productivity of the fit and the restricting of the birth-rate of the unfit. Galton also made special investigations of colour blindness, mental imagery, instincts, number forms and of criminality, he originated the process of composite portraiture, and paid much attention to finger-prints and their employment for the identification of criminals In 1909 he was knighted He died at Haslemere on Jan 17, 1911, founding by his will a laboratory for the study of national eugenics

Galton's chief scientific works are: *Hereditary Genius* (1869); *English Men of Science* (1874); *Inquiries into Human Faculty* (1883), *Record of Family Faculties* (1884); *Natural Inheritance* (1889), *Finger Prints* (1892); *Finger Print Directories* (1895); *Noteworthy Families* (1906); *Essays in Eugenics* (1909)

See his *Memories of My Life* (1908) and K Pearson's *Life of Galton* (2 vols, 1914–24), also the article ANTHROPOMETRY

GALTON WHISTLE: *see* ACOUSTICS IN BUILDINGS.

GALUPPI, BALDASSARE (1706–1785), Italian composer, was born on Oct 18, 1706, on the island of Burano near Venice, and was named Il Buranello His father, a barber, and violinist at the local theatre, was his first teacher. He studied at the Conservatorio degli Incurabili at Venice, under Antonio Lotti. After producing two operas in collaboration with G B Pescetti, in 1728 and 1729, he began to compose operas for the Venetian theatres, writing sometimes as many as five in a year He visited London in 1741, and arranged a *pasticcio, Alexander in Persia,* for the Haymarket. Burney considered his influence on English music to have been very powerful In 1740 he became *vice-maestro di cappella* at St Mark's and *maestro* in 1762 In 1749 he began writing comic operas to libretti by Goldoni, which enjoyed an enormous popularity He was invited by Catherine II. in 1766 to Russia where he composed his opera *Ifigenia in Tauride* (1768) He returned to Venice in 1768, where he had held the post of director of the Conservatorio degli Incurabili since 1762. He died on Jan 3, 1785.

Galuppi's best works are his comic operas, of which *Il Filosofo di Campagna* (1754), known in England as *The Guardian Trick'd* (Dublin, 1762) was the most popular His melody is attractive rather than original, but his workmanship in harmony and orchestration is generally superior to that of his contemporaries He was one of the first to extend the concerted finales of Leo and Logroscino into a chain of several separate movements, working up to a climax

For details of Galuppi's operas *see* Alfred Wotquenne, *Baldassare Galuppi, étude bibliographique sur ses oeuvres dramatiques* (Brussels, 1902).

GALVANAUSKAS, ERNEST (1882–), Lithuanian statesman, was born on Nov. 7, 1882 at Vabalninkai He studied as a mining engineer at Leningrad (St Petersburg) and Liège, and his activities in the Lithuanian national movement date from his student days. In 1906 he was imprisoned for his attempts to free the country from the Russian yoke. He escaped to Belgium in 1908, where he continued in touch with the Lithuanian liberation movement. The outbreak of the World War found him in Belgrade, and after the enemy occupation of that city, Galvanauskas left with the Serbian army and shared all the privations of the retreat. He subsequently proceeded to France and volunteered for military service. On the recovery of Lithuanian independence in 1918, Galvanauskas served as a member of the Lithuanian delegation to the Versailles Peace Conference He was several times prime minister and minister for foreign affairs, and also held the portfolios of finance and communications. He became president of the Lithuanian delegation to the League of

Nations and in Aug 1924 was appointed Lithuania's first envoy extraordinary and minister plenipotentiary to London and simultaneously envoy extraordinary and minister plenipotentiary to The Hague

GALVANI, LUIGI (1737–1798), Italian physiologist, after whom galvanism received its name, was born at Bologna on Sept 9, 1737 He was appointed public lecturer in anatomy at Bologna in 1762, and gained repute as a comparative anatomist from his researches on the organs of hearing and genito-urinary tract of birds He enunciated his theory of animal electricity in a treatise published in 1791. Twenty years before he had begun his investigations as to the action of electricity upon the muscles of frogs The observation that the suspension of frogs on an iron railing by copper hooks caused twitching in the muscles of their legs led to the invention of his metallic arc, the first experiment with which is described in the third part of the *Commentary*, under the date Sept 20, 1786 The arc he constructed of two different metals, which, placed in contact the one with a frog's nerve and the other with a muscle, caused contraction of the latter In Galvani's view the motions of the muscle were the result of the union, by means of the metallic arc, of its exterior or negative electrical charge with positive electricity which proceeded along the nerve from its inner substance Volta, on the other hand, attributed them solely to the effect of electricity having its source in the junction of the two dissimilar metals of the arc, and regarded the nerve and muscle simply as conductors. Galvani died at Bologna, on Dec 4, 1798.

A quarto edition of Galvani's works *Opere edite ed inedite del professore Luigi Galvani* was published at Bologna in 1841–42 by the Academy of Sciences of the Institute of that city *See* J L Alibert, *Eloges historiques*, pp 187–338 (1806)

GALVANIZED IRON AND STEEL. Of all the methods which have been adopted to coat the surface of iron and steel to offer resistance to corrosion the applying of a coat of zinc, although a very old device, seems up to the present to be the most effective. There are four methods of applying zinc to the surface of iron or steel, these being as follow —

(1) The Hot Dip Process.
(2) Electrolytic or Zinc-Plating
(3) Sherardizing
(4) Spraying of Hot Metal

Of these the Hot Dip Process is the one most widely used, and the one which, when properly carried out, gives the best coating for exposure to the atmosphere

The Hot Dip Process.—It seems that the idea of using zinc for coating other metals arose as soon as this metal was known in Europe, during the first half of the 18th century The earliest patent for Hot Dip Galvanizing was taken out by Crawford in England in 1837 Why the term "galvanize" was chosen is difficult to understand, as no particular galvanic action takes place in the process other than that which is common to all forms of chemical reaction There is, however, a galvanic or electrolytic action brought into operation when the coated iron is exposed to the atmosphere, on account of the zinc being electro-positive to iron, this action resulting in the protection of the latter

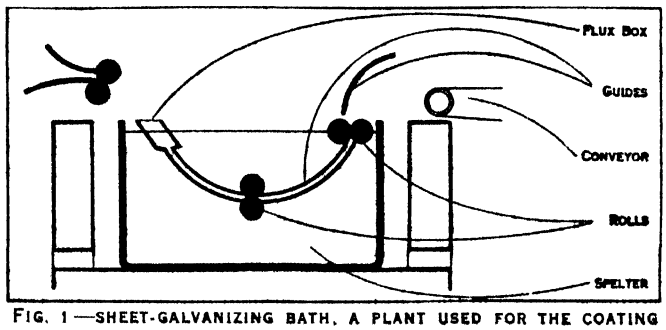


FIG. 1.—SHEET-GALVANIZING BATH, A PLANT USED FOR THE COATING OF SHEET IRON OR STEEL WITH ZINC BY THE HOT PROCESS

In its application to the coating of small articles the process is simple. All that is necessary is to have a wrought iron or mild steel pot containing molten spelter, the heat required being applied on the vertical sides. The article requiring to be galvanized is first thoroughly cleaned in hydrochloric acid, dried, and carefully dipped in the molten zinc after the latter has been sprinkled with sal-ammoniac. The surplus spelter is then drained off and the article plunged into water, washing away any spent sal-ammoniac that may remain on the surface

The manufacture of galvanized mild steel sheets is one of the most important of the metal industries, both in America and Great Britain where about 900,000 tons of sheets are produced annually



FIG 2.—SPANGLES ON SURFACE OF GALVANIZED SHEET IRON

In the carrying out of the process the sheets are first pickled in batches either in hydrochloric or sulphuric acid, and after the scale has been completely removed they are washed in running water For the actual galvanizing a plant is used of the character shown in fig 1. The clean wet sheet is passed throug a flux box containing sal-ammoniac and so on through the molten metal, leaving the surface of the bath by a pair of horizontal rollers that serve the purpose of regulating the thickness of zinc on the sheets The amount of spelter taken up on the surface of a sheet may vary from 1¼ to 3¼oz per square foot, depending upon the kind of process used and the condition of same

In the galvanizing of sheets efforts are usually made to produce them with the largest and best form of spangles (fig 2), as this type of sheet possesses good selling properties There is a difference of opinion as to what causes the variation in the size of spangles, but without entering very deeply into the scientific explanation it may be said that the spangling is controlled by anything which alters the surface tension of the zinc, the following being the governing factors.—

(1) The kind of steel used
(2) The method and quality of the pickling
(3) Variation in the sheet annealing factors
(4) The condition of the sheet surface
(5) The kind of spelter used.
(6) The temperature of the galvanizing bath
(7) The length of time the sheet is immersed in the zinc
(8) The method of galvanizing

Wire for fencing, telegraph lines and other purposes is galvanized by a continuous process in which the wires, running parallel, are passed through an annealing furnace, an acid cleaning cistern, washing and fluxing tanks, and on through the molten zinc of the galvanizing bath, and finally to the winding blocks, as shown in fig. 3

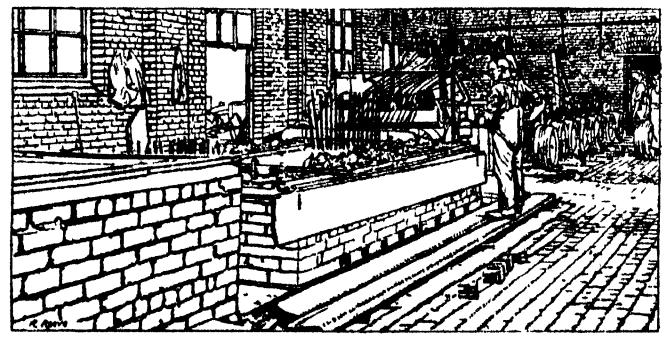


FIG 3.—THE GALVANIZING OF WIRE, A CONTINUOUS METHOD OF ANNEALING AND GALVANIZING WIRE BY THE HOT PROCESS

To regulate the thickness of the coat on the wires it is usual to have a bed of moist sand or other material on the surface of the out-going end of the bath through which the coated wires pass

The coatings on wire vary very considerably, both in quality

and thickness. Two kinds of coatings are shown in fig. 4, the one which is hard and brittle breaking off when the wire is bent, whilst the other is flexible and is tenaciously bound to the surface of the wire When wire is required to have a thin flexible coat it is usual to pass it through wipers instead of drawing it through a sand bed.

Electrolytic or Zinc-plating Process.—The cold or electro-galvanizing process is now commonly used for certain classes of work. Its advantages over hot galvanizing are:—

(1) Greater economy in the use of zinc, and somewhat healthier conditions

(2) Complete control over the thickness of coating required up to a certain maximum

(3) The depositing of a coat of pure zinc

(4) Its suitability for articles such as steel springs, etc, which may be affected by the temperature of the molten zinc, if coated by the hot process

(5) No distortion or buckling in the coating of flat surfaces as with the hot process

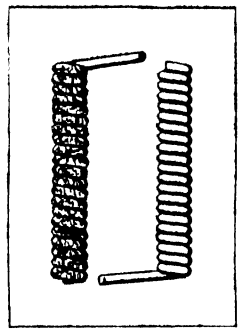


FIG 4.—GOOD AND BAD GALVANIZED COATINGS ON WIRE, ON THE LEFT, A BADLY CRACKED AND PEELING COATING, ON THE RIGHT, AN UNBROKEN SMOOTH COATING OF ZINC

Its disadvantages are —

(1) The time required is much greater than with the hot process

(2) It is very difficult to obtain a thick, non-spongy coat

(3) The coating is usually not as bright as that obtained with hot galvanizing.

(4) Much greater care is required and greater difficulties are encountered to obtain a correct coat than with hot galvanizing

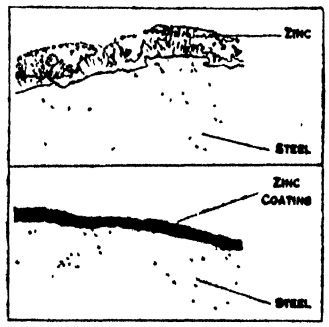
(5) For articles that have to be made watertight the electrolytic process does not have the same "soldering" effect as the hot process

To show clearly the difference between the coatings of the hot and cold methods of galvanizing, figs 5 and 6 should be closely compared

Many different solutions for the electrolyte are used in connection with the cold process, but the basis of all of them is zinc sulphate

Sherardizing.—This consists of heating the material to be coated in metal drums or boxes whilst being surrounded with zinc dust containing metallic zinc This process is particularly suitable where a thin clear protection coat is required, where the pattern or design on the article will not be interfered with, but it can only be applied to comparatively small articles.

Metallic Spraying.—This is a process which consists of applying a fine spray of molten zinc to the surface of the steel, which has been previously cleaned and warmed In this process the zinc in the form of a wire or strip is fed at a uniform rate through an oxy-hydrogen or other flame, or through the electric arc, and from these projected on to the surface which is required to be coated. In practice a specially prepared metal spray pistol is used for producing the spray. This method seems to offer some promising results in the way of coating large vessels whilst they are fixed in position. The metal coating, of course, does not alloy with the base metal but simply adheres to it almost the same as a coating of paint or varnish (*See* WIRE and WIRE MANUFACTURES) (E. A. A.)



FIGS. 5 AND 6.—TOP, SECTION OF HOT GALVANIZED COATING MAGNIFIED TO ABOUT 40 DIAMETERS, BOTTOM, SECTION OF ELECTRO ZINC COATING OF THE SAME MAGNIFICATION

GALVANIZED WIRE: *see* WIRE; WIRE MANUFACTURES.

GALVANOMETER. An instrument for measuring a galvanic (electric) current. *See* INSTRUMENTS, ELECTRICAL

GALVESTON, a city of south-eastern Texas, U S A., on the Gulf of Mexico; a port of entry and headquarters of a customs district, the county seat of Galveston county, the leading cotton shipping port in the United States, and one of the leading exporters of wheat It occupies 8 sq m. extending across Galveston island, near the eastern end, and is connected with the mainland by a causeway of earth and concrete 2m long, which carries the railroad tracks and a road for vehicles and pedestrians Galveston is the southern terminus of the Colorado-to-Gulf and the Meridian highways; and is served by the Galveston, Houston and Henderson, the Missouri-Kansas-Texas, the Missouri Pacific, the Santa Fe, and the Southern Pacific railways, and by 75 steamship lines, operating to all the principal ports of the world The population in 1920 was 44,255, of whom 6,892 were foreign-born white and 9,888 were negroes; and was estimated locally at over 60,000 in 1928

The south side of the city, on the gulf, is protected by a massive concrete sea-wall, 17ft high and 7½m long, below which stretches a fine bathing beach of hard, clean sand A wide boulevard, starting from the north-east corner of the city, follows the sea-wall, passing the principal hotels and the beach resorts, to Ft Crockett and the Air Corps flying field at the south-west corner The climate is mild and comparatively equable There is sunshine for 65% of the possible hours in the year, and the normal monthly mean temperature ranges from 53 8° F in January to 83 4° in July The city is both a summer and a winter resort

The harbour, stretching along Galveston channel on the north side of the city, has berthing space for 100 ocean-going steamers Deepening of the channel from 30ft to 32ft, with an overdepth of 2ft to allow for siltage, is under way. Waterfront facilities have been developed chiefly by the Galveston Wharf Company, in which the city owns one-third interest. Two of the railways and the principal oil companies have their own piers There is 3,000,000 sq ft of covered storage space on the waterfront. Storage facilities for cotton provide for 2,000,000 bales, and the grain elevators have a capacity of over 5,000,000 bushels Except for oil, most of the traffic is of a through character Cargo moves rapidly, as rail and water facilities are well co-ordinated and no lighters are used The average detention of freight cars at the port is less than three days. In 1916, 1,146 ships cleared for foreign ports and 530 for American ports The total commerce of the port was valued at $688,403,560, of which $288,371,327 represented exports to foreign countries (chiefly cotton, cotton-seed products, sulphur, crude and refined oil, grain and lumber), and $24,755,766 represented imports (chiefly raw sugar from Cuba, coffee, crude oil and novelties). The value of all the cotton passing through the port was $454,158,000, nearly as much as for all the other ports of the country combined The assessed valuation of property in 1927 was $57,142,449 Manufacturing is less important than commerce, but the factories within the city had an output in 1925 valued at $13,356,288 There are large flour and rice mills, sugar refineries, the only wire and nail factory in the State, a bagging factory, cottonseed oil mills and a new cotton mill (1927) operating 14,000 spindles The medical branch of the University of Texas is at Galveston The Federal Government maintains life-saving, immigration, and quarantine stations, and in 1927 appropriated $700,000 for a marine hospital. Ft. Crockett is headquarters of the third attack group of the air service.

Galveston Bay was named about 1782 by Spanish explorers, probably after Bernardo de Galvez, governor of Louisiana. In the early days of the 19th century it was the chief rendezvous of the notorious Jean Lafitte and his band of buccaneers and pirates, who were finally dispersed by United States authorities about 1820. The first settlement from the United States was made in 1837, and the town was incorporated by the Republic of Texas in 1839 In 1900, a West Indian hurricane, blowing steadily for 18 hours and reaching a velocity of 135m. an hour, piled up enormous waves which swept across most of the city. About 5,000 lives were lost, and the property loss was estimated at $17,000,000. The city was rebuilt rapidly on a more substantial scale and measures were taken which constitute thorough protection against the recurrence of such a disaster; the sea-wall was constructed 1·5ft.

higher than the high-water mark of the storm and 7·5ft. above the previous record, the causeway was built to take the place of several bridges that had been washed away; and the entire grade of the city was raised from one to 15ft above the old level.

In the crisis created by the storm the city Government proved so inefficient that the Deepwater Commission (commercial experts concerned with developing the harbour) practically took control, and prepared a charter providing for Government by a board to be appointed by the governor of the State. A modification of this plan was in effect for a time, but in 1901 a third charter was adopted, providing for a commission form of Government (since known as the "Galveston Plan"), which is still in force and which has had a wide influence on municipal Government in the United States. The commerce of the port increased 150% between 1910 and 1925.

GALVESTON AND BRAZOS CANAL, in the United States, connects Galveston, Texas, and Brazos River, Texas, and opens inland navigation 150 m for vessels requiring 4 ft draught of water. It is 38 m long and cost about $500,000

GALWAY, a county in the west of Ireland, in the province of Connaught, bounded north by Mayo and Roscommon; east by Roscommon, Offaly county and Tipperary; south by Clare and Galway bay, and west by the Atlantic ocean. With an area of 1,467,850 ac., the county is second in size to Cork among Irish counties To the east of Lough Corrib the surface rests on a limestone base and has extensive bogs Its southern portion is partly a continuation of the Golden Vale of Limerick and partly occupied by the Slieve Aughty mountains (highest points *c* 1,200–1,250 ft.) in which Silurian and Devonian rocks appear A broad mass of ice-worn gneiss and granite lies west of Lough Corrib, and its steep edge towards Galway bay suggests an east to west line of fracture Quartzites, associated with limestone and mica-schist stand out in the Twelve Bens or Pins (highest point, 2,395 ft.). The coast is much indented and studded with islands, providing safe anchorages for fishing vessels

The Suck, which forms the eastern boundary of the county, rises in Roscommon, and passing by Ballinasloe, unites with the Shannon at Shannonbridge. The Shannon forms the south-eastern boundary of the county, and passing Shannon Harbour, Banagher, Meelick and Portumna, swells into the great expanse of water called Lough Derg, which skirts the county as far as the village of Mount Shannon The Clare flows southward through the centre of the county, and enters Lough Corrib 4 m above the town of Galway The Ballynahinch, one of the best salmon-fishing rivers in Connaught, rises in the Twelve Pins, passes through Ballynahinch lake, and enters Bertraghboy bay Lough Corrib extends from Galway town northwards over 30,000 ac., with a short of 5om in extent, and is studded with islands, some of them inhabited. The district west of Lough Corrib contains many lakes, about 25 of them more than a mile in length. There are also several low tracts, called turloughs, which are covered with water during a great part of the year

History.—Galway was made a county about 1579 by Sir Henry Sydney, lord deputy of Ireland The round tower at Kilmacduagh is 112ft. high, leaning considerably out of the perpendicular. Raths or encampments are numerous, and several cromlechs are in good preservation Knockmoy abbey, about 6m from Tuam, probably founded in 1180 by Cathal O'Connor, was adorned with fresco paintings, valuable as representations of ancient Irish costumes. Castles and square towers of the Anglo-Norman settlers are numerous The castle of Tuam was built in 1161 by Roderick O'Connor, king of Ireland, at the period of the English invasion. The small church of Clonfert, with a Romanesque doorway, is a cathedral, the diocese of which was united with Kilfenora, Kilmacduagh and Killaloe in 1833.

Climate and Industries.—The climate is mild, but violent westerly winds are common. Frost or snow seldom remains long on the western coast, and cattle continue unhoused during the winter. The eastern part of the county produces the best wheat Oats are frequently sown after potatoes in moorland soils The flat shores of the bays afford large supplies of seaweed for manure. Limestone, gravel and marl are to be had in most other parts. When manure for potatoes is scarce the usual practice is to pare and burn the surface. In many places on the seashore early potatoes are raised in deep sea-sand manured with seaweed, and the crop is succeeded by barley Sheep-walks occupy a very large tract between Monivea and Galway and between Athenry and Kinvarra Pigs and poultry are extensively reared, but a large area is quite barren

Manufactures are controlled by local demand Coarse friezes, flannels and blankets are made in all parts and sold largely in Galway and Loughrea Connemara is noted for hand-knit woollen stockings Coarse linen called bandle linen is also made Galway and Clifden are centres of the fishing industry Black marble is quarried near Galway and red marble is worked at Shantallow. Leenane, at the head of Killary harbour, Renvyle House at its entrance, Letterfrack on Ballynakill bay, Streamstown and Clifden, and Cashel on Bertraghboy bay are fishing villages much frequented by tourists Recess, near Lough Derryclare, and Ballynahinch, on the lough of that name, are inland tourist centres

The population of Galway county in 1926 was 169,311 Ballinasloe and Galway are urban districts and Loughrea and Tuam are towns The county returns nine members to Dáil Eireann

GALWAY, a seaport and county town of Co Galway, Ireland, on the north shore of Galway bay, and on the Great Southern railway Pop of urban district (1926), 13,255 After the building of its walls (*c* 1270) it developed commercially Richard II's charter of incorporation, confirmed by Henry IV., was extended in 1545 to give the port jurisdiction over the Aran islands, and to permit exportation of all goods other than linens and woollens A charter from James I formed the town and the land within a radius of 2 m into a county During the Civil Wars of 1641, the town surrendered to the Parliamentary forces The inhabitants were dispersed and their property given to adventurers and soldiers During the campaigns of William III., the town was again captured

Lynch's Castle is Spanish in style, with a square central court St Nicholas church, a cruciform building founded in 1320, was collegiate from 1484 until 1840, and Edward VI created the Royal College of Galway in connection with it There are remains of a Franciscan friary founded in 1296, and the town is the seat of a Roman Catholic diocese University college, a quadrangular building in Tudor-Gothic style, was founded as Queen's college under an act of 1845, and its name was changed when it received a new charter in 1908

Claddagh, a suburb, is engaged in sea and salmon fisheries The harbour is connected with Lough Corrib The chief exports are wool, agricultural produce and black marble, polished locally Other establishments are corn-mills, iron-foundries, distilleries, and brush and bag factories.

GAMA, VASCO DA (*c* 1460–1524), Portuguese navigator and discoverer of the sea-route to India, was born at Sines, a small seaport in the province of Alemtejo, probably about the year 1460. In that year died Prince Henry the Navigator, to whose intelligence and foresight must be traced back all the fame that Portugal gained on the seas in the 15th and 16th centuries Explorers sent out at his instigation discovered the Azores and unknown regions on the African coast, whence continually came reports of a great monarch, "who lived east of Benin, 350 leagues in the interior, and who held both temporal and spiritual dominion over all the neighbouring kings." John II. of Portugal resolved that the attempt should be made to reach the country of this potentate, and nine years later, when Emanuel I had succeeded to the throne, preparations for the voyage were completed

For the supreme command of this expedition the king selected Vasco da Gama, who had in his youth fought in the wars against Castile, and had gained distinction as an intrepid mariner. The fleet, consisting of four vessels specially built for this mission, sailed down the Tagus on July 9, 1497, after prayers and confession made by the officers and crews in a small chapel on the site where now stands the church of S. Maria de Belem (*see* LISBON), afterwards built to commemorate the event. Four months later the flotilla cast anchor in St. Helena Bay, South Africa, rounded the

Cape in safety, and in the beginning of the next year reached Malindi, on the east coast of Africa. Thence, steering eastward, under the direction of a pilot obtained from Indian merchants met with at this port, da Gama arrived at Calicut, on the Malabar coast, on May 20, 1498, and set up, according to the custom of his country, a marble pillar as a mark of conquest and a proof of his discovery of India. His reception by the zamorin, or Hindu ruler of Calicut, would probably have been favourable enough, but for the jealousy of the Mahommedan traders who incited the Hindus against the new-comers. Da Gama was unable to establish a Portuguese factory, and returned to Portugal in Sept 1499 The king received him with every mark of distinction, granted him the use of the prefix *Dom*, thus elevating him to the rank of an untitled noble, and conferred on him pensions and other property

In prosecution of da Gama's discoveries another fleet of thirteen ships was immediately sent out to India under Pedro Alvares Cabral, who, in sailing too far westward, by accident discovered Brazil, and on reaching his destination established a factory at Calicut The natives, again instigated by the Mahommedan merchants, rose up in arms and murdered all whom Cabral had left behind. To avenge this outrage a powerful armament of ten ships was fitted out at Lisbon, the command of which was at first given to Cabral, but was afterwards transferred to da Gama, who received the title admiral of India (Jan 1502) A few weeks later the fleet sailed, and on reaching Calicut da Gama immediately bombarded the town, treating its inhabitants with a savagery too horrible to describe From Calicut he proceeded in Nov to Cochin, "doing all the harm he could on the way to all that he found at sea," and having made favourable trading terms with it and with other towns on the coast, he returned to Lisbon in Sept 1503, with richly laden ships He and his captains were welcomed with great rejoicings and he received additional privileges and revenues

Soon after his return da Gama retired to his residence in Evora However he continued to advise King Emanuel I on matters connected with India and maritime policy up to 1505, and there are extant twelve documents dated 1507–22 which prove that he continued to enjoy the royal favour The most important of these is a grant dated Dec 1519 by which Vasco da Gama was created count of Vidigueira, with the extraordinary privileges of civil and criminal jurisdiction and ecclesiastical patronage During this time the Portuguese conquests increased in the East, and were presided over by successive viceroys The fifth of these was so unfortunate that da Gama was recalled from his seclusion by Emanuel's successor, John III., and nominated viceroy of India, an honour which in April 1524 he left Lisbon to assume Arriving at Goa during Sept of the same year, he immediately set himself to correct abuses, but he died on Dec 24, at Cochin. His voyage opened up the commerce of the East to the Western world

Bibliography—*Vasco da Gama's First Voyage*, by Dr E. Ravenstein (London, Hakluyt Society, 1898, is a translation with notes, etc, of the anonymous *Roteiro* (Journal or Itinerary), written by one of Vasco da Gama's subordinates who sailed on board the "S Raphael," which was commanded by the admiral's brother Paulo da Gama This is the most important of the original authorities, five accounts of the voyage in letters contemporary with it are appended to the Hakluyt Society's translation. *See* also J. de Barros, *Decadas da India* (Lisbon, 1778–88, written *c.* 1540), F L de Castanheda, *Historia do descobrimento da India* (Coimbra, 1551, largely based on the *Roteiro*); *The Three Voyages of Vasco da Gama and his Viceroyalty*, by Gaspar Correa (Hakluyt Society, 1869), chiefly valuable for the events of 1524; *The Lusiads* of Camoens, the central incident in which is Vasco da Gama's first voyage, *Calcoen* (*i.e.*, *Calicut*), *a Dutch Narrative of the Second Voyage of Vasco da Gama*, written by some unknown seaman of the expedition, printed at Antwerp about 1504, reprinted in facsimile, with introduction and translation, by J. Ph. Berjeau (London, 1874); Thomé Lopes, narrative (1502) in vol. i. of Ramusio.

GAMALIEL. This name, which in Old Testament times figures only as that of a prince of the tribe of Manasseh (Num i. 10, etc.), was hereditary among the descendants of Hillel. Six persons bearing the name are known.

1. Gamaliel I., a grandson of Hillel, and like him designated the Elder, by which is apparently indicated that he was a member of the Sanhedrin. According to tradition Gamaliel succeeded his grandfather and his father as *Nāsī*, or president of the Sanhedrin. Though this tradition does not correspond with historic fact, and merely reflects later conditions after A.D. 70, it is at any rate certain that Gamaliel took a leading position in the Sanhedrin, and enjoyed the highest repute as teacher of the Law. He was the first to whose name was prefixed the title *Rabban* (Master, Teacher) It is related in Acts (v 34 *sqq.*) that he intervened in the Sanhedrin in favour of the Disciples of Jesus and in this connection he is referred to as a Pharisee of wide repute In the Mishna (*Gittin* iv. 1–3) he is spoken of as the author of certain legal ordinances affecting the welfare of the community. His function as a teacher is proved by the fact that the Apostle Paul boasts of having sat at the feet of Gamaliel (Acts xxii 3) Of his teaching, beyond the saying preserved in Aboth. i. 16, which enjoins the duty of study and of scrupulousness in the observance of religious ordinances, little is elsewhere preserved. His renown in later days is summed up in the words (Mishna, end of Sotah): "When Rabban Gamaliel the Elder died, regard for the Torah (the study of the Law) ceased, and purity and piety died"

2. Gamaliel II, grandson of Gamaliel I To distinguish him from the latter he is also called Gamaliel of Jabneh. In Jabneh (Jamnia), where during the siege of Jerusalem the scribes of the school of Hillel had taken refuge by permission of Vespasian, a new centre of Judaism arose under the leadership of the aged Johanan ben Zakkai, a school whose members inherited the authority of the Sanhedrin of Jerusalem. Gamaliel II became Johanan ben Zakkai's successor, and rendered immense service in the strengthening and reintegration of Judaism, which had been deprived of its former basis by the destruction of the Temple and by the entire loss of its political autonomy. He put an end to the division which had arisen between the spiritual leaders of Palestinian Judaism by the separation of the scribes into the two schools called respectively after Hillel and Shammai. Gamaliel was recognized by the Roman Government as Patriarch He devoted special attention to the regulation of the rite of prayer, which after the cessation of sacrificial worship had become all-important He gave the principal prayer, consisting of eighteen benedictions, its final revision, and declared it every Israelite's duty to recite it three times daily. He died before the insurrections under Trajan. His son, Simon, long after his father's death and after the persecutions under Hadrian, inherited his office, which thenceforward his descendants handed on from father to son.

3 Gamaliel III, son of Jehuda I, the redactor of the Mishna, and his successor as Nāsī (Patriarch) The redaction of the Mishna was completed under him, and some of his sayings are incorporated therein (Aboth ii. 2–4). Gamaliel III. lived during the first half of the third century

4 Gamaliel IV, grandson of the above, patriarch in the latter half of the third century: about him very little is known.

5 Gamaliel V, son and successor of the Patriarch Hillel II: beyond his name nothing is known of him He lived in the latter half of the fourth century

6. Gamaliel VI., grandson of the above, the last of the patriarchs, died in 425 (W Ba.; G. H. B.)

GAMBETTA, LÉON (1838–1882), French statesman, was born at Cahors on April 2, 1838. In his sixteenth year young Gambetta lost by an accident the sight of his left eye, which eventually had to be removed. Notwithstanding this privation, he highly distinguished himself at the public school of Cahors, and in 1857 proceeded to Paris to study law. His southern vehemence gave him great influence among the students of the Quartier Latin, and he was soon known as an inveterate enemy of the imperial government. He was called to the bar in 1859. In 1868 he defended the journalist Delescluze, prosecuted for having promoted the erection of a monument to Baudin, who was killed in resisting the *coup d'état* of 1851. Gambetta seized his opportunity and assailed both the *coup d'état* and the government with an eloquence of invective which made him immediately famous.

In May 1869 he was returned to the Assembly, both by the first circumscription of Paris and by Marseilles, defeating Hippolyte Carnot for the former constituency and Thiers and Lesseps for the latter. He elected to sit for Marseilles, and lost no oppor-

tunity of attacking the Empire in the Assembly. He was at first opposed to the war with Germany, but when it had become inevitable, he threw himself with all his energy into the work of national defence After Sedan Gambetta himself proclaimed the fall of the emperor at the *corps législatif*, and the establishment of the republic at the *hôtel de ville*. He was minister of the interior in the new government of national defence. He advised his colleagues to leave Paris and conduct the government from some provincial city. This advice was rejected from dread of another revolution in Paris, and a delegation to organize resistance in the provinces was despatched to Tours, but when this was seen to be inefficient Gambetta himself (Oct 7) quitted Paris in a balloon, and upon arriving at Tours took the supreme direction of affairs as minister of the interior and of war. Aided by M. de Freycinet, then a young officer of engineers, as his assistant secretary of war, he organized an army, which might possibly have effected the relief of Paris if Metz had held out, but after the surrender of Bazaine and the defeat of the French near Orleans early in December the seat of government had to be transferred to Bordeaux. When Paris surrendered at the end of January, Gambetta submitted to the capitulation concluded with Prince Bismarck. He immediately resigned his office. Elected by nine departments to the National Assembly meeting at Bordeaux (March 1, 1871) he chose to sit for Strasbourg, which by the terms of the treaty was to be ceded to Prussia, and when the treaty was adopted by the Assembly he resigned in protest and retired to Spain

He returned to France in June, was elected by three departments in July, and agitated for the definitive establishment of the Republic. His new journal, *La République française*, soon became the most influential in France. His orations at Bordeaux on his return, and at Grenoble on Nov. 26, 1872, in which he spoke of political power having passed to *les nouvelles couches sociales* showed him at the height of his oratorical powers. But in spite of his republican convictions Gambetta urged moderation on his supporters on the fall of Thiers and the accession to power of the conservative MacMahon His tact and parliamentary dexterity, no less than his eloquence, secured the voting of the constitution in Feb. 1875. This policy he continued during the early days of the now consolidated Republic, and gave it the appropriate name of "opportunism." It was not until May 4, 1877, when the peril from reactionary intrigues was notorious, and the clerical party had begun a campaign for the restoration of the temporal power of the pope, that he delivered his famous speech denouncing "clericalism" as "the enemy " On May 16 MacMahon perpetrated his parliamentary *coup d'état* in support of the clerical reactionaries and on Aug. 15, Gambetta, in a speech at Lille, gave him the alternative *se soumettre ou se démettre*. He roused the republican party throughout France in a campaign which culminated in a speech at Romans (Sept 18, 1878) formulating its programme MacMahon had no choice but to dismiss his advisers and form a moderate republican ministry under the premiership of Dufaure.

After the abdication of MacMahon, Gambetta declined to become a candidate for the presidency, but gave his support to Grévy; nor did he attempt to form a ministry, but accepted the office of president of the chamber of deputies (Jan. 1879). This position did not prevent his occasionally descending from the presidential chair to make speeches, one of which, advocating an amnesty to the communards, was especially memorable. Although he really directed the policy of the various ministries, he maintained a neutral attitude as far as possible, but events hurried him on, and early in 1881 he placed himself at the head of a movement for restoring the *scrutin de liste* in place of *scrutin d'arrondissement*. A bill to re-establish *scrutin de liste* was passed by the Assembly on May 19, 1881, but rejected by the Senate on June 19.

Gambetta's supporters were in a large majority, and on the reassembling of the chamber, he formed a ministry—known as *Le Grand Ministère*. Every one suspected him of aiming at a dictatorship; attacks, not the less formidable for their injustice, were directed against him from all sides, and his cabinet fell on Jan. 26, 1882, after an existence of only sixty-six days. His declarations leave no doubt that he would have cultivated the British alliance and co-operated with Great Britain in Egypt; and when the Freycinet administration shrank from that enterprise only to see it undertaken with signal success by England alone, Gambetta's foresight was quickly justified. His fortunes were in the balance. At his house in Ville d'Avray, near Sèvres, on Nov. 27, 1882, he was shot in the hand by a revolver which accidentally went off. He died on Dec. 31, as the result of this accident.

REAL STATESMANSHIP

Gambetta rendered France three inestimable services: by preserving her self-respect through the gallantry of the resistance he organized during the German War, by his tact in persuading extreme partisans to accept a moderate Republic, and by his energy in overcoming the usurpation attempted by the advisers of MacMahon His death cut short a career which had given promise of still greater things, for he had real statesmanship in his conceptions of the future of his country, and a potent eloquence to secure their acceptance The romance of his life was his liaison with Léonie Léon (d. 1906), with whom Gambetta fell in love in 1871. Gambetta himself constantly urged her to marry him during this period, but she always refused, fearing to compromise his career, she remained, however, his confidante and intimate adviser in all his political plans The date of the marriage had been fixed, when the accident which caused his death occurred in her presence It is certain that there was no question of suicide. Their correspondence is of absorbing interest. But in various matters of detail the serious student of political history must be cautious in accepting her later recollections.

Gambetta's *Discours et plaidoyers politiques* were published by J. Reinach in 11 vols. (1881–86), his *Dépêches, circulaires, décrets . . .* in 2 vols (1886–91) The principal biographies are J. Reinach, *Léon Gambetta* (1884), *Gambetta orateur* (1884) and *Le Ministère Gambetta, histoire et doctrine* (1884), Neucastel, *Gambetta, sa vie, et ses idées politiques* (1885); J. Hanlon, *Gambetta* (1881), Dr Laborde, *Léon Gambetta, biographie psychologique* (1898); P. B. Gheusi, *Gambetta, Life and Letters* (Eng. trans by V M Montagu, 1910); P Deschanel, *Gambetta* (1919). *See* also G. Hanotaux, *Histoire de la France contemporaine* (1903, etc); H. Stannard, *Gambetta and the Foundations of the Third Republic* (1921). F Laur's *Le Coeur de Gambetta* (1907, Eng. trans, 1908) contains the correspondence with Léonie Léon; *see* also his articles on "Gambetta and Bismarck" in *The Times* of Aug 17 and 19, 1907, with the correspondence arising from them.

GAMBIA, the smallest and most northerly of the British West African dependencies It consists of a stretch of land on both sides of the Lower Gambia The colony, with the protectorate dependent upon it, has an area of approximately 4,000 sq.m. and a population (1921) of 210,530, an increase of 60,000 in ten years The colony proper has an area of about 69 sq miles The protectorate consists of a strip of land extending 10 km (about 6 m) on each side of the river to about 200 m in a direct line (250 m. by the river) from the sea The land outside these limits is French.

Physical Features.—The country derives its character and value from the river Gambia (*q.v.*), which is navigable throughout and beyond the limits of the protectorate. Away from the swamps by the river banks, the country is largely "bush." The region above McCarthy's island is hilly. The fauna includes a few maneless lions, a few elephants, leopards, several kinds of antelope, monkeys, bush-cow and wild boar. Hippopotami are found in the upper part of the river, and crocodiles abound in the creeks. The birds most common are bush-fowl, bustards, guinea fowl, quail, pigeon and sand-grouse. Bees are very numerous in parts of the country. The flora resembles that of West Africa generally, the mangrove being common. Mahogany and rosewood (*Pterocarpus erinaceus*) trees are found, though not in large numbers, and the rubber-vine and oil-palm are also comparatively scarce. There are many varieties of fern. The cassava (manioca) and indigo plants are indigenous.

The climate during the dry season (December–May) is considered fairly healthy for Europeans. The mean temperature at Bathurst is 77° F, the shade minimum being 56° and the solar maximum 165°. Up river the variation in temperature is even greater than at Bathurst, from 50° in the morning to 100°–104°

at 3 P.M. being common at McCarthy's isle The rainfall varies from 35 to 65 or more inches a year, the average is about 50 in. a year. Save for showers in May and June there is rarely any rain except between July and October. A very dry east wind known as the *harmattan* blows intermittently from December to March.

The inhabitants, who are both thrifty and industrious, are almost entirely of negro or negroid race, the chief tribes represented being the Mandingo (*q.v.*), the Jolof and the Jola Numbers of Fulani (*q.v.*) are also settled in the country Some four-fifths of the natives are Mohammedans Of the remainder, considerable numbers are converts to Christianity. The European residents are officials, traders or missionaries.

The capital, and the only town of any size in the Gambia, is Bathurst, pop. (1921) 9,227, including 265 Europeans (130 British). It is built on St. Mary's island, which lies at the mouth of the river, near its south bank, and is connected with the mainland by a bridge across Oyster creek Founded in 1816, it is named after the 3rd earl of Bathurst, then Secretary of State for the Colonies Bathurst is a fairly well-built town, the chief material employed being red sandstone. It lies about 12 to 14 ft above the level of the river The principal buildings face the sea. The market place is shaded by a fine avenue of bombax and other wide-spreading trees. A trading station called Georgetown is situated on McCarthy's island, but the chief up-river port is Kuntaur (150 m. from Bathurst) At Kuntaur ships drawing up to 17 ft can berth alongside. Albreda is a small port on the north bank of the river, near its mouth, of some historic interest.

Products and Trade.—Ground-nuts (*Arachis hypogaea*) are the staple product for export, and millet and rice are the staple food of the people The curing of hides, the catching and drying of fish, boat-building, and especially the weaving of cotton into cloths called *pagns*, are minor occupations. Formerly the principal exports besides slaves, were gold-dust, wax and hides, the gold being obtained from the Futa Jallon district, farther inland. Between 1830 and 1840 from 1,500 to 2,000 oz of gold were exported annually, but shipments ceased soon afterwards, though small quantities of gold-dust can still be obtained from native goldsmiths. The cultivation of the ground-nut, first exported in 1830, assumed importance by 1837, and by 1850 had become the chief industry of the country. Nearly the whole male population is engaged in it for eight months of the year Planted in June, after the early rains, the crop is reaped in the months of October or November Owing to the efforts of the Agricultural Department, established in 1924, the quality and the quantity of the nuts exported from the Gambia increased, the output in 1927 being about 70,000 tons as against some 40,000 tons in 1907 Apart from ground-nuts the agricultural resources are little developed, and food crops have often to be imported

Surrounded, save seaward, by French territory, the Gambia is dependent upon its own resources, for while there is some entrepôt trade, the French, in general, prefer to send their exports to their own ports rather than use the fine highway provided by the river Gambia As it is, a good proportion of the trade is with France, which before the World War took some 75% of the ground-nuts exported The nuts were sent to Marseilles for the extraction of the oil, which found its way to markets as "olive" oil. During the war the nuts went to England; since 1925 they have gone in fairly equal proportions to England, France and Holland. The oil now forms a main ingredient of margarine The other exports include palm-nuts and hides, but are almost negligible. The chief imports are cotton goods (from England), kola-nuts (from Sierra Leone), rice, sugar and tobacco The volume of trade had risen from about £600,000 annually in the period 1898–1907 to some £1,500,000 in 1914. There was an abnormal increase during and immediately after the war (in 1920 the volume of trade was nearly £5,000,000) In 1923, which may be regarded as a normal year, the volume of trade exceeded £1,710,000. In 1927 the value of exports was £999,000 and of the total the ground-nuts were worth £967,000. In the same year the value of imports was £863,000. The balance of exports over imports in the decade 1916–26 averaged £140,000 yearly. Shipping is chiefly British (771,000 tons in 1926 out of a total of 1,255,000 tons), with French and German ships next in order.

Administration and Revenue.—The Gambia is governed on Crown Colony lines, with a nominated legislative council including unofficial members. Education is almost wholly in the hands of Christian missions, which receive small grants; there is a school for Mohammedans at Bathurst very largely supported by the Government The protectorate is divided into five provinces, with an official, styled "travelling commissioner," in each Native law courts are established, from them appeals may be made to the supreme court at Bathurst Between 60 and 70% of revenue is derived from customs duties, an export duty of 5s. a ton was first imposed on ground-nuts in 1862; the duty was raised in 1874 to 6s. 8d., and in 1920 to £1. A "yard" or hut tax, averaging 10d. a head, is levied in the protectorate. Revenue, which in 1906 for the first time exceeded £60,000, was in 1927, £252,000

HISTORY

The Portuguese visited the Gambia in the 15th century, and in the beginning of the 16th century were trading in the lower river Apart from a traffic in slaves their main object was to reach "the land of gold" supposed to be not far distant, and in fact considerable quantities of gold reached the lower Gambia from Bambara. It was on the initiative of Portuguese living in England that Queen Elizabeth, in 1588, granted a patent to "certain merchants of Exeter and others of the west parts and of London for a trade to the river of Senega and Gambia in Guinea" This company's operations led to no permanent settlement in the Gambia In 1618 James I granted a charter to "the Company of Adventurers of London trading into Africa," formed at the instigation of Sir Robert Rich, afterwards earl of Warwick, for trade with the Gambia and the Gold Coast This company sought to open up trade with Timbuktu, then believed to be a great mart for gold. Timbuktu was not reached, and the company's first agent, George Thompson, was murdered by natives after his ship, the "Catherine," had been seized and the crew murdered by Portuguese and half-castes Dutch traders now appeared and about 1660 a merchant named Vermuyden asserted that he had reached from the Gambia a country full of gold

The Company of Adventurers had built a fort near the mouth of the Gambia This was superseded in 1664 by a fort built by Captain (afterwards Admiral Sir Robert) Holmes on a small island 20m from the mouth of the river and named Fort James, in honour of the duke of York (James II.) This fort was built expressly to defend the British trade against the Dutch, and from that time the British remained in permanent occupation of one or more ports on the river In 1723 Captain Bartholomew Stibbs was sent out by the Royal African company, which had succeeded the earlier companies, to verify Vermuyden's reports of gold. He proceeded 60m above the Barraconda falls, but the land of gold was not found From the 17th century the French had been rivals for the trade of the Gambia, but the treaty of Versailles in 1783 assigned the trade in the river to Britain, reserving, however, Albreda for French trade, while it assigned the Senegal to France, with the reservation of the right of the British to trade at Portendic for gum This arrangement remained in force till 1857, when an exchange of possessions was effected and the lower Gambia became a purely British river In the period between the signing of the treaty of Versailles and 1885 the small territories which form the colony proper were acquired by purchase or cession from native kings. During this period the colony had gone through an economic crisis by the abolition of the slave trade (1807), which had been since 1662 its chief financial support. The beginning of a return to prosperity came in 1816 when some British traders, obliged to leave Senegal on the restoration of that country to France after the Napoleonic wars, founded a settlement on St. Mary's isle. From that year the existing colony, as distinct from trading on the river, dates. The Gambia witnessed many administrative changes. When the slave trade was abolished, it became dependent upon Sierra Leone; in 1843 it was made an independent colony, its first governor being Captain Henry Frowd Seagram, R.N In 1866 the Gambia became a portion of the officially styled "West African Settlements," but in 1888 it

regained, and has retained, a separate entity.

In 1870 negotiations were opened between France and Great Britain on the basis of a mutual exchange of territories in West Africa Suspended owing to the outbreak of the Franco-Prussian War the negotiations were resumed in 1876 "Definite proposals were at that time formulated by which the Gambia was to be exchanged for all posts held by France between the Rio Pongas (Pongo river, French Guinea) and the Gabun This would have been a comprehensive and intelligible arrangement, but so strong a feeling in opposition to any cession of British territory was manifested in parliament, and by various mercantile bodies, that the government of the day was unable to press the scheme" (Despatch of Lord Salisbury to the British ambassador to France, March 30, 1892) Nothing was done, however, to secure for the Gambia a suitable *hinterland*, the French pressed forward from Senegal and when the boundaries were settled by the Anglo-French agreement of Aug 10, 1889, Great Britain was able to secure only a ten-kilometre strip on either side of the river as far inland as Yarbatenda, a town situated at the limit of navigability of the Gambia from the sea By Art 5 of the Anglo-French convention of April 8, 1904, Yarbatenda was ceded to France, with the object of giving that country a port on the river accessible to sea-going merchantmen No use was made of this privilege, the French preferring to divert trade to their own ports Thus the Gambia has remained without access to the interior, an example of how political barriers can stifle the development of commerce

The people of the protectorate are in general prosperous and contented There was occasional trouble with slave-raiding chiefs; in particular with Fodi Silla who in 1894 ambushed a force under Capt. E H Gamble, R N, the British losing 15 killed and 47 wounded. Another slaver, Fodi Kabba, was also a thorn in the side of the Government With the co-operation of the French his stronghold (in French territory) was stormed and Fodi Kabba killed, March 1901. After that slave raiding ceased and the country enjoyed peace Provision was moreover made by an ordinance of 1906 for the extinction of slavery itself throughout the protectorate. The Gambia has been self-supporting since 1871 and has weathered various economic crises, such as that of 1922, for example, when the French five-franc piece—the usual currency—was demonetized at the cost of a whole year's revenue

See H F Reeve, *The Gambia* (1912), a monograph by a retired official, *The Gambia*, a British Foreign Office handbook (1920), and the Annual Reports issued by the Colonial Office, London (F R C)

GAMBIA, a large river of West Africa, and the only river of Africa navigable by ocean-going boats at all seasons for over 200 m from its mouth It rises in about 11° 25′ N and 12° 15′ W, within 150 m of the sea on the north-eastern escarpment of the Futa Jallon highlands Although the distance from the source to the mouth of the river is little more than 300 m in a direct line, the length of the stream owing to its serpentine course is about 1,000 m It flows first N N E, receiving many left-hand tributaries, but about 12° 35′ N takes a sharp bend N W and maintains this direction until it leaves the fertile and hilly region of Bondu The descent to the lower district is marked by the Barraconda rapids, formed by a ledge of rock stretching across the river. From the Barraconda rapids to the Atlantic the Gambia has a course of about 350 m Throughout this distance the waters are tidal At Yarbatenda, a few miles below Barraconda, the river has a breadth, even at the dry season, of over 300 ft, with a depth of 13 to 20 ft From the falls to McCarthy's island, a distance of 200 m, the river valley, which here presents a park-like appearance, is enclosed by low rocky hills of volcanic character For 50 m below the island, where the stream is about 800 yds. wide, the banks of the river are steep and thickly wooded They then become low and are fringed with mangrove swamps From Devil's Point, a sharp promotory on the north bank, the river widens and enters the Atlantic, in about 13½° N. and 16½° W, by a broad estuary. Near the mouth on the south side is St Mary's island (3½ m long by 1½ broad), and opposite is Barra Point, the river being here contracted to 2½ m. Eighteen miles lower down the distance from shore to shore is 27 m. There is a sand-bar at the entrance to the river, but at the lowest state of the tide there are 26 ft. of water over the bar. Vessels drawing 13 ft. can ascend to McCarthy's island and those drawing 6 ft to Barraconda all the year round The Gambia is in flood from November to June, when the Barraconda rapids can be passed by small boats, while above the rapids the stream is navigable for 160 m. Politically the Gambia is divided between Great Britain and France—Britain possessing both banks of the river up to, but not including, Yarbatenda

The Gambia was one of the rivers passed by Hanno the Carthaginian in his voyage along the west coast of Africa It was known to Ptolemy and the Arabian geographers, and was at one time supposed to be a mouth of the Nile, and, later (18th century), a branch of the Niger It was possibly visited by Genoese navigators in 1291, and was certainly discovered by the Portuguese *c* 1446, but was first explored for any distance from its mouth (1455) by the Venetian Alvise Cadamosto, who published an account of his travels at Vicenza in 1507 (*La Prima Navigazione per l'Oceano alle terre de' Negri della Bassa Ethiopia*) Afterwards the Gambia became a starting-place for explorers of the interior, among them Mungo Park, who began both his journeys (1795 and 1805) from this river It was not until 1818 that the sources of the Gambia were reached, the discovery being made by a Frenchman, Gaspard Mollien, who had travelled by way of the Senegal and Bondu The middle course of the river was explored in 1851 by R G MacDonnell, then governor of the Gambia colony, and in 1881 Dr V S Gouldsbury also navigated its middle course No native craft of any kind was seen above Barraconda

GAMBIER, JAMES GAMBIER, Baron (1756–1833), English admiral, was born on Oct 13, 1756, at the Bahamas, of which his father, John Gambier, was lieutenant-governor Family interest procured him rapid promotion in the navy, which he entered in 1767, and in 1778 he was raised to the rank of post-captain and appointed to the "Raleigh," in which he took part in the capture of Charlestown (1780) He commanded the "Defence" in the war of the French Revolution For his services in the battle of June 1 (1794) he received a gold medal and was made colonel of the marines, and the following year he became rear-admiral and a lord of the Admiralty From 1804 he remained at the Admiralty, with a short break in 1806, until 1807, when he was given command of the Baltic fleet, which in concert with Lord Cathcart's army enforced the surrender of the Danish navy. He received the thanks of Parliament, and was rewarded with a peerage

In 1808 he gave up his seat at the Admiralty on being appointed to the command of the Channel fleet In this capacity he missed the opportunity of destroying the French fleet in Basque roads, by failing to give effective support to Lord Cochrane Although he was acquitted on the charge of delay and neglect of duty by a partisan court-martial, his incompetence is undoubted He retained command of the Channel fleet for the full period of three years In 1814 he was made G C B. for his offices in negotiating a treaty of peace with the United States, and in 1830 was raised to the rank of fleet admiral He died on April 19, 1833 Although he was an upright man himself, Lord Gambier's membership of the Admiralty was marked by scandalous maladministration, and his command of the fleet in the Bay of Biscay was equally unfortunate

See the so-called *Memorials, Personal and Historical, of Admiral Lord Gambier* by Lady Chatterton (1861); *Minutes of a Court Martial, holden on board his Majesty's ship Gladiator on the Trial of Lord Gambier* (Portsmouth, 1809); J. Marshall, *Royal Naval Biography* (6 vol., 1823–35); J. Ralfe, *The Naval Biography of Great Britain* (4 vol, 1828); D. Cochrane, Lord Dundonald, *The Autobiography of a Seaman* (1890); and general history of the period.

GAMBOGE (găm-bōōj′) (from *Camboja*, a name of the district whence it is obtained), a gum-resin from *Garcinia Hanburii* (Nat. Ord Guttiferae), a dioecious tree with leathery, laurel-like leaves, small yellow flowers, and usually square-shaped and four-seeded fruit, indigenous to Cambodia and parts of Siam and the south of Cochin China, formerly comprised in Cambojan territory The juice, which when hardened constitutes gamboge, is contained in ducts in the middle layer of the bark, and from this

it is procured by making incisions, bamboo joints being placed to receive it as it exudes Gamboge occurs in commerce in cylindrical pieces, known as pipe or roll gamboge, and also, usually of inferior quality, in cakes or amorphous masses It is of a dirty orange externally; is hard and brittle, breaks with a conchoidal and reddish-yellow, glistening fracture, and affords a brilliant yellow powder, is odourless, and has a taste at first slight, but subsequently acrid, forms with water an emulsion, and consists of from 20 to 25% of gum soluble in water, and from 70 to 75% of a resin Its commonest adulterants are rice-flour and pulverized bark

Gamboge is a drastic hydragogue cathartic, less active only than croton oil and elaterium A small quantity is absorbed, adding a yellow ingredient to the urine and acting as a mild diuretic Its irritant action on the skin may cause the formation of pustules Gamboge is used as a pigment, and as a colouring matter for varnishes It appears to have been first brought into Europe by merchants from the East at the close of the 16th century.

GAMBREL ROOF, a roof in which, on each side of the ridge there are two slopes, the lower more steep, the upper less so, and which has gables at the end walls They are particularly characteristic of American colonial work in New England, New York and New Jersey, although found in many parts of the world The origin of their common use in America is not definitely known, and may be purely an independent invention in the effort to obtain greater head room in the attic or upper floor In the New England examples the slope of the lower portion approximates 60°, that of the upper portion varying from 30° to 40°, in places where Dutch influence was strong, the lower slope was more nearly 45°, and the upper about 30°, and frequently there was a large projection at the eaves In Europe the form occurs spasmodically in work of the 17th century and later throughout the Teutonic countries, especially in Scandinavia. There are also rare examples which may be seen in the south of England. (*See* ROOF)

GAMBRINUS, a mythical Flemish king who is credited with the first brewing of beer His name is usually derived from that of Jan Primus, *i e*, Jan (John) I, the victorious duke of Brabant (1261–94), who was president of the Brussels gild of brewers, his portrait with a foaming glass of ale in his hand had the place of honour in the gild-hall, and this led in time, it is suggested, to the myth of the beer king who is usually represented with a tankard in his hand



END OF NINTH VOLUME

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