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A RATIONAL ECONOMIC GEOGRAPHY

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By

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63 MAPS AND DIAGRAMS

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PREFACE

THIS book provides the essentials of a course on World Economic Geography, and is especially suitable for students preparing for commercial examinations such as that of the Royal Society of Arts, the London Chamber of Commerce, the Institute of Bankers, the Institute of Transport, and for the Endorsed Certificates in Commerce of the Board of Education.

The plan of this book is based on the idea of commerce as a piece of machinery which performs three main operations—the Production of Raw Materials, Manufacture, and Distribution. Geographical and human controls are emphasised throughout to explain the distribution of Man's economic activities: so the chief economic products are studied in connection with the major climatic and vegetation belts of the world and the regions in which they are produced; manufacturing industries, their raw materials, their processes, their markets, and their distribution in the industrial regions of the world are considered together; the study of distribution is based on the transport routes of the world and the movement of commodities from regions of supply to regions of demand. Facts are arranged very largely under headings to facilitate learning.

The assimilation of geographical facts is further assisted by the production of sketch-maps and diagrams. A large number of these are included, not only to illustrate the text but also to serve as a guide to the student as to the type of sketch-map most useful for examination purposes.

The authors wish to acknowledge their indebtedness to the following examining bodies for permission to include questions from their examination papers: The Institute of

Transport, The Royal Society of Arts, The London Chamber of Commerce.

In accordance with regulations we wish to state that the London County Council accepts no responsibility for any statements made herein.

G. H. FAIRS.

F. L. FOX.

PREFACE TO SECOND EDITION

AT a time when production in every field, and commerce, are determined by the needs of war, and Western Europe is territorially upset, it is not possible to make any satisfactory revision of the statistics or other material of this book.

In consequence the authors have been restricted to the correction of certain limitations of the first edition, to which attention was drawn by reviewers and others who have kindly offered their criticisms and opinions. To this end, in addition to minor corrections and modifications of statements, an appendix and an additional chapter have been added.

(a) An appendix on the Middle West of the U.S.A. has been added to complete the account of Temperate Grassland production and development.

(b) The other chapter treats the distribution of World Populations as the expression of the influence on man's life and work of those geographical and economic factors by which commerce is controlled.

G. H. FAIRS.

F. L. FOX.

October 1940.

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A RATIONAL ECONOMIC GEOGRAPHY

SECTION I

THE GEOGRAPHICAL CONTROLS

CHAPTER I

THE MACHINERY OF COMMERCE

THE work of the machinery of commerce may be divided into three main stages :

- (1) The Production of Raw Materials.
- (2) Manufacture or Industrial Production.
- (3) The Distribution of Commodities to the Market.

Geographical factors or controls, such as structure, relief, and climate play important parts in the work of this machinery, and before setting it in motion we must examine more closely the work of its three operations and their relation to the geographical controls.

THE PRODUCTION OF RAW MATERIALS

This first stage includes all the processes by which the various raw materials of commerce are obtained, such as the mining of minerals, the growth of plants, and the rearing of animals. Minerals, such as coal, iron, copper, lead, and zinc form the first class of raw materials. Coal is a raw material until it has been used to produce heat or power ; iron, copper, lead, and zinc are raw materials which have to be prepared by smelting before they can be used to produce machinery or sheeting or for whatever product they are

ultimately intended. Where and how the extraction of minerals is carried on will be determined by their distribution and the form in which they are found, which in turn depend on the relief and structure of the Earth's crust.

A second class of raw materials is that of vegetable origin. They may be textile raw materials such as flax, jute, cotton, and hemp, or food-stuffs such as wheat, maize, rice, and fruits. The growing of these products will be mainly determined by the combined influence of two factors : Climate and Soils.

The third class of raw materials is animal products. These may be raw materials such as wools, hides, skins, or horns, or food-stuffs such as meat and milk. Since the distribution of the animals from which they are obtained is determined by that of vegetation, climate and soil conditions will again be the controlling factors in their production.

MANUFACTURE

Manufacture forms the second stage in the machinery of commerce. In it the raw materials are manufactured into the form desired by the ultimate consumer or user. For instance, Cotton may be spun and woven and become a cotton shirt ; Iron may be smelted and converted into steel in the shape of a steel girder.

There are three factors essential to this stage. First of all, there is the need for some form of power to drive the machinery. It may be coal, oil, or water, but whatever its form its location is dependent either on earth structure or relief. Coal and oil are associated with particular rock formations, while water-power is only available where the relief causes a rapid fall of water.

Then comes the demand for supplies of raw materials. We have already seen that the production of all raw materials is determined by geographical factors. In some cases raw materials are produced near sources of power, and industries using these materials develop. The woollen industry of Yorkshire, using wool from the sheep of the Pennines and

moors, is an example. In other cases, where certain raw materials are in demand and cannot be produced locally, they are imported from regions which are suitable for their production. For instance, we import rubber from Malaya and cotton from the Southern States of the U.S.A.

Finally comes the need for people to do the work. The supply and cost of labour will depend to some extent on the ease with which food can be produced locally or obtained from other regions. Food is the raw material of labour, and where geographical conditions make it possible to produce food cheaply and abundantly, as in the Ganges Valley, the population will be dense and labour will be cheap and abundant. In contrast to this is Switzerland, where, because little food can be produced locally and much has to be imported at great expense, labour is comparatively sparse and dear.

Moreover, labour is not uniformly good, a fact which is largely due to climatic differences. Generally speaking, man in the cool temperate regions is vigorous, energetic, and progressive, while in the hot lands man is indolent and slow.

DISTRIBUTION OF COMMODITIES TO THE MARKET

The third stage of our machinery is that of distribution, by which raw materials reach the manufacturer and manufactured products reach their consumers or users. Let us explain this more fully. The coal, the iron ore, the wool, and the cotton which we talked of in the raw material stage are first of all distributed to the manufacturers. In their hands, the iron becomes a steel girder, the wool becomes a jersey, and the cotton becomes a shirt. These various products are then distributed to their final consumers; the steel girder goes to the engineer for the construction of a bridge, the woollen jersey to a football player, and the cotton shirt to a city worker.

This distribution of commodities is mainly the work of transport systems through, of course, the medium of shops and warehouses. The transport of commercial commodities

is as yet restricted to land and water. Transport on land either by railway or road is controlled mainly by factors of relief, since communications follow the lines of least resistance for reasons of cheapness and ease of construction. Transport by water also involves the consideration of geographical factors. Relief will determine the positions of harbours and the navigability of rivers, while climate may be an important control where seas and rivers are frozen or fogs impede the movements of ships.

We have now seen that geographical controls affect every turn of the machinery of commerce, so we must pass on to a review of these controls and a more detailed study of the part they play.

CHAPTER II

THE PART PLAYED BY STRUCTURE AND RELIEF IN THE MACHINERY OF COMMERCE

THE structure and surface features of the Earth are both important in promoting or retarding the working of our machinery of commerce. We shall understand their influence best if we consider the part they play at each stage.

STRUCTURE AND RELIEF IN RAW MATERIAL PRODUCTION

(a) **Rocks and Mineral Wealth**

Rocks and minerals occur in definite associations. Most of the metallic minerals, such as gold, tin, and copper, occur as ores or in veins in the older and harder rocks. From these rocks, too, we also obtain important materials for building, such as granite and slates and marbles.

Coal and petroleum, the raw materials of industrial power, limestones and chalk, both important for cement manufacture, sands used in glassmaking, and clays, the raw material of bricks, are all examples of raw materials obtained from rocks of younger formation.

It should be remembered that structure not only determines the distribution of minerals and mining centres, but also the form in which they occur and therefore the methods which are employed to obtain them.

(b) **Soils and Vegetation**

Soil fertility is an important factor in the production of vegetation. Fertility depends not only on the quantity of plant foods which soils contain, but also upon their texture and depth. Some soils, such as alluvium, river-borne soil, and loëss, wind-borne soil, are very fine and particularly fertile

because they give up their plant foods very readily. Some soils, such as chalk and sands, are porous. These are light and easily worked, but usually support only the poorer types of grass. Soils in areas of old hard rock are thin and support nothing but heather and shallow-rooted poor grasses, fit only for sheep pastures. Wales, the Southern Uplands, and the Pennines are examples of areas where these conditions exist. Impervious soils, such as clays, are heavy, but retain their moisture near the surface and so are valuable in regions of light rainfall. Deep soils in plains and valleys are invariably fertile, and support either long grasses for cattle, cultivated crops, or forests. Some soils, such as alluvium, loëss, and loams, are especially important, not only because of their great fertility but also on account of their wide distribution.

STRUCTURE AND RELIEF IN INDUSTRIAL PRODUCTION

(a) Power

The most important factor in determining the position and growth of industrial production on a large scale is the supply of power for machinery.

Coal is as yet the most important source of industrial power. Owing to its large bulk and the heavy cost of transportation, it is usual to carry the raw materials to the coal. So we find that the most important industrial areas of the British Isles, Europe, and the U.S.A. have grown up on or in close proximity to coal-fields.

The Black Country (South Staffordshire field), Tyneside (Northumberland and Durham field), and Clydeside (Lanark field) are examples which are familiar to us all.

The location of many industrial centres was determined originally by the presence of a stream or river sufficiently swift to operate a water mill. These centres grew up on the river where the greatest amount of power could be developed, which was usually where the river dropped from its upper course in the highland to the plain.

The towns which have grown up along the line where

the rivers drop from the Piedmont Plateau to the Atlantic Coastal Plain of the U.S.A. are excellent examples of industrial centres of this class. Further examples are provided by many of the pulp and sawmills centres of Canada which have grown up at the foot of falls. Ottawa (Chaudière Falls) and Grand Mere (falls of river St. Maurice) are just two examples.

The woollen centres of Yorkshire and the Southern Uplands are other examples, and in the U.S.A. Minneapolis and St. Paul, at the foot of the St. Anthony Falls, became important flour centres where power from water was available for milling.

(b) **Water Supplies**

In some industries a plentiful supply of water or a supply of water with particular qualities is needed, and these industries have developed on rivers where such supplies are available. The woollen industry of Yorkshire which has centred round the streams of the Central Pennines is an example. The streams in this section are free from lime, and so provide water which is soft and fit for wool washing. Flax retting, brewing, dyeing, and bleaching are other industries which require supplies of water with particular qualities. The paper industry is one that demands not only pure water but also large supplies of it, hence the location of paper mills near rivers, such as the British Paper Mills at Dartford (Kent) on the river Dart.

RELIEF AND DISTRIBUTION

(a) **Land Transport**

Railways and roads, the principal channels by which commodities are distributed, are constructed over plains, along valleys, and through gaps and passes in order to avoid steep gradients and other obstacles of relief which cause construction to be difficult and running costs to be heavy.

If we examine our maps we shall find a wealth of examples, but here we must content ourselves with a few prominent

illustrations. The great links between Western and Eastern Europe lie across the great European Plain of the north; the routes into Scotland from England follow the east and west coast plains and the river valleys; the main routes across the Pennines follow the Tyne and Aire gaps; the transcontinental railways of Canada cross the Rockies by passes—the Crow's Nest, Kicking Horse, and Yellowhead passes.

(b) Market Centres

Where routes naturally converge, market centres grow up as the half-way houses of distribution where commodities are collected from their producers, exchanged, and distributed to their markets. The number of towns which owe their position and existence to being at the focus of routes and therefore market towns is enormous. Carlisle, Vienna, Winnipeg, Chicago are examples of such market centres.

(c) Sea Routes

Sea routes are not controlled by relief in the same way that land routes are, but if we examine a map of the world's shipping routes we shall discover many examples of relief control. For example, we find that ships focus at the great ship canals—the Suez and the Panama—and we must remember that their positions were determined by the existence of the narrow isthmuses through which they were cut. Similarly, straits and channels such as the Straits of Malacca and the English Channel cause a focusing of ship routes. Yet another example is the meeting of ship routes at the cross-roads of the oceans, such as Colombo in Ceylon (Fig. 14) and the Hawaiian Islands in the Pacific. Finally we must remember in this connection the part played by the position of ports and their importance as distributing centres.

(d) Seaports

(1) *Domestic Seaports* are the gateways to, and the outlets of, production regions. The region thus served by a port is

known as a Hinterland. For example, San Francisco serves the rich Californian Valley, Liverpool serves the Lancashire industrial region, and Calcutta serves the Ganges Basin. The actual position of ports depends on two important factors—the existence of a natural harbour and ease of communication with its hinterland.

Where, however, no natural harbour exists it may be necessary to build an artificial harbour in order to provide an outlet for a producing region. Madras in India and Takoradi on the Gold Coast both have artificially constructed harbours.

(2) *Outports*.—The growth in the size of ocean-going vessels has meant that certain ports are now inaccessible and that new ports nearer the sea have grown up to deal with the trade of the old port. These new ports are called outports. Examples are Havre for Rouen, Avonmouth for Bristol, and Bremerhaven for Bremen.

(3) *Entrepôt Ports*.—These ports are like the market centres of the land routes and grow up at the cross-roads of ocean routes or at the meeting-point of important trade routes. They are collecting centres to which the trade of smaller ports is sent and in turn distributing centres from which products are distributed by minor routes to smaller ports. Their traffic is always in transit. Generally such ports are refuelling centres and have facilities such as floating docks for ship repairs. Singapore and Port Said are two outstanding examples.

CHAPTER III

THE INFLUENCE OF CLIMATE ON THE MACHINERY OF COMMERCE

CLIMATE AND THE PRODUCTION OF RAW MATERIALS

CLIMATE plays no part in the distribution of minerals and little part in their exploitation, but together with soil fertility regulates the production of all raw materials derived from plants or from animals that feed on plants. As all soils are more or less fertile, and fertility may be increased artificially, climate, that is the distribution of heat and moisture, is the most important factor.

Heat, modified by such local factors as winds, altitude, and the influence of the sea, decreases on the whole from Equator to Pole, and its distribution allows a broad division of the world into tropical (hot) regions and temperate regions. Within both of these broad belts we find forests, grass, and cultivated vegetation, the distribution of which depends largely on moisture, the amount and season of the rainfall, but the character of which depends on the combined influence of heat and moisture. In other words, we have tropical forests and temperate forests, tropical and temperate grasslands, tropical and temperate crops, all with different characteristics and yielding a wide range of commercial products.

Forests and their Products

(a) *Tropical Forests*.—These include the forests of the Equatorial areas, the Monsoon lands, and other regions within the Tropics. These forests yield supplies of hard timbers such as mahogany, ebony, and teak, dye-stuffs such as logwood, many tanning materials, and resins such as rubber and copal.

(b) *Temperate Forests*.—These include the deciduous forest, from which some hard woods such as oak are obtained, and the coniferous forest, which is the main source of the world's soft timber supplies. Resins yielding turpentine and others, such as the kauri gum of New Zealand, are other products.

Grasslands and their Products

(a) *The Tropical or Hot Grasslands*.—These grasslands, to which we give the name of Savannas, occur in the broad belts on either side of the Equatorial forests, where summer convectional rains occur. The great heat and rainfall of summer foster a rapid growth of long but coarse grasses which wither in late summer and early autumn.

These lands are primarily cattle lands, but their high summer temperatures and moderate rainfall favour also the growth of crops such as cotton and maize.

(b) *The Temperate Grasslands*.—These grasslands occur in the regions of continental summer rains in the centres of continents. The Prairies of North America, the Pampas of South America, the Steppes of Europe and Asia, the Veld of South Africa, and the Murray Darling basin of Australia are the principal areas.

Primarily important for cattle and sheep, yielding meat, hides, skins, and wool, these lands have become important cereal-growing areas where efficient communications have been established.

Cultivated Products

Many cultivated crops thrive under a wide range of climate conditions. Wheat, for instance, is mainly grown in the temperate belt, but also thrives in hot regions such as India and Egypt, where the winters are sufficiently cool to allow its growth during that season. Again, maize is mainly a temperate crop but grows throughout the Tropics. No detailed or rigid classification of crops is therefore possible, but in the tables below crops are entered in the climate belt

in which they are produced on a large scale for commerce. Where important overlaps occur they are shown.

	Cereals.	Fruits.	Other Foods.	Raw Materials.
Temperate Crops.	Rye. Oats. Barley. Wheat.	Apples. Pears. Cherries. Plums. — Lemons. Grapes. Grape Fruits. Currants.	Sugar Beet. Potatoes. Hops. —	Flax. Hemp. Silk. —
	Maize.		Dates. Tea.	Tobacco. Cotton.
Tropical Crops.	Millet. Rice.	Pine-apples. Bananas. Coco-nut.	Coffee. Sugar Cane.	Hemps. Jute. Ground Nuts. Rubber.

CLIMATE AND MANUFACTURE

The development and localization of manufacturing industries usually result not from one but from a number of factors, but in some, as in the following examples, we see the predominating influence of the climatic factor.

The widespread manufacture of cotton cloth as a domestic craft in India resulted in the first place from the demand for a material which was sufficiently light to be worn in the hot climate conditions of India. Along with this old domestic industry there now exists the modern cotton mills, whose situations have been determined mainly by a climate factor of a different kind. The dry vegetable fibres of cotton break if they are spun and stretched in a dry atmosphere. So we find that Bombay, with over 80" of rain per year, has become an important manufacturing centre, while Karachi, with equally good facilities for obtaining raw materials but with

only 10" of rain per year, does very little manufacture because the resulting dryness of the atmosphere does not make successful spinning possible.

The localization of the cotton industry around Manchester and Glasgow and the humid atmosphere of these regions on the west facing the moisture-laden westerlies from the Atlantic, is another example of the same climatic factor.

Switzerland provides us with another type of climatic control. Many of the manufacturing industries of Switzerland began as home industries with which the people occupied themselves during the hard period of the winter when snow and frost brought outdoor activities to a standstill. It is interesting to notice that these home industries demanded a high standard of skill which, increased by an efficient system of technical education, still remains an important feature of such Swiss industries as the manufacture of watches, clocks, silks, and embroideries.

CLIMATE AND DISTRIBUTION

Climate is an important controlling factor in the exchange of all commodities except minerals, because, as we have seen, it determines the source of all plant and animal raw materials, and furthermore it influences very largely the kind of manufactured goods which producers of raw materials will require in exchange. Let us take some concrete examples.

Nigeria produces palm oil, which is exported to Great Britain for soap and margarine manufacture. The hot climate is the main factor which controls the production of the palm oil, and the same factor also creates a demand for cotton cloth from Lancashire for clothing. In contrast to this we get our supplies of soft coniferous timbers from Scandinavia and the Baltic lands, where the cold climate favours their growth and also creates a demand for warm clothing such as woollens from our Yorkshire mills.

But the actual means and routes of distribution are in many cases also determined by climate conditions. Frozen seas and rivers are an obvious example. The fact that the

rivers Lena and Yenisei of Siberia are frozen in winter, flooded in summer, and flow north to a frozen sea created the need for an east-to-west trade channel—the Trans-Siberian Railway. Ice restricts the use of the Hudson Bay route for Canadian grain export to a few months in the year. The frozen St. Lawrence makes Montreal inaccessible for about four months in the year, and makes it necessary for ships to use the port of Halifax in Nova Scotia, which is always ice-free. These are but isolated examples of the climatic factor, but wind, snow, and others may be equally important.

In the days of sailing ships, trade routes were determined by wind systems, and even to-day the movement of Arab traders to and from Zanzibar in sailing vessels is controlled by the monsoons of the Indian Ocean.

Heavy snowfalls and frozen surfaces may block or impede railway and other means of communication, and in some cases may involve the use of specially adapted means of transport. The use of snow sledges in Russia and the timber sledges of Canada are examples.

CHAPTER IV

THE HUMAN CONTROLS

THE geographical controls, Relief and Climate, which we have considered, cannot be materially altered by man, but man can considerably modify their effect or turn them to his own advantage.

Mountains will always exist; the Tropics will always be the Tropics; deserts will always be deserts. Man has, however, found the means of making mountains less effective as barriers to the movement of peoples and trade, of utilizing the conditions of the Tropics for the production of commercial commodities, and on a small scale of combating the aridity of the desert by irrigation. Bananas and cotton cannot grow in England under natural conditions, nor can man modify our climate conditions to make this possible. Their production must always be limited to those regions where the necessary climate conditions do exist, but man, however, can secure better crops and larger harvests by such means as the scientific planting and treatment of the plants and careful cultivation of the soil. In short, man has no real mastery over natural conditions, but has introduced many artificial means of making the best possible use of them, and of overcoming some of the disadvantages which they would naturally impose upon him.

In this chapter we shall consider some of the more important ways in which man controls or modifies his natural conditions.

THE HUMAN CONTROL AND SURFACE FEATURES

(a) The Use of Fertilizers

The use of artificial manures or fertilizers to increase the fertility and productivity of the soil has become an important

feature of all agricultural systems in areas of dense populations where it is necessary to obtain the maximum crop production from the land. By research, the chemical composition of the foods which different plants withdraw from the soil has been discovered. These plant foods may be artificially restored or even increased by the sowing of nitrates, phosphates, sulphates, and a variety of chemical manures so that the productivity of the soil may not only be maintained but even increased.

(b) **Terrace Cultivation**

Terracing is a system of agriculture adopted to increase the area under cultivation in countries where the plain land is limited and large populations create enormous demands for food. This system involves the cutting of terraces in the hill-slopes in order to make cultivation and irrigation possible. Much of the tea of Japan is grown on the hill-terraces, while in the basin of Sechwan in the Upper Valley of the Yang-tze Kiang in China cultivation of crops is carried on by this method to a height of several thousand feet above sea-level, the type of product varying with the elevation.

(c) **Communications**

It is, however, in communications where the most obvious results of man's work are to be seen.

Tunnels carry railways and roads through mountains and under rivers. The mountain barrier of the Alps in Europe has been pierced by a series of tunnels of which the St. Gothard, the Lotschberg (both over 9 miles long), and the Simplon are the most important. The Severn and Mersey tunnels, and the Blackwall tunnel under the Thames, all carry transport under wide rivers and are examples with which we are familiar.

Rack-rail railways carry trains over high mountains. If the principle of the rack-rail and centre cog-wheel has not actually made possible railway transport over steep gradients it has at least made it much safer. Many of the Swiss railways

and that part of the transcontinental railway from Buenos Aires to Valparaiso which passes over the high Andes have been constructed on this principle.

Bridges, train-ferries, and causeways carry railways over rivers, straits, and inland seas. Many examples of each of these will occur to us. There is the great Forth Bridge crossing the wide estuary of the Forth, and the Menai tubular bridge linking North Wales to the packet station of Holyhead. Train-ferries are large boats on to which trains may run and so continue their journeys without disturbing the cargoes which are being carried. Many examples of train-ferries exist, but one of the largest is the Harwich-Zeebrugge service, which is maintained by the London and North-Eastern Railway.

Causeways are akin to bridges and serve the same purpose. A good example exists in Utah, where the railway which formerly made a long and difficult detour round the north of the Great Salt Lake is now carried 31 miles over the lake, 20 miles by a causeway and the rest by a bridge.

THE HUMAN CONTROL AND CLIMATE

(a) Irrigation

The lack of natural supplies of moisture and rainfall necessary to make the soil productive is often supplied by artificial means to which we give the name of Irrigation. Many different methods of irrigation are practised in various parts of the world, but the two principal classes are :

- (1) The Flood or Inundation Canal System.
- (2) The Perennial Canal System.

(1) Flood Irrigation is, as its name implies, dependent on the annual flooding of the river from which at flood-time the water is carried by canals to the fields. It is obvious that this system must suffer from the disadvantage of supplies of water brought by the river being irregular: too little may mean famine; too much will mean destruction. It suffers, too, from the fact that water supplies are only available at one season of the year.

(2) **Perennial Irrigation**, that is, throughout the year, is made possible by the construction of dams to hold back water supplies which may be drawn off by canals at any time. By dams, too, floods may be controlled and supplies conserved for use in seasons when the water supplies are below normal.

(b) Dry Farming

Dry farming serves a similar purpose to that of Irrigation, but in a very different way. In some regions of Australia, Western U.S.A., and Western Canada, where the rainfall would normally be sufficient for crop production, much moisture is lost by the porosity of the soil or by evaporation. Dry farming, therefore, involves either making the surface soils less porous by an admixture of impervious material or providing the surface with a protective covering, often of stones, to prevent evaporation.

(c) Drainage

In contrast to dry-farming methods, many low-lying wet or even water-covered regions have been made productive by the drainage of surplus waters. In this way, the Polders of Holland, many of which have actually been reclaimed from the *Zuider Zee*, and the Fens of Eastern England, have been made important farming areas.

(d) Glass-Houses

There is as yet no control of temperature conditions, and the nearest approach made is the creation of artificial conditions of heat in hothouses, forcing-frames, and glass-houses. The enormous cost of building and maintaining the necessary machinery limits this system and restricts its use to the production of special or early fruits and flowers which will yield a very high price in the market.

The production of tomatoes in S.E. England and in Holland, of bulbs and flowers in Lincolnshire are some of many examples which will suggest themselves.

An interesting and recent illustration of man's ability

to make use of and modify natural conditions is the harnessing of Arctic winds in North Russia to generate electrical power with which to heat glass-houses for vegetable production.

With some knowledge of these geographical and human controls, let us pass on to the actual conditions and regions in which our raw materials are produced.

QUESTIONS

SECTION I

1. Write notes on the character and distribution of any three important types of soil.

2. Describe the chief sources of mechanical power with reference to their effect on the development of great centres of industry in the past and their possible effect in the future. (London Chamber of Commerce, 1934.)

3. Describe, with examples, the geographical conditions necessary for the growth of a great seaport. (London Chamber of Commerce, 1934.)

4. Illustrating your answers by sketch-maps, show the geographical conditions which have contributed to Carlisle and Winnipeg as market centres.

5. Name three types of forest and describe their general characteristics and the geographical conditions most favourable to the growth of each.

6. Explain these terms: Dry Farming, Perennial Irrigation, Terrace Agriculture.

SECTION II

THE PRODUCTION OF COMMERCIAL COMMODITIES

CHAPTER I

THE EQUATORIAL FOREST LANDS

1. Distribution

The Equatorial forest belt lies roughly between latitudes 8° N. and S. (Fig. 1). It covers the Amazon Basin in South

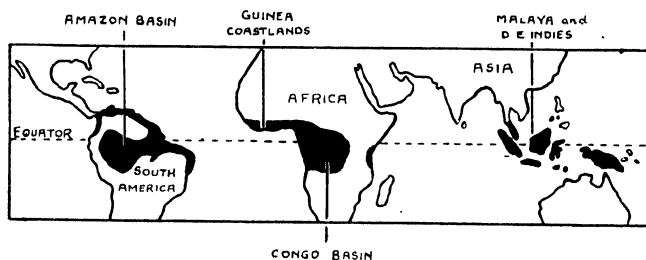


FIG. 1.—EQUATORIAL FOREST LANDS

America, the Congo Basin and the Guinea Coastlands in Africa, and most of Malaya and the Dutch East Indies in Asia.

2. Climate

The climate of these Equatorial lands has three important characteristics :

(a) Uniformly high temperatures throughout the year, with very small range either between season and season or day and night. The following figures are representative and illustrate these points :

	Jan.	July.	Range.	Rainfall.
Manaos (Amazon Basin) .	78°	78°	0°	86"
Lagos (Nigeria, West Africa)	77°	79°	2°	76"
Singapore (Malaya) . .	78°	82°	4°	98"

(b) Rain at all seasons, with two maxima at the Equinoxes when the sun is overhead. These rains are convectional rains, and nearly everywhere the amount exceeds 80" per year (see Table above).

(c) A daily routine of early mists which begin to clear with the hot sun of the day. The heat increases in intensity, reaching its maximum at midday and causing rapid evaporation and the rising of moisture-laden air. Heavy rain clouds form, and rain falls in the late afternoon. The air then becomes clear, and the evening period is cool and refreshing.

3. Natural Vegetation

The "always hot, always wet" climate provides greenhouse conditions on a large natural scale, and produces very rank and luxuriant forest vegetation in which there is a continual struggle going on to reach light and air. Let us consider the general character of these forests:

(a) The trees are tall, their trunks unbranched, and their foliage is restricted to the tops near the light and air.

(b) The trees are very varied in character but are largely hardwoods.

(c) In South America, where the forest is very dense, climbers or lianes struggle upwards around the tree trunks, and with such parasites as tree ferns, interlace themselves in the foliage of the trees, forming a massive canopy of vegetation.

(d) In the Congo Basin and Asia the forest is less dense and allows more air and light to penetrate. The result is

a dense undergrowth, so dense in parts as to be almost impenetrable.

NATURAL CONDITIONS AND COMMERCIAL DEVELOPMENT

The climate and natural vegetation conditions, presenting as they do many difficulties, have determined the extent and character of the development of these lands, and these difficulties we must consider.

(a) The difficulty of exploiting natural products. The scattered nature and varied character of the trees, which supply the principal resources, make the collection of those of commercial value both difficult and expensive.

(b) The difficulty of clearing. The timbers are mainly hardwoods and are difficult to cut or burn. Moreover, clearings are difficult to maintain, owing to the rapid growth of ground vegetation and poor forest types.

(c) The labour difficulty. Such regions are mainly inhabited by backward and stunted races such as the Indians of the Amazon and the Pygmies of the Congo. Their wants being few and easily supplied from the forests, there is little inducement for them to work. Moreover, nothing can be done by white labour owing to the unfavourable climate conditions.

(d) The difficulty of communication. The dense undergrowth and the swampy nature of these areas make the building of roads and railways difficult and expensive, while the present smallness of the trade does not justify any great outlay of capital on communications.

It is important to remember, however, that these forest lands are rich storehouses of food-stuffs and raw materials for the great industrial areas of the temperate zones. Indeed, so important are they that their development is now mainly in the hands of the white man. When successfully cleared and planted, these lands are very productive. It remains for this process of clearing and of establishing plantations to continue with the organization of the white man and the labour of the native.

IMPORTANT COMMERCIAL PRODUCTS

We have just seen that these lands are storehouses of food-stuffs and raw materials. It is important to know not only what these products are but also how they are produced and to what economic uses they can be put.

(a) *Timbers*.—There are vast reserves of beautiful hard timbers such as mahogany, ebony, and greenheart, but except in West Africa little is cut. The main reason is, as we have seen, that their collection is difficult, and transport over long distances is both difficult and expensive.

(b) *Rubber*.—Rubber is the latex or juice of a wide variety of trees. Its use in industry has been the result of the discovery of the process of vulcanization. In this process the rubber is mixed with sulphur and so rendered more elastic, less porous, and free from the stickiness of pure rubber.

It is extensively used in the motor-car industry for tyres and springs, for water pipes and hoses, machine belting and waterproof coverings of all kinds.

Ebonite or vulcanite is a product obtained by the mixture of a large percentage of sulphur and is used in the manufacture of chemical apparatus, combs, umbrella handles, and piano keys.

(c) *Cacao*.—The fruit of the cacao tree is a large pod, resembling a cucumber. The pods contain the cocoa beans which are sun-dried, roasted, husked, and split before becoming the cocoa-nibs with which we are familiar, and from which cocoa powder is prepared. Cocoa is important as a beverage and as chocolate in various forms of confectionery.

(d) *Vegetable Oils*.—From Africa we get palm oil, palm-kernel oil, and the oil of the shea butter nut. Palm oil is obtained from the fleshy pulp which covers the hard kernel of the nut, and, like the oil of the shea butter nut, is used extensively in soap and candlemaking. Palm-kernel oil is a finer product extracted from the kernel itself and used in margarine manufacture.

The coco-nut palm yielding coco-nut oil is widely grown in many tropical lands but is especially important in Asia. The oil is extracted from the copra, the dried flesh of the nut, and is used in margarine and soap manufacture.

(e) *Sugar*.—Like the coco-nut, sugar-cane grows in many tropical regions, and its growth is not limited to Equatorial lands.

The sugar-cane is a gigantic grass with a thick stem, the sap of which is rich in sugar. Two processes must be distinguished in its preparation for our use.

(1) Extracting the sugar from the cane. The canes are passed through heavy rollers, and the extracted juice is heated and then allowed to cool in shallow pans. The sugar crystallizes and a thick syrup called molasses is left. These molasses are used in the manufacture of cow-cakes.

(2) Refining the raw sugar. This involves the removal of impurities and colouring matter, and is usually done in the country of consumption. Treacle and golden syrup are important by-products of this second process.

From these general considerations we must pass on to a more detailed study of those regions of the world where these geographical conditions prevail, and these economic products are produced.

CHAPTER II

REGIONS OF THE EQUATORIAL FOREST LANDS

SELVAS OF SOUTH AMERICA

SELVAS is the name given to the dense Equatorial forests of South America. On the map (Fig. 2) study their distribution in relation to :

(a) The Amazon Basin, noting the extensions of the forests along the valleys of the main tributaries.

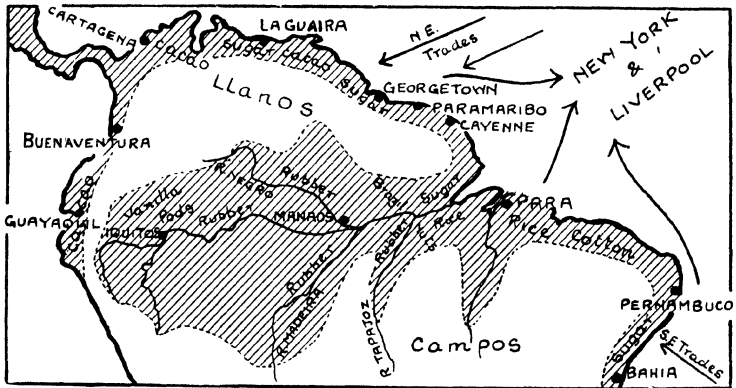


FIG. 2.—EQUATORIAL FOREST LANDS OF SOUTH AMERICA 

(b) The Coastal lands, noting the constant onshore winds which bring heavy rains to these regions.

(a) The Amazon Basin

The interior forests of the Amazon Basin present all the difficulties of collecting, clearing, labour, and transport which we found were the main factors retarding the general development of such lands.

The valleys of the main river and chief tributaries are

the only highways of transport, and the natural resources of the forest are principally exploited in these areas.

Rubber is a leading product, but now supplies only about 2 per cent. of the world's production. The Para rubber of commerce, now obtained chiefly from the plantations of Malaya, the Dutch East Indies and Ceylon, is native to Brazil, which was originally the chief source of world's supply. Apart from the rapid increase in plantation production in the Orient, there has been a decline in production in Brazil, resulting from wasteful methods of collection and the destruction of trees.

Vanilla pods (from which the essence used for flavouring is prepared), Brazil nuts, manioc (for tapioca), valuable timbers, and many dyewoods such as logwood, are other products of the interior forest land.

Para, at the mouth of the river Para, is the chief port, while Manaos, standing at the confluence of the Rio Negro and the Amazon, and Iquitos, are important river ports and collecting centres.

(b) The Coastal Lands

These lands are less densely forested, more accessible and so more developed. Much of the land has been cleared and plantations established for rice, sugar, cacao, and rubber. In the production of sugar, Brazil ranks first amongst the South American States and fifth in the list of world producers. British Guiana, formerly called Demerara, is the home of Demerara sugar and a smaller producer. The South American States account for more than 20 per cent. of the world's cacao supplies. Of the individual producers Brazil takes second place after the Gold Coast in world production, while Venezuela and Ecuador are smaller producers. Most of the South American production of cacao goes to the U.S.A., while that of West Africa comes mainly to Europe.

The rice plantations have been established chiefly as the result of Japanese enterprise and are worked mainly by Japanese labour.

The position of the following ports should be studied on Fig. 2 and a political map in the Atlas. Bahia and Pernambuco serve the eastern coastal lands of Brazil, Cayenne (Fr.), Georgetown (Br.), and Paramaribo (Dutch) are the ports for the Guianas. La Guaira is the chief port of Venezuela; Barranquilla and Cartagena are the ports on the north coast of Colombia, while Buenaventura is its principal Pacific port. Guayaquil is the port of Ecuador.

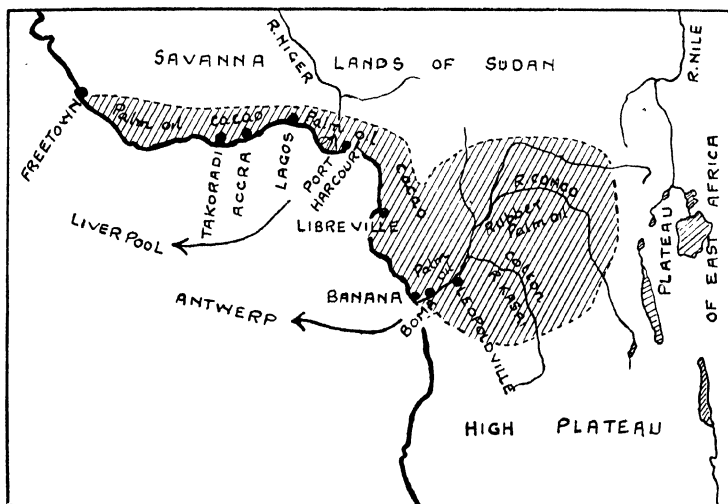


FIG. 3.—EQUATORIAL FOREST LANDS OF AFRICA

THE EQUATORIAL FOREST LANDS OF AFRICA

The Equatorial forest lands of Africa (Fig. 3) extend over :

- (a) The coastlands of the Gulf of Guinea.
- (b) The greater part of the Congo Basin.

(a) The Coastlands of the Gulf of Guinea

This area stretches from Sierra Leone on the west to the Cameroons on the east, and lies between the sandy coast on

the one hand and the edge of the high plateau on the other (see Fig. 3). The coast is sandy and surf-beaten, and approach to it is very difficult. The absence of any natural harbour from Freetown to Lagos was the reason for building artificial harbours such as Takoradi on the Gold Coast.

Temperatures are high throughout the year owing to the nearness of the region to the Equator, and although rain falls throughout the year, most falls in summer on account of the higher temperatures and the onshore S.W. monsoon.

In contrast to the undeveloped and very scantily populated Amazon Basin, this region has been considerably developed and produces a wide range of tropical products for the world's markets. Cacao is the leading product of this region, which in all produces about 60 per cent. of the world's supplies. Palm nuts, palm kernels, copra, and rubber are other products which are exported. Mahogany and small quantities of ebony are exported from Nigeria and the Gold Coast, which are well situated to supply the timber market of Great Britain.

Transport facilities are still very scanty, although railways have been built from the ports to the interior and roads for motor traffic have been made.

Britain has three important possessions along this coast. Sierra Leone on the west has a good port with a sheltered harbour at Freetown from which a short railway runs to the interior. The Gold Coast, which ranks first in the world's producers of cacao, is still important for its gold, which ranks second in its list of exports. Railways run from Accra, the capital, and Sekondi to Kumasi in the interior. Takoradi, the artificially constructed port, will in the future become the chief trade centre of the colony. Nigeria, the largest and most important colony, has two ports. One is Lagos, from which the railway runs north to Kano in the savanna belt, and the other, Port Harcourt, from which a railway runs to the Udi coal-field and thence northward to join the Lagos-Kano line.

(b) The Congo Basin

The Equatorial forest is here restricted to the valleys of the main river and of the tributaries, which are surrounded by highlands of lightly wooded savannas. This forest region still largely depends for its economic wealth on the collection of natural products such as copal, wild rubber, ivory, and the fruit of the wild oil palm, but is reaching the stage when cultivation is becoming important. Copal is a fossilized resin collected from swamps and is used as a base in varnish manufacture, but its output has declined in recent times owing to the competition of synthetic varnishes. The supply of rubber is now very small, and the future of this region will depend largely on the cultivation of the oil palm.

In the higher lands surrounding the forest where savanna conditions exist, European plantations have been established and agricultural development has been extensive. Cotton, coffee, and cacao are important products of these plantations.

A large part of this great river basin forms the Belgian Congo. In addition to its wild and cultivated products, the Belgian Congo is important for its minerals, especially copper, which is mined in the Katanga region of the south-east, where Elizabethville is the chief centre.

Leopoldville, on Stanley Pool, is the capital of the colony, and the chief ports are Banana, Boma, and Matadi.

THE EQUATORIAL FOREST LANDS OF ASIA

These lands, which include part of the Malay Peninsula and most of the East Indian Islands, are the most highly developed of all Equatorial forest lands (Fig. 4).

The greater development of these regions as compared with those of Africa and South America results from a number of important factors which we should keep in mind.

- (1) Much of the land is high ; the forest is therefore less dense and the hills provide healthy settlements for Europeans.
- (2) The peninsulas and islands of this region are obviously

more accessible than the vast interiors of the Amazon and Congo.

(3) Much of the region is covered with rich volcanic soils and is very productive.

(4) More abundant and satisfactory labour supplies are

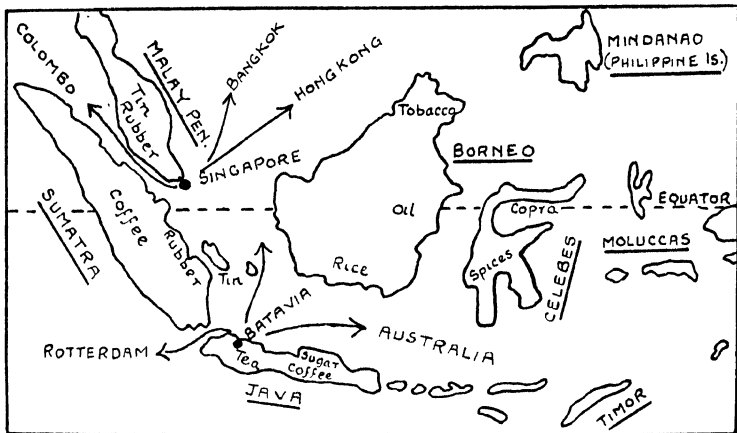


FIG. 4.—EQUATORIAL FOREST LANDS OF ASIA

available here from the densely populated regions of India and more particularly of China.

(a) Malaya

Malaya includes :

(i) The Straits Settlements (Singapore, Malacca, Penang, Wellesley Province, Dindings, Labuan, Christmas Island, and Cocos Islands).

(ii) The Federated Malay States (of which the most important are Perak and Selangor).

(iii) The Unfederated Malay States.

(iv) British Borneo, including British North Borneo, a territory under the administration of the British North Borneo Company ; Brunei and Sarawak, native states under British protection.

The forest products of these regions include many varieties

of hard timbers, rattans (the raw material of cane furniture), gutta-percha (used largely for electrical insulation), and damar (a resin base of varnish), similar to copal.

Most of the agriculture is worked on the plantation system. The most important plantation product is rubber, of which more than half the world's supply comes from Malaya. Coco-nuts are produced, especially on the alluvial plains where they thrive best in the saline atmosphere and soils. Pine-apples are also grown.

Rice is a very important food crop, but is mostly grown by Asiatic small-holders, and not on extensive plantations. Pepper, tapioca, and tobacco are other products.

Malaya is additionally important for the quantity and quality of its tin. More than half the world's supply is produced here, and owing to its exceptional fluidity it is particularly valuable in the tin-plate industry.

Singapore is the chief port for this region and owes its importance to its commanding position. It lies on the great sea route between China and Japan on the east, and India and Europe on the west (see Fig. 4). It is an island separated from the peninsula by a narrow strait over which a causeway has been built to carry the railway to the mainland. Produce from all the world is discharged here for distribution to the peninsula and East Indies, and, being a free port, produce is collected here from the East Indies, Indo-China, China, and Japan for transport to other parts. In addition to serving Malaya and its large volume of entrepôt trade, Singapore is a naval base and coaling station—the "Malta of the East."

(b) The East Indies

These islands, with the exception of the British possessions in Borneo, are Dutch. Of the total population of 60 millions, 40 millions live in Java, which though not the largest is by far the most important and rightly deserves its name, "The Garden of the East." In Java, crop production is favoured by the climate conditions and the fertility of the volcanic

soils, and by the fact that on the rising highlands a wide range of products may be grown according to elevation. These natural advantages have been used to the full by the Dutch, who have established careful systems of garden cultivation and efficient systems of railways and roads.

Rubber, sugar, and rice are the important products of the wet lowlands, while tea, coffee, tobacco, and cinchona (the source of quinine) are produced mainly in the hillside gardens and plantations.

The remainder of the Dutch East Indies have been little developed. Sumatra and Borneo export pepper, coffee, and tobacco, while the Celebes and Moluccas are noted for their spices, such as pepper, nutmeg, and cinnamon.

Batavia, the capital of Java, is the great port and collecting centre for the Dutch East Indies. It controls the Sunda Straits and, like Singapore, has a large volume of entrepôt trade.

CHAPTER III

THE SAVANNA LANDS

(1) Distribution

The Savanna Lands lie in broad belts to the north and south of the Equatorial forest lands of South America and Africa and to the south of the forested lands of North Australia. Their distribution is shown on Fig. 5.

By the term "Savanna" we mean the tropical grasslands of the world, but we should remember that in each region

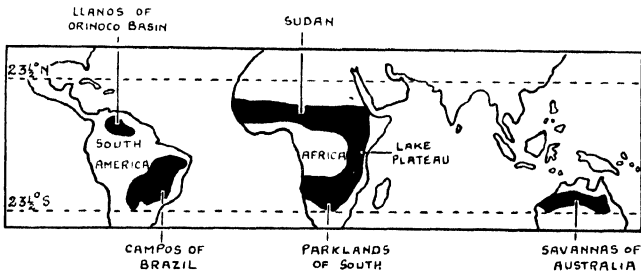


FIG. 5.—THE SAVANNA LANDS

local names are used. In the Orinoco Basin and Guiana highland region of South America they are called "Llanos," while to the south on the Brazilian Highlands they are called "Campos." In the Sudan region of Africa the name "Savanna" is used, but in Rhodesia in the south they are called "Parklands." In Australia, the term "Savanna" is used, but that part which lies in Queensland is often described as the "Downs."

(2) Climate

Since these savanna lands stretch through some 10° of latitude and border the Equatorial forest lands on the one

side and the hot desert on the other, considerable variations in climate are bound to exist. Certain characteristics common to all regions can, however, be distinguished.

(a) Temperatures are high at all seasons and seldom fall below 70° F., except in regions of very high altitude. As distance from the Equatorial lands increases, so the difference in temperature between the hot and cool season becomes more marked—in other words, the range of temperature becomes greater.

(b) There is a definite rainy season in summer when the Equatorial belt of convectional rain moves north and south with the sun. Near the Equatorial lands there are two periods of rain (in early and late summer) at the seasons when the sun is overhead, but farther north these rain periods become merged into one. There is a corresponding decrease in the amount of rainfall from 60" on the edge of the forest to 15" on the edge of the desert.

(3) Natural Vegetation

The decrease in rainfall which we have noticed as one moves away from the Equatorial lands affects the character of the natural vegetation. Moving from the forest edge we pass through parkland with many trees to the savanna grassland proper, where trees are found only near the water-courses, and thence to scrub, where the small amount of rainfall produces only a poor type of grass.

Everywhere grass is the predominant vegetation. At the beginning of the rain season the seeds burst into life and grow rapidly and vigorously in the hot wet conditions of the summer period, reaching full growth and seed-time at the beginning of the dry season. The grasses are luxuriant in the rainy period, but are very coarse with thick, hard stems and grow mostly in tussocks and clumps. During the dry period which follows, the grasses wither and form a thick mat of dry hard vegetation over the ground.

NATURAL CONDITIONS AND ECONOMIC DEVELOPMENT

The savanna lands are as yet little developed economically. They are inhabited by natives who keep herds of poor cattle and are content to grow only sufficient crops for their own needs. They are, however, lands of great possibilities both as pastoral and crop-producing lands.

(a) *Pastoral Development*.—As the growing of grain crops becomes more important and more extensive in the temperate grasslands there will arise, and, in fact, there has arisen, the need for new areas of ranching land on which to rear cattle for meat. The savanna lands with their large areas of cheap land are suited to meet this need, and will become important ranching lands in the future. The development of these lands for this purpose will necessitate the building of new and more efficient means of communication, the improvement of the natural grasses, and the improvement of the native cattle stock.

(b) *Crop Production*.—The high temperatures which prevail at all seasons make crop-growing possible all the year round. At present only tropical products, such as maize and millet, which will grow in the short summer rain season, are produced, but when irrigation systems have been introduced and water supplies are available at all seasons, crops requiring a longer growing period will be grown, and temperate crops will be produced in the cooler winter period.

IMPORTANT ECONOMIC PRODUCTS

Already the savanna lands supply a number of important commodities, and an account of the more important ones is given below.

(a) *Hides and Skins*.—Both hides and skins, but in particular cattle hides, are exported from all savanna lands. These hides are usually sun dried and produce a poorer and cheaper leather than the wet salted hides, which are the product of the great slaughtering establishments of the temperate meat lands. As ranching increases and slaughtering

centres are established in the savannas, so the quality and quantity of the hides will improve.

(b) *Maize*.—This is a cereal capable of growth in a fairly wide range of conditions. It is eaten extensively by the natives of the savannas, especially in Africa, but a great deal is exported for cattle fodder, while some is used in the manufacture of human foods such as maizena and cornflour.

(c) *Ground Nuts*.—These nuts, popularly known as pea nuts or monkey nuts, are so called because their pods develop in the air and bury themselves to ripen in the ground. They are used for food by the natives and are commercially valuable on account of the oil which they yield for margarine and soap manufacture.

(d) *Cotton*.—The raw cotton of commerce consists of the small fibres which surround the seeds of the cotton plant. Cotton grows under a wide range of climate and soil conditions, and the type and quality of the cotton varies accordingly. Generally speaking, the plant requires plenty of moisture in the growing period until the flowers are formed, and then a dry sunny period until the pod or “boll” bursts and the cotton can be gathered.

When the “boll” bursts, a ball of small white fibres and small black seeds is exposed, and it has to be picked immediately to prevent its being damaged by rain, mud, or dust. The fibres, which are called the “lint,” are then separated from the seeds by a process called “ginning” before being compressed and packed into bales. The seeds yield cotton seed oil, which is used extensively in making stock or cow-cakes.

(e) *Coffee*.—This is obtained by roasting the beans of the coffee tree or bush. The coffee bush grows best on wet but well-drained hill-slopes, and requires shade from the direct sun. This shade is often provided by the planting of taller trees, which usually yield a secondary product.

The increasing importance of these savanna lands as producers of foods and raw materials makes it necessary to consider the separate regions in some detail, and this we shall do in the next chapter.

CHAPTER IV

REGIONS OF THE SAVANNA GRASSLANDS

THE SAVANNA LANDS OF SOUTH AMERICA

WE have already seen that there are two areas of savanna land in South America—the Llanos of the Orinoco Basin and the Campos of the Brazilian Plateau.

(a) **The Llanos of the Orinoco Basin**

This region is cut off by the mountains from the rains brought by the north-east trade winds, and is relatively dry, but flooding from the rivers is frequent in the summer period in the very low-lying areas.

The only use made of these areas is the rearing of large herds of half-wild cattle of a poor type which are kept by native herdsmen known as Llaneros. Only near the chief cities have any attempts been made for the development of the industry by the fencing of pastures or improvement of the stock. The lack of transport facilities and freezing establishments and the scarceness of pasture during the dry winter period prohibits the production and export of meat. The hides are of little economic value, because of the damage done to them by insect pests. The market for both the meat and the hides is local, either in Venezuela or the West Indies.

The chief collecting centre, Ciudad Bolivar, stands on the Orinoco River, which is the only highway. The region is scantily populated, and development in the future is likely to be very slow.

(b) **The Campos of Brazil**

These areas are on the high interior plateau which is a wild and desolate region for the most part, cut off by the

high rim of the plateau from the coast. There again, as in the Llanos, large herds of half-wild cattle are reared, but the inaccessibility of the region, the absence of transport and freezing facilities, and the adverse climate conditions make them of little economic use.

The eastern part of the plateau, particularly the state of Minas Geraes, is rich in minerals, including iron, manganese, and gold. Diamonds are also found. This region will probably become important in the future for its minerals, but as yet the lack of roads and railways prevents any profitable working of them.

The most important section is the southern edge of the plateau, where coffee is produced extensively, especially in the state of São Paulo. This region, with its rich volcanic soils particularly suited to coffee growing, produces more than two-thirds of the world's coffee supply. Of this, a very high percentage is produced in the state of São Paulo, where everybody is connected with coffee; planters, labourers, merchants, transport workers, and shipping agents all play some part in its cultivation, sale, or transport.

São Paulo is the chief collecting and marketing centre, and Santos and Rio de Janeiro are the two principal exporting centres.

THE SAVANNA HORSESHOE OF AFRICA

The term "Horseshoe" aptly describes the distribution of the savanna lands of Africa (see Fig. 6). In the north they form a broad belt running west to east through the Sudan and Northern Nigeria to the Anglo-Egyptian Sudan on the east. From here they are linked by the savannas of the East African plateau to the Parklands in the south, which cover Rhodesia and extend through Angola on the west to the coast.

Three separate sections may therefore be distinguished :

- (a) The Sudan Region of the North.
- (b) The East African Plateau.
- (c) The Parklands of the South.

The Sudan Region of the North

This region covers a wide belt stretching across the width of the continent, bordered on the one side by the Equatorial forest and on the other by the Sahara Desert. Two distinct regions may be considered :

- (1) The Western Sudan.
- (2) The Anglo-Egyptian Sudan.

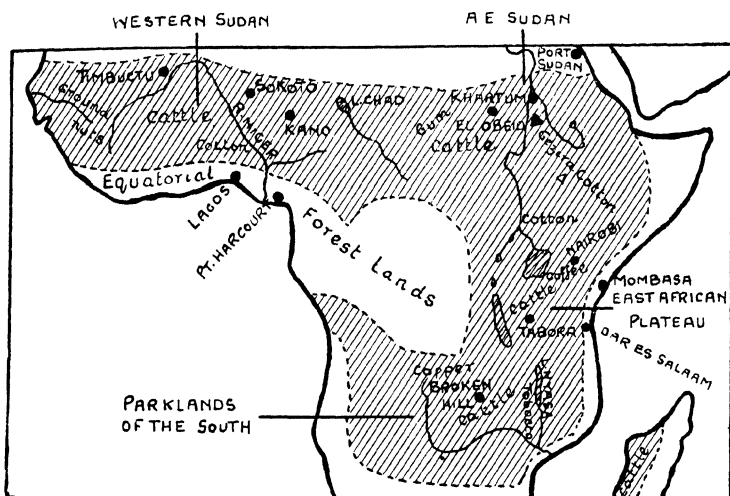


FIG. 6.—THE SAVANNA HORSESHOE OF AFRICA

(1) The Western Sudan

This includes French Sudan and Northern Nigeria. It is a high plateau and covers the basins of the Senegal, Gambia, the middle and upper Niger, and the area drained by the rivers flowing into Lake Chad.

Throughout this region large herds of native cattle are kept, and from them important supplies of hides, including those used in the manufacture of "Morocco" leather, are obtained. In recent years there has been a small export of beef from Nigeria to Great Britain, but as yet meat production is only in its preliminary stages.

The agriculture of these regions is of a primitive type. In addition to maize and millet, which are grown mainly as native foods, cotton and ground nuts are both produced for export.

Minerals are important in some regions. Tin ore is produced on the plateau of Northern Nigeria where Bauchi is the mining area, and coal is produced farther south in the Udi Coal-field, which is connected by railway with Port Harcourt.

The towns in this region are collecting centres for cotton, ground nuts, and hides. Kano—which is connected by railway with Lagos and Port Harcourt, the principal ports of Nigeria—and Sokoto are the chief centres in Northern Nigeria. Timbuctu is the main centre in the French Sudan. It is the focus of caravan routes from the north and is also connected by a river-railway route with the port of Dakar on the West Coast.

(2) Anglo-Egyptian Sudan

The Anglo-Egyptian Sudan is a large territory of about one million square miles, with a population of 6 millions. It lies between 5° and 22° N., and so stretches through a wide range of rainfall conditions from over 40" in the south to less than 10" in the north. There is a corresponding range of natural vegetation conditions from woodland in the wetter south, through open savanna, to poor scrub in the drier north.

The essential feature of the whole region is the Nile. In the south the river flows over the wide low-lying Bahr-el-Jebel plain and receives the Bahr-el-Ghazal tributary. This section of the river is liable to obstruction from floating vegetation called "Sudd." Beyond this it receives three tributaries from the Abyssinian highlands—the Sobat, Blue Nile, and Atbara, of which the Blue Nile is by far the most important. At the confluence of the Blue Nile stands Khartoum, beyond which the river enters a narrow valley, and starts its descent to a lower level by the six cataracts.

The savanna conditions of the Anglo-Egyptian Sudan make it essentially a pastoral country, with cattle in the wetter areas, and sheep, camels, and goats in the drier north. Hides and skins are here again an important article of trade, but some meat is exported to Egypt, which provides a convenient market. Gum arabic is another important product. It is collected by tapping certain acacia trees, and is used in confectionery work and stationery. Some 70 per cent. of the world's supply of gum arabic comes from this region.

Agriculture is becoming increasingly important, especially in regions where irrigation works have been established. Cotton is by far the most important export or money crop, providing about 75 per cent. of the total value of the exports. It is grown principally in irrigated areas and particularly in the important Gezira plain or triangle between the White and Blue Niles (see Fig. 6). This area is irrigated from the waters of the Blue Nile, across which the Sennar Dam was completed in 1926.

The quality of the cotton is high, and the quantity produced is increasing under the organization of syndicates. There is no native manufacture of cotton in the Sudan, and practically the whole output is exported to Great Britain.

Other crops of importance are millet—which is the staple food of the people and yields a surplus for export in good years—ground nuts, and dates.

Khartoum is the administrative centre. El Obeid, the rail-head, and Omdurman are important market centres, especially for cattle. Most of the export trade goes through Port Sudan on the Red Sea, to which a railway runs from Berber; but there is also a considerable trade by rail and river with Egypt.

The East African Plateau

This region includes Uganda Protectorate and the plateau sections of Kenya Colony and Tanganyika territory. The plateau has an average height of about 4000 feet, and is crossed from north to south by two great rift valleys. Between

the rift valleys Lake Victoria (Victoria Nyanza) occupies a large depression nearly as large as Scotland.

The climate of the whole region is modified by the altitude of the plateau. The nearness to the Equator results in little variation of temperature from an average of 70° F. Rainfall everywhere is moderate. In consequence of these conditions most of the region is covered with rich savanna, and is suited to white settlement.

Cattle and sheep rearing are carried on everywhere on the savanna, hence hides and skins are important articles of commerce. The higher pastures of Kenya, blanketed by morning mists and with a well-distributed rainfall, are covered with a perennial growth of pasture suited to dairy cattle, and there is already an export of butter to Great Britain.

Coffee is an important crop, especially grown by European settlers. It is a valuable crop and one which is easy to handle where transport facilities are poor as they are here. The leading producer is Kenya, where coffee accounts for 40 per cent. of the total value of the exports. Native coffee production is on the increase, and is known as "berry" coffee, to distinguish it from the plantation varieties, which are usually better cured.

Cotton is mainly a native production. There is no real organization of the producers, but the Government watches over their interests by supervising the ginneries, distributing free seed, and enforcing fresh sowing annually. The leading producer is Uganda, where cotton forms 80 per cent. of the total exports.

Sisal hemp or "Sisal," as it is more often called, a fibre used especially in making ships' ropes because it does not rot easily in sea water, is another leading product.

Maize, grown for food and export, ground nuts, and rubber are other products.

Gold is mined in Kenya in the Kakamega field and in Tanganyika. Kenya also has soda deposits in the Lake Magadi depression.

Two important railways link up the ports on the coast

with the inland towns and lake ports. The Kenya-Uganda railway runs from Mombasa to Nairobi, the capital of Kenya, north of Lake Victoria to Kampala, in Uganda, a total distance of 886 miles. From this line a branch runs to Kisumu, in Kenya, on Lake Victoria.

In Tanganyika, the line runs from Dar-es-Salaam on to the plateau to Tabora, the capital, and thence to Kigoma, the port on Lake Tanganyika. From Tabora a line runs north to Mwanza on the southern end of Lake Victoria.

The Parklands of the South

This region includes Nyasaland, Northern Rhodesia, and the relatively unimportant Angola.

Nyasaland Protectorate consists of a narrow strip of land about 520 miles in length along the western side of Lake Nyasa. It is entirely an agricultural country, for no minerals of any commercial value have yet been discovered. The main crop for export is tobacco, while crops of secondary but increasing importance are cotton, tea, and sisal hemp.

Transport is both difficult and expensive, with the result that production for export is restricted to those high-priced commodities which can bear the expense. Blantyre is the commercial centre, while Zomba is the seat of the Government.

Northern Rhodesia contrasts with Nyasaland in being primarily a mineral country, almost entirely dependent on the Northern Rhodesia copper belt. The prosperity of the native, the welfare of the white farmers, the railway, traders, commercial and professional men, are all dependent for their living on the mines. The copper belt is probably the most important potential source of copper in the world, and the fringe of its development has as yet only been touched.

Apart from its minerals, Northern Rhodesia is a poor country. Native agriculture is confined to the production of native food-stuffs and tobacco for the local market. The European farming community is engaged principally in maize and cattle production. The mining areas are the

chief markets for these products, and the extension of meat production, dairy farming, and other farming industries depends on the prosperity of the mining.

The capital is Livingstone—other important towns are Broken Hill, Fort James, and Lusaka, where it is proposed to establish a new capital.

THE SAVANNAS OF AUSTRALIA

The savanna lands of Australia stretch in a belt from Western Australia through Northern Territory to Queensland, bounded by the Monsoon forest lands on the north, the dry interior on the south, and the Great Dividing Range on the east.

The pastures of these lands vary considerably according to the amount of rainfall, but everywhere there is a long dry season, during which nature undertakes the process of hay-making and provides dry hard grasses suitable only for beef cattle.

The development of the cattle industry has been influenced by such factors as water supply, transport facilities, proximity to ports, the distance of Australia from the markets for its meat, and the development of refrigeration.

In Western Australia, the Kimberley district and the valley of the Fitzroy River are the important cattle regions. In the Northern Territory development has been slow owing to the ravages of cattle tick and the difficulty of transporting cattle through waterless country. The former has been partly overcome by dipping, and the latter by adding to the number of wells on the stock routes and the opening of meat establishments at Port Darwin.

The most important region is Queensland. The plentiful supply of water from the artesian wells of the Great Australian Basin, which yield some 400 million gallons of water per day, has largely overcome the great handicap of drought with which Queensland has had to deal. The extension of railways, the establishment of meat works, tanneries and tallow factories, and the improvement of shipping facilities

at the ports have all contributed to make Queensland the most important region.

The principal cattle and meat ports are :

- (a) Rockhampton, which is connected by railway with Longreach and Blackhall, the cattle centres.
- (b) Townsville, which connects by railway with Hughenden, Winton, and Cloncurry, which are cattle centres farther north.

These railways also serve the mineral-producing centres of this region such as Cloncurry (copper), Charters Towers (gold), and Longreach (opals).

The future development of the meat industry of Australia is largely one of markets. The greater distance of Australia from Great Britain and Europe has made it necessary in the past to transport the beef in a frozen state, and frozen beef values have been very low as compared with the chilled product of the Argentine. But in 1932 a successful shipment of chilled beef was made, and during 1934 thirty-two shipments arrived in good condition, so that, although there are other problems to overcome, it may be said that the carriage of chilled beef from Australia has successfully passed the experimental stage.

CHAPTER V

THE MONSOON LANDS

THE MONSOON TYPE OF CLIMATE

THE Monsoon lands take their name from the special type of climate they enjoy—the Monsoon climate. The word “Monsoon” comes from an Arabic word meaning “season,” but is now generally used to describe the seasonal winds,

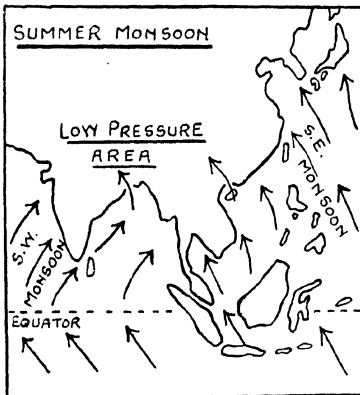


FIG. 7

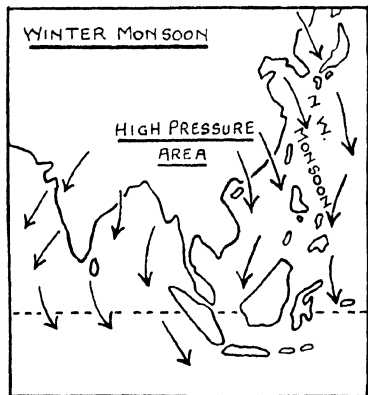


FIG. 8

which are the chief factors in determining the peculiar climatic conditions of the Monsoon lands.

All regions with a Monsoon type of climate are characterized by (a) a dry winter period; and (b) a wet summer period, in which the rains result from a complete reversal of the normal wind system. These conditions are experienced principally in the Monsoon lands of S.E. Asia which include India, Burma, Thailand, Indo-China, China, Japan, and the Philippine Islands.

The causes of these seasonal conditions—the dry winter

and wet summer—will be readily understood if we think of Monsoons as “land and sea breezes on a seasonal scale.” In summer, the land-mass of Asia becomes quickly heated, and the high temperature creates low-pressure conditions. Moisture-laden winds flow in from the higher pressure over the sea to this low-pressure centre over the land and so bring rains during the summer period. In the cool season the opposite is the case. The land-mass is cold and is an area of high pressure from which dry winds blow out towards the sea. These winds should be studied carefully in Figs. 7 and 8.

THE MONSOON LANDS OF ASIA IN GENERAL

Climate

We should notice, of course, that these lands in Asia cover a very great area and a wide range of latitude. While the common characteristics of this type of climate are experienced everywhere, every region has its own peculiarities and considerable variations in rainfall and temperature occur. These variations allow us to distinguish three main groups, each of which is represented in the figures given below :

	Hottest Month.	Coldest Month.	Range.	Rainfall.
(a) Tropical Monsoon . (BOMBAY)	85° F.	75° F.	10° F.	74"
(b) Sub-Tropical Monsoon (SHANGHAI)	81° F.	38° F.	43° F.	44"
(c) Temperate Monsoon . (PEKING)	79° F.	23° F.	56° F.	24"

(a) The Tropical Monsoon (represented by Bombay) of India, Indo-China, South China, and the Philippine Islands, where hot summers and very warm winters are general.

(b) The Sub-Tropical Monsoon (represented by Shanghai) of Central China and most of Japan, where the summers are

hot but the winters are cool. Rainfall is heavy and is fairly evenly distributed.

(c) The Temperate Monsoon (represented by Peking) of North China, the Korea, and North Japan, where the summers are hot but the winters are cold. Rainfall is slight, and practically all of it occurs in the short period of June–August.

Products of Natural Vegetation

Teak is important commercially on account of its hardness, weight, and resistance to insects. It is cut from the forests of India, and more especially of Burma, where most of the transport work is done on the rivers and by elephants. After training, the elephants show considerable skill in carrying, sorting, and piling the logs in the timber yards of the saw-milling centres of Mandalay, Moulmein, and Rangoon.

Sandalwood, another important and valuable product of the Indian forest, provides an important cabinet wood, but is chiefly used for the distillation of its oil, which is used in the manufacture of perfumes and varnishes.

Lac, a resinous product of certain trees, is another forest product with a wide range of uses, including the manufacture of gramophone records and polishes.

Bamboos grow extensively in all the Monsoon lands, but are especially important in China and Japan, where they are used for building and the manufacture of furniture and household utensils.

Lacquer, the gum or sap of the lacquer tree, is used extensively in ornamental work by the Japanese, who are expert in this work.

Camphor, from the wood of which camphor oil is extracted.

The soft coniferous timbers of the temperate forests of Northern Japan, such as pine and white fir, are used largely in paper and match manufacture.

Commercial Commodities, their Products and Uses

The Monsoon climate with its seasons of heat and heavy rainfall occurring at the same period gives the land a wonder-

ful fertility, and food crops are raised with great ease and great abundance, much of the land yielding more than one crop in the season. Accordingly, agriculture is the chief occupation of the Monsoon lands.

(1) Food Crops

Rice is the most important crop of the Monsoon lands, since it is the chief food of the bulk of the people, but there is little surplus for export. The grain is first sown in small fields, "nurseries," and transplanted when the plant is about 6 inches high to the flooded paddy field. Owing to the rapid growth of the plant it is usual to get at least two crops in one season.

Rice is grown principally in flat, low-lying regions such as river deltas, where flooding is possible, but considerable quantities are also grown on terraced hill-slopes.

Tea. The tea leaf of commerce is obtained from the young shoots of the tea shrub, which thrives best on wet but well-drained hill-slopes. The young shoots are picked at intervals through the season as they reach a certain size, and the number of pickings may reach as many as sixteen in certain regions.

Wheat is grown in the cooler regions of North China and Japan, and also in India as a winter crop.

Millet, the small-grained seed of various cereals, is the food crop of the drier parts of the Monsoon lands.

Sugar is another food crop which is extensively grown.

(2) Raw Material Crops

Jute is a fibre crop, which grows only under very hot, wet conditions in lowland areas, and its growth is restricted mainly to the Ganges delta lands. The fibre is used locally in the manufacture of sacks, known as gunny bags, and sacking, and there is a considerable export for the manufacture of hessians, tarpaulins, floor-cloths, and cheap carpets.

Oilseeds are obtained from a number of plants, especially

the flax, which supplies linseed. The extracted oils are used in margarine, soap, and varnish manufacture.

Silk is the fibre obtained from the cocoon of the silkworm, which feeds on the young leaves of the mulberry tree. Each cocoon yields from 300–500 yards of thread, which is so fine that five or more threads are reeled off together. The threads are sticky and are easily united to form one thread.

Cotton. We have already considered the general conditions essential for its production. The types and regions of productions in the Monsoon lands will be considered later.

SMALLER MONSOON AREAS

Outside Asia there are a number of smaller areas which experience a Monsoon type of climate. Of these areas, Northern Australia and the Lower Mississippi basin are the most important.

Northern Australia

The north-west coastlands of Australia receive a typical summer rainfall brought mainly by the north-west Monsoon. These coastlands are low and flat, with sandy beaches and mudflats. Mangroves and tropical forests occur in patches, but the forest trees are of little commercial value.

The successful production of coco-nuts, rice, bananas, and cotton in limited areas shows that this region is capable of considerable agriculture development. Climatic conditions are, however, adverse to white settlement, with the result that at present little capital and labour are available, and it is doubtful whether any extensive development is possible without the help of coloured labour.

The Lower Mississippi Basin

This region is not so typically a Monsoon region, as its rainfall is not definitely restricted to the summer period. However, it does experience heavy summer rains from the winds which are drawn inwards from the sea, especially

the Gulf of Mexico, to the areas of high temperature and low pressure of the interior.

Within this region lies the important cotton belt of U.S.A. and the lowlands around the Gulf of Mexico.

(1) The Cotton Belt

This is still the largest cotton-producing and largest cotton-growing area of the world. It extends in a belt, some 500 miles wide, from Texas on the west to the coast on the

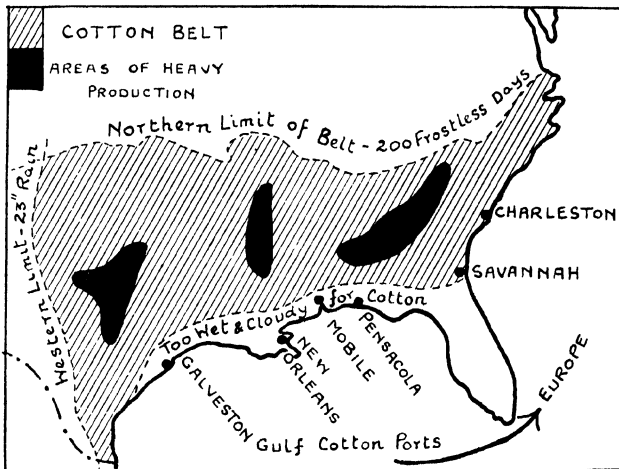


FIG. 9.—COTTON BELT OF U.S.A.

east, a length of about 1500 miles (Fig. 9). On the north it is limited by the line of 200 frostless days, on the west by the rainfall limit of about 23 inches, and on the south by the belt where the soil and climate are too wet for cotton growing.

Soil conditions are an important factor, and within the cotton belt three areas of intensive production are found where very favourable soil conditions exist :

- (a) The black waxy Prairie of Texas.
- (b) The Mississippi Bottoms or Flood Plain.
- (c) The black Prairie Belt of Alabama.

Much of the work has to be done by hand, hence arose the need for supplies of cheap labour and the presence of the large negro population of to-day. Many of these negroes now rent or own farms of their own.

Owing to the decreased demand for cotton during recent years, and the losses caused by disease, the cotton growers have been compelled to turn their attention to the growing of other crops, especially maize.

About one-third of the total cotton crop is exported, and of this about one-third comes to Great Britain. The chief ports for cotton export are Charleston and Savannah on the Atlantic, and Galveston, New Orleans, Mobile, Houston, and Pensacola on the Gulf Coast.

(2) The Coastlands of the Gulf

Much of the coastal land bordering the Gulf of Mexico is marshy and useless, but much of the more favourable areas is devoted to rice and sugar, for which the hot climate and the abundant supplies of water are especially suitable. The coast plain of Louisiana is especially important as a sugar-producing area.

Early fruits and vegetables are also produced in large quantities for the markets of the north.

CHAPTER V

THE COUNTRIES OF THE MONSOON LANDS— INDIA (INCLUDING BURMA) AND CEYLON

INDIA has a population of 350 millions. Although she has achieved important industrial development, she is still essentially an agricultural country. Over 70 per cent. of her vast population rely directly on the cultivation of the soil for their livelihood, mainly as small cultivators on their own account.

The abundant crop production which supports this dense population results from the favourable conditions of the Monsoon climate and the rich soil conditions of the great alluvial deltas and plains. Furthermore, over 85 per cent. of the total value of the export trade of the country is made up of agricultural products, which are sent to overseas markets through the ports.

These brief considerations lead us to think particularly of :

- (a) The Physical and Climatic Conditions, and such artificial factors as irrigation, which favour crop production.
- (b) The Distribution of Crops.
- (c) The Manufacturing Industries connected with crops.
- (d) The Ports, their hinterlands and trade.

THE MAIN PHYSICAL DIVISIONS

A glance at the map will show that India falls into three main physical divisions (Fig. 14).

(a) **The Great Mountain Barrier**

The great mountain barrier is formed by the Himalayas in the north, the Sulaiman and Hindu Kush mountains in

the north-west, and the mountains of Burma on the east. Except in the north-west, where there are several passes, including the Bolan and Khyber Passes, these mountains form an effective political, climatic, and commercial barrier.

(b) Indo-Gangetic Plain

The broad fertile lands of the Indus and Ganges plains are among the most fertile in the world. The soil is chiefly alluvium brought down by the rivers from the Himalayan ranges where they rise.

(c) Peninsular India

The Peninsula of India consists of five divisions, which

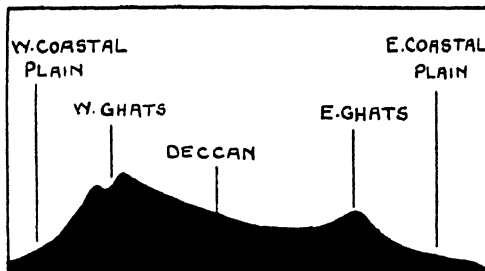


FIG. 10.—DIVISIONS OF PENINSULAR INDIA

are illustrated in the section below (Fig. 10). Study this section carefully in conjunction with an atlas.

THE MONSOON AND THE DISTRIBUTION OF RAINFALL

The question of water supply is obviously one of paramount importance in a country so dependent on agriculture.

We have already seen that the summer is the season of rainfall in the Monsoon lands. At this season the sun migrates northwards, heats the land-mass, and creates low pressure conditions. The S.E. Trades are drawn across the Equator and, under the influence of deflection to the right in the Northern Hemisphere, become S.W. Monsoons moving in towards the low pressure conditions over the land (Fig. 11).

One part crosses the Arabian Sea and meets the Western Ghats, rises, cools, and loses a great deal of moisture on the Western coastal plain and Western Ghats. (It should be noticed that the full force of the S.W. Monsoon is not felt north of the Gulf of Cutch, so that little rain reaches the Indus basin.) The winds continue as drier winds, bringing only moderate quantities of rainfall to the Deccan.

The other part passes across the Bay of Bengal. Some of it is drawn up the Ganges Valley and brings heavy rains to the lower valley and delta region, and decreasing quantities to the middle and upper sections of the Ganges Valley. Some reaches the mountains of Burma or is drawn into the Irrawaddy delta lands, bringing heavy rains to both regions. The course of the rain-bearing Monsoons and the distribution of rainfall should be studied carefully in Fig. 11.

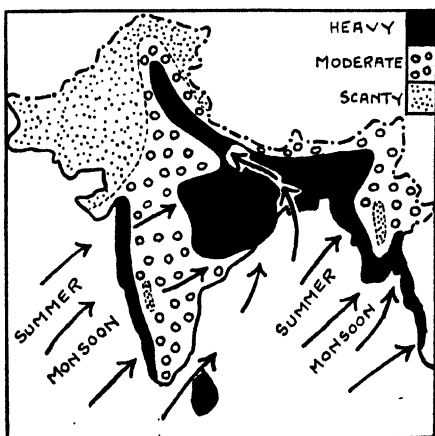


FIG. 11.—RAINFALL OF INDIA

IRRIGATION IN INDIA

The need for artificial irrigation in India is closely related to the rainfall distribution which we have just considered.

(1) There is, first of all, the need for irrigation in the regions of scanty rainfall, such as Sind, where crop-growing is impossible without artificial supplies of water.

(2) There is, secondly, the need for irrigation in regions such as the Deccan and Upper Ganges Valley, where the normal Monsoon is only sufficient to grow the necessary crops, and where any irregularity or failure of the Monsoon may result in famine.

The old methods of irrigation, consisting either of wells, canals using flood waters, or tanks in which water was dammed back in a river by primitive mud-banks, are now being replaced or supplemented by gigantic works, which will make possible a supply of water at all seasons and the growing of summer and winter crops. Artificial irrigation feeds nearly a quarter of the total area under cultivation, and out of this 48 per cent. is irrigated from Government works, 24 per cent. from wells, and 28 per cent. from primitive tanks and wells.

The important works are all State-owned and managed, and have cost 75 million pounds. The Sukkar barrage built across the Indus in Sind, with its 6000 miles of distributing canals, will irrigate 6 million acres, an area larger than the total area under cultivation in the whole of Egypt. The Lloyd dam on the Deccan, south of Poona, irrigates an area of 1500 square miles. Besides these, irrigation works are under construction on the Cauvery River in Madras, in the Punjab, and several other parts of India.

The general effect of these permanent and large-scale systems will be to increase the supplies of food, by converting large areas of barren waste into crop-growing areas, and to remove the fear of famine from regions of marginal rainfall.

CROP PRODUCTION IN INDIA

We may divide the more important crops which are grown in India into two main groups :

- (a) Food Crops (Fig. 12).
- (b) Raw Material Crops (Fig. 13).

(1) Food Crops

These are by far the more important, and cover nearly 82 per cent. of the total cultivated land. *Rice* is the staple food of the people in the hot, wet regions such as the Lower Ganges, the Lower Irrawaddy, the river deltas, and the coastal plains. It occupies 35 per cent. of the total area under cultivation in India, and the amount produced is about

50 per cent. of the total world production. There is a small surplus for export, mainly from Burma.

Millet is the chief food crop of the people in the drier areas, such as the Deccan.

Wheat is important as a food crop in the cooler regions of Northern India, especially in the Punjab and the Upper Ganges Valley, where it is grown as a winter crop. About 10 per cent. of the crop is exported, mainly to Great Britain, through Karachi.

Tea, as we have already seen, thrives best on wet but well-drained hill-slopes. The Himalayan slopes in Assam and Bengal, the Nilghiri Hills in Southern India, and the hill-slopes of Ceylon are the chief areas of production.

Sugar is grown extensively in the Upper and Middle Ganges Valley and also in the

Punjab, but there is not sufficient to meet home needs, and much is imported from other countries, especially Java.

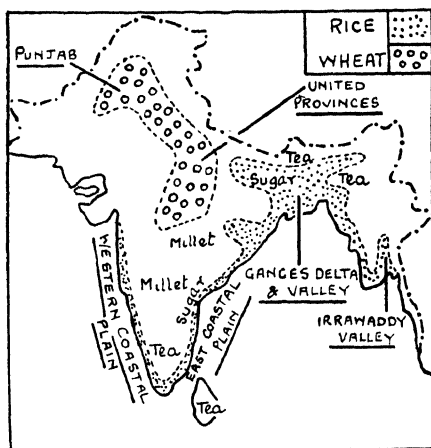


FIG. 12.—FOOD CROPS OF INDIA

(2) Raw Material Crops

Of these crops, Cotton and Jute are especially important, since they provide the necessary material for two of India's leading factory industries, and in raw or manufactured state supply nearly 50 per cent. of the total exports.

Cotton.—Amongst the cotton-growing countries of the world, India stands second only to America with regard to area and production. Much of the cotton grown on the black cotton soil region of the Deccan is a native Indian short-stapled cotton, whilst longer-stapled American cottons are

grown principally in the Punjab and Upper Ganges Valley.

Jute.—We have already seen that the growth of jute is restricted to the Ganges delta and valley lands, from which most of the crop goes to the jute mills of Calcutta for the manufacture of gunny bags and sacking.

Coco-nut Products.—The coco-nut thrives best in saline conditions, and so is grown most extensively on the western

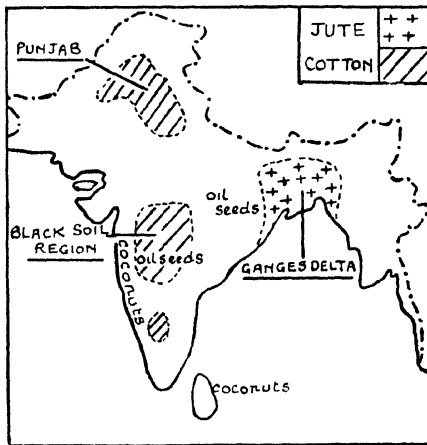


FIG. 13.—RAW MATERIAL CROPS

coastal plain and in Ceylon. Coir (fibre) and copra (the dried kernel from which oil is extracted) are both exported.

Oilseeds.—India grows a great variety of oilseeds, including cotton, sesamum, rape, linseed, and poppy, and altogether some 8 per cent. of the total cultivated area is covered by these crops. Some

are used in the manufacture of food-stuffs such as margarine, some for cattle foods, and some in the manufacture of soaps, paints, varnishes, and lubricants.

MANUFACTURING INDUSTRIES

Although India is essentially an agricultural country, it possesses some important manufacturing industries. Cotton spinning and weaving take first place. Bombay, with its proximity to cotton supplies, its moist climate, and cheap power, is the principal centre. Cawnpore and Ahmadabad are other important centres. The manufacture of jute is carried on in Calcutta. Howrah is the centre of important iron and steel works. Woollen goods are made in many centres,

especially in Northern India. Shawls and carpets are both important in Kashmir, and important woollen mills are centred also at Cawnpore.

There is also a large number of manufacturing industries concerned with the preparation of local products. Amongst these may be mentioned the rice mills of Burma, the oil-crushing mills of Madras, the flour mills of the Punjab, the sawmills of Burma and Assam, the tea factories of Assam and Ceylon, the oil refineries of Burma, Assam, and the Punjab, and the tobacco factories of Madras.

Besides these modern factory industries, India has a vast range of domestic industries and crafts. These domestic industries include textiles, silk, cotton, and wool, metal-working, especially in gold and silver, and woodcrafts.

THE PORTS, THEIR HINTERLANDS AND TRADE

Calcutta.—Calcutta stands on the Hugli, a distributary of the Ganges, and, although 80 miles from the sea, can be reached by large ocean-going steamers. It is the outlet for the rich producing region of the Ganges Basin, and chief among its exports are raw jute, jute manufactures, and tea.

Bombay.—Bombay stands on an island, but is connected with the mainland by a causeway. It has a fine natural harbour. In addition to its trade in cotton, which forms its principal export, Bombay is also important for its railway shops and leather manufactures.

Madras.—Madras is the chief port on the east coast—a surf-beaten coast—a fact which has necessitated the building of an artificial harbour at Madras. Raw cotton and cotton goods are exported. Cotton manufactures, tobacco, and leather industries, and the refining of sugar are among its most important industries.

Karachi.—Karachi stands to the west of the Indus delta. It is the natural outlet for the products of the Indus Valley and the chief port for the wheat and cotton producing lands of the Punjab. It has important flour mills and tanneries.

It will become an important air base as the services to India from Great Britain and across India are developed.

Rangoon is the capital and chief port of Burma. It exports the products of the whole country, especially rice, teak, cotton, and petroleum.

Colombo, in Ceylon, is also a capital and chief port. It

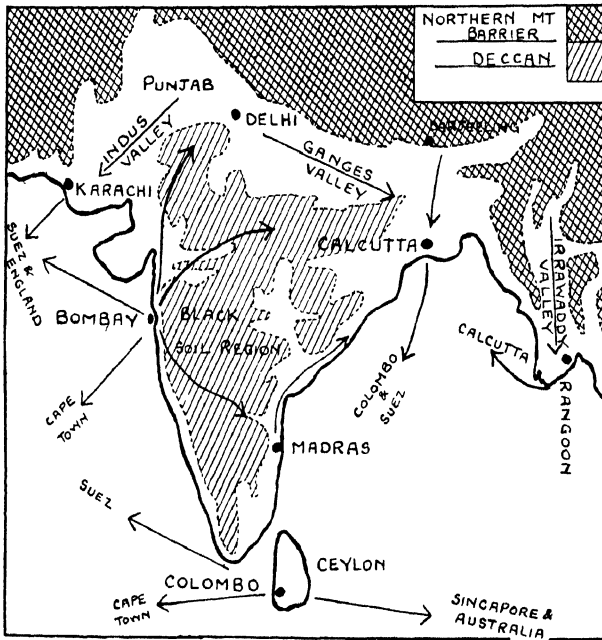


FIG. 14.—INDIA: PORTS AND THEIR HINTERLANDS

stands on an artificial harbour protected by breakwaters, and exports the valuable products of Ceylon, such as tea, rubber, and coco-nut products. Colombo has also a large amount of entrepôt trade, a natural result of her position at the focus and cross-roads of many important shipping routes.

The positions of these ports should be carefully studied on Fig. 14.

CHAPTER VII

THE JAPANESE EMPIRE

THE Japanese Empire consists mainly of a long chain of islands off Eastern Asia, stretching from Taiwan (Formosa) in the south to Saghalien (Sakhalin) in the north, and including the four principal islands—Honshiu (Mainland), Kiushu, Shikoku, and Hokkaido (Yezo). It also includes the important peninsula of Korea and smaller territories on the mainland besides many groups of Pacific islands.

Position

If we examine a map we shall find that the island of Taiwan in the south is cut by the Tropic of Cancer ($23\frac{1}{2}^{\circ}$ N.), and that, in the north, the boundary of Japanese Saghalien is the latitude of 50° N. Japan stretches, therefore, through $27\frac{1}{2}^{\circ}$ of latitude—a wide range which results in a correspondingly wide range of climate conditions and productions.

From our map, too, we shall notice Japan's position in the Pacific in close relation to the continent of Asia, and faced by the Americas on the other side. It is interesting to notice the importance of this in her commercial relations, and to learn that 42 per cent. of the exports go to countries of Asia, while another 42 per cent. go to the U.S.A., a position which must have an important bearing on her foreign policy.

Relief

The outstanding features of the relief of Japan are :

- (1) The long and almost continuous backbone of mountains.
- (2) The limited areas of plain land.
- (3) The earth movements, earthquakes, and volcanic

disturbances which are associated with this line of crustal weakness.

(4) The short, rapid rivers.

All these features have had their bearing on the life and activities of the people. The mountains are themselves an important climatic factor, as we shall see later, and, by

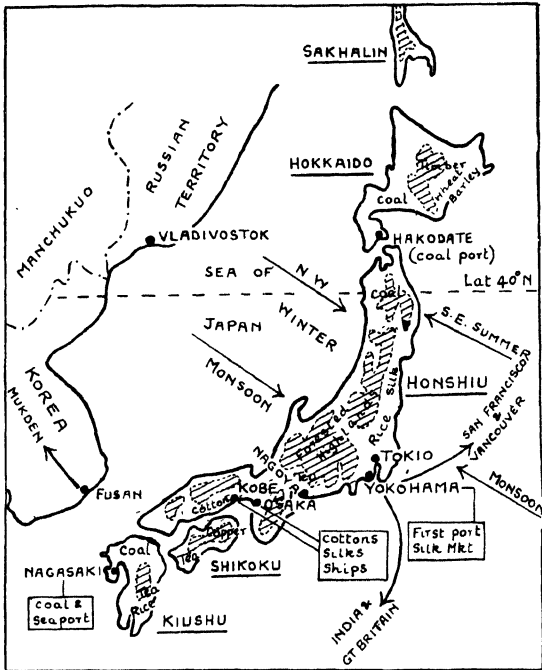


FIG. 15.—JAPAN: GENERAL MAP

limiting the areas suitable for crop production, have made it necessary for the Japanese to cultivate intensively and to secure control of new food-producing lands such as Taiwan and the Korea.

The intensive cultivation of the land is aided by the fertility of the volcanic soils, which cover large areas, and which result from the decomposition of lavas thrown out by volcanoes.

THE JAPANESE EMPIRE

The rivers are short and swift and of little value for navigation, but are useful for the irrigation of paddy fields, for the floating of timber rafts, and the generating of electrical power.

Climate

Japan has a temperate Monsoon type of climate. In winter it is subject to the continental influences brought by the N.W. Monsoon outflowing from Asia, and in summer to warm oceanic influences brought by the S.E. Monsoon (Fig. 15).

But the climate of the Japanese islands shows considerable variations, both from north to south and also from east to west. This is due to a combination of factors: the great range of latitude, the position in relation to the land-mass, the influence of relief on the winds, and the distribution of rainfall and the contrasting influence of the sea with its warm Kuro Siwo current in the south and the cold Kurile current in the north. The variations from north to south, which are the more important, are illustrated in these figures for North Formosa in the south and Hakodate on the island of Hokkaido in the north.

	Latitude.	Coldest Month.	Hottest Month.	Rainfall.
North Formosa . . .	25°	62° F.	84° F.	125"
Hakodate	41°	27° F.	70° F.	45"

NATURAL VEGETATION AND ITS PRODUCTS

This range of temperature conditions from south to north results in a corresponding wide range of vegetation. In the south, especially in Formosa, the vegetation is tropical in character. Camphor is an important product of this region, from which 75 per cent. of the world's supplies still come. At the present time this natural product is faced with competition by synthetic camphor.

In the centre, on the island of Honshiu, bamboos, cedars, lacquer, and the mulberry are important. We already know the economic uses of these trees, but it is well to notice here the particular value of the mulberry to the Japanese. We may gather some idea of the importance of silkworm rearing in Japan if we remember that silk is the largest individual item in the export trade. Although the mulberry is a natural product, it is interesting to notice that it is also extensively cultivated.

In the north, in Hokkaido, mixed deciduous and coniferous forests occur, while farther north still, in Saghalien, the coniferous forests supply important soft woods for paper, match, and toy manufactures.

CROP PRODUCTION IN JAPAN

The system of crop production in Japan is largely controlled by two main factors: the first is the small area of the land which is fit for cultivation, amounting to only 12 per cent. of the whole; and the second is the large and increasing population for which Japan has to supply food.

(1) **Methods of Production**

The demand for food-stuffs has compelled the Japanese to cultivate on a very intensive system, and in this they have been aided by favourable climate and soil conditions. The important features of this system are the widespread use of hand methods of cultivation on small holdings, the average size of which is $2\frac{1}{2}$ acres; a careful system of crop rotation, in order to secure two or more crops per year; terraced hill-slopes which provide additional land for cultivation; and an extensive use of artificial fertilizers to supplement farmyard manures and fish guano.

(2) **Crop Distribution**

Rice is predominantly the most important crop, and is the staple farm crop. It occupies 50 per cent. of the culti-

vated land, but in spite of this insufficient is produced for home needs.

Wheat, barley, rye, and millet are grown in the north, especially on Hokkaido, and also in some cases as winter crops on the paddy fields of the south.

The soya bean is grown extensively and is used in the making, amongst other things, of soy, a bean curd rather like cream cheese.

Tea, mainly green tea grown in the south of Japan, was once a staple export crop but is now of secondary importance.

Silk production may be mentioned here, since it is an indirect product of vegetation. It is Japan's staple export commodity, supplying 60 per cent. of the world's supply, and is important, too, in her own manufacturing industries.

COMMERCIAL AND INDUSTRIAL DEVELOPMENT

Japan, with her limited areas, her limited colonies, her lack of certain natural resources, and the problem of an overwhelming and increasing population, cannot possibly be economically self-supporting. Her dependence on imported foods and raw materials is leading to an increased development of industry and overseas trade.

The development of modern industries in Japan resulted from a definite policy to introduce Western methods, and to benefit from Western science and engineering technique. This resulted in the introduction of modern textile and other industrial machinery, the development of modern systems of communications, the railway and telegraph, the exploitation of her mineral resources, especially coal, and the development of electric power.

1. Textile Industries

The textile industries are favoured by a number of important factors :

- (a) Japan's insular position and the resulting moist climate for spinning.

- (b) The local or easily imported supplies of raw materials.
- (c) Coal and hydro-electric power are both available.
- (d) The cheap and abundant female labour.
- (e) Proximity to the huge markets for cotton goods of China and other Eastern countries.

Cotton Goods.—Kobe and Osaka, “The Manchesters of Japan,” and Nagoya are the principal manufacturing centres (Fig. 15). Japan produces some of the raw material, but most of it is short-stapled cotton imported from India and the U.S.A.

Woollen Goods.—Raw material is imported chiefly from Australia for the manufacture of woollen goods, which is mainly carried on at Osaka and Nagoya.

Silk Reeling, Spinning, and Weaving are widely distributed industries, but the chief centre is Kobe, while silk spinning is also carried on as a subsidiary business by the cotton mills of Osaka and Nagoya.

2. Iron and Steel Industries

Japan’s supplies of iron are small, and considerable quantities have to be imported for her industries. Moreover, her own supplies are not in close proximity to coal, so that the iron and steel industries are carried on in many of the big industrial centres, especially those of Central Honshiu. Shipbuilding, important owing to the demands of her large naval and mercantile fleets, is centred at Kobe and at Nagasaki, the principal naval dockyard (Fig. 15).

3. Other Industries

Amongst other industries the following are important: the preparation of food-stuffs, sugar refining, and flour milling; the manufacture of pottery; manufactures connected with wood, such as paper, toys, and matches; the manufacture of chemicals for dyes and artificial fertilizers; the making of cheap glass and the manufacture of cement.

THE TRADE OF JAPAN

The industrial development of Japan has changed the character of her trade. As her manufactures develop, she buys more raw materials, textile fibres, industrial metals, fuel, and food, and less finished products, and so benefits those countries which supply raw cotton, wool, wheat, iron, oil, and timber. As means of payment for these products, manufactured goods are exported to an increasing extent. In this connection the following lists of leading imports and exports in their order of importance are interesting.

Imports: Raw Cotton (25 per cent.); Iron and Steel and Machinery; Wool; Timber.

Exports: Raw Silk; Cotton Textiles; Rayon Textiles; Silk Textiles.

CHAPTER VIII

CHINA—"THE LAND OF THE THREE RIVERS"

THE THREE RIVER BASINS

IF we examine a relief map of China, or Fig. 16, we shall find three important rivers: the Hwang-ho in the north, the Yang-tze in the centre, and the Si-Kiang in the south. If we examine the courses of these rivers and their tributaries we shall see that most of China proper lies in the basins of these great rivers. So it has been said that "the geography of China is the geography of three great river basins."

But that is not all. The valley and plain courses of these rivers, with their fertile alluvial soils, their sheltered and favourable monsoon climate, and their supplies of water for irrigation, are the most important regions for crop-growing. The distribution of rice, wheat, and millet, which together occupy three-quarters of all the cultivated area, is an illustration of this (see Figs. 17, 18, 19). Since 75 per cent. of the Chinese depend directly on crop-growing for a living, we shall naturally expect to find that these areas are also the areas of densest population. Finally, since the rivers provide the main arteries of communication, the main commercial and industrial centres have grown up on or near the rivers.

The economic life of the people is, we can see, closely related to its three great river basins, and each, with its own characteristic relief conditions, climate, and products, forms a separate unit or natural region, corresponding to a division of the country into North, Central, and Southern China.

NORTH CHINA—THE HWANG-HO BASIN

1. Relief Features and Course of the River

The river Hwang-ho rises in the mountains of Tibet, and its upper course, fed by melting glaciers, flows through

deep gorges. In its middle course, it flows through a high plateau covered with loëss to a depth of two or three thousand feet. Loëss, as we have already learnt, is a wind-borne soil, and is here brought by the outflowing winds of winter from the heart of Asia. When well watered it is very fertile, but in the absence of sufficient rainfall its extreme porosity

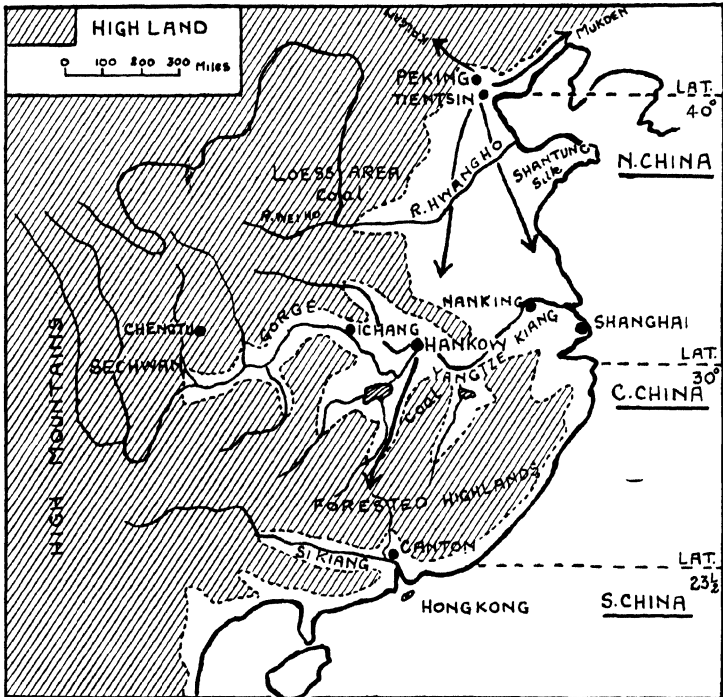


FIG. 16.—CHINA: "THE LAND OF THE THREE RIVERS"

makes irrigation necessary or renders it infertile. Fig. 16 shows the loëss-covered area.

Below its confluence with the very important Wei-ho tributary, which provides a route into the interior of Asia, the river flows over a broad fertile plain, mainly built up of alluvium derived from the loëss deposits. In this part of its course, the river bed is constantly being raised by the

deposition of sediment, so that the river flows in a raised bed enclosed by dykes and embankments. This facilitates irrigation, but causes the ever-present danger of floods through the breaking of the embankments. Disastrous floods have occurred from time to time, resulting in heavy loss of life and property, so that it is little wonder that the Hwang-ho is called "China's Sorrow."

As it is liable to flood and is also shallow on account of the constant deposition of silt, the river is of no use for

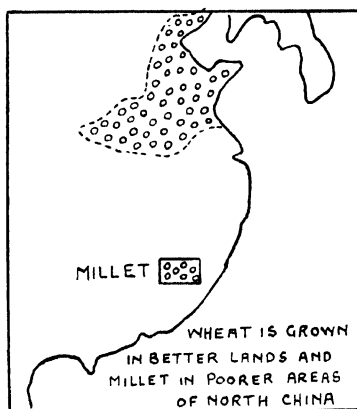
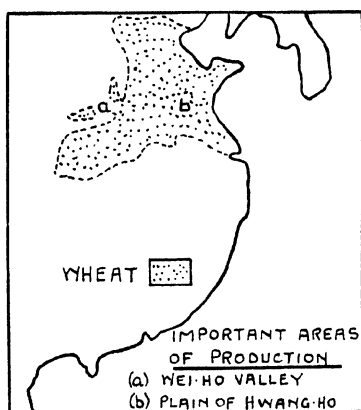


FIG. 17.—WHEAT AREAS OF CHINA FIG. 18.—MILLET AREAS OF CHINA

steamer navigation, and the absence of any large towns either on its shifting banks or at its mouth is noticeable.

2. Products

Owing to the severity of the climate, cultivation in winter is impossible, and crop-growing is restricted to the summer, the season of the Monsoon rain. The farms of China are small, and everywhere hand cultivation predominates. By irrigation, manuring, and a careful rotation of crops, two crops a season are often grown.

Wheat and millet are the principal cereal crops of North China (see Figs. 17 and 18). Generally speaking, wheat is grown on the better soils and millet on the poorer soils.

Each of these cereals occupies rather less than a quarter of the total cultivated area of the whole of China.

Barley is also grown, but more important is the soya bean, which, with its products, now figures as an important export. It is used locally both as a human food and as a fodder for pigs. The extracted oil, used in soap and margarine manufacture, and the residue bean-cake are both exported. The bean cake is used for cattle fodder and as a fertilizer, and for this purpose finds a market in Japan.

Silk is produced in the Shantung Peninsula. Here the mulberry does not flourish on account of the cold winters, and the silkworm is fed on oak leaves. The product is used in the manufacture of the material called shantung.

Coal deposits are very extensive in Shansi and Shensi, but only a small amount is as yet produced. Iron is also found in Shansi and the Shantung Peninsula.

3. Chief Towns

Peking, the chief town of North China, stands on the Pei-ho in the narrow landgate between the mountains and the sea, controlling the routes into and out of China. Although it ceased to be the capital of China in 1927 its present position as the focus of the railway system is extremely important, and should be studied carefully on Fig. 16.

Tientsin is the port for Peking and North China. It stands on the Pei-ho, which is navigable for river steamers, except between December and March, when the river is frozen.

CENTRAL CHINA—THE YANG-TZE KIANG BASIN

1. Relief Features and Divisions

Physically the basin of the Yang-tze divides naturally into five well-defined sections. (Refer to Fig. 16 as you learn these sections.)

- (a) The Mountain section, where the river, like the Hwang-ho, rises in the high mountains of Tibet, and where the headstreams, fed by melting glaciers, flow through deep gorges.

- (b) The Basin of Sechwan, an elevated basin surrounded by higher mountains and filled with deposits of red sandstone, a fertile soil the colour of which accounts for the oft-used name of "The Red Basin."
- (c) The Gorge section occurs between the Red Basin and Ichang, and also isolates the Red Basin from the lower part of the river.
- (d) The Central plain below the Gorge, in which the river receives a number of important tributaries, including the Han, at the confluence of which stands Hankow. This region consists of lowlands of fertile alluvial soil deposited in the basins of former lakes, remnants of which still exist.
- (e) The delta region below Nanking—"The Holland of China"—is a low-lying, alluvial plain traversed by innumerable canals and canalized streams.

The river is navigable as far as Hankow, 600 miles from the mouth, for ocean-going vessels, and for a further 400 miles to Ichang for larger river craft and small ocean steamers. Beyond that point normal navigation is interrupted by the rapids in the Gorge section, but specially constructed boats can pass through for the greater part of the year.

2. Products

Rice is the principal cereal and food crop of the whole basin, and is cultivated in all the lowland regions. Rice occupies rather more than a quarter of the whole of the cultivated area of China. Examine the distribution of rice production on Fig. 19, and notice that in the Yang-tze basin, the Red Basin, and the Delta are regions of very heavy production.

Wheat, next to rice the most important food crop, and millet are also grown. Tea is grown on the hill-slopes to the south of the river. Its cultivation is favoured here and

farther south by the absence of any marked season of drought, the fertile and well-drained soils, and the presence of abundant cheap labour for picking.

Cotton and silk are the important raw material crops, and are grown widely throughout the basin. The rearing of the silkworm, here fed on the mulberry, is everywhere a household industry, especially important in the delta region where the mulberry is grown on the banks of the canals.

Although the Yang-tze basin is primarily important as a rich crop-producing region, it is also rich in minerals. Coal occurs in large quantities in Sechwan, where it crops out on the valley sides, but more important at present are the fields to the south of Hankow, which supply the industries of this large centre. Iron is also found to the south-east of Hankow and is used in the iron industries of Hanyang.

3. Towns and Industries

If we examine Fig. 16 we shall find marked the key towns of the Yang-tze basin, and we must know something of the importance of each.

Chengtu is the chief town of Sechwan, a province nearly as large as France, which is important for its great fertility, intensive cropping, and dense population. Chungking and Ichang are both river ports at either end of the Gorge. Ichang, as we have already learnt, has grown up at the limit of navigation for larger river craft. The triple towns of Hankow, Wuchang, Hanyang, which have grown up at the confluence of the Han, are the foremost commercial and industrial centres of the whole basin, an importance which they owe to their position. They stand at the focus of routes from all

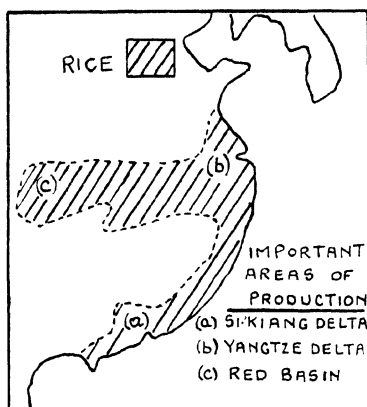


FIG. 19.—RICE AREAS OF CHINA

directions (see Fig. 16), near supplies of coal and iron, and in the centre of a rich agricultural region which produces the necessary raw materials and food for their industries and labour. Hankow manufactures cotton and silk goods, while Hanyang has blast furnaces and steel foundries, and Wuchang specializes in silk manufacture.

Nanking, now the capital of the Chinese republic, stands midway between the north and the south, and it was mainly this central position which determined its choice as capital.

Shanghai is the outlet for the rich hinterland of the Yang-tze basin and the chief port of China. It has a large entrepôt trade, and in addition to its commercial activities has many industries including flour milling, sugar refining, and textile manufacture.

SOUTH CHINA—THE SI-KIANG BASIN

1. Relief Features

The rich valley of the Si-Kiang is separated from that of the Yang-tze by a belt of mountainous country. To the west is the high plateau of Yunnan in which the river rises. In its lower course the river flows through a valley covered with fertile alluvium, and then enters the sea through a rich delta land formed by the junction of three rivers.

The Si-Kiang is navigable for steamers as far as Wuchow, and for a further 200 miles by native river craft.

2. Products

This region has the tropical Monsoon climate. Too wet for millet and too hot for wheat, rice is the principal cereal, and grows abundantly on the fertile alluvial soils of the delta (Fig. 19). Sugar is also cultivated, but not in sufficient quantities to meet the needs of the country, so that much is imported from the East Indies. Silk is produced everywhere in the lowlands.

3. Chief Towns

Canton, the chief town of South China and the outlet for the rich Si-Kiang valley, stands at the mouth of the river.

At the entrance to the estuary is the island of Hongkong on which Victoria is the chief town and port. It is a free port used by some 30,000 vessels every year and has a large entrepôt trade. It is a British naval base and has the largest shipbuilding and ship-repair yards in the Empire outside the British Isles. It has, moreover, developed a number of industries, including sugar refining and the manufacture of rope, tobacco, and cement.

Macao, a Portuguese port, also stands at the mouth of the Si-Kiang.

TRADE AND DEVELOPMENT OF CHINA

In 1929 the total foreign trade of China accounted for only 2·12 per cent. of the total world trade. When it is realized that nearly a quarter of the world's population is in China, the undeveloped nature of the trade is evident.

We have already seen that China is basically an agricultural country and should be almost self-supporting in food supplies. Yet in 1932, 20 per cent. of the total imports consisted of wheat and rice, and 10 per cent. of sugar and other food-stuffs. Thus one-third of her total imports were food supplies. Before China can become a great market for foreign countries, she must develop her own resources, especially the production of food-stuffs and raw materials, in order to provide the means of exchange.

Economic expansion will necessitate also the improvement and development of communications. Throughout the whole of China not more than 8000 miles of railway exist. But economic development in any form requires capital, foreign and domestic, which will only be forthcoming when there is security and that will only come with political stability.

CHAPTER IX

TRADE-WIND ISLANDS OF OCEAN AND DESERT : THE ISLANDS OF THE WEST INDIES

STRUCTURE AND RELIEF

WE may conveniently divide the islands of the West Indies into four main groups :

(a) The Bahamas, a scattered group of coral islands. These islands are low-lying, while many of the following groups are mountainous, being the summits of a sub-oceanic ridge of mountains running between North and South America.

(b) The Greater Antilles, including Cuba, Jamaica, Haiti, and Porto Rico, the highlands of which continue the line of highlands of the mainland of Central America.

(c) The Lesser Antilles, including the Virgin Islands, the Leeward Islands, the Windward Islands, and the Barbados, continue the line of the highland axis, but many are of volcanic origin, while many on the east or Atlantic side of these groups are of coral formation.

(d) Trinidad and Tobago, forming a fourth group, are detached portions of the South American mainland.

CLIMATE

The climate conditions of these islands are simple to understand, especially if they are connected with the following factors :

(a) Their position within or bordering on the Tropics results in there being little difference in the temperatures of summer and winter.

(b) The constant north-east trade winds from the sea

result in heavy rainfall, which occurs at all seasons but chiefly in summer. Its distribution depends largely on relief. The low coral islands such as the Bahamas and the leeward slopes of the mountainous islands receive low rainfall, while the windward slopes of the mountainous islands have very heavy rainfall. Compare in this connection the position of Port Antonio (Jamaica), which has an annual rainfall of 139", with that of Kingston, which receives only 36".

(c) and (d) The daily sea breezes and the elevation of the land both combine to temper the tropical heat and make the climate healthy.

PRODUCTS

(a) Forests

The wet windward slopes of the larger islands are covered with dense tropical forests which yield important commercial products. Cedars are important, particularly in Cuba, for cigar-box manufacture, while mahogany, ebony, and log-wood, important for its dye extract, are exported from Cuba, Jamaica, and Haiti.

(b) Crops

The tropical heat and moisture favour the production of sugar and cacao. The saline conditions of the lowlands bordering the coast favour the growth of coco-nuts and sea-island cotton. Fruits, including bananas, grapefruit, and pine-apples, are extensively grown, and find ready markets in the U.S.A. and Western Europe. Bananas are the leading products of Jamaica, and are exported mainly from Port Antonio to U.S.A., Great Britain, and Canada. Tobacco is grown particularly in Cuba, which is famous for its Havana cigar tobacco. Coffee thrives on the hill-slopes in many of the islands, but especially well known is the Blue Mountain coffee of Jamaica. The production of vegetables for the winter markets in the U.S.A. is an industry which has been fostered by the proximity of the islands to these markets.

(c) Minerals

Iron ore is mined in Cuba and shipped to the industrial regions of the north-east of the U.S.A.

Asphalt is produced from the La Brea and other pitch lakes of the interior of Trinidad. It is loaded direct into tramp steamers for export, mainly to Great Britain, where it is used in road-making.

Petroleum is now extremely important in Trinidad, and provides one-third of the total value of the exports. The island now ranks as the second largest producer in the British Empire, and produces all grades of petroleum products.

THE ISLANDS OF THE PACIFIC

STRUCTURE

The Central and West Pacific in the trade-wind belt (30° N.– 30° S.) are studded with small islands which may be divided into two main groups according to their structure.

High Islands

The High islands, which are of volcanic formation, are the tops of peaks rising from the Pacific. The more important islands of this group are the Fiji Islands, the Samoan Islands, and the Hawaiian Islands.

Low Islands

The Low islands, which are of coral formation, are built up by the coral polyp on the mountain peaks and ridges below the surface. The Gilbert and Ellice Islands, the Caroline Islands, and the Society Islands are the principal groups of this type.

PRODUCTIONS

The contrasting structure of these islands has an all-important bearing on their productions.

(a) The High Volcanic islands have rich fertile soils,

abundant rain, due to the high relief and constant trades, and high temperatures, and are consequently very productive. Sugar is the staple produce, but tropical fruits, especially bananas and pine-apples, are also of great importance.

(b) The Low Coral islands have poor limestone soils and low rainfall, but the saline condition of the soil and air favours particularly the growth of the coco-nut, which is by far the most important product. Besides supplying the needs of the native for various products, copra and coir are both exported.

TRADE AND PORTS

The products of commercial value, sugar, fruits, and copra, are collected by coastal vessels into the larger ports, which serve as entrepôt ports. This collecting system is necessary, since direct collection by the large vessels would not only be slow and uneconomical, but also impossible on account of harbourage difficulties.

Two ports are outstanding, Honolulu and Suva.

Honolulu, on the island of Oahu in the Hawaiian group, serves not only as an entrepôt for the whole group but also for the North Pacific generally. It is a port of call for nearly all trans-Pacific vessels and its position at the cross-roads of the Pacific steamer routes should be carefully studied on an atlas map.

Suva is the chief port for the Fiji islands, and serves also as an entrepôt for the island groups of the South Pacific. It has wharfage for the largest vessels, and is a coaling station and regular port of call for vessels sailing from the American ports of Vancouver and San Francisco to Australia.

IRAQ—"THE LAND OF THE TWO RIVERS"

THE TWO RIVERS

Iraq is the land watered by the two rivers—the Tigris and the Euphrates and their tributaries. Although its former name of Mesopotamia, "The land between the two rivers"

is not now applicable, these twin rivers are still the life-blood of the larger Iraq.

Although of limited value for navigation, these rivers, with the flood waters which they bring down from the mountains between March and May, are used and can be used still more extensively for irrigation. Iraq is a land of great possibilities. The soil is rich, but on account of the low rainfall vast areas can only be cultivated if irrigated. At present it is estimated that about one million acres are irrigated, but more works and more scientific methods are necessary. In the Shatt-el-Arab region the extensive date-growing areas are watered by tidal irrigation. The rising tides dam back the water twice daily and cause an overflow into the canals.

CLIMATE

Iraq lies on the fringe of the Mediterranean region. The chief characteristics of the climate are therefore :

(a) Mild winters, during which three-quarters of the total rainfall occurs. Owing to the distance from the sea, the rainfall is low, ranging from 6 to 15 inches. Baghdad, for instance, has 10 inches.

(b) Intensively hot summers practically untempered by any sea influence and without any rain.

PRODUCTIONS

(a) Crops

Crop production is influenced and limited by climate conditions and by irrigation. We shall best understand this if we divide the crops into four groups :

(1) *Winter Crops*.—These crops, such as wheat, barley, beans, are sown at the beginning of the winter, and for them the winter rain is sufficient. They are harvested in April or May, so that in Lower Iraq, where irrigation is available, summer crops can also be grown on the same lands.

(2) *Spring Flood Crops*.—In spring, when the snow melts in the mountains, the rivers flood their banks, and rice, the

staple food crop of Lower Iraq and a valuable item of export, and maize are both sown to be harvested in the autumn.

(3) *Summer Irrigation Crops*.—Cotton is the principal of these crops. Although as yet it is only cultivated in small quantities, good cotton land is abundant, and there are immense possibilities for the production of the fine Egyptian cottons. Sugar and tobacco are also grown under irrigation.

(4) *Dates*.—We have already referred to the production of dates in the irrigated Shatt-el-Arab region, which supplies 80 per cent. of the world's trade in dates. Apart from its fruit, which enters into commerce, the date palm yields a wide range of products for local use.

(b) Minerals

Iraq has important oil resources in the region between the Middle Tigris and the Persian frontier, and from it a pipeline has been constructed to the Mediterranean Sea. Kirkuk is an important centre in the mining region.

TOWNS AND TRADE ROUTES

The rivers, the caravan routes, and the modern railway all play a part in determining the position of the towns and the direction of the trade.

Basra stands 70 miles from the sea, near the Shatt-el-Arab. It is the centre of the date-producing region and the outlet for the delta lands and for much of the sea-borne traffic of Iraq. It is also the terminus of the Baghdad railway.

Baghdad is a focal centre for caravan routes from Persia, Mosul, Aleppo, Damascus, and Mecca, and so serves as an inland entrepôt. It stands on the Tigris and from it the Baghdad railway runs south to Basra and north to Mosul, while a branch follows a tributary valley to Persia.

Mosul, standing at the limit of navigation on the Tigris and at the focus of routes, is another important trade centre.

EGYPT—"THE GIFT OF THE NILE"

THE NILE AND IRRIGATION

Egypt geographically means two things—the Desert, and the Nile; as a habitable country it is only one—the Nile.

Its valley forms a great river oasis in the desert by which it is bordered on either side. When we realize that nearly all of the 14 million people of Egypt live in this narrow valley, which is only 600 miles long, and that 60 per cent. of the people are cultivators, dependent on the waters of the Nile for their crop growing, we have some idea of the significance of the phrase, "Egypt is the gift of the Nile."

We know already that the waters of the Nile are derived from two sources, and that the flood waters upon which irrigation in Egypt is dependent are brought by the Blue Nile and the Atbara rivers from the Abyssinian Mountains, which have heavy Monsoon rains in summer.

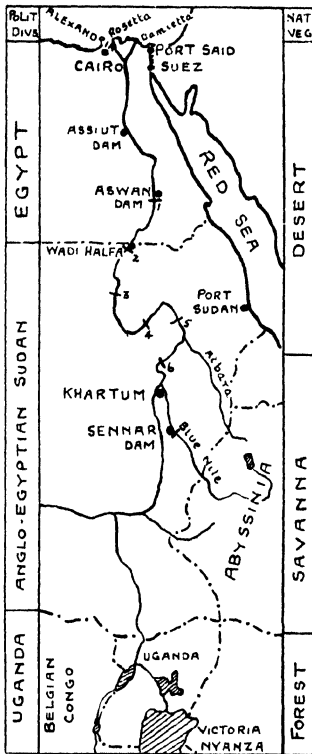


FIG. 20.—EGYPT AND THE NILE

SYSTEMS OF IRRIGATION

(a) Basin Irrigation

From the dawn of Egypt's history her lands were irrigated on the basin or flood system, by which the waters were led

by natural channels into basins, and when the water had been run off, seed was sown on the mud flats. This system still prevails in Upper Egypt, south of Deirut, and covers one-quarter of the total cultivated area.

This system has some important disadvantages. As water for irrigation is available only at one season, only one crop can be grown per year. As the water arrives in late summer or early autumn, the crops grown are those that can withstand the colder conditions of winter, such as wheat, beans, and clover. The main advantage of this system of natural flooding is that the water not only irrigates but also fertilizes with the fertile silt which it brings down and deposits in the basin.

(b) **Perennial Irrigation**

The growing of the more important commercial crops such as cotton and sugar demands a regulated supply of water at all seasons. This system of perennial irrigation now serves about 4 million acres, four times the area under the old basin system, and has been made possible by modern engineering and the building of dams and barrages to regulate and conserve the flood waters.

Two great benefits have been derived from perennial irrigation—the possibility of growing crops in summer as well as in winter, and an extension of the cultivated area. Against these advantages must be considered the danger of soil impoverishment, which may result from the loss of silt, the effects of continual cropping, and the over-saturation of the soil, which is a particular danger to cotton.

PRODUCTS

(a) *Winter Crops*.—The winter crops are those which are sufficiently hardy to withstand the colder conditions of winter, and include wheat, barley, clover, lentils, peas, beans, and onions. Although these crops are mainly grown for local use, all except clover are exported to some extent.

(b) *Summer crops* are the more valuable cash crops. The principal one is cotton, which supplies 90 per cent. of the total exports, covers one-third of the cultivated area, and supplies two-thirds of the people with a means of living. The cotton is of fine quality, long-stapled, silky, and strong. Maize is grown extensively and is an important food crop. Rice is important in Lower Egypt, the delta region, while sugar and millet are important summer crops of upper Egypt.

Two other products deserve notice: dates, which are produced along the Nile valley and in oases; and eggs, the production of which is high and has been favoured by the cheap supply of low-grade cereals for feeding.

TRADE ROUTES AND PORTS

The Nile is navigable throughout Egypt and is an important routeway with a regular service of Government steamers besides much native craft. The principal railways run out from Cairo, the capital, which stands on the Nile, 14 miles from the head of the delta. Lines run northwards to Alexandria, through which the bulk of Egyptian trade passes, to Damietta, and to Port Said and Suez on the Suez Canal. Southwards a railway runs to the first cataract at Aswan, and from here a steamer connection runs to Wadi Halfa to link up with the Sudan Railways.

Cotton is the leading export of Egypt and accounts for 70 per cent. of the total exports. In consequence, the bulk of the export trade is with cotton-spinning countries. Great Britain is Egypt's best customer and is also the largest supplier of her imports, which are mainly manufactured goods.

CHAPTER X

THE MEDITERRANEAN LANDS

THE Mediterranean lands of the world include all those regions of the world which have Mediterranean type of climate, a distinctive type of climate which is so called because it is characteristic of the lands girdling the Mediterranean Sea. The distribution of these lands is shown on Fig. 21.

(a) Northern Hemisphere :

(1) Lands girdling the Mediterranean Sea.

(2) California.

(b) Southern Hemisphere :

(1) Central Chile.

(2) Cape region of South Africa.

(3) South-west of West Australia and the coast lands from Adelaide to Melbourne.

If we examine the distribution of these lands carefully, we shall discover two facts about their position common to them all: firstly, they are all on the west of land-masses; secondly, they all lie between latitudes 30° and 40° . We must remember these facts, because they are the keys to the climate.

MEDITERRANEAN CLIMATE

Belts of high pressure lie between latitudes 30° and 40° in the northern and southern hemispheres, and from these belts the trade winds blow out towards the Equator and the westerlies blow out polewards. With the apparent movement of the sun to the north in our summer and to the south in our winter, there is a corresponding swing to the north and to the south of the main pressure and wind belts.

As a result of this swing, regions between latitudes 30° and 40° are in the trade-wind belt in summer. On the west of land-masses—that is, in our Mediterranean lands—the trade winds are blowing offshore from the land-mass and are therefore dry winds. Moreover, since they are blowing from the hot land, there is little modifying sea influence and the temperatures are high. Summer conditions are, then, both hot and dry.

Regions in the same latitudes are in the belt of westerly winds in winter. On the west of land-masses, these winds blow onshore from the sea, bringing rain and the modifying influence of the sea. The winters are therefore warm and wet. In fact, we sometimes speak of the Mediterranean type of climate as the Winter Rain Climate.

The following short but useful summary of the seasonal conditions of Mediterranean climate should be remembered :

Hot dry summers with off-shore trades.

Warm wet winters with westerly winds.

NATURAL VEGETATION

The dryness of the summer period makes it necessary for the vegetation either to store water from the winter or to be able to reach water supplies in this period of drought. Most of the vegetation consists of evergreen trees and shrubs, some with thick fleshy leaves in which water is stored, and some, like the orange and the olive, with small, leathery small-pored leaves from which little moisture can be lost. Some plants, like the vine for example, have exceptionally long roots, and can reach the moisture of the subsoils.

Owing to the long summer drought and the absence of surface moisture there is very little grass vegetation, and pastoral industries are, in consequence, few. Esparto grass is, however, a product of Mediterranean lands, especially of Spain and North Africa. It is a coarse, tough grass which is used locally for making mats, baskets, carpets, ropes, and nets, and is exported for the manufacture of paper.

Forests occur in the wetter areas. Chief among the

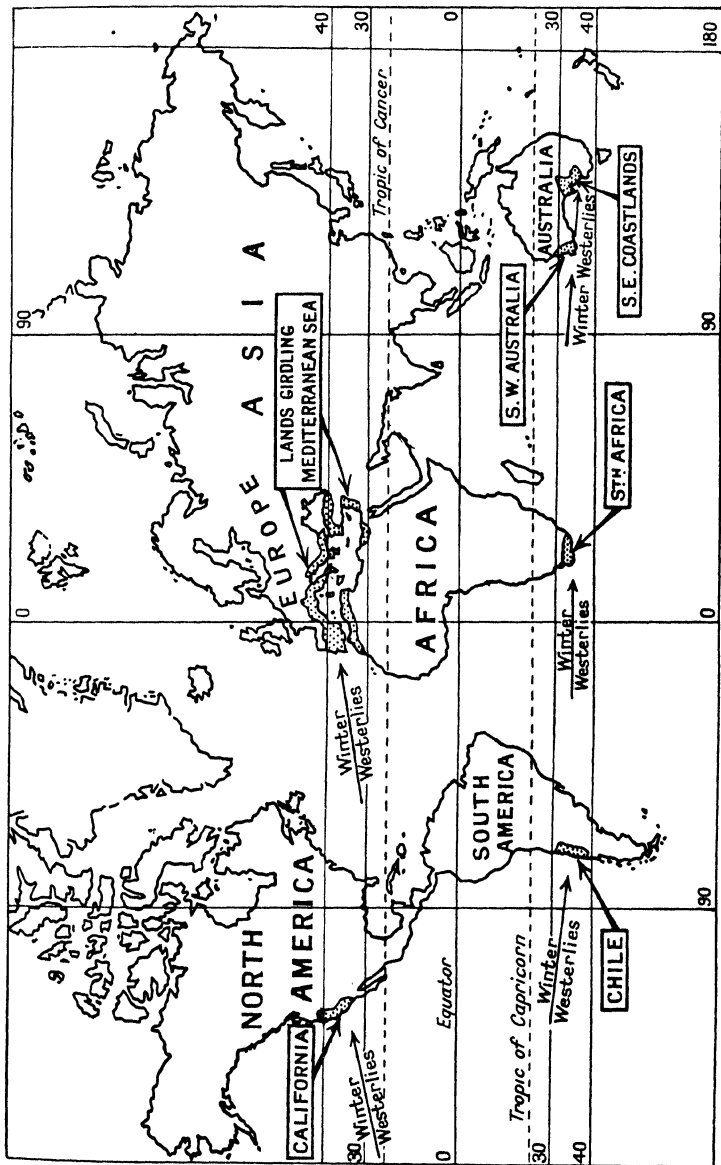


FIG. 21.—MEDITERRANEAN LANDS OF THE WORLD

trees which supply commercial timbers are the Jarrah and Karri of Australia, walnut and the Californian redwoods and sequoias. Jarrah is very hard and is used in ship and bridge building, furniture manufacture, and for railway sleepers. Walnut, especially the black walnut, yields a valuable cabinet wood, and it is used also to make veneers to cover less expensive woods. Cork is obtained in large quantities from the forests of cork oak, especially of Spain and Portugal. Natural fruits, such as walnuts and chestnuts, are another form of natural wealth.

COMMERCIAL ASPECTS OF THE MEDITERRANEAN LANDS

The commercial development of all Mediterranean lands has followed along similar lines, due to the predominating influence of the common type of climate.

1. The favourable climate, mild in winter and sunny and dry in summer, makes all these lands important crop-producing regions.

2. The long dry summers favour particularly the ripening and harvesting of grain and fruits.

3. The fruits which are grown, such as oranges, grape-fruit, lemons, peaches, figs, and grapes, are largely of "luxury" character, and are chiefly produced for export in exchange for other products.

4. With fruits and other products to trade and advantageously placed on great sea routes (Mediterranean lands, South Africa), or at terminal points of great railway systems (California, Chile), the Mediterranean lands have become prominent commercial regions.

5. The attractiveness of the climate and the abundant return which a small amount of labour yields have caused these lands to be densely populated and to be adequately provided with labour supplies.

6. The mild winters and the abundance of sun encouraged tourist traffic, especially during the winter, and this provides a very important additional source of wealth.

CHAPTER XI

THE MEDITERRANEAN LANDS OF THE NORTHERN HEMISPHERE

LANDS GIRDLING THE MEDITERRANEAN SEA

ALTHOUGH split into a number of political divisions, within which are a diverse collection of topographical, climatic, racial, and linguistic groups, these lands, from the standpoint of economic geography, have sufficient in common to permit them being grouped together into one geographical unit.

The most important of these common features is the Mediterranean climate. Although considerable local differences in climate exist, yet the small range of temperature, the high percentage of sun and winter rain prevail everywhere. Economically there is a general lack of the necessary resources such as minerals for industrial development, so that these lands, with their favourable climate, are essentially agricultural.

PRODUCTS AND TRADE

(1) Agriculture

The importance of agriculture in these lands is indicated by the percentage of the total population who are dependent mainly on the land for a living. In Portugal, Spain, and Italy the figure reaches 60 per cent., in Greece 45 per cent., and in Algeria 70 per cent.

Wheat is sown in the autumn (winter wheat) and harvested in the following May or June, at the beginning of the drought. The leading regions of production (Fig. 22) are the North Meseta, where Valladolid is an important milling centre, and the Plain of Lombardy, which is famous for the hard wheat used in the making of spaghetti and vermicelli. Barley is

widely grown, especially in the drier regions, and is much in demand in Northern Europe for malting on account of its high quality.

Maize is grown principally in the Plain of Lombardy, and from it is prepared "polenta," a staple food of the Italian peasantry.

Vegetable crops are grown in all parts for local consumption and for export. Especially important are Algeria and the Mediterranean coastal lands of Spain, which produce large quantities of winter vegetables for North Europe.

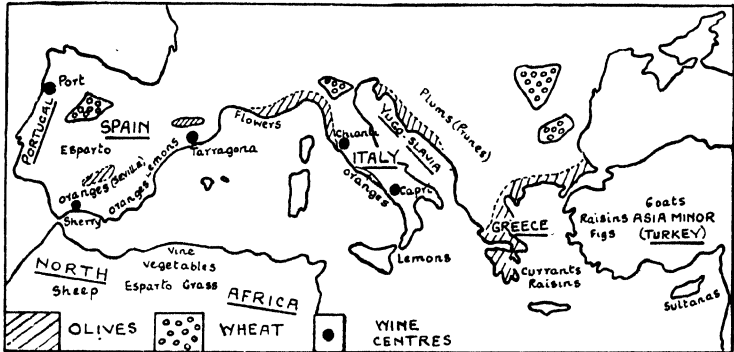


FIG. 22.—PRODUCTS OF THE MEDITERRANEAN LANDS

Flower production on the French Riviera for the important urban and social centres such as London and Paris is also worth noticing.

The vine is grown throughout the Mediterranean lands, but some regions are outstandingly important because of their well-known wines (Fig. 22). Oporto (port), Jerez (in the Guadalquivir Valley), famous for its sherry, and Tarragona are leading centres for wines in Portugal and Spain; while Asti, Chianti, and Capri are the names of well-known Italian wines.

Grapes are commercially important for wine making and also as dried fruits in various forms. Raisins are produced particularly in South Spain, where Malaga gives its name to

a special kind ; currants, small seedless grapes, are grown mainly in Greece, and sultanas, another form of grape, are produced particularly in Cyprus and along the coastlands of Syria (Fig. 22).

Figs from the Smyrna district of Turkey, and prunes, dried plums from Yugo-Slavia, are other dried fruits which enter into commerce (Fig. 22).

Like the vine, olives are grown in most of the Mediterranean lands (Fig. 22). Spain and Italy, the leading producers, account for nearly two-thirds of the whole production. Olive oil is used locally instead of butter and animal fats, and in industry for soap manufacture and fish canning. There is a considerable export from Spain to the U.S.A. and of the well-known Lucca oil from Italy.

Citrus fruits, particularly oranges and lemons, are important, while grapefruits are also extensively grown. The chief regions of commercial production are the Guadalquivir Valley, the home of the Seville orange ; the irrigated coastlands of Valencia in Spain ; the coastal lands of South Italy and Sicily, where lemons are the staple product, and the coastlands of Palestine where the famous Jaffa oranges are produced. Mandarin oranges, a small variety, are an Algerian product.

Silk is an important product, especially in the Plain of Lombardy, where the climate is too extreme for citrus fruits and the olive, but favours the hardy mulberry (Fig. 22). Moreover, the dense population of this region supplies the demand for cheap and abundant labour which is necessary at all stages of silk production. With local supplies of raw material, silk spinning and weaving have become leading industries in such centres as Milan, Turin, Como, and Bergamo.

The region round Brusa in Turkey and the coastlands of Southern Spain are regions of smaller production.

(2) Pastoral Products

Cheeses, of which Parmesan, La Gruyère, and Gorgonzola are well known, are important products of the dairying

industry of North Italy, where the cattle are fed on the Alpine pastures or stall-fed on fodder crops in the plain.

Wool is produced from the sheep fed on the dry pastures of the Meseta in Spain, the home of the famous Merino wool sheep, and from the sheep of the Shott plateau of North Africa and of the high plateau of Asia Minor. Mohair, the fine hair of the Angora goat, is also a product of the high plateau of Asia Minor (Turkey) (Fig. 22).

Swine are reared in large numbers in some parts of Spain, Portugal and Italy where they feed on the acorns of the oak forests.

(3) Natural Products

Chestnuts are produced from the forests of Italy, Portugal, Spain, and Corsica. They not only provide a food supply for the peasants but are also exported. Cork, produced from the cork oak tree, is an important product of Spain, North Africa, and especially of Portugal, where it ranks second to wine in the list of exports.

Esparto grass is gathered and exported from the southern Meseta of Spain and from North Africa (Fig. 22).

TRADE ROUTES AND PORTS

The main entrances to the Mediterranean are represented by three Sea Gates :

1. The Sea Gates (see Fig. 23)

(a) Straits of Gibraltar—the gateway from the Atlantic. Through this gateway comes—

(1) The traffic from Liverpool, London, Hamburg, and the ports of Western Europe, which is bound for the Mediterranean, or that for the Far East and Australasia *via* the Suez Canal.

(2) The traffic from the New World, including supplies of raw cotton for the textiles industries of Italy.

(3) The traffic from French Colonies in Africa, especially vegetable oils for Marseilles.

(b) The Bosphorus, leading from the Black Sea. Wheat from the Russian Black Earth region shipped from Odessa and oil from Trans-Caucasia are leading cargoes from the Black Sea to the Mediterranean for distribution to all parts of Europe.

(c) The Suez Canal. From Western Europe and the Mediterranean ports of Marseilles, Genoa, and Trieste ships converge on the Suez for the Far East, India, and Australasia.

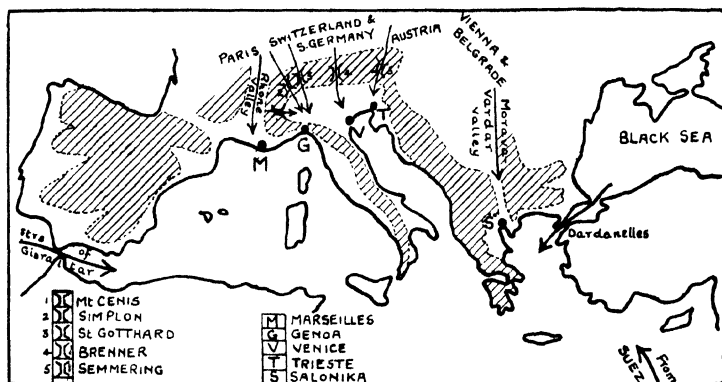


FIG. 23.—LAND AND SEA GATES OF THE MEDITERRANEAN

2. The Land Gates (Fig. 23)

The land gates to the Mediterranean focus at four important ports—Marseilles, Genoa, Trieste, and Salonika.

(a) The Rhone Valley, which provides the route from the Channel ports through Paris to Dijon and Lyons and so to Marseilles. Marseilles is a port of call for many vessels passing through the Mediterranean. Its trade is largely with the French possessions of Morocco and Algeria in North Africa and with the East. Its principal industries are oil refining, soap manufacture, fish canning, and shipbuilding.

(b) The Alpine Routes. (1) On the west, through the Mount Cenis, Simplon, and St. Gotthard passes, routes converge from France, Switzerland, and South Germany on to Turin and Milan and thence through the Bocchetta Pass to

Genoa. Thus Genoa serves as a port not only for the immediate hinterland of the Plain of Lombardy, but the more remote regions of Switzerland and south Germany.

(2) On the east, routes lead from Munich *via* the Brenner Pass to Venice, and from Austria through the Semmering Pass to Trieste—the port at the head of the Adriatic.

(c) The Morava–Varda Route. From Western and Central Europe *via* Vienna and Budapest, a route runs to Belgrade and thence by the valleys of the Morava and Varda to Salonika, which is thus the terminus of a trans-continental route.

CALIFORNIA

California lies in the same latitudes as the Mediterranean lands of Europe and has in general the same kind of climate—warm wet winters and hot dry summers. In contrast with Europe where the grain of the relief is east to west, in California the mountains run in parallel ranges from north to south, and the Mediterranean climate is restricted to the western margin of the continent.

From the map (Fig. 24) we see how the parallel ranges have determined the general relief, which may be distinguished by (1) the narrow coastal plain, (2) the coast range, (3) the broad central valley drained by the Sacramento and San Joaquin rivers, and backed by (4) the Sierra Nevada.

INDUSTRIES AND PRODUCTS

1. Farming

The most important farming region is the rich Californian Valley. The maritime influence of the Pacific, its sheltered position, and its dry sunny summers have favoured the development of the most intensive fruit-growing industry in the world. The sheltered position of the Valley and the summer drought make irrigation necessary, but abundant water supplies for the purpose are available from the streams which cross the Valley from the Sierra Nevada.

The long distance from the markets of Eastern U.S.A. and of Western Europe has made it necessary for the growers to do the picking, packing, and transport with the maximum of efficiency, and also to develop fruit-drying and canning industries. In addition to citrus fruit such as oranges, lemons, and grapefruits, which are marketed mainly as fresh fruits, soft fruits such as apricots and peaches for tinning are also extensively grown.

2. Lumbering

The slopes of the Coast Range and the Sierra Nevada are both clothed with extensive coniferous forests. The favourable climate causes the trees such as the Californian redwood, and the sequoias which are now reserved, to grow to enormous heights and sizes. The fast-flowing rivers are important for transport, and also provide power for the saw and pulp mills. Oakland is the leading timber centre.

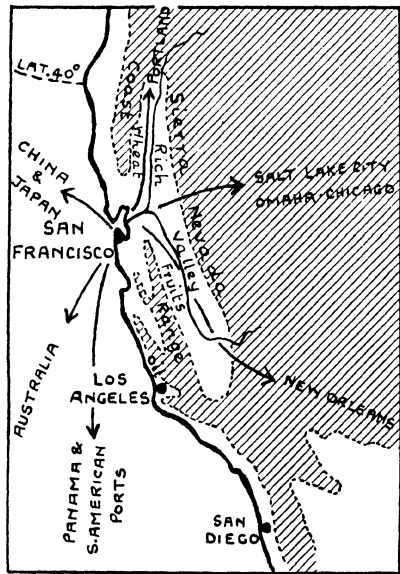


FIG. 24.—CALIFORNIA AND POSITION OF SAN FRANCISCO

3. Mining

California is the leading producer in the U.S.A. of gold and a large producer of petroleum. The principal oilfields are in the south, where Los Angeles is the principal oil-refining centre, and San Pedro, with an artificial harbour, is an important oil port.

4. Other Industries

The motion picture industry, which is centred in Hollywood, near Los Angeles, was favoured originally by the clear,

sunny skies for photography and the wealth of natural scenery, desert, islands, mountains, and varied vegetation, all factors which were particularly important before studio technique reached its present high standard.

Salmon fishing is carried on in the rivers and is the basis of an important canning industry.

TOWNS AND PORTS

San Francisco, the principal port of California, stands in a unique position on the Golden Gate, the only important break on the West Coast and opposite the principal gateways through the mountains behind it. It has thus become a focus of both shipping and trans-continental railway routes (see Fig. 24). Its hinterland includes practically the whole of California, and not only its trade but also its industries, sawmilling, fish and fruit canning, and oil-refining are based on its products. San Francisco trades not only with the Pacific lands and Australasia, but also through the Panama with Eastern U.S.A. and Western Europe.

Los Angeles, in addition to its oil and film industries, is the centre of a large fruit-growing region and is important also for fruit canning and wine making.

CHAPTER XII

THE MEDITERRANEAN LANDS OF THE SOUTHERN HEMISPHERE

THE CENTRAL VALLEY OF CHILE

(1) Relief and Climate

The Central Valley of Chile, "The Heart of Chile," is a plain about 600 miles long with an average width of 25 to 30 miles. It extends from latitude 30° S. in the north to 40° S. in the south and lies between the parallel ranges of the Coast Range and the Andes.

It has a typical Mediterranean climate with winter rain and summer drought. Owing to the fact that the parallel mountain ranges lie in the path of the winter westerlies, the rainfall of the all-important Central Valley is small and irrigation is necessary for crop production.

The valley has a rich alluvial soil and is intersected by numerous small streams from the Andes which supply water for the irrigation. The methods of irrigation are primitive and inexpensive.

(2) Farming

The land is mainly in the hands of large landowners who are very conservative, opposed to progress, and still employ very primitive methods of cultivation. Wheat of excellent quality is grown, and covers four times the area of the other cereals which are grown, such as oats, barley, and maize.

Vegetables, such as peas, beans, potatoes, and asparagus for the U.S.A. winter market are extensively grown. Fruit production is favoured by the climate, with its lack of extremes and abundance of sunshine. Since there is no large home market, an important dried and preserved fruit industry has developed. Grapes, apples, peaches, and pears are the

principal fruits. Nuts, almonds, and walnuts are also important items of export, especially as distance from the market presents no difficulty of transport.

Santiago, the capital of Chile, is situated in the Central Valley on the transcontinental railway which runs from Buenos Aires through the Uspallata Pass to Valparaiso, which is the chief port for the Central Valley.

THE MEDITERRANEAN REGION OF SOUTH AFRICA

The Mediterranean region of South Africa is a triangular area behind Cape Town (Fig. 25). It is a region of alternating hills and valleys and of mountains enclosing sheltered and fertile plains. The climate, especially the absence of frost in winter and the dry, sunny summers, has made these plains and valleys especially noted for fruit production.

(1) **Productions**

(a) *Fresh Fruit Industry.*—The importance of this region commercially lies in its supply of fresh fruits to Northern Europe. Owing to its position in the Southern Hemisphere the harvest season is reversed, and fresh fruits, Cape plums, pears, and apricots arrive in Northern Europe soon after Christmas, when our fruit supplies are getting scarce. In this trade South Africa has a distinct advantage over the other Mediterranean regions of the Southern Hemisphere, on account of its greater proximity to the markets of Europe.

(b) *Other Products.*—Grapes are used extensively in wine manufacture and in the dried fruit industry for currants, while other fruits are grown for jam manufacture. Olive oil is an important product and is manufactured chiefly at Paarl. Winter wheat is particularly important in the Malmesbury Plain.

(2) **Towns**

There are a number of towns in the plains—Paarl, Worcester, Wellington, and Malmesbury being the chief—which

are the centres for fruit packing and drying, and wine and jam manufacture.

The chief centre is, of course, Cape Town, the chief port and largest town of South Africa. It stands in a fine position on Table Bay, sheltered by Table Mountain. It is the terminus of the South African railway system, and serves not only as a port for South Africa but also as a port of call



FIG. 25.—MEDITERRANEAN REGION AND POSITION OF CAPE TOWN on the route to Australia. It has a well-equipped harbour and port with a dry dock and up-to-date equipment.

THE MEDITERRANEAN LANDS OF AUSTRALIA

In Australia there are two Mediterranean areas :

- (1) South-west of Western Australia.
- (2) The Coastal lands from Adelaide to Melbourne.

1. South-west of Western Australia

The south-west of Australia may be divided into three production belts based on the decreasing rainfall from the coast inland (Fig. 26).

(a) The Timber belt lies near the coast and is important for its Jarrah and Karri timbers, two of the Eucalyptus family. The timbers, as we have already heard, are very hard and are used in ship and bridge building, furniture manufacture, and road paving, etc.

(b) The Crop belt is important for its fruits and wheat.

(c) The Pastoral belt lies still farther inland, where the

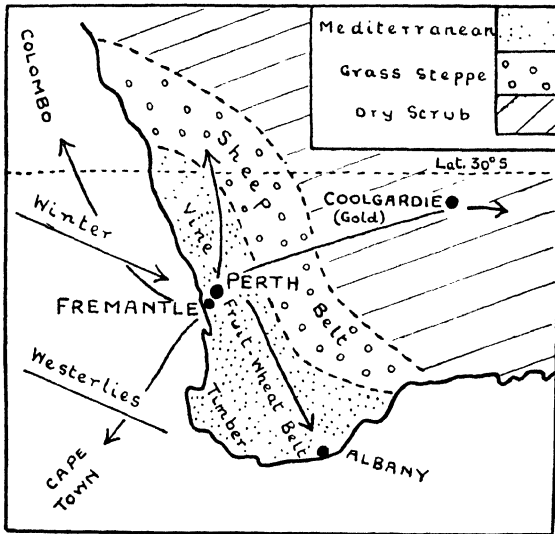


FIG. 26.—MEDITERRANEAN REGION AND POSITION OF PERTH

rainfall is too small for crops, but is sufficient to provide sheep pastures.

2. The Coastal Lands

The Coastal lands from Adelaide to Melbourne, although not on the west of the Continent, have winter rains, like other Mediterranean regions, brought by the westerly winds. The region is important for its wheat and fruits. There is little export trade in fresh fruits (compare South Africa), but apricots and peaches are grown in greater quantities for canning, and grapes are dried for currants and raisins.

CHAPTER XIII

THE GRASSLANDS OF TEMPERATE REGIONS

DISTRIBUTION AND CLIMATE

THE Temperate grasslands are found in regions having light rainfall in spring and early summer. The rainfall, varying from 15 inches to 25 inches, is not sufficient to keep the soil moist at all seasons, so that trees do not flourish, and grass is the prevailing natural vegetation.

The map (Fig. 27) shows us that temperate grasslands occur in two areas in the Northern Hemisphere and in three areas in the Southern Hemisphere.

The areas of the Northern Hemisphere—the Prairies of North America and the Steppes of Asia—both lie in the centres of large land-masses, remote from the modifying influences of the sea, and in consequence both have great extremes of climate. Figures for Winnipeg in the Prairies of Canada and for Barnaul in the Asiatic Steppes illustrate these extremes.

	Hottest Month.	Coldest Month.	Range.
Winnipeg	66° F.	-3° F.	69° F.
Barnaul	67° F.	-2° F.	69° F.

The areas of the Southern Hemisphere—the Pampas of South America, the Veld of South Africa, and the Murray-Darling basin of Australia—are not so extensive, on account of the tapering of the continents, and all have more equable climate conditions as the result of their greater proximity to the sea. The figures below for Bahia Blanca (South America), Bloemfontein (South Africa), and Bourke (Australia) should be

compared with those for Winnipeg and Barnaul, because, as we shall see later, the contrasting climate conditions have had an important bearing on their economic development.

	Hottest Month.	Coldest Month.	Range.
Bahia Blanca	71° F.	45° F.	26° F.
Bloemfontein	73° F.	48° F.	25° F.
Bourke	84° F.	51° F.	33° F.

NATURAL VEGETATION

Large undulating areas of grass with an almost complete absence of trees are the chief features of these regions. The spring and early summer rains, together with the summer warmth, result in a quick growth of grass which, as the season advances and the temperature gets higher and the rainfall less, becomes parched, withers, and eventually dies with the approach of winter.

In winter, in the regions of the Northern Hemisphere, the ground is frozen hard and is usually covered with snow. Production is therefore limited to the summer period when crops, especially cereals, can be grown. But in the Southern Hemisphere where, as we have seen, climate conditions are more moderate, animals can live outdoors and find pastures throughout the winter. It is for this reason that these regions of the Southern Hemisphere are predominantly important for their pastoral industries.

ECONOMIC DEVELOPMENT

In the earliest stage of development these lands are the homes of nomads, such as the Red Indians of the Prairies, who hunted herds of buffaloes on the great plains, and the Khirgiz of Asia, who are still herders of flocks on the poor Steppe.

Their present economic importance results from their

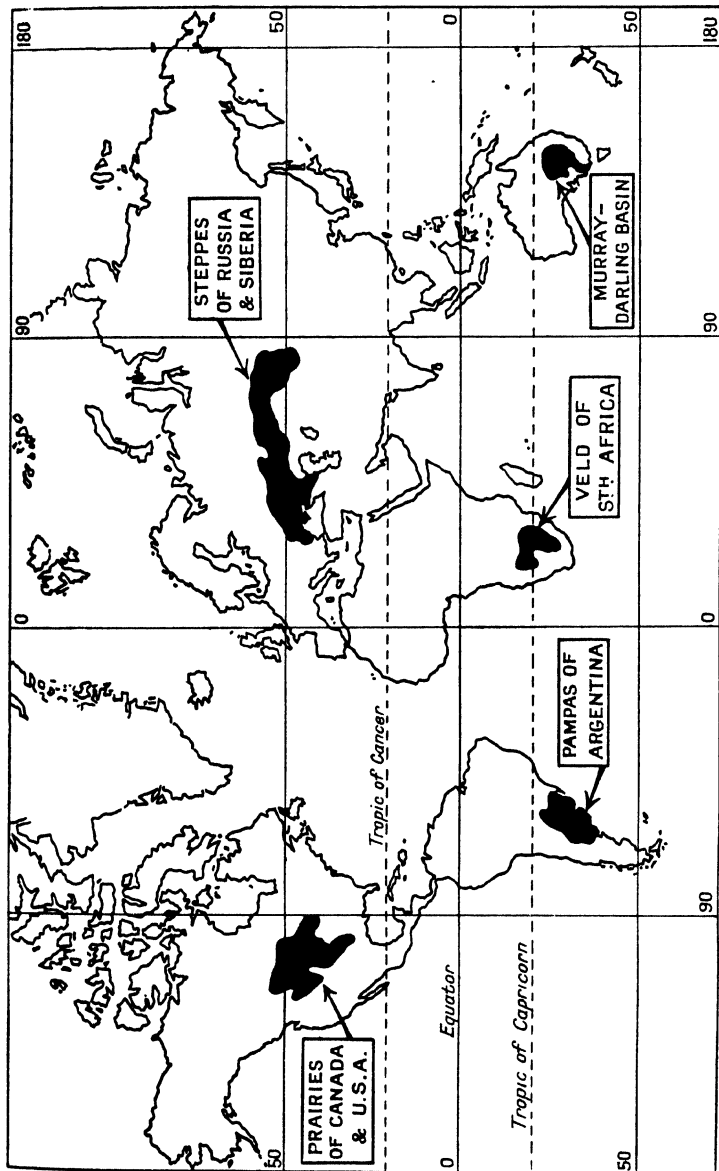


FIG. 27.—TEMPERATE GRASSLANDS OF THE WORLD

exploitation and development as pastoral and crop lands to meet the increasing demands of the world's markets for food and raw materials.

In the first place, the large areas of natural grass and the cheapness of the land have favoured large-scale development such as the cattle industry of the Argentine and the sheep industry of Australia.

As time goes on, open ranching gives place to more extensive stock-raising, with the introduction of fodder crops and of new breeds to improve the quality of the stock.

Secondly, the climate of these regions, which is favourable to the growth of natural grasses, favours also the growth of cultivated grasses such as wheat, barley, maize, and some of these lands have become the granaries of the great industrial regions of the world.

The building of railways has played an important part in the opening up of these lands not only by providing a means of transport to the market, but also by encouraging increased immigration of labour and capital.

In the following sections no attempt will be made to give a detailed account of each region, but emphasis will be laid on the one industry or group of industries for which each region is commercially important. By this means we shall learn not only something about the factors which favour the production of particular products, but also something about their systems of production and methods of handling, transporting, and marketing.

CHAPTER XIV

THE WOOL INDUSTRY OF AUSTRALIA

As regards the size of its flocks and the quality and quantity of wool produced, Australia has long occupied a leading position amongst the sheep-raising countries of the world.

Australia, with 15 per cent. of the world's sheep, produces about a quarter of the wool supply of the world and about half of the world's supply of merino wool.

The importance of wool production in Australia is illustrated also by the fact that for the five years ending 1932, the export of wool averaged 43 per cent. of the value of the total export trade.

SPECIAL ADVANTAGES FOR WOOL PRODUCTION

Australia possesses special advantages which have given her the leading position which we have just examined.

(a) There are extensive areas of natural grasses suited to sheep and especially to the merino wool sheep, which comprises 70 per cent. of the total flocks. Much of the natural grass, too, has drought-resisting properties and provides sheep pasture in areas of low rainfall.

(b) The climate conditions of the grassland areas are favourable. Wool sheep require cool, dry conditions. Sheep suffer from too much heat, and in very wet areas are subject to disease, especially foot rot. In Australia, the temperate grasslands and the principal sheep areas lie south of the 60° F. isotherm for July (winter). The areas of great density lie in the rainfall belt of 15 to 30 inches, but the sheep areas extend beyond this belt into the regions with a lower rainfall on the edge of the desert where salt bush provides a very

suitable sheep pasture, but as the rainfall decreases, the number of sheep per acre becomes smaller.

(c) The development of the industry has been helped, too, by the fact that little labour is required as compared with other farming industries, such as crop-growing or dairying. It is generally estimated that one man is required to look after 1000 sheep, 100 meat cattle, or 10 dairy cattle.

ADVERSE FACTORS

In addition to these advantages, the Australian sheep farmer has had his difficulties.

(1) First of all, the question of water supply has been a very trying problem, especially in the areas of low rainfall. From time to time drought has caused enormous losses amongst the flocks. Fortunately this difficulty is now largely overcome by the extensive supplies of stock waters which are available from artesian bores, by the growing of fodder crops, and the possibility of moving stock by railway in periods of drought.

(2) One other problem has been the loss of pasture resulting from the rabbit plague. It is estimated that the damage done by the rabbit and the cost of combating this evil by trapping and constructing rabbit-proof fencing amounts annually to about 60 million pounds. Rabbit drives are held periodically, and thousands are killed. The carcasses are exported as frozen meat and the furs are sold for felt hat manufacture. This trade in rabbit products amounts to 4 million pounds per year.

DISTRIBUTION OF SHEEP AREAS

The sheep areas are shown on Fig. 28. We have already seen that they lie mainly between the rainfall limits of 15 to 30 inches, and that in the north they are bounded by the July isotherm of 60° F. Now study the map carefully in conjunction with these figures which show the percentage distribution of the sheep in the various States :

New South Wales, 48 per cent. ; Queensland, 20 per cent. ;

Victoria, 15 per cent. ; West Australia, 9 per cent. ; others, 8 per cent.

HANDLING AND MARKETING THE WOOL

(a) *Shearing.*—The shearing of the sheep is done at the beginning of the hot season, starting in early August in Queensland and in September in Victoria. The work is done by skilled shearers who are employed for the shearing

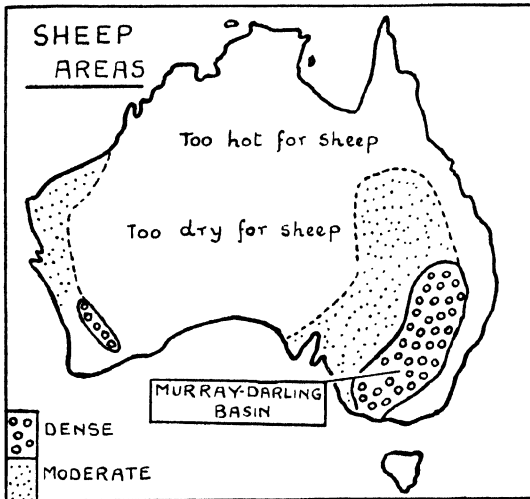


FIG. 28.—SHEEP AREAS OF AUSTRALIA

season only, and who move from station to station. The work is mainly done as piece-work, that is, the shearer is paid for the number of sheep sheared. A good shearer will do more than 100 per day. The shearing takes place in a big shed by machine-driven clippers. After shearing, the wool is sorted and packed into bales for transport to the markets.

(b) *The Markets.*—Approximately 90 per cent. of Australian wool is sold in local markets before export. Buyers from the United Kingdom, France, Germany, Belgium, and other countries attend the wool sales which are held at such

important collecting centres as Sydney, Albury, Melbourne, Geelong, Ballarat, Brisbane, Perth, and Hobart, where the wool can be seen in bulk. The remainder is exported for sale in the wool markets of London and other European countries.

(c) *Wool Export.*—Most of the wool (about 80 per cent.) is exported in “the grease,” pressed and packed into bales weighing about 350 lb. Although $2\frac{1}{4}$ lb. of wool in the grease is only equal to 1 lb. of scoured wool, it has been found that wool is damaged considerably when transported as scoured wool and that the extra cost of transporting “greasy” wool is worth while.

Australia's best customers for wool are the United Kingdom (which takes 30 per cent. of the exports), France, Japan, Germany, and Belgium in that order. Other sheep products such as tallow, skins, hoofs, and horns are also exported.

MODERN TENDENCIES IN THE SHEEP INDUSTRY

With the introduction of refrigeration, considerable attention has been given to the meat industry, and heavier breeds—the Romney and Lincoln—have been introduced. Some 12 million sheep and lambs are now slaughtered annually for export.

The question of future wool export is also one that has to be considered. In the first place, the use of wool for clothing is meeting with considerable competition from artificial silk, and it may become increasingly difficult to find markets. Secondly, it must be remembered that as time goes on Australia is herself using more and more raw material in her own industries, although at present the amount used is only about 6 per cent. of her total wool production.

CHAPTER XV

THE MEAT INDUSTRY OF THE ARGENTINE

ARGENTINE holds the same leading position in the meat trade of the world as Australia does in the wool trade. Although she ranks only fifth in the total number of cattle kept, and fifth, too, in the total number of sheep, she ranks as the world's leading country of meat export (beef and mutton). She is by far the largest exporter of beef, and ranks second after New Zealand for the export of mutton.

Argentine holds this leading position in the meat trade of the world because geographical conditions have favoured its development.

GEOGRAPHICAL BACKGROUND

(a) Position

With regard to position, three important points should be borne in mind. In the first place, the cattle lands of the Argentine are all near the seaboard, so that long expensive overland transport is avoided. Secondly, the seaboard faces the Atlantic and the markets of the great industrial regions of Western Europe. Finally, Argentine lies nearer to these markets than other meat-producing lands and benefits by the cheaper transport and the export of her meat in chilled state.

(b) The Pampas

The Pampas is a vast level grassy plain. The large areas, the cheapness of the land, and the suitability of the natural grasses for stock pastures made this region an important cattle and sheep land at an early date. In the first place, there were large open ranches on which the long-horned

Spanish cattle were kept, and hides, tallow, and jerked (salted) beef were the principal products.

The rivers and the great plains, over which railway construction has been easy, have been natural assets in establishing adequate transport facilities. The important Plate waterway, carrying ocean vessels up to Rosario and river steamers to many points farther up, is now supplemented by railways which form a network radiating from the ports of Buenos Aires, Rosario, and Bahia Blanca.

(c) Climate

Most of the Pampas lies in the Warm Temperate Zone. The pleasant climate is very favourable to European settlement and has resulted in considerable immigration. This has not only brought adequate supplies of labour, but also capital with which the meat industry has been put on a sound commercial, more intensive, and scientific basis.

Moreover, the mildness of the winter makes it unnecessary to stable the stock during this period.

THE DEVELOPMENT OF THE MEAT INDUSTRY

The advance of the cattle industry, from the stage when hides and tallow were its chief products to its modern position as the basis of the world's largest meat industry, is mainly the result of the application of science and the adoption of more intensive systems of farming. We shall do well to look at some of the chief features of this change.

(a) The improvement of the stock and of the quality of the meat has been accomplished by the importation of pure-bred stock and careful breeding. The pedigree stock comes mainly from Europe and the U.S.A., and as many as 150,000 head are imported yearly.

(b) The old system of open ranching has been replaced by a more intensive system which is characterized by the fencing of pastures and the growth of fodder crops, such as maize, linseed, and alfalfa grass, for fattening. The introduction of alfalfa was particularly important, not only on

account of its excellent fattening properties but also because it will grow well in dry regions.

(c) The preparation of the meat, meat products, and cattle by-products is now done on vast up-to-date systems in the huge meat-packing and refrigerating plants built by concerns such as Swifts and Armours at the important collecting centres of Buenos Aires, La Plata, Bahia Blanca, and Rosario. The largest refrigerating plant in the world with a capacity for 5000 cattle and 10,000 sheep per day is at Buenos Aires. Besides the trade in fresh meat, there is a considerable trade in tinned meats such as corn-beef, ox tongues, and meat extracts such as Bovril.

(d) Transport has been perhaps the principal factor in the development of the meat industry. We have already referred to the importance of the rivers and railways, but the dependence of Argentine on overseas markets has made shipping the chief factor. By far the most revolutionary development was the introduction of the refrigerator ship. It was this that made overseas trade in fresh meat possible, and opened the European market to Argentine beef.

(e) By-products and their uses are an important feature of the meat industry, and some reference to them and their uses is necessary. There are the hides and skins for leather industries; the fats are used for tallow, and in the manufacture of margarine, and as a lard substitute; the bones are made into buttons; the hair and bristles are used in brush and upholstery industries; the horns and hoofs are employed in glue manufacture; the blood and bones are made use of in the preparation of artificial fertilizers.

CHAPTER XVI

THE PASTORAL INDUSTRIES OF NEW ZEALAND

THE temperate climate, fertile soils, and freedom from drought are the chief factors which make New Zealand an important pastoral country. The importance of the pastoral industries in New Zealand may be gauged by the fact that more than 90 per cent. of her total exports are pastoral products, including wool, meat, dairy produce (butter and cheese), hides, and tallow.

SHEEP FARMING

The importance of New Zealand as a sheep-rearing country is indicated by the fact that the number of sheep per square mile is higher than in any other country of the world, and also by the large number of sheep breeds which find favourable conditions in one or more regions. In the hilly and down country of the South Island, such as the Otago Plateau, the long-wooled merino is important. In the Canterbury Plain, mutton sheep, mainly merino cross-breeds such as the famous Corriedale, predominate. In the North Island, the Romney sheep, which on account of its freedom from foot-rot is suited to the moister conditions there, and the Southdowns, which are bred to supply fat lambs for slaughtering, are the principal breeds (Fig. 29).

The success of the sheep-farming industry in New Zealand is due to a number of causes :

- (a) The mildness of the climate, which makes winter stabling and fodder crops largely unnecessary.
- (b) The richness of the pastures, much of which consists of English sown grasses.
- (c) The successful crossing of breeds to produce sheep

which combine the best fleece and the most suitable carcass for freezing purposes.

- (d) The utilization of by-products, skins for leather, tallow for soaps and candles, horns for buttons.

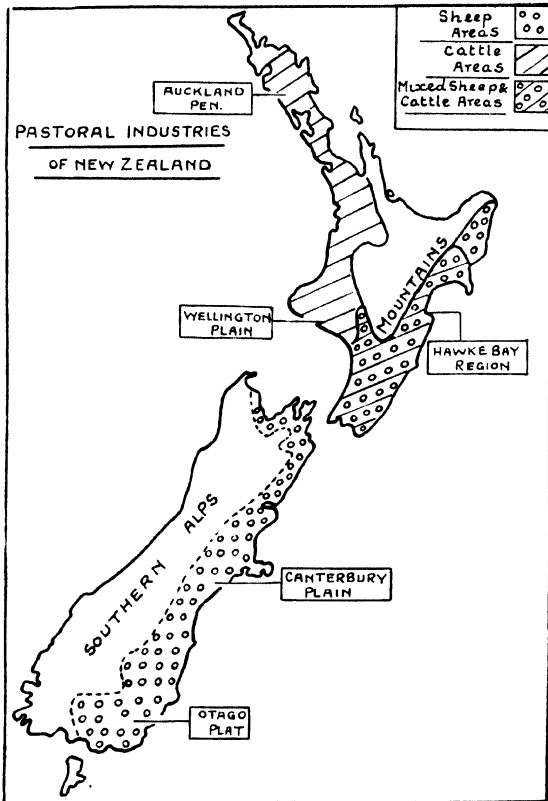


FIG. 29.—PASTORAL INDUSTRIES OF NEW ZEALAND

- (e) The introduction of refrigeration and the resulting trade in frozen meat.

Of the two major products of the sheep industry, wool is the more valuable export and is more widely distributed; 70 per cent. of the total wool export comes to Great Britain

and the remainder goes to other countries—France, Germany, U.S.A., and Japan in that order of value. Of the frozen meat products, mutton and lamb, of which some 7 million carcasses are exported every year, 90 per cent. comes to Great Britain.

THE DAIRYING INDUSTRY

The cattle industry is mainly restricted to the North Island, where the warmer, moister, and more extensive lowlands provide more suitable pastures than the mountainous west and drier east of the South Island (Fig. 29).

The development of the dairying industry has been favoured by a number of important factors.

- (a) The abundance of rich pastures throughout the year and the mild climate, making winter feeding and stabling unnecessary.
- (b) The introduction of refrigeration, allowing butter and cheese to be exported to distant markets.
- (c) The improvement of the herds by the importation of pure-bred stock from Europe.
- (d) The application of scientific methods by the farmers themselves, including scientific feeding, milk recording, and the use of milking machines, which has helped to overcome the difficulty of labour shortage.
- (e) The organization of the industry on a co-operative basis by which the most efficient marketing system can be operated and the maximum return secured by the farmer.
- (f) A strict Government supervision of all exports so as to ensure that no goods are exported which will damage the reputation for good produce which New Zealand holds.

It is important to notice that butter is mainly produced in Auckland, while cheese comes chiefly from the Wellington and Taranaki districts.

In the export trade, New Zealand is the leading exporter of cheese in the world, and second only to Denmark in the export of butter. Practically all the butter and cheese exports come to Great Britain.

BEEF CATTLE

The beef industry of New Zealand has declined on account of the increasing attention given to the dairying industry and the difficulty of competing in the London markets with the fresh and chilled meat which comes from the Argentine and other countries. However, in 1933, several trial shipments of New Zealand chilled beef were made and proved successful, and this may lead to the opening of a new trade in beef.

CHAPTER XVII

THE VELD OF SOUTH AFRICA

THE temperate grasslands of South Africa are found on the Veld, the lofty plateau which is bounded on the south-east by the Drakensberg mountains and on the south by the Nieuweld Range.

The plateau, which is highest in the south-east, slopes towards the north and towards the west ; the rainfall brought mainly by the summer trades from the south-east decreases from the east, where the Transvaal and the Orange Free State have about 30 inches to Bechuanaland in the west which has only 10 inches or less ; temperatures increase towards the north as the tropic is approached. These factors combine to cause considerable differences in the grassland conditions of the plateau, which may be divided into the three sections, described below and shown on Fig. 30.

THE GRASSLANDS

1. In the south-east, occupying the greater part of the Transvaal and Orange Free State is the High Veld, a high plateau of over 4000 feet and a typical temperate grassland region. This region has adequate rainfall and fertile soils and is therefore the most productive and most densely populated region.

2. Towards the north, occupying the northern part of the Transvaal, is the Low Veld, where the plateau is less than 3000 feet high. The higher temperatures and more humid conditions make this region unhealthy, and the grassland is more like savanna type.

3. On the west in Bechuanaland is the Bush Veld. There the dry conditions cause the grass to become scarce and

poor and to pass gradually into scrub, and finally into semi-desert on the extreme west.

Economically, the importance of the Veld may be judged by the fact that its minerals, pastoral products (wool, mohair, hides, and skins), and crops (maize and maize meal) make up

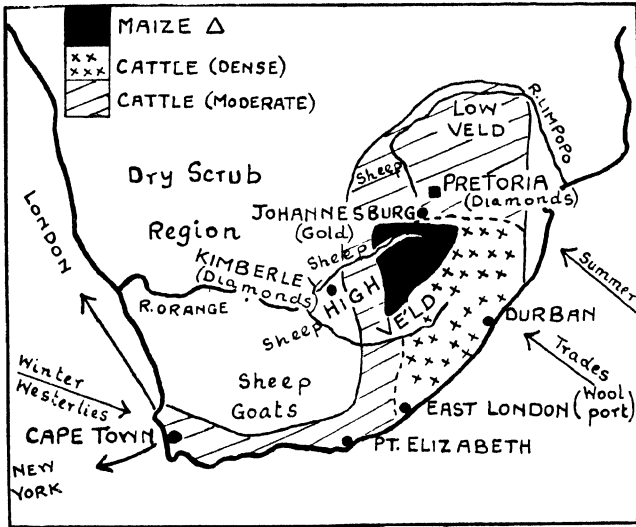


FIG. 30.—VELD OF SOUTH AFRICA

about 90 per cent. of the total export trade of the Union of South Africa.

PRODUCTIONS OF THE VELD

1. Minerals

The minerals of South Africa will be discussed more fully in a later chapter. It will be sufficient here to indicate where the principal minerals are found. Gold occurs in the Southern Transvaal in an outcrop of old rock known as the Witwatersrand. Johannesburg is the principal mining and commercial centre. Diamonds are found in pipes of blue volcanic clay in various areas, the chief centres being Pretoria in the Transvaal, Kimberley in the north of Cape Colony, and Jagersfontein in the Orange Free State.

2. Pastoral Industries

(a) *Sheep*.—The merino, the principal wool sheep, flourishes in all regions except where the bush is too dense or the grazing is too scanty, but the greatest density is in the Orange Free State on the High Veld. English breeds and the native fat-tailed Cape sheep exist in scattered flocks.

(b) *Goats*.—Commercially, the Angora goat is important. It forms 25 per cent. of the total 6 million goats of South Africa, and from it are obtained both mohair and goatskins. Mohair is a fine silky wool product which finds its principal markets in Bradford and the U.S.A.

The native goat is very hardy and grows to a considerable size, but is of little use except for native food.

(c) *Cattle*.—For draught purposes the large-boned native Afrikaner is used, but for beef and dairy industries, European stock has been imported. Meat cattle are principally important in the maize areas, which will be referred to later in this chapter. The overseas trade in meat began in 1914 and has grown considerably with the increase in slaughtering and cold storage facilities. In 1932 a start was made in the export of chilled meat.

Experience has shown that many regions in South Africa with mild climate and good rainfall are adapted to dairying. The leading area is the region of the High Veld in the hinterland of Port Elizabeth and East London. Apart from favourable natural conditions, the development of the dairying industry has been fostered by the growth of fodder crops such as maize, lucerne, oats, cow peas, and beans, and also by the importation of pure-bred stock from Great Britain and Holland. The importance of the industry may be gauged by the fact that in 1932 there were 206 factories in South Africa dealing with milk produce.

3. Crop Production

Maize is the principal cereal. Besides its value as a staple native food and as a fodder crop, maize has become an

important item of export. Two-thirds of the maize production come from the maize triangle of the Transvaal and the Orange Free State, which is shown on the map (Fig. 30). The chief commercial and collecting centres in this area are Bethlehem and Kronstad.

Wheat grows in a narrow belt on the eastern margin of the plateau, where the rainfall is 20" to 25". One region of particularly heavy production is the fertile Caledon Valley on the borders of Basutoland and Orange Free State.

CHAPTER XVIII

(A) "THE GRANARY OF THE EMPIRE"—WHEAT PRODUCTION IN CANADA

CANADA ranks as the second largest wheat producer in the world and as the leading wheat-exporting country. Of the total Canadian production, 90 per cent. is produced in the Prairie provinces of Manitoba, Saskatchewan, and Alberta,

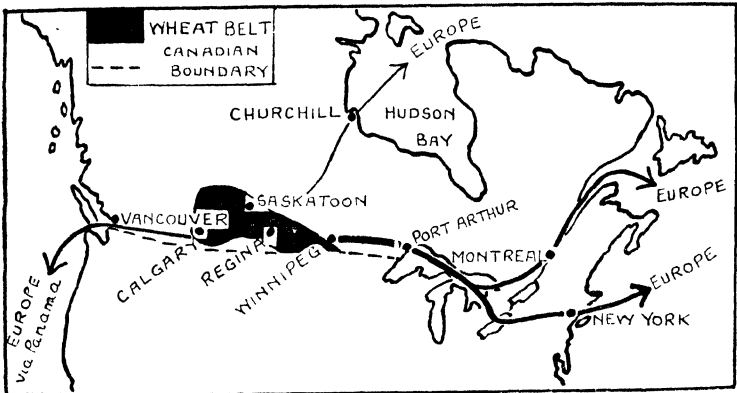


FIG. 31.—CANADA: WHEAT AREAS AND ROUTES TO MARKETS

and it is to these provinces that we give our title "The Granary of the Empire" (Fig. 31).

Let us see, then, what the factors are which favour the production and distribution of wheat in this region.

PHYSICAL FACTORS

(a) *Areas and Relief.*—The Prairies cover a large triangle of level or gently undulating treeless grassland, which is bordered on the north by the coniferous forest belt and on

the west by the foothills of the Rockies. No pioneering or clearing work of any great extent was necessary in these treeless areas which, on account of their large areas and the cheapness of the land, have encouraged extensive production and the use of large scale methods. The plain character of the prairie lands, moreover, has also favoured production on the extensive system by making possible the use of large-scale machines such as disc-ploughs and combine harvesters, and by facilitating the establishment of efficient systems of transport. The question of transport is one of great importance since the principal markets for the wheat are at least 5000 miles distant, and the extension of the wheat-growing areas has been largely bound up with railway development.

(b) *Soil*.—The soils of the Prairies are mainly clay loams, which have resulted from the breaking-up of the old glacial “ till ” or boulder clay left by the retreating ice-sheet. Apart from their high fertility, these soils are fairly stiff and impervious, and so are able to give the plant the support it needs and retain moisture near the surface.

CLIMATIC FACTORS

The continental type of climate, with its cold winters, high summer temperatures, and light rains in spring and early summer, is an important control in the wheat production of Canada.

(a) In the cold winters, Nature is her own cultivator of the soils. The heavy frosts not only break up the soils but also kill the pests and insects which damage the plant.

(b) The spring and early summer rains fall at the period when the wheat is being sown and is beginning to germinate, and rain at this time is essential for the wheat plant.

(c) The late summer is a period of hot, dry, sunny weather and gives ideal conditions for harvesting. Besides producing a good-coloured hard grain, these conditions make it possible to reap, thresh, and bag the corn all at the same time. This is done by one machine—a combined or sunshine harvester, and a considerable amount of time and labour is saved,

ARTIFICIAL FACTORS

(a) In the drier western areas of Alberta, where the rainfall is only 12 to 15 inches per year, much wheat is produced, either under irrigation or by dry-farming methods.

(b) The work of experimental and research stations is another important factor in wheat production. One important part of this work has been to discover varieties of wheat which require shorter growing periods and which can therefore be grown farther north. The old Fife wheat required a growing period of 125 days, but this was replaced by the Marquis, which requires only 110 days. Further research has produced the Prelude, Reward, and Garnet varieties, which it is hoped will ripen in even shorter periods and lead to a further extension of the wheat-growing areas.

MARKETING AND TRANSPORT

The marketing of wheat is now mainly controlled by "Wheat Pools," which is a form of co-operative marketing by the producers themselves. There are three pools, one for Manitoba, one for Saskatchewan, and one for Alberta. These pools have established over 1600 country grain elevators all over the wheat lands. After the farmer has delivered his crop to one of these elevators, the rest of the marketing is done by the Wheat Pool.

At the country elevator, which is usually at the railway station, the grain is weighed, cleaned, and stored. From here it is sent by railway to the terminal elevator at the port, and so by one of the following routes to its ultimate market (Fig. 31):

- (a) *Via* Port Arthur or Fort William on Lake Superior, whence it is sent by whalebacks, the wheat boats used on the lakes, to Montreal or to New York *via* the Erie Canal for shipment to Europe. About two-thirds of the total export is shipped by this route.

- (b) *Via* Vancouver on the west coast, whence it is shipped to Europe *via* the Panama. This route handles the wheat export of the Western Prairies, which now amounts to more than one-third of the total export.
- (c) *Via* Port Churchill on Hudson Bay, and thence by ship to Europe. The disadvantage of this route is that the sea is open only for three or four months in the year, and the route can only be used in seasons of early harvest. As yet only very small quantities are sent out by this route.

NOTE.—The grasslands of the Middle West of the U.S.A. are dealt with in Appendix (see p. 321).

(B) THE RUSSIAN STEPPE LANDS

Under this heading we are thinking of the fertile Steppe lands, the rich agricultural areas of Russia, which extend from the Ukraine on the west to the Urals, and also extend beyond to cover a large area in Western Siberia.

The importance of these areas as agricultural regions is due to the favourable continental type of climate for cereal growing, and to the fertility of the “ Black Earth ” soil which covers most of the land. This “ Black Earth ” soil is a loëss or wind-borne soil, and has, in addition to its fertility, the advantage of being very easily worked. It is estimated that in Russia proper this soil covers one-fifth of the total area.

SOUTH-WEST RUSSIA

In this region wheat was formerly the principal crop and was grown mainly for export. To-day crops grown for home consumption are more important, especially rye, oats, barley, and maize. Wheat is, of course, still exported, chiefly through the port of Odessa on the Black Sea.

The chief towns of this region are Kiev, Kharkov, Saratov,

and Samara. Within this belt are important mineral deposits, especially iron, and the important Donetz coal-field.

STEPPE OF WESTERN SIBERIA

This region is the most developed and most densely populated area of Siberia. This is due to the favourable soil and climate conditions, and the immigration of settlers following the construction of railway transport. These settlers brought with them the knowledge of agricultural and farming machinery, of irrigation, and scientific methods of crop production.

This region is important for its cereals, wheat, rye, and barley, and also for its stock-farming, especially dairying and the manufacture of butter.

The chief centre of this region is Omsk, the Winnipeg of Siberia, whilst other centres are Barnaul and Tobolsk.

CHAPTER XIX

THE TEMPERATE FOREST BELT

THE forests of the Temperate regions are of two kinds :

- (a) The Deciduous or broad-leaved forest.
- (b) The Coniferous forest.

(a) **Deciduous Forests**

These forests thrive in the moister and less extreme regions on the east and west margins of the Cool Temperate lands. The chief trees in these forests are the oak, beech, elm, and maple, all of which yield strong hard timbers useful for building purposes.

The areas which these forests originally covered have now been largely cleared, and in their place we have the important agricultural and industrial regions of Western Europe and Eastern North America.

(b) **Coniferous Forests**

The Coniferous forests flourish in the more extreme and drier conditions of higher latitudes and altitudes, and stretch in a broad belt across the Northern Hemisphere. The conifers or cone-bearing trees of these forests are fitted for these conditions by their tough, needle-like leaves, their stores of resin, and their shallow and widespread roots.

Larch, spruce, pine, fir, and hemlock are the principal trees of these forests, which are the world's chief source of softwoods, and which cover a broad belt in Northern Canada and Siberia and smaller areas in Scandinavia, Finland, and the smaller Baltic countries of Europe.

The economic development of these northern forests is connected primarily with the working of the timber in the

more accessible regions and the trapping of the fur-bearing animals in the less accessible and colder regions in which these animals find shelter.

THE TIMBER INDUSTRIES

THE FORESTS AND LUMBER INDUSTRY OF CANADA

The great Coniferous forest belt, "The Empire's Storehouse of Softwood Supplies," stretches across Canada in the north in a broad belt from north-west to south-east.

In the west is British Columbia, which now produces more than 50 per cent. of the cut lumber of Canada. Most of this timber is used for sawn timber, and finds markets in the countries of the Pacific and in the Atlantic coastal states of the U.S.A. and Canada, through the Panama. In the centre, the forest covers the northern parts of the Prairie Provinces, where the timber is used locally for buildings, fuel, and on the railways. In the east, in Ontario, Quebec, and New Brunswick, the lumber is used principally in the pulp and paper industries.

FACTORS IN THE DEVELOPMENT OF THE FORESTS

1. Labour

The felling operations in the forest are done during the winter when the sap of the trees is low, and are carried out by lumbermen who at one time were employed as seasonal workers. This seasonal supply of labour was available because the winter was the slack period in the fruit and grain areas in which these men found employment during the summer. Now these men are employed in summer on re-afforestation or in felling, which in some areas is necessary in summer to meet the market demands.

2. Transport

After the felling of the trees the timber has to be transported from the woods to the mills, and this work is started

about February. The hard winter conditions cause the land surface to be frozen hard, and over it, after the snow has been cleared by snow ploughs, it is possible to prepare hard, frozen, icy roads. Along these roads sleighs, heavily laden with logs, are easily drawn down to the river by horses.

The logs are then drawn on to the frozen surface of the river to wait for the spring floods to carry them down, or are assembled into log rafts, three or four of which may be drawn down together by a tug when the river thaws. In British Columbia, river transport is largely superseded by the use of logging railways, which transport the timber direct from the woods to the mills on large timber wagons called freight cars.

3. Power

Finally comes the need for power for the sawing and pulping operations. Many of the saw and pulp mill centres, especially in Eastern Canada, have grown up near falls on the rivers, where water-power could be used originally and hydro-electric power can now be developed. Ottawa, at the foot of the Chaudière Falls, is one example.

ECONOMIC USES OF THE TIMBER

(a) Sawn timbers are used in the manufacture of building materials, such as doors and window frames, and in the manufacture of furniture, especially cupboards, tables, and shop fittings. Packing boxes are also made to meet the large demand for the packing of butter, fruits, and tinned products for export.

(b) Pulp timbers are used in the manufacture of paper, especially for newsprint. Canadian newsprint is exported to twenty-six countries, and the total exports of it are greater than from the rest of the world combined. The manufacture of pulp and paper ranks first amongst the industries of Canada. Recent developments in this industry are the establishment of mills making both pulp and paper, and the increase of mills owned by American interests.

Wood pulp produced from spruce is also used in the manufacture of artificial silk, which in many ways is superior to real silk for the manufacture of fabrics and stockings.

(c) *Other Timbers*.—Telegraph poles, pit props, plywoods for tea chests, and the manufacture of composition materials, such as wallboards for buildings, are other uses for Canadian timbers.

SAW AND PULP MILL CENTRES

The leading centres in Eastern Canada are Sault Ste. Marie, which has the largest pulp mill in the world, Ottawa and Hull, on the Ottawa River below the Chaudière Falls, Quebec, Three Rivers, and St. John in New Brunswick. In British Columbia, New Westminster is the leading centre and has the largest sawmills in the world.

THE TIMBER LANDS OF EUROPE

In Europe, as in Canada, the chief sources of timber are the Coniferous forests which, as we have seen, cover large areas in Scandinavia, Finland, the Baltic Republics, and Soviet Russia.

The lumbering and timber industries of these countries have been developed extensively, because nearly everywhere rivers provide cheap transport and cheap electrical power, and because the forest products find ready markets near at hand in the industrial countries of Europe.

SWEDEN

Sweden is the most important of the timber lands of Europe. Forests occupy one-half of the total area of the whole country, and their exploitation has been facilitated by special advantages.

(a) The rivers run in parallel courses, and each provides a separate system of transport to sawmills and ports, of which Pitea, Umea, and Hernosand are the chief,

The rivers have at great cost been prepared as floating channels, and the total length of these channels is estimated to be 18,000 miles.

(b) The rivers run mainly south-eastward, hence the lower parts thaw first, and there are no floods.

The abundance of water and hydro-electric power has enabled Sweden to develop numerous manufacturing industries based on timber.

Moreover, the Swedish timber industry is conducted on scientific lines, and great attention is given to soil treatment, forest culture, and methods of felling and seasoning.

Timber products, which include round timbers such as pit props, sawn timber, and partly-manufactured products such as window frames, matches, wood pulp, plywood, and paper, account for over 40 per cent. of the total exports of the country.

NORWAY

In Norway the forests cover about one-quarter of the total area. Norway has the special advantage of an ice-free coast which provides shipping facilities throughout the year.

In the export trade, manufactured or partly manufactured products such as pulp, newsprint, cellulose, cardboard, and matches are now more important than sawn timbers. These timber products provide nearly one-third of the total value of the exports of the country.

FINLAND

Finland's large areas of forests cover three-quarters of the whole country.

As in Norway, Finland is concentrating more and more on the refinement of her own raw products instead of exporting the forest products in raw state. So we find that her exports of forest products, which supply three-quarters of her total exports, include pulp, cellulose, cardboard, paper (newsprint), and matches in addition to sawn timber. A

recent development has been the manufacture of wallboard from waste wood, which is ground to fibre and then compressed into sheets.

SOVIET RUSSIA

Although the forest areas of Soviet Russia, covering the north of Russia and Siberia, are the most extensive in the world and are estimated to contain 28 per cent. of the world's timber resources, the exploitation of this great source of wealth is hampered by a number of factors :

- (1) Vast areas are inaccessible, and development is therefore restricted to the western and eastern margins.
- (2) The rivers are of little use, as they flow towards the Arctic, and flooding in summer is serious.
- (3) Russia is not favourably placed in relation to the markets of Western Europe.

On the western margin of the forest in Europe, large quantities of timber are cut for domestic use and for industrial fuels for locomotives and factories, but there is also a considerable export. In contrast to the other countries of Europe, most of her forest products are exported unmanufactured as sawn timber. Much of the timber export goes through Archangel on the White Sea, but great quantities are floated down the West Dvina River and exported through the Latvian port of Riga.

On the eastern margin in Siberia, timber is carried by rail to the Pacific ports of Vladivostok and Nikolayevsk and from there is finding markets in the Far East and Australia, which till now have been dependent on American supplies.

As transport facilities are extended, these resources are bound to become an important source of wealth. A recent development in this direction has been the opening of a port at Igharka at the mouth of the Yenisei. This port can be reached for about three months in the year, and from it both timber and furs are being exported.

THE FUR INDUSTRIES

The great northern forests are the natural haunts of a large number of fur-bearing animals and make a considerable contribution to the fur trade of the world. Moreover, conditions in these forests are particularly favourable to the growth of furs of high quality and to the organization of the fur-collecting industry.

- (1) The long cold winter of the north puts the coats of the animals into prime condition and provides a long season for trapping.
- (2) The unfavourable climate and the inaccessibility of these regions preclude any other form of economic development, and so large areas of forest are retained as shelter for the animals.
- (3) The numerous waterways are the homes of some of the animals such as the beaver and the muskrat and also provide a means of transport for the trappers.

CANADA

Although the reserves of fur-bearing animals have been diminished by the advance of lumbering, mining, and agricultural settlements and it is now necessary to restrict their capture, raw furs are still the only economic product of hundreds of thousands of square miles in North Canada.

The animals are usually caught in traps in the winter when the frozen surface makes the country more accessible to the trapper, and, as we have seen, the pelts are in their best condition. The furs of the silver fox provide nearly one-third of the total value of Canadian furs, but the muskrat, mink, lynx, beaver, ermine and marten are other important producers.

The severe winter conditions of Canada make fur clothing a necessity and create a large home market. The furs are sold in sales held at Edmonton, Winnipeg, and at Montreal,

which is an international fur centre. New York and London are other important markets for Canadian furs.

It should be remembered that commercial furs are also produced on fur farms and that in Canada these farms now account for about 25 per cent. of the total raw fur production. Fox farming has proved to be the most successful, but mink, skunk, and marten are also raised.

RUSSIA

Furs are an important item in Russian export trade and one that is capable of immense expansion.

The collection of the furs is mainly in the hands of well-organized trading concerns working under Government supervision to ensure the enforcement of game laws and the economic exploitation of the fur resources.

The furs, which include those of the squirrel, ermine, grey hare, and a wide variety of foxes, are marketed in local centres such as Irbit and Novgorod, and are also exported to the markets of Leipzig, London, and New York. Leipzig with its annual fair was until recently the greatest fur centre in the world, being situated in the centre of a great fur-wearing population. Of late, London has become the leading fur market of the world.

CHAPTER XX

FARMING IN THE TEMPERATE FOREST BELT

WE have seen in the previous chapter that the Deciduous forest areas of America and Europe have been largely cleared, and that their place has been taken by agricultural and industrial areas. In this chapter we must examine some of the important farming industries of these lands.

CROP PRODUCTION IN EUROPE

The systems of crop production in Europe are mainly controlled by the fact that areas are limited, population is dense, and land is dear. These facts make it essential to secure the maximum return from the limited areas available, which results in a very intensive system of cultivation, involving the application of science, the use of fertilizers, and a careful system of crop rotation.

THE DISTRIBUTION OF CEREALS

The distribution of cereals depends on the varying climate and soil conditions.

Wheat requires good, well-drained soils, rain at the period of germination, and a dry sunny harvesting period. Apart from the "Black Earth" region of Ukraine, which we have considered in another chapter, the important areas for wheat production are the Plains of Rumania and Hungary, the Danube Lowlands, the Magdeburg Basin and Rhine Valley of Germany, and the basins of Paris and Aquitaine in France.

Rye, the grain from which black bread is made, is the staple food crop of the people of Eastern Europe. It will

grow on poorer soils and under more severe climate conditions than other cereals. It is therefore grown particularly in the colder north and east of Europe, in Russia, the North German Plain, Poland, and the Baltic States.

Barley, like rye, grows on poor soils and under a wide range of climate conditions. As it does not require such a long ripening period as wheat, it is grown extensively in the northern lands of Europe. It is used for the brewing of beer, as a cattle and pig food, and in some parts as a human food.

Oats is another of the hardier cereals, and flourishes especially in areas too wet or cold for wheat. Oats are mainly used as a cattle fodder.

RAW MATERIAL CROPS

Flax is the most important raw material crop of Europe. From it we obtain the fibre from which linen thread is made. It is grown extensively on the North German Plain and in Russia and the Baltic States. Both in the production of the fibre and its preparation a supply of cheap labour is essential, as much of the work in both has to be done by hand.

Hemp yields a fibre similar to flax, but coarser and stronger. It is used in the manufacture of rope, sailcloth, and sacking, and again the principal producer is Russia.

ROOT CROPS

Sugar beet is grown in nearly all the countries of Europe, Germany, Czecho-Slovakia, France, Poland, Russia, Belgium, and Holland being the most important. Sugar beet requires a fertile soil, scientific cultivation, and a great deal of labour. The refuse left after the extraction of the sugar is a valuable cattle food.

Potatoes are an important food crop in Europe and are consequently grown in most countries. Besides their use as food, potatoes are used in the production of starch and alcohol.

Mangolds, swedes, and turnips are other root crops which

are grown. They are mainly grown for cattle and are used for stall feeding during the winter.

MARKET GARDENING

Under this term we include the growing of fruits, the production of peas, beans, cabbage, celery, carrots, and other vegetables, the cultivation of flowers, and the production in glass-houses of tomatoes, grapes, etc. These industries are mainly carried on near large urban centres where the produce is easily and quickly marketed, or in regions where very favourable climate conditions make early production possible.

Belgium and France provide us with examples of this type of farming. In Belgium, the most important region is Brabant where the light sandy soils are easily worked and there are large urban markets. Glass-house production of grapes is also an important feature of this region. Belgium has a surplus of vegetable and fruit supplies, most of which is marketed in Britain. In France the principal regions are the fertile valleys of Normandy and Brittany, where fruits and early vegetables are produced for the Paris and London markets; the Paris Basin and the French Riviera, where the climate favours the early production of flowers.

FRUIT PRODUCTION IN CANADA

Before considering the fruit industry of Canada, two important facts must be remembered :

1. Temperate fruits are divided into two types: Deciduous or tree fruits, such as apples, pears, plums, and cherries; soft fruits, such as raspberries and strawberries.

2. In fruit production climate is an all-important factor. Absence of late spring frosts when the trees are already in blossom and of early autumn frosts before the fruit is harvested is one essential, while protection from cold, strong winds is another. The most favourable areas for fruit are, therefore, maritime regions where the climate is tempered by the sea and in valleys or plains sheltered by mountains or hills.

In Canada there are three principal areas where commercial fruit-growing is important.

1. Nova Scotia, where the famous Annapolis Valley is the chief region. This valley, which is about 100 miles long and only a few miles broad, runs parallel to the Bay of Fundy, from which it receives a warming influence in winter and is well protected by the surrounding mountains. This region is particularly important for apples, of which about two million barrels are packed and sold annually, but plums, pears, and cherries are also important.

2. The Lake Peninsula of Ontario. This region lies in a particularly favourable position. It is bordered on three sides by the Great Lakes, which have the effect of delaying spring growth until the danger of late frost is over and of counteracting the early frosts of autumn. It lies in the most southerly part of Canada in the latitude of Central Italy, and so has very warm summers. These favourable conditions make it possible to grow not only pears, plums, and apples, but also peaches and grapes. Moreover, the region lies within easy reach of many of the large urban centres of Eastern Canada, which provide a ready market for large quantities of fresh fruit.

3. The Valleys of British Columbia, of which two in particular are important—the Okanagan Valley and the Fraser Valley. Here again the maritime climate and the protection of the mountains favour fruit farming. In many districts the rainfall is low owing to the fact that they are sheltered by the mountains from the rain-bearing westerlies, and irrigation is necessary. The Okanagan Valley is famous for its apples and pears, while the Fraser Valley is especially noted for strawberries and other soft fruits.

We should remember that, apart from the packing of fresh fruits, fruits are important in a number of manufacturing industries. The most important of these industries is that of canning and preserving; others are the making of cider, wines, vinegar, pickles, and sauces.

DAIRY FARMING IN DENMARK

Successful dairy farming demands :

(a) Climate and soil conditions which will provide good natural pastures for long periods and will also favour the growing of root crops for winter feeding.

(b) Proximity to large urban centres for the sale of the liquid milk, or to markets for milk products such as butter and cheese.

These conditions are found on the plains of Great Britain and the North-West Coastlands of Europe, where the good soils and moist climate produce long grasses suitable for cattle. The chief exporting countries in these regions are Denmark, Holland, the Baltic States, and Sweden. Of these, Denmark is pre-eminently important.

The leading position which Denmark holds in the dairying industry results mainly from geographical conditions.

The absence of coal, iron, raw materials, and water power has precluded the development of manufacturing industries, and thus Denmark is essentially an agricultural country.

With the great increase of world grain production in the latter part of the last century and the consequent decline in prices, Denmark concentrated her attention on her cattle industries, especially the production of milk and dairy products. The small areas have made it necessary that the most intensive and economical systems should be employed. In other words, the maximum return both from the animals and from the products is the basis of the industry, and we must see by what means these ends are secured.

(a) *Breeding*.—Great attention is paid to breeding in order to produce healthy animals and those which throughout a long period will produce high yields of milk.

(b) *Feeding*.—Natural pastures are supplemented by fodder crops such as roots (mangolds and swedes), and also by concentrated food-stuffs such as oilcakes. The production of

cattle-food crops in Denmark has been doubled in the last forty years as the result of introducing high-yielding crops and scientific manuring.

(c) *Milk Recording*.—The feeding of fodder crops and concentrated foods to cows must be done economically. For this reason the yield of every single cow must be recorded to ensure that each cow is fed according to her yield of milk.

(d) *Co-operative Dairies*.—While great attention is paid to the production of milk, equally important are the systems of dealing with it and disposing of it. For these purposes the producers have joined together into co-operative dairies, and by this means all farmers can take advantage of the best methods of handling, preparing, and marketing their production. Moreover, by cutting out the middleman and his profit the farmers get a higher price for their produce. After the milk has been used for butter or cheese-making, the by-products, such as butter milk and whey, are returned to the farmers for pig feeding, an industry of first-rate importance.

(e) *Government Supervision*.—Finally, the high standard of Danish produce is ensured by a Government supervision of all products.

The specialization of Denmark in pastoral industries, especially dairy farming, is well seen in the character of her foreign trade. The following figures show that about 80 per cent. of the total exports are animal products :

Butter, cream, milk, cheese	33	per cent.
Bacon, beef, and other meat products	32	per cent.
Live animals, eggs, lard, condensed milk, hides, and skins	18·7	per cent.
	83·7	per cent.

It is interesting to notice that the markets for her exports are the large industrial areas of Western Europe, 75 per cent. going to Great Britain and Germany. Of this figure, Great Britain takes 56 per cent.

FARMING IN THE BRITISH ISLES

The distribution of the different types of farming in the British Isles is not accidental but closely related to relief, soil, and climate conditions. On the basis of relief we may make a broad division into plains and highlands. The plains are areas of good, deep soils, while the highlands have thin, poor soils. As for climate, another broad division may be made by the rainfall line of 30 inches, which separates the wet west with more than 30 inches of rainfall from the dry east with less than 30 inches.

If we connect these facts we can make yet another broad division—this time of farming types :

1. The wet plains on the west have good soils, rich pastures, and are cattle lands.

2. The dry plains on the east have good soils and are predominantly crop lands.

3. The highlands on the east and north, with their thin, poor soils, produce only poor pastures and are therefore sheep lands.

We must remember, however, that there is really no such rigid division, and that mixed farming is practised in nearly all regions. The cattle farmer on the west has most of his farm under permanent grass for cattle pastures, but on part of his farm he grows beans, oats, barley, and root crops for cattle foods and winter bedding. The crop farmer on the east rotates his crops, and in addition to wheat grows clover, root crops, potatoes, and other crops. Cattle and sheep are kept to eat some of these food-stuffs and to provide manure for the arable land.

CROP PRODUCTION

Wheat is most extensively grown on the drier, sunnier plains of the east, especially in Fifeshire in Scotland and the region between the estuaries of the Humber and Thames in England (see Fig. 32).

Barley thrives best in the Midland Plain and on the lowlands of eastern Scotland and Ireland. The superior quality of the barley grown in these regions for the brewing of beer and whisky-distilling accounts for the high reputation of Burton for its beer and Edinburgh and Dublin for their whiskies.

Oats thrive in cooler and damper regions and on poorer

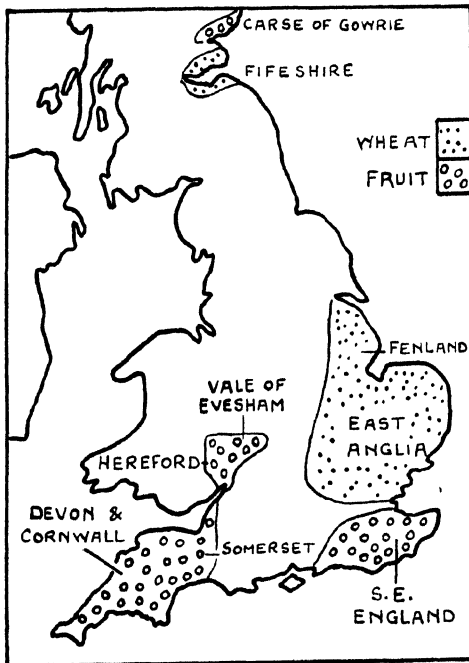


FIG. 32.—CHIEF WHEAT AND FRUIT AREAS

soils. They are grown in all parts, but are principally important in the lowlands of Scotland, Northern Ireland, and Wales.

Potatoes for the London market are grown extensively in Lincoln and the Fen district; for the industrial areas of the North they are grown in Cheshire, Lancashire, and Cumberland; for Scotland they are produced in the Central Lowlands, especially in Fifeshire and the district around

Edinburgh. Northern Ireland is an especially important region for potatoes, and from there considerable quantities are exported to England.

Flax is grown for the linen industry over limited areas in Northern Ireland, especially important being the Lisburn district.

Hops, in addition to fertile soils and plenty of sunshine, demand considerable labour and skill for their cultivation. They are grown for the brewing industry and are cultivated mainly in the vales of Kent and Sussex and the lowlands of Worcester, Hereford, and Essex.

FRUITS AND MARKET GARDENING

We have already seen that proximity to towns, light soils, and favourable climate conditions are important factors in fruit growing and market gardening.

Fruits are widely grown in the British Isles, but a careful examination of their distribution shows that the chief fruit-growing areas are near the coast where the modifying maritime influence is felt to the greatest extent, or in sheltered plains or valleys (Fig. 82). The following areas of outstanding importance are worth special consideration: The Vale of Kent, near the London market, famous for its cherries and its strawberry gardens; the Vale of Evesham, in Worcester, noted for its plums and pears, serves the Black Country; the plains of Devon, Somerset, and Hereford, renowned for their cider apples and cider manufacture; the Carse of Gowrie and the Vale of Strathmore, north of the Tay estuary, important for their strawberries and the supply of fruit for the preserve industry of Dundee; Clydesdale, and the Hampshire basin, the principal strawberry area.

Market gardening is so widely distributed in the neighbourhood of large towns as to make mention of particular areas difficult, but special reference must be made to the Medway Valley and southern Essex, which owe their prosperity to their nearness to the London market; and to the Channel Islands, Scilly Islands, and South Cornwall, where

the winter climate is so mild as to make the region especially important for its early vegetables and spring flowers.

PASTORAL FARMING

The British Isles is one of the most important sheep-rearing countries of Europe. Sheep are reared in most parts

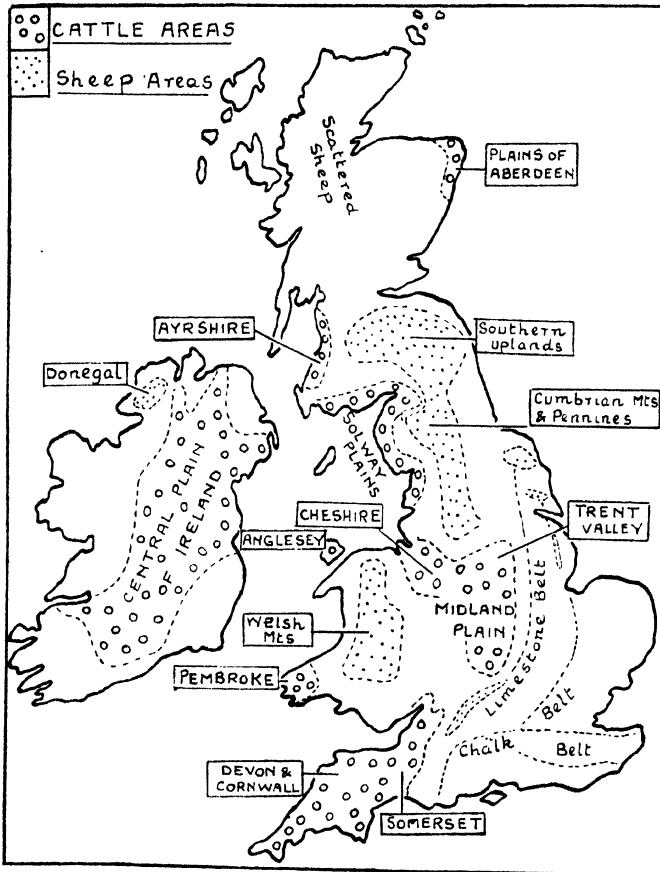


FIG. 33.—PASTORAL FARMING IN THE BRITISH ISLES

as they thrive on the upland pastures of Scotland, Wales, and England. The outstanding sheep regions (shown on Fig 33.)

are the Southern Uplands of Scotland and the Tweed Basin ; the mountain pastures of Wales ; the Lake District ; the Pennines, and the limestone and chalk hills of south-east England. The high quality of Scotch and Irish (Donegal) tweeds results from the fine wools produced in these regions, while other regions, especially the chalk hills of southern England, are equally famous for their mutton and sheep, of which the Southdown sheep are an example.

Cattle thrive, as we have seen, on wet rich pastures, and so are most numerous on the plains of the Midlands and western parts of the British Isles. The Central Plain of Ireland, famous for its butter of the Golden Vale of Tipperary ; Devon and Cornwall, noted for their creams ; Somerset (Cheddar) and Cheshire, well known for their cheeses, are a few examples (Fig. 33).

The proximity of large urban centres of population in which supplies of milk and dairy produce are in constant demand is an important factor in the dairy-farming industry. So we find dairy-farming important on the plains of Cheshire and Lancashire, and the plains and valleys of Cumberland for the markets of the industrial regions of the north-west and north-east, and in Ayrshire for the markets of Clydeside. All these regions are on the west, and natural cattle lands, but similar dairying areas are to be found on the east, in Essex, the Kennet Valley, and the clay vales of Kent and Sussex supplying the London market and the towns of south-east England.

Some regions specialize in beef cattle. Hereford, famous for the Hereford breed, the Yorkshire dales, and the agricultural districts of eastern England and Scotland are the most important of these regions.

CHAPTER XXI

THE FISHING INDUSTRIES OF THE WORLD

THE more important fishing areas are found in the Temperate Zone. There are definite reasons for this :

(a) Fish food is more plentiful in higher latitudes, and fish life is consequently more abundant.

(b) The bordering lands in higher latitudes are either so infertile or so densely populated that people have turned to the sea to supplement their food supplies.

(c) Trade in fish is easier in cooler latitudes where it is less difficult to preserve fish in warm weather.

Within this broad belt of the Temperate Zone we find that the fisheries are restricted to regions where there is a broad continental shelf or where there is a submerged platform or bank, for it is here that the organisms live on which the fish feed.

There are four regions of outstanding importance all bordering the broad land-masses of the Northern Hemisphere :

- (a) The Coasts of North-West Europe, including the North and Baltic Seas.
- (b) The North-East Atlantic Coasts of North America (Labrador, Newfoundland, the Maritime Provinces and New England States).
- (c) The North-West Pacific Coast of North America (Alaska, British Columbia, Washington, and Oregon).
- (d) The Coasts of Japan.

THE FISHERIES OF NORTH-WEST EUROPE

The fisheries of North-West Europe extend from Spain to the Arctic. Of this area, the North Sea is predominantly

the most important section. It is very shallow and abounds in fishing banks, of which the Dogger Bank is the most famous. It is surrounded by populous countries and is within easy reach of British, French, Norwegian, Dutch, and other fishermen.

1. British Fisheries

Britain is the second fishing country of the world in order of the value of fish landed, being surpassed only by Japan. About 110,000 people are employed in the fishing industry, which is mainly centred on the East Coast and the North Sea fisheries.

The herring fisheries are the most important, and account for about 50 per cent. of the total catch. Cod and haddock are also important. Grimsby, Aberdeen, Hull, Yarmouth, and Lowestoft are the principal East Coast fishing ports, followed by Fraserburgh, Peterhead, Wick, and Lerwick.

Hake fisheries are important off the West Coasts of Britain, where Fleetwood and Milford are the leading ports. Inshore shell fisheries, especially the oyster fisheries of the tidal estuaries of the Thames and the rivers to the north, are also important. Colchester and Whitstable are the leading centres of the oyster industry.

2. Fisheries of France

France shares in the cod fisheries of Newfoundland and Iceland, for which St. Malo is the principal port, and in the North Sea herring fisheries, for which Boulogne is the centre.

Sardine fisheries are important in the Bay of Biscay, and sardine packing is carried on at Bordeaux. In the Mediterranean, sardines, anchovy, and tunny are caught and packed for export.

3. Norwegian Fisheries

Fishing is the leading industry in Norway, and supplies one-third of the total value of the exports. The safe harbourage of her protected fiord coast, the proximity of fishing

grounds and of the industrial and catholic countries of Europe in which to sell her exports, are all factors which have favoured the development of the Norwegian fishing industry.

The cod fisheries carried on round the Lofoten Islands are the most important, but are closely rivalled by the herring and sprat fisheries of the south near Bergen. Norway also has a large share in the whaling industry of the Antarctic, to which reference will be made later.

Bergen, Tromso, and Hammerfest are the leading fishing ports.

THE FISHERIES OF THE NORTH-EAST ATLANTIC COASTS OF NORTH AMERICA

There are two groups of fisheries along these coasts :

(a) *The Inshore or Coastal Fisheries*, which are limited mainly to Nova Scotia, New Brunswick, Prince Edward Island, and the New England States. The chief products are haddock and cod, but lobsters are also caught.

(b) *The Deep Sea Fisheries*.—These are on the Grand Banks and other fishing grounds to the south of Newfoundland. The harvests of these fisheries are shared by the U.S.A., Canada, Norway, England, France, and Portugal. Cod is by far the most important product, but in addition haddock, halibut, and mackerel are caught.

The vessels engaged in these fisheries are usually of 40 to 100 tons, with crews of 12 to 20 men. The vessels go for the season, which for cod begins in June. The fish are prepared and salted on board, but on reaching port are sorted, gutted, and re-salted.

THE PACIFIC FISHERIES OF NORTH AMERICA

These fisheries, too, are of two kinds :

(a) *The Estuary Salmon Fisheries*.—The catching of salmon is carried on in the estuaries of the rivers Fraser, Skeena, Columbia, Sacramento, and other rivers. The salmon are caught in traps consisting of rows of stakes and

nets as they ascend the rivers for spawning in spring or early summer.

In Canada, salmon, of which the sock eye is the principal kind on account of its abundance and deep red colour, accounts for two-fifths of the fish production.

(b) *The Coastal Fisheries*.—These are of smaller importance. The principal fish caught are cod, halibut, and herring, while sardines are caught off the Californian coast farther south.

Prince Rupert, the Pacific terminus of the Canadian National Railway, is the leading fishing centre on this coast. It maintains artificial hatcheries for the breeding of fish, especially salmon, and has large freezing and canning plants for the preparation of the fish.

THE JAPANESE FISHERIES

The Japanese fisheries are especially important in the cool seas around the north of Honshiu, Hokkaido, and Karafuto. There, the submarine banks are supplied with fish food brought by the cold Kurile current from the north and the warm Kuro Siwo from the south.

Japanese fisheries, in the value of the catch, are the largest in the world, and employ about 1½ million people. The products of the fishing are various. Herring, cod, sardine, haddock, and mackerel are all caught for food. Fish are also caught and used in large quantities as a cheap and abundant form of manure. Sea weeds are collected and dried to be used as a relish for soup and rice, and to be used also in the manufacture of paper and isinglass. Culture pearls are produced by introducing a grain of mother-of-pearl between the shells of three-year-old oysters.

MINOR FISHING INDUSTRIES

1. Whaling

The principal whale fisheries are in the Antarctic and are mainly in the hands of Norwegian fishermen, who have their headquarters on South Georgia. There is a smaller

industry off the Pacific Coast of Canada, with headquarters on Queen Charlotte Island.

All parts of the whale are used, but oils and bone are its most important products.

1. Train oils are obtained from the blubber or fat under the skin. These oils are used mainly in soapmaking.

2. Sperm oil, a finer product than train oil, is used in making cold creams.

3. Whalebones are the horny plates hanging from the palates of certain types of whales. They are important for their strength, flexibility, and toughness.

2. Sponge Fishing

Sponges are fished for in the Eastern Mediterranean from Greece, Cyprus, and Libya, and in the seas around the Bahama Islands, where sponge fishing is the staple industry.

3. Oyster Fishing

Oysters flourish in tidal estuaries and shallow bays. Reference has already been made to the oyster fisheries of Britain. The principal fisheries, however, belong to the U.S.A., which claims five-sixths of the world's total. It is the most valuable fish product of the U.S.A. and is caught mainly in the shallow bays of the Atlantic Coast between Cape Cod and Galveston, especially important being Chesapeake Bay.

QUESTIONS

SECTION II

R.S.A. = Royal Society of Arts.

L.C.C. = London Chamber of Commerce.

I. of T. = Institute of Transport.

EQUATORIAL LANDS

1. What difficulties impede the exploitation of Equatorial Lands ? (R.S.A., 1922.)

2. Sketch the distribution of Equatorial Forests in either South America or Africa, and discuss the conditions which hinder their development.

3. In what parts of the world is rubber (*a*) collected ; (*b*) grown as a plantation crop ? Account for the difference. (R.S.A.)

SAVANNA LANDS

1. State and account for the distribution of grasslands in the Tropics. (R.S.A., 1935.)

2. What are the conditions most favourable for the growth of coffee. In what parts of Brazil is it specially grown, and why is it grown there ? (R.S.A., 1928.)

3. Summarize the Economic Geography of each of the following : Nigeria ; Anglo-Egyptian Sudan ; The Llanos.

MONSOON LANDS

1. Describe and explain the distribution of rainfall in India. (R.S.A., 1933.)

2. Describe and explain the distribution of crops in India. (R.S.A., 1933.)

3. Describe the position and importance of any four British seaports in the Indian Ocean. (L.C.C., 1935.)

4. Write a short geographical account of the Yang-tze Basin. (R.S.A., 1934.)

5. Describe the relation of climate to crops in *either* China or Japan. (R.S.A., 1935.)

6. Describe with special reference to U.S.A. the conditions favourable to the production of cotton.

TRADE-WIND ISLANDS OF OCEAN AND DESERT

1. Compare fully the East Indies and the West Indies. (R.S.A., 1935.)

2. Describe the Nile in relation to its utilization for purposes of navigation or irrigation. (I. of T., 1934.)

3. Write brief geographical accounts of (a) Egypt; (b) Iraq.

MEDITERRANEAN LANDS

1. What conditions characterize a Mediterranean climate? Where would you expect to find such conditions and why? (I. of T., 1934.)

2. Describe and explain the climate of the Mediterranean Region and show its relation to the typical plants of the region. (R.S.A., 1924.)

3. Compare the region of Mediterranean climate in the Old World with that on the same latitude in the New World and account for any differences in the climates. (R.S.A., 1934.)

TEMPERATE GRASSLANDS

1. State and account for the distribution of good grassland throughout the North Temperate Zone. Give a rough sketch map of it. (R.S.A., 1934.)

2. Give an account of the chief centres of wheat production in Canada, and of the various routes by which it is exported. (L.C.C., 1935.)

3. Discuss carefully the relation between the sheep industry of Australia and temperature and rainfall, and

explain by what routes the wool reaches Australia's chief customers. (R.S.A., 1922.)

TEMPERATE FORESTS

1. What are the climatic conditions found in the North Coniferous forest? How do these conditions limit Economic exploitation and development? (R.S.A., 1935.)

2. Write an account of the Lumber Industry of Canada.

FARMING IN THE TEMPERATE FOREST BELT

1. Give some account of the geographical aspects of dairy farming in a country where it is well developed. (I. of T., 1933.)

2. Describe the British Fruit Industry. (L.C.C., 1935.)

3. Describe and account for the distribution in Great Britain of apple orchards, sugar beet, and wheat.

FISHING INDUSTRIES

1. Describe fully and account for the existence of any great sea-fisheries in the North Temperate Zone. (R.S.A., 1934.)

2. Write an account of the fishing industry on the East Coast of Britain, indicating (a) the chief fishing grounds; (b) the kind of fish caught; (c) the chief ports concerned in the industry. (R.S.A., 1922.)

3. Draw a large sketch of the North Sea. Name the countries along the coasts, inserting with names their capitals and chief ports. Insert the Dogger Bank, and show by dotted lines its connection with three named British fishing centres. (L.C.C., 1935.)

SECTION III

MINERALS

CHAPTER I

METALLIC MINERALS--BASE METALS

IRON.—The uses of iron are so numerous and well known that it is needless to enlarge upon them. At the same time it is well to keep in mind that it was the great demand for iron in the manufacture of machinery, railway plant, bridge parts and other building structures, and in shipbuilding that caused the enormous growth in the iron and steel industry. This great demand still exists, making iron the second chief factor, after coal, responsible for maintaining commerce and industry on a large scale.

Iron is not found pure in nature, but its ores are very widespread, making iron one of the commonest of metals. The ores vary greatly in character, however, and their working depends both on the percentage of iron in the ore and on their accessibility.

The chief ores of iron are :

1. *Hæmatite*.—This is a red ore, often found in veins and pockets of limestone rocks, and yielding more than 50 per cent. of its weight as metal.

2. *Magnetite*.—A high quality black ore which yields up to 70 per cent. of its weight as metal.

3. *Ironstones*, of which the best known is the black band ironstone. This latter occurs in the shales containing the coal measures.

4. *Brown Iron Ore* or *Limonite*.—This occurs chiefly

in the jurassic sedimentary rocks. Although this ore has only a small iron content, it is one of the most important sources of iron, especially in England and Lorraine. This is because it occurs in thick deposits at or near the surface of the earth, which permits it to be obtained by quarrying or shallow mining.

Ores vary greatly in the impurities they contain. Certain of these impurities are injurious to the character of the iron obtained from the ore. Phosphorus makes iron brittle, and ores containing this impurity have to be smelted in a special way in order to remove it. Sulphur makes steel brittle when hot, making it impossible to hammer or forge it. Other impurities are arsenic, silica, and other metals, and smelting processes have to be varied to remove these different impurities. The great iron and steel centres of the U.S.A., Great Britain, and Germany are now dependent on ores from Sweden, Algeria, and Spain for their high quality steels as their own local supplies of iron ore are of poor quality.

COPPER.—The great variety of uses of copper still cause it to rank second to iron as an industrial metal, although its position is gradually being superseded by aluminium. In view of its ductility, its excellence as a conductor of electricity and heat, and its resistance to atmospheric corrosion, copper is the chief metal used in electrical manufactures, wireless industries, electric light and power lines, and telegraph and telephone wires. Other uses for it are found in the building industry for pipes and cisterns in hot-water systems and for roofing. Alloys of copper are important (*a*) with zinc, giving brass; (*b*) with tin, giving bronze. Certain compounds of copper are valuable in the manufacture of paints, and copper sulphate is important in agriculture as a destroyer of insect pests.

Copper is found as native metal but is principally obtained from one or other of the many ores in which it is found.

Under normal conditions the United States produces

about 50 per cent. of the world's output of copper. The chief centres of production are :

1. The peninsula of Keeweenaw on Lake Superior in North Michigan.
2. S.E. Arizona.
3. Montana, round the town of Butte.

Other producers in present order of importance are : Chile, Canada (Ontario, British Columbia, Manitoba and Quebec provinces), Rhodesia, Belgian Congo (Katanga Mines—some of the richest in the world), Japan, U.S.S.R., Mexico, Yugo-Slavia, Spain (Rio Tinto), and Portugal.

Other worked deposits are in Germany, in the Harz Mountains. The deposits in Northern Rhodesia, only recently discovered and developed, have proved to be some of the most valuable in the world.

The production of copper in England from home ores is almost nil. Swansea, where this industry was mainly developed, now imports large quantities of copper ores and crude copper from Canada and Spain, and an even greater quantity of unwrought metallic copper from the U.S.A. and Chile.

ALUMINIUM.—This metal is hard and tough, yet easy to work, is extremely light, resists corrosion in air under ordinary conditions, and compares with copper in electrical conductivity. It combines readily with many metals to form excellent alloys, of which the most important at present is Duralumin (aluminium-magnesium) which is much tougher than the pure metal.

Because of its lightness, which is the chief characteristic of aluminium, and its strength, the uses to which aluminium is put are legion. The better known ones are in the manufacture of aircraft, pistons for motors, and household utensils.

Aluminium does not exist in nature in its metallic state, but its compounds are more widely distributed than those of any other metal. The ore required for the manufacture

of aluminium is bauxite, which contains 60 per cent. of aluminium oxide, and impurities which are not too costly to remove. Although it is found in many parts of the earth the chief deposits worked are in France, Hungary, Yugoslavia, Italy, Surinam, British Guiana, the United States, the Dutch East Indies and Malaya, and the U.S.S.R.

The reduction of the ore to aluminium requires the extremely high temperatures of an electric furnace. To enable this reduction to take place the bauxite is dissolved in a bath of molten cryolite. Cryolite, another aluminium ore, is found only in Greenland. The fact, however, that the same cryolite is used over and over again, and is now also prepared synthetically, indicates that, as far as the manufacture of aluminium is concerned, the apparent rarity of this mineral is to-day of no great importance. As it takes 5 horse-power of electrical energy working continuously for one year to produce one ton of aluminium, cheap electricity is a necessity. Thus electricity, produced by water-power, is used. Consequently, the chief aluminium-producing countries are those with well-developed hydro-electric schemes. They are, in the order of their 1938 output, Germany, the United States, Canada, U.S.S.R., France, Norway, Switzerland, Italy, the United Kingdom, and Japan. This output was affected by certain preparations for war.

TIN.—As it is not easily acted upon by air, tin is largely used in the manufacture of tinplates. These are thin sheets of mild steel or wrought iron which have been covered with a thin coating of tin to prevent them from rusting. The tinplates are used extensively for the manufacture of "tins" for canned foods such as meat, fish, fruit, vegetables, and milk, and for hundreds of household commodities, such as polishes, biscuits, tobacco, etc. Tin is also used to make many alloys such as bell metal, Britannia metal, bronze, gun-metal, and pewter. Some of the compounds of tin are also very valuable as mordants in the dyeing and calico-printing trade, and the gold used for gilding and imitation bronze work is a sulphide of tin.

Cassiterite or tinstone is the principal ore from which tin is obtained. This is found in veins in granite, as in Cornwall and Bolivia, and in alluvial deposits where it is known as "stream tin."

In view of the over-production of tin, with the resultant drop in prices to an uneconomic level, the output of tin has been restricted. The chief producing countries to-day are : Malaya (30 per cent. of the world's total production), Bolivia (22 per cent.), the Dutch East Indies (from the islands of Banks and Billiton—16 per cent.), Thailand, Southern China (the province of Yunnan), Nigeria, and Cornwall.

LEAD.—The three main uses of lead are for cable covering, storage batteries, and paints, and on account of its non-corrosive properties it finds wide use for pipes and sheet in buildings and chemical plant. Lead is also used for ammunition, and as a constituent of the alloys—solder, pewter, type, and bearing metal. Compounds of lead—chiefly the oxides—are used in glass making, glazing pottery, for jointing purposes, and as paint.

Very little lead is found as native metal, but it does occur in Cumberland, Ireland, Spain, and Madeira. The chief source of lead is the ore, galena. This ore normally carries about 85 per cent. of lead, with generally an appreciable amount of silver and small quantities of other metals. Should the silver content be sufficiently high it is recovered, and, in fact, a large proportion of all the silver produced in the world to-day is a by-product in the extraction of lead. At the Broken Hill works, New South Wales, probably the largest individual lead-smelting establishment in the world, the silver recovered amounts usually to over 5,000,000 ounces annually.

The principal lead-producing countries are :

1. The United States—nearly 25 per cent. of the world's total production.

The chief producing areas are :

(a) The Ozark Mountains in Missouri and Joplin.

(b) The Rocky Mountain States—Idaho, Colorado, and Utah.

2. Mexico—about 17 per cent. world's total.
3. Australia—about 14 per cent. world's total production—mainly from Broken Hill, New South Wales.
4. Canada—about 10 per cent.—chiefly from British Columbia.

Spain, Germany, and Great Britain are other important producers.

ZINC.—The two chief sources of zinc are the ores—blende and calamine.

The chief uses of zinc are as an alloy with copper to form brass, and for the galvanizing of iron and steel sheets and iron wire. Compounds of zinc are widely used in the manufacture of paints, in medicine, and in the motor-tyre industry.

World producers in order of importance are :

1. The United States—45 per cent. of world's total production.

From three areas chiefly—

- (a) The Joplin district.
- (b) Franklin Furnace, New Jersey.
- (c) Butte, in Montana.

2. Belgium.
3. Poland (from Polish Silesia).
4. Canada.
5. Australia.

Germany, France, Great Britain, Spain, Sardinia are smaller producers.

PRECIOUS METALS

GOLD.—Gold is considered to be the first metal used by Man. Its bright reddish-yellow colour of high metallic lustre and its ability to take a high polish made it attractive. In view of its extraordinary malleability and ductility, which is much greater than that of any other metal, it was treasured because of the beautiful ornaments that could be fashioned from it. A proportion of the gold mined to-day is turned into gold coin, but the greater proportion is accumulated in

the form of bars (known as bullion) by various Governments to cover, in part, the value of the paper money which they have put into circulation. Other uses of gold are in the preparation of jewellery and of plate, and in gilding.

Gold occurs in its native state, being one of the most stable of metals. It is very widely distributed, but is generally in such minute proportions that it is not recoverable. The two chief sources of gold are :

1. Alluvial deposits, called placer deposits, which have been laid down in the beds and banks of existing or ancient rivers by water coming from gold-bearing rocks. The gold, being heavy, has been deposited in streaks of granular "dust," and in occasional nuggets, at or near the base of the sands or gravels. These deposits are usually near the surface, but in some regions, as in California, mines of 500 feet have been necessary to work them.

2. Reef or lode deposits, usually in quartz rock. To obtain the gold, the rock has to be crushed and the gold removed by chemical means, as it is in such minute particles as to be invisible to the naked eye. The greater part of the gold of the world is obtained to-day in this way, but it can only be done by wealthy mining interests, as the outlay on plant is huge.

The chief sources of the world's gold are :

1. The Union of South Africa—chiefly the Transvaal—which produces just under half the world's production. The Transvaal deposits are found in the famous bankets of the Witwatersrand. Johannesburg is the headquarters of the mining interests working these.

2. Canada takes second place, producing about one-eighth of the world's total production. This comes chiefly from the provinces of Ontario (Porcupine) and British Columbia (Rossland).

Other producers are the United States, Soviet Russia, Mexico, Australia and New Zealand, Southern Rhodesia, India, Japan, West Africa (Gold Coast), Belgian Congo, Central America, and the Andean States of South America.

SILVER.—One of the chief uses of silver is as coinage. Unfortunately, in view of the present adulteration of silver coins, the demand for silver for this purpose has lessened considerably. This has created a surplus of silver with a resultant reduction in value. For those countries, such as India and China, with silver as the basis of their coinage, the effect has been to reduce their purchasing power, causing a drop in imports, and so restricting important markets for all of the great industrial and exporting countries.

Other uses of silver are in jewellery and in electroplating, and certain silver salts are the basis of photography.

While silver is produced both as native metal and from certain silver ores, 60 to 70 per cent. of the world's output comes from the desilverization of lead ores, chiefly galena. Thus, being a by-product of the lead industry, the drop in world prices of silver has not affected its output to anything like the same extent as it would have if the mines were worked for silver alone.

The chief producing countries are :

Mexico (nearly 50 per cent. of the world's total production), the United States (the Rocky Mountain States), Canada (British Columbia), Peru and Bolivia, Australia (mostly from Broken Hill), Germany, India and Burma, Japan and Korea.

PLATINUM.—A very rare metal, which is used chiefly in various types of apparatus for the chemical laboratory, in dentistry for dental plates, for jewellery, and as containers for radium.

Platinum is found generally associated or combined with other metals like palladium, rhodium, iridium, and osmium, all of which have important uses. The chief sources of supply are alluvial deposits, but further supplies are now being obtained from the nickel-copper ores of Sudbury, Ontario, and from platinum-bearing rocks in the Transvaal.

Soviet Russia produces nearly half of the world's output from alluvial deposits in the Urals. Canada is the next

largest producer, although actually the residues from the nickel-smelting works of Sudbury are reduced at Swansea, Glamorgan, to recover the platinum and its associated metals. Colombia and the Union of South Africa are responsible for practically the whole of the remainder of the world's output.

METALS ASSOCIATED WITH IRON AND STEEL INDUSTRIES

MANGANESE.—Manganese, usually in the form of an alloy called spiegeleisen, is chiefly used to harden steel. Other uses of manganese are in the manufacture of electric batteries, in the preparation of glass, in colouring pottery, tiles, and bricks, and in bleaching powder used in the textile industry. Two important disinfecting liquids are compounds of manganese—the permanganates of sodium and potassium.

The leading producers of manganese ores are Soviet Russia (in Trans-Caucasia), India, the Gold Coast, Brazil, and South Africa.

NICKEL.—Nickel, one of the hardest and least fusible of metals, has a tensile strength exceeding that of iron. As it is resistant to ordinary atmospheric influences its first important use was in the plating of other metals, and it is still one of the purposes for which it is largely employed. Coins of many countries are hardened by an addition of nickel, but its most important use to-day is in the production of the extremely hard nickel steels. These steels are particularly valuable as tool and structural steels, for use in the construction of motors and heavy mill and power machinery. A copper-nickel alloy has recently been employed in the manufacture of condenser tubes in ships, as it has been found to be able to resist corrosion which brass, originally used, could not. Other nickel alloys have recently been introduced in the manufacture of radio transformers.

The copper-nickel ores of Sudbury, Ontario, Canada, produce about 90 per cent. of the world's requirements, and

practically the whole of the remainder comes from New Caledonia, the French island in the Pacific Ocean.

CHROMIUM.—Chromium, at one time obtained from the Shetland Isles, now comes chiefly from Rhodesia (about 50 per cent. of the world's total production), India, and Greece.

The chief use of chromium is in the manufacture of chrome steels, which are harder than ordinary steels, and have those very desirable properties of being stainless and rustless. More uses for these steels are being found every day; those better known are in the manufacture of stainless cutlery, furniture, and fittings for houses and cars. Compounds of chromium are used for paints and dyes and as a tanning agent, but in view of the increasing demand for the metal in the steel industry, it has been proposed to prohibit its use in any other industry.

CHAPTER II

NON-METALLIC MINERALS—FIRE-RESISTING MINERALS

ASBESTOS.—Asbestos is a silky, fibrous mineral found usually in veins. The longer the fibres the more valuable is the mineral.

Its chief value lies in its non-inflammability, and consequently it is used in the manufacture of fire-resisting materials. Woven into a cloth, it is used as a fireproof covering for machinery, insulating jackets for boilers and pipes, and “safety” curtains in cinemas. Unwoven, it is used for packing joints in stoves, and is also moulded into sheets which are used in the building and roofing of garages and other structures where protection against fire is essential.

The chief producers of asbestos are Canada (in Quebec, South of the St. Lawrence), South Africa, Rhodesia, Russia, and U.S.A.

MICA.—Micas are minerals which readily split into very thin plates. The most valuable type is the colourless variety which, on account of its transparency and its resistance to heat, is used for lamp glasses and windows in the doors of furnaces. Its insulating properties are such that it is very widely used in the construction of electrical plant and wireless components.

Micas are found in crystalline rocks such as granites, gneisses, and schists, but generally the mica crystals are too small to be of use. Larger ones, however, are obtained from India, the United States, Canada (Quebec), and Rhodesia.

FIRECLAY.—Fireclay is so called because the materials made from it are able to withstand intense heat, and do not split when subjected to rapid changes of temperature. Such

a clay is invaluable for the manufacture of fire-resisting bricks, crucibles, linings of furnaces, and the backings of fireplaces.

Fireclays are found in many places. In Great Britain they are worked on or near the coal-fields, one of the finest existing either below, or alternating with, the coal seams. Other deposits are worked in Cornwall, Devon, Dorset, and that from Stourbridge, Worcestershire, is famous for its fine quality.

MINERALS ASSOCIATED WITH THE CHEMICAL INDUSTRIES

SULPHUR.—The chief uses of sulphur are in the manufacture of sulphuric acid, gunpowder, and the vulcanization of rubber.

Sulphur is a non-metallic mineral which occurs in the free state in volcanic districts, especially in Sicily and Mexico. It is widely distributed in the sulphides of many metals, the sulphide of iron (iron pyrites) being an important source of supply.

Commercial sulphur is obtained from deposits in :

1. The volcanic districts of the Mediterranean, especially Sicily.
2. The oil districts of the United States.
3. From the iron pyrites in Spain and Portugal.

SALT.—The chief uses of salt are :

1. The manufacture of the heavy chemicals, especially sodium bicarbonate, caustic soda, and other sodium compounds.
2. The preservation of meat and the manufacture of butter.
3. The preservation of fish, *e.g.* herrings for export from Yarmouth, and cod from Norway, to Mediterranean lands.

4. Domestic purposes.
5. Medicinally, as brine baths, etc.

The three main sources of salt are :

1. Mines of rock salt.
2. Sea water.
3. Brine springs and wells.

Rock salt deposits, which are the principal source of salt supplies, are mined in :

1. England, at Northwich (Cheshire), Droitwich (Worcestershire), and in south-east Durham.
2. Germany, at Stassfurt and Hanover.
3. Poland, at Wieliczka, in Galicia.
4. Russia.
5. Spain.
6. In many States of the United States, making the U.S.A. the world's leading producer.
7. China.

Salt is an important commodity in world trade, being imported by all tropical countries where there is an excess of rain and a deficiency in salt. The chief exporting countries are Great Britain, Germany, Spain, and Portugal.

MINERAL MANURES

POTASH SALTS.—These are found in huge deposits at Stassfurt, Germany, and also in Alsace (France). The chief purchasers are the United States and Great Britain.

NITRATE OF SODA.—This soluble salt is obtained from immense deposits in the Atacama deserts, North Chile, between latitudes 15° S. to 26° S. These nitrates are exported, chiefly from Iquique, to the United States, Great Britain, and Germany. Ninety per cent. of the world's production of Iodine is a by-product of the Chilean nitrate works.

PHOSPHATES.—The rocks producing these are found in Florida and Tennessee in the United States, Tunis, Algeria,

Egypt, Belgium, and in the Pacific Islands of Christmas, Ocean, and Nauru.

GUANO.—This name is given to the accumulated droppings of birds found on the islands west of Peru and Chile, and also on the Seychelles and the Falklands.

PRECIOUS STONES

DIAMONDS.—The diamond is a crystalline form of carbon and is the hardest known substance. Diamonds are obtained from a blue-clay rock forming the pipes of extinct volcanoes. When found they have a rough, stony appearance, and require cutting and polishing to bring out the beauty of their crystalline form. This is very skilled work, and the most famous centres for it are at Amsterdam, Antwerp, and London.

Diamonds are worn chiefly as jewellery, but are also used as the “jewels” in high quality chronometers, in glaziers’ tools, and the black and brown varieties as the boring-points of rock drills.

The chief source of diamonds is the area round Kimberley, South Africa. Brazil, Australia, and British Guiana are other producers.

EMERALDS.—Long, green, six-sided prisms which are obtained from Colombia, Soviet Russia (Urals), Egypt, Australia, United States, and Austria.

RUBIES.—Deep red crystals which come from Burma (Mandalay), Thailand, and Ceylon. So-called Australian Cape rubies are only garnets, while the Siberian ruby is a tourmaline.

PEARLS.—The pearl is a secretion deposited by oysters and mussels. The pearl oyster is the principal producer of the best pearls and of mother-of-pearl, which is the smooth inner lining of the shells.

Most pearl fisheries are found in tropical seas. The most productive fishing grounds are the oyster beds of the Persian Gulf, the Red Sea, Ceylon, Queensland, and West Australia. Fishing for pearls also takes place off California

and South America, among the Pacific Islands, and in the Chinese estuaries.

BUILDING AND OTHER MINERALS

GRANITES.—As granite is a hard crystalline rock it is suitable both for building purposes and for polished ornamental work. Granites are found in all parts of the world. Some of the best known British granites are obtained from Aberdeen, Peterhead, Cornwall, and Shap (Cumberland).

LIMESTONES AND SANDSTONES.—These provide a very important supply of building materials. Well-known limestones used for building purposes are: Portland Stone (of which St. Paul's and many other London public buildings have been constructed), Bath Stone, and Purbeck Stone (from Swanage).

SLATES.—Slate has been formed from clays and shales which have undergone great pressure and heat due to earth movements. Owing to this pressure these clays have consolidated into cleavage planes along which the slate splits easily. A good slate should be hard and durable, and must be able to withstand wide variations of temperature without splitting.

The chief use of slate is for roofing because of its ability to stand weathering, the ease with which it can be split into thin sheets and, finally, its lightness. Another use for slate is in the construction of damp courses round the foundations of buildings. When ground into powder it is a constituent of certain varieties of cement.

The finest roofing slates in the world come from N.W. Wales from the quarries of Llanberis and Festiniog. Other British slate quarries are found in Cumberland, Scotland, and Ireland. Slates are also quarried in many parts of Europe and North America.

MARBLES.—True marbles are limestones which have taken on a crystalline structure due to earth pressure. Because of this crystalline structure they are capable of

being polished and are used extensively, in consequence, for ornamental stone work of all kinds. The term "marble" is much more freely used in commerce and is applied to any limestone capable of taking a polish.

Well-known marbles are :

1. Carrara marble—Tuscany (Italy). White in colour and used in statuary.
2. Pentelic marble—Attica (Greece).
3. Parian marble—Island of Paros.
4. Connemara marble—West Ireland. Green in colour.

Black marbles are quarried in West Ireland and at Ashford, Derbyshire. Ashford is better known for its famous marble which, when it is polished, has the appearance of rosewood.

KAOLIN OR CHINA CLAY.—Kaolin is a soft white clay produced by the weathering, chiefly, of granite. The clay is washed to remove impurities, and is used to make the finer types of porcelain and tiles. It is also used in the manufacture of paper.

The finest deposits are found in Cornwall (near St. Austell, exported from Fowey, and Bodmin Moor) and Devon (Dartmoor), whence it is sent to the Potteries of North Stafford and elsewhere. Other deposits are found in France, Germany, the United States, China, and Japan.

CHAPTER III

SOURCES OF POWER

THE sources from which power is chiefly derived to-day fall into two main groups. These are :

1. Fuels.
2. Electrical energy.

FUELS

When steam-power took the place of the water-wheel for driving machinery, we saw the development of manufacturing industry as we understand it to-day. The application of steam-power to transport revolutionized our means of communication. Some time must be spent, therefore, in considering—

1. The chief fuels used to generate the heat by which steam is produced.
2. The world distribution of these fuels.

COAL

With the advent of steam-power coal became almost the universal source of power and, in consequence, the bulk of manufacturing industries were established on coal-fields. To-day the leading industrial and commercial countries of the world are not only those which have the most extensive coal resources in the world, but also those which are working their coal resources to maximum capacity.

Coal is fossil forest vegetation, a vegetation which existed in the earlier periods of the geological history of the Earth. Uplift and denudation have exposed, at the Earth's surface,

the seams of coal in these older rocks. Coal-fields, therefore, are found on the margins of the older highland areas.

VARIETIES OF COAL.—Coals differ according to the percentage of carbon they contain.

1. Anthracite Coal

Over 90 per cent. of this coal is carbon. It has a shiny surface, is clean to handle, burns with very little flame or smoke, and produces intense heat. For these reasons it was used very extensively by ships. Modern ships are using oil fuel, however, as this is easier to handle and gives ships not only greater speed but also a greater cruising range. In consequence, the anthracite coal industry has been experiencing an acute depression, which is slowly being relieved by the development of central heating plant in modern buildings.

The two most important anthracite coal-fields in the world are in Great Britain (South Wales) and in the United States (Pennsylvania).

2. Bituminous Coal

This coal contains from 85 to 90 per cent. carbon. It contains, however, more coal tar and gas than anthracite, and is used, therefore, in the manufacture of coal gas and coke.

There are two chief types, based on the carbon content, of bituminous coal. These are :

1. House coal.
2. Steam coal.

3. Splint and Cannel Coals

These are Scottish names for varieties of bituminous coal.

4. Lignite or Brown Coal

This coal was formed at a much later period in the geological history of the earth's crust than those coals already mentioned. In consequence, we find that the vegetable matter of which it is formed is in a very much less altered state and the percentage of carbon is low.

Coke is an important raw material of the iron and steel industry. It is an artificial product, however, and is made by heating bituminous coal in ovens or retorts. By this the more volatile constituents are removed, leaving coke, a hard porous mass of which the carbon content is as high as that of anthracite. At one period the various gases were allowed to escape. To-day, they provide gas for lighting, and from them are extracted a great many chemicals, of which ammonia and benzene are some of the more important.

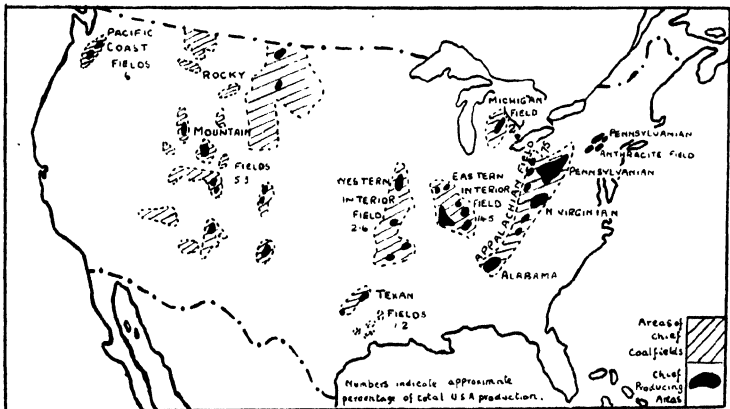


FIG. 34.—COAL-FIELDS OF THE UNITED STATES

COAL-PRODUCING COUNTRIES OF THE WORLD.—The following table gives the chief coal-producing countries of the world and approximate figures, in million tons, of their 1938 production :

Country.	Figures in Million Tons (metric).
U.S.A.	352
United Kingdom	232
Germany (including Saar from 1/3/35)	186
U.S.S.R.	133
France (excluding Saar from 1/3/35)	46.5
Japan	46

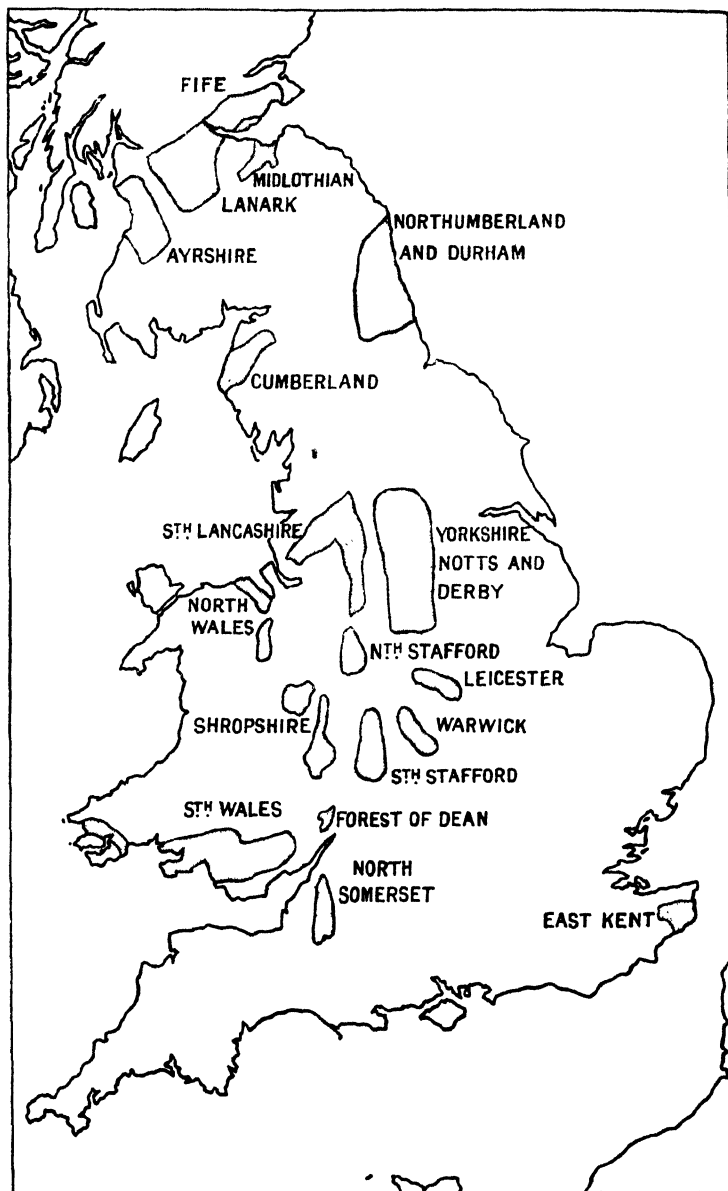


FIG. 35.—COAL-FIELDS OF GREAT BRITAIN

Country.	Figures in Million Tons (metric).
Poland	38
Belgium	29·6
India	25·6
Czecho-Slovakia (excluding lignite) .	13·8
Australia	12·3
Canada	9·8
Spain	7·0
New Zealand	·9
South Africa	·86
World	1225

The position of the coal-fields in the Southern Hemisphere should be carefully noted. Although these coal-fields are only small, the fact that there are so few of them adds to their importance, especially in their association with shipping routes.

THE EXPORT OF COAL.—Great Britain is the chief exporter of coal. This is due to :

1. The presence of coal-fields near the coast—the Northumberland and Durham Coal-field, the South Wales Coal-field, the Cumberland and Ayrshire Coal-fields, the Fife and Midlothian Coal-fields, and the Yorkshire Coal-field.

2. Proximity to countries with no coal or insufficient coal for their requirements—France, Italy, Germany, Sweden, Russia, Belgium, Holland, and Denmark.

3. The magnitude of the British merchant service, which not only requires huge quantities of coal in its bunkers but also demands the establishment of coaling stations at important points all round the globe.

4. The cheap rates offered to coal as an outgoing cargo. As the volume of goods imported by Great Britain is greater than that exported, many ships would be almost empty on

leaving British ports. To avoid an unremunerative trip in ballast, ships offer cheap rates for cargoes of coal.

The British coal export trade has been seriously hit

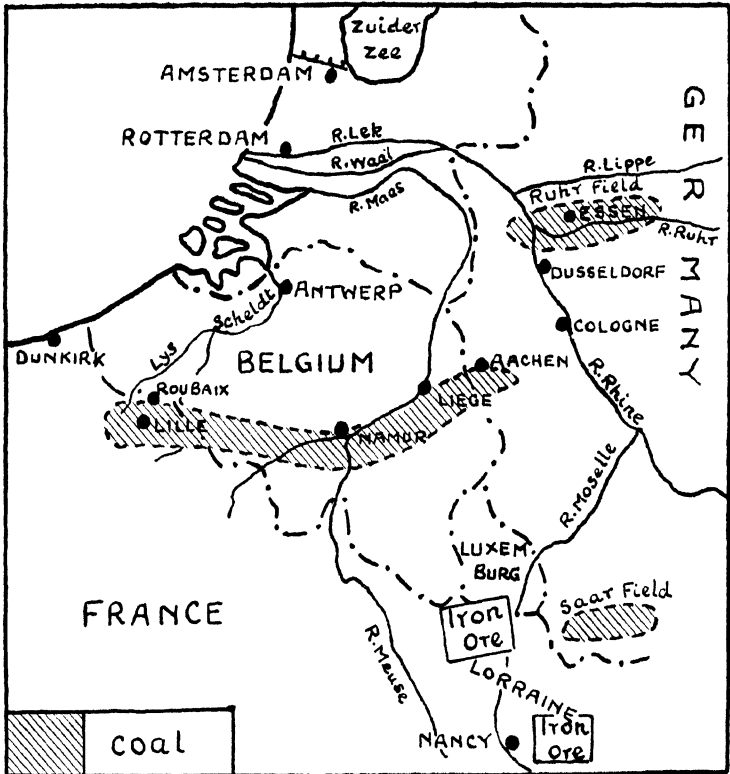


FIG. 36.—COAL-FIELDS AND IRON ORE WORKINGS OF NORTH-WEST EUROPE

during the last few years. A number of factors have led to this, of which the most important are :

1. The use of oil fuel in ships in the place of coal, and the introduction of the motor ship.
2. The rapid development of hydro-electricity resources, especially in those countries with little or no coal which were once large buyers of British coal.

3. The great restriction to all export trade by the establishment of world tariffs.

DISTILLATION OF COAL.—In order to recover some of the ground lost to the petroleum industry, the possibilities of some of the products of the destructive distillation of coal are being explored. The best known of these products is perhaps Benzole, and to-day, National Benzole Mixture, a mixture of Benzole and high-grade petrol, is one of the chief motor spirits used in the British Isles.

Further developments along these lines are anticipated



FIG. 37.—COAL-FIELDS OF CENTRAL EUROPE

in the near future, and these may mean a very considerable revival of the coal industry.

PETROLEUM

Petroleum is the name given to the oils which are found in the Earth's crust. How these oils have been formed is still a matter of conjecture. But it is now generally supposed to have been distilled, under pressure, from decaying vegetation.

To obtain petroleum, holes are bored in the earth to the oil-containing rocks. From these holes or wells the oil either

flows freely or has to be pumped. A well from which the oil flows freely with both volume and speed is called a "gusher."

The rocks which contain petroleum do not belong to any definite geological period as do the rocks which contain coal. In consequence, the geologist, in his search for oil, has very little to help him. In most cases oil-producing areas have been discovered by chance. Thus the world's resources of petroleum cannot be estimated with anything like the same degree of accuracy as can the world's coal resources.

A great many products are obtained by distillation and other methods from the crude petroleum that issues from the earth. The more important of these petroleum products, given in the order in which they are distilled, are :

1. *Gasoline*.—This is also known as petrol or motor spirit. It is used chiefly in the internal combustion engine.

2. *Kerosene*.—In the British Isles this oil is known as paraffin oil, and is used in lamps. In America the heavier oils used for heating or lubrication are known as the paraffin oils.

3. *Diesel oil*. Used in a special type of motor engine.

4. *Lubricating oils*.

5. *Fuel oils*. These are used to develop steam.

6. *Bitumen or asphalt*.

7. *Paraffin wax*.

8. *Vaseline*.

9. *Medicinal paraffin oil*.

These come from
certain oils only.

Although the petroleum industry has only developed in recent years yet it has expanded enormously. To-day it has such a grip on the world's commerce that possession of petroleum resources is a primary consideration of first-class commercial nations. The chief reasons for this tremendous expansion are :

1. The abundance of petroleum supplies which have been discovered in recent years.

2. The cheapness of petroleum products due to the ease with which the crude oil is obtained and sent by pipes for long distances.

8. The invention of the internal combustion engine which has revolutionized transport by land, air, and water.

4. The growing demand for oil fuel by shipping in the place of coal. The advantages gained by ships using oil fuel are an increase in speed and cruising range, a reduction of crew by almost 50 per cent., less time spent in refuelling, and a greater space available for cargo.

5. The increasing demand for the petroleum lubricating oils. These are much more efficient than those lubricating oils of animal or vegetable origin.

PETROLEUM-PRODUCING COUNTRIES.—In view of the element of chance in the discovery of oil-producing areas, their rapid development and sometimes equally as rapid exhaustion, a detailed account of such areas is hardly desirable. The following table gives the position of the world's chief petroleum producers :

Country.	Petroleum Production in Thousand Tons (approx.).	
	1938.	
U.S.A.	.	164,000
U.S.S.R.	.	29,000
Venezuela	.	28,000
Iran (Persia)	.	10,400
Dutch East Indies	.	7,400
Rumania	.	6,600
Mexico	.	5,654
Iraq	.	4,272
Colombia	.	3,000
Trinidad	.	2,500
Argentina	.	2,439
Peru	.	2,100
Burma	.	1,050
Poland	.	500
World	.	272,044

Other producing countries are Sarawak, Japan, Germany, Egypt, Ecuador, Canada, and France.

The Russian oil-fields are found in the district known as Trans-Caucasia. The most productive district is that of Baku, on the peninsula of Apsheron in the Caspian Sea.

The Venezuelan oil supplies come chiefly from the district round the Gulf of Maracaibo.

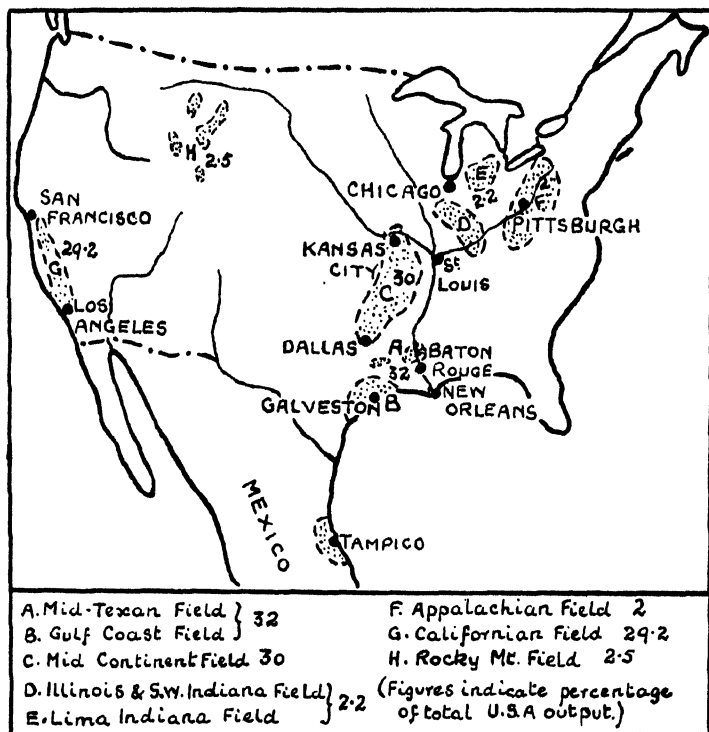


FIG. 38.—PETROLEUM FIELDS OF THE UNITED STATES AND MEXICO

The oil-fields of Rumania and Poland are found on the outer slopes of the Carpathian Mountains.

Burma produces the bulk of Indian petroleum, while Java, Sumatra, and Borneo provide the Dutch East Indian supply.

OIL SHALE INDUSTRY.—Products similar to those of petroleum are produced by the distillation of oil shales.

This industry has been established in the midland valley of Scotland for a long time. Competition from the cheaper petroleum products has caused the decrease of this industry here, and has prevented the exploitation of the vast resources of oil shales that are known to exist in the world.

TIMBER

Timber is used as a fuel in those countries with extensive forest areas but with little or no coal, and which can import coal only at considerable expense. For this reason charcoal is as important a fuel as coke in the Swedish and Russian iron and steel industries. In view of the great cost of transporting the huge amounts of timber required, such industries have been established in or near the forest areas.

Timber is still used as fuel on the Russian, Swedish, and Finnish railways as it was on the old Mississippi steamboats.

ELECTRICITY

Commercial electricity is produced by dynamos. The power used to drive these dynamos may be :

1. Running water.
2. Steam.
3. Oil.

HYDRO-ELECTRIC POWER

Hydro-electricity is the name given to electricity produced by dynamos driven by running water. This method for producing electricity is one of the most important developments of modern times. Any new method of obtaining power is important because :

1. The world's supplies of coal and oil are decreasing.
2. The prices of coal and oil are gradually rising as their scarcity increases.

Hydro-electric power has the added advantage of being cheap.

To develop the water-power of any river the following conditions are required :

1. A sufficient volume of water in the river.
2. The gradient of the river bed to be such that the water flows rapidly enough to drive machinery.
3. The volume and the rate of flow of the river to be the same approximately all the year round.

These conditions are supplied by rivers which rise in the hills and mountains of countries receiving rain all the year round, and especially by those which have their origin in glaciers or mountain snow-caps. Countries which have extended periods of drought or of low temperatures are at a disadvantage in the development of their hydro-electricity resources. During those periods when the volume of water in the river is low, or its movement restricted by ice, no electricity can be produced.

Certain industries are closely associated with hydro-electricity, since cheap power is one of the chief factors in their development. The more important of these industries are the production of aluminium, wood-pulp, "carbide," and the manufacture of artificial manures and other nitrogen compounds by the fixation of atmospheric nitrogen.

Figures showing the water-power resources of countries are only approximate since they have been obtained from data which, in many cases, is very imperfect. The following table gives the installed water-power schemes in 1930 in million turbine kilowatts :

Country.	Million Turbine Kilowatts.
United States	8·4
Canada	4·2
Italy	3·2
Germany	2·0
France	1·9
Norway	1·7
Switzerland	1·7

Country.	Million Turbine Kilowatts.
Sweden	1·25
Austria	·6
Finland	·3
Yugo-Slavia	·2

(1 kilowatt = 1·341 horse-power.)

HYDRO-ELECTRICITY DEVELOPMENTS IN VARIOUS COUNTRIES

1. The U.S.A.

Water-power plays a very big part in the industries of the United States. Many towns owed their origin as industrial centres to the mechanical power derived from the falls or rapids in the rivers on which they were built. To-day these towns still function as industrial centres, not by using water-wheels to drive their machinery, but by applying in every way possible the electricity developed by the running water. Such a series of industrial centres are the Fall Line towns of Eastern U.S.A.

Other important hydro-electrical industrial centres are Massena (New York State), which is near the Long Sault rapids and is principally concerned with aluminium manufacture; the Troy district (New York State), near the Hudson rapids; Minneapolis, at the Falls of St. Anthony on the Mississippi River, for flour milling; Dayton and Akron, in Ohio; and near the Niagara Falls.

2. Canada

Hydro-electric developments are chiefly concentrated in Eastern Canada, where electricity is in great demand for the manufacture of wood-pulp and paper, and in the saw mills. Some of the more important hydro-electric developments are:

1. The Niagara—which supplies power to the industrial towns of the Lake Peninsula.

2. The Saguenay and St. Maurice rivers in Quebec. The power derived from these rivers is making Three Rivers into a flourishing seaport.
3. The Sault Ste. Marie rapids—steel-works and pulp mill.
4. The Winnipeg River supplying Winnipeg and district.
5. The Nipigon River supplying Port Arthur and Fort William.
6. The Kootenay River—in British Columbia.

3. Italy

Italy is favoured with an abundance of water-power which is being rapidly developed. The bulk of this power, which is derived from the Alpine streams, is situated mainly in northern Italy, in Lombardy—the centre of the textile industries. Other industries using hydro-electrical power are the motor industry of Turin, the steel-works of Terni, and the manufacture of calcium carbide at Piano d'Orta.

Italy has practically no coal and, at one time, depended on an extensive import of this commodity from Great Britain. Such has been the development of the hydro-electricity resources of Italy that the amount of coal now imported is almost negligible.

4. Germany

Important power stations are established in Germany at :

1. Innerwerk (aluminium).
2. Grevenbroich, near Dusseldorf.
3. Bitterfeld, near Halle.

5. France

Two important hydro-electric schemes in France are :

1. At L'Argentière, on the Durance, where aluminium is produced.
2. At Grenoble, on the Isère, where it is used in the glove industry.

6. Norway and Sweden

The water-power of Norway and Sweden is available for nine months in the year only. It is being rapidly developed and is used chiefly in the manufacture of wood-pulp, nitrogenous manures, calcium carbide, and chrome steels. Some of the chief power stations are :

1. Scarpsborg, east of Oslo Fjord—calcium carbide and zinc rolling mills.
2. Notodden, south of Oslo—nitrate of lime, nitrate of soda and ammonia.
3. Trollhattan Falls, Gota River—chrome steels.
4. Odde, on Hardanger Fjord—calcium cyanamide.

ELECTRICITY FROM COAL

One of the most important developments of recent years is the increased use industries have made of electricity derived from coal. At one period such electricity was used mainly for lighting purposes, but to-day a very big percentage of it is used for power.

The great advantage that electricity from coal has over steam-power, obtained from coal, is that electricity is the cheapest way of transporting coal. In other words, it is cheaper to transmit electricity from the coal-fields than it is to transport coal. The reasons for this are :

1. Power stations need only be established where coal is cheapest—that is, on the coal-fields.
2. A few power stations are able to supply the needs of all consumers instead of each consumer having to provide himself with a steam-engine.
3. Each consumer pays for the actual amount of power he requires to run his factory.

In view of the cost of transporting coal, industries were established on coal-fields. To-day, since electricity, produced on coal-fields and at other suitable centres, can be obtained at a reasonable cost the tendency is to establish

industries, using electricity as power, where markets can be most easily reached and not where coal can be obtained most cheaply. As an illustration of this there has been a marked migration of industry from northern England to London and the Thames Valley, since London provides a finer distributing centre to Great Britain and the world than any other part of the British Isles.

Electricity, too, is playing a bigger part in railway transport. Each year sees increased mileage covered by the electric train. The reasons for this are :

1. The electric train has a more rapid acceleration, which permits increased services. The fine service, second to none in the world, which the Southern Railway gives to South London and suburbs, owes its success to this.

2. The electric motor maintains a stronger pull at high speeds than the steam engine.

3. Electric power can be recovered when the trains are running under their own momentum downhill.

The Grid System of the British Isles, utilizing electricity derived from both coal and water-power, is the scheme adopted to transmit electricity to all parts of the British Isles at a standard voltage.

CHIEF ELECTRICITY-PRODUCING COUNTRIES OF 1938

U.S.A. . . . .	. . . . .	116,000,000,000 kw. hrs. (approx.)		
Germany . . . . .	. . . . .	55,000,000,000	„	„
U.S.S.R. . . . .	. . . . .	36,000,000,000	„	„
United Kingdom . . . . .	. . . . .	31,000,000,000	„	„
Canada . . . . .	. . . . .	26,000,000,000	„	„
Japan . . . . .	. . . . .	26,000,000,000	„	„
France . . . . .	. . . . .	19,300,000,000	„	„
Italy . . . . .	. . . . .	15,100,000,000	„	„
World . . . . .	. . . . .	420,000,000,000	„	„

QUESTIONS

SECTION III

1. Discuss the main sources of the world's supply of gold. (L.C.C.)
2. Indicate, giving examples, the conditions necessary for the development of hydro-electric power. (L.C.C.)
3. Describe the coal resources of either France or Germany. To what extent are they adequate for the regions they primarily serve. (I. of T.)
4. Describe the position of the chief areas of mineral wealth in the Tropics, and indicate their value. (R.S.A.)
5. Write a short geographical account of any one coal-field in England. (R.S.A.)
6. Where are the chief coal-fields in either Canada or the U.S.A.? Which is the most important, and why? (R.S.A.)
7. What countries are usually the chief markets for British coal? From what ports in this country, and to what ports in other countries, is it sent? (R.S.A.)
8. Selecting three important examples, show how climate and relief affect the development of water-power in Europe. Give some account of the industries in the selected areas.
9. Discuss the main sources of the world's supply of petroleum. State briefly what effect the development of the petroleum industry has had on the coal industry.
10. Give a brief account of the main sources of the World's supply of (a) copper; (b) aluminium; (c) tin.
11. Discuss the advantages and disadvantages of using coal supplies for the large-scale production of electricity.
12. Write brief notes on the production of: kaolin, silver, asbestos, mica, salt, building materials.

SECTION IV

INDUSTRIES

CHAPTER I

MANUFACTURING INDUSTRIES—THE IRON AND STEEL INDUSTRY

WHEN studying the origin and growth of a manufacturing industry in any one area, the chief factors to consider are :

1. The local demand for the manufactured product.
2. The supply of raw materials.
3. The supply of cheap power.
4. The labour supply.
5. The facilities for marketing the finished product.

THE IRON AND STEEL INDUSTRY

Some reference has already been made to the Iron and Steel Industry in Section III, Chapter I. We will now consider this subject in detail, including a study of the chief world iron- and steel-producing regions.

RAW MATERIALS.—As iron rarely occurs in its native state it has to be obtained by reducing the iron ores (see Section III, Chapter I). To do this the iron ores are mixed with carbon and limestone and smelted in a blast furnace.

The carbon is supplied mainly in the form of coke, but occasionally as charcoal. Under great heat the carbon unites with the oxygen in the ore, freeing the iron. This, being heavy and in a molten condition, falls to the bottom of the blast furnace. Two tons of coal (*i.e.* one ton of coke) are required to produce one ton of iron.

The limestone facilitates this reduction of the iron ores and, for that reason, is called a "flux." The other impurities in the ore unite with it, forming a mixture called "slag," which, being lighter, floats on the top of the molten iron.

PIG IRON.—The molten iron is run off from the bottom of the furnace by means of a pipe, and is placed in rectangular moulds formed in moulding sand. These rectangular castings of impure iron are called "pigs," and weigh about 1 cwt. each. Thus, pig iron is the crude iron obtained from the ores, and is the raw material supplied to other branches of the iron and steel industry. Five per cent. of it consists of impurities, of which the chief is carbon. Other undesirable impurities, frequently found in pig iron, are sulphur and phosphorus.

CAST IRON.—Cast iron is the term used for those articles made by running pig iron into moulds of the shape of the articles required. Impurities like sulphur and phosphorus make cast iron brittle. To reduce brittleness, the percentage of these impurities is lessened by smelting purer scrap iron with the pig iron. Cast iron articles are rather brittle, however, but they can stand great heat.

WROUGHT IRON.—Wrought iron, the purest form of iron, is produced by removing the impurities from pig iron. Being no longer brittle at red heat it can be hammered into any required shape, or two pieces can be welded together. Of all forms of iron and steel, wrought iron contains the least percentage of carbon.

STEEL.—Steel is pure iron to which a very small known percentage of carbon, which varies in amount from 0.3 to 2.2 per cent., has been added. When the steel is cooled suddenly this carbon hardens it.

There are a number of methods for producing steel.

1. Cementation Process

This is an old and expensive method but is still the best as it produces the finest steel, such as is used in good cutlery.

2. Bessemer Process

The Bessemer process was the first method of large-scale steel production. The Open Hearth or Siemens-Martin was a later development of this. These processes for producing steel depend on removing the carbon and other impurities from pig iron and then adding the required amount of carbon and other compounds.

The one undesirable impurity of certain types of pig iron not removed by these processes is phosphorus, which makes steel brittle. Consequently, the only pig iron that could be used in the early days of large-scale steel production was that produced from ores not containing phosphorus. As suitable ore, in considerable deposits, was to be obtained in Cumberland, the iron and steel industry, using these processes, first developed in England. Other supplies being easily imported at those steel towns situated on the coast (*e.g.* Middlesbrough), from such countries as Sweden, Spain, Italy, and Algeria, this industry grew apace.

3. The Basic Process

Later developed the basic process which is similar to the Bessemer process, but with the addition of lime to the mixture in the converter. The lime removes the phosphorus from the pig iron.

This discovery brought into use the large supplies of "minette," a phosphorus-containing iron ore, of the continent of Europe, making Germany and France, using these ores, important competitors of Great Britain.

The basic process of steel production is the method largely adopted in the United States and on the continent of Europe. This steel is not of a sufficiently high grade for shipbuilders, who are the chief users of British steel. Thus, in Great Britain, the majority of the steel-producing areas use the open hearth process.

In recent years much has been discovered in the development of steels for particular purposes. By the addition of

compounds of other metals special properties are imparted to the steel produced. Some of the chief of these are :

(a) Stainless Steel

A chromium steel which is hard and does not rust. The number of uses to which it is put is increasing rapidly.

(b) Chrome Steel

Another chromium steel which is very hard. For that reason it is used for projectiles which have to pierce armour plate.

(c) Nickel Steel

Being very hard, this steel is extensively used in the production of armour plate.

(d) Manganese Steel

(e) High-Speed Steels

These steels contain compounds of tungsten and chromium. As they possess the property of remaining hard at high temperatures, they are used to make the cutting tools of machines such as lathes.

REASONS FOR THE GROWTH OF THE IRON AND STEEL INDUSTRY

It is important to know why an industry has developed in any one area. In the early days the growth of the iron and steel industry depended on the presence in the area of the chief requirements, which were :

1. Deposits of iron ore.
2. Forests, to provide charcoal.
3. Fast flowing streams, to provide power for the blast furnaces and hammers.
4. Local markets for the goods produced.

As transport was difficult it was essential that these requirements should be in close proximity to one another as they were for the old iron industry of Sussex.

Later, coal took the place of charcoal for smelting. Those iron and steel areas, already developed on or near a coal-field, continued to grow, while new ones sprang up, as at Middlesbrough. The competition from these caused the disappearance of the industry in those areas, such as Sussex, which were too far from coal to import it.

To-day, smelting is carried on near coal supplies, which are either near, or have easy access to, supplies of iron ore, or near which iron is in great demand for local industries. The distribution of the various branches of the iron and steel industry, however, and the type of product produced may depend on a variety of factors other than on the actual supply of coal and iron.

1. The quality of the iron ore available. High-grade ores will be used to produce high-quality steels, as in the case of the Swedish ores at Sheffield.

2. The cost of transporting the raw material. Where cost is high, the tendency is to specialize in products of small bulk for which the amount of raw material required is small.

3. The special demand of local markets, such as the demand for marine engines and ship's plates in shipbuilding areas, or agricultural implements in farming areas.

4. The supply of special materials, such as grindstones at Sheffield.

WORLD MARKETS FOR IRON AND STEEL GOODS

The markets for iron and steel goods are found chiefly in two types of areas :

1. The chief manufacturing countries, where machinery of all types is always required in large quantities. Further, as the population in such countries is usually large and generally with a higher standard of living, labour-saving devices and luxuries are much in demand.
2. The "newly" developed countries, such as the

Argentine. In these there is always a big demand for iron and steel goods both for transport and building.

WORLD'S PRODUCERS OF PIG IRON AND STEEL, 1938

	Pig Iron.	Steel.
U.S.A. . . .	19,600,000 tons (approx.)	28,800,000 tons (approx.)
Germany . . .	18,655,000 "	22,991,000 "
U.S.S.R. . . .	15,000,000 "	18,200,000 "
United Kingdom	6,872,000 "	10,561,000 "
France . . .	6,027,000 "	6,100,000 "
Japan . . .	3,600,000 "	6,000,000 "
Belgium . . .	2,463,000 "	2,284,000 "
Czecho-Slovakia	1,225,000 "	1,750,000 "
Luxembourg . .	1,554,000 "	1,440,000 "
Italy . . .	930,000 "	2,400,000 "
Poland . . .	971,000 "	1,570,000 "
Sweden . . .	713,000 "	975,000 "

IRON AND STEEL INDUSTRY OF U.S.A.

The United States leads in the iron and steel industry, producing about a half of the world's iron and steel. Iron ores are both abundant and widely distributed, but the chief supplies come from :

1. The Mesabi Range, in Minnesota, near the western end of Lake Superior.
2. Peninsular Michigan between Lakes Superior and Michigan.
3. The Appalachians, especially from the Birmingham district of Alabama.

The ore from the Lake Superior districts, especially the Mesabi Range, which amounts to three-fifths of the U.S.A. total production, is shipped from Duluth, Superior, and other ports on Lake Superior to the Appalachian coal areas around Pittsburgh, or to the Lake Erie industrial towns of Buffalo and Cleveland.

FOUR CHIEF IRON AND STEEL CENTRES OF THE
UNITED STATES**1. Pittsburgh District**

This is the chief iron and steel centre of the United States, producing about 50 per cent. of the total U.S.A. output of pig iron.

The reasons for the origin and growth of the industry in this area are as follows :

- (a) Local coal from the North Appalachian Coal-field. The size of this coal-field, which produces about one-third of the world's total coal supply, combined with the excellence of the coking coal of the Connellsville district, permitted the large-scale development of the steel industry here.
- (b) Local iron ore, which soon failed to satisfy the increasing demand. This was replaced by the huge supplies of Superior ore, which could be transported cheaply to this area *via* the Great Lakes.
- (c) Abundant local supplies of limestone for flux.
- (d) The convergence of the rivers Alleghany, Monongahela, and Youghiogeny, to form the Ohio, simplified transport in and out of this area. This type of transport has been supplemented by a network of railways with connections to all parts of the United States.

Pittsburgh, the centre of this area, grew up where the rivers Ohio, Alleghany, and Monongahela join. It now produces about 25 per cent. of the total U.S.A. steel. Other towns in this district which account for the other 25 per cent. are Alleghany, Akron, Sharon, and Warren.

2. Lake-side Centres

These steel centres owe their origin to the meeting of Superior ore with Pennsylvanian coal at the lake-side edge.

These towns are growing at the expense of the Pittsburgh district. The chief areas are :

- (a) On or near Lake Erie—Cleveland, Buffalo, Detroit.
- (b) On Lake Michigan—Chicago, Gary, Milwaukee.
- (c) On Lake Superior—at Duluth, as coal is taken as a return cargo in the ore and wheat ships.
- (d) On the Canadian side, Toronto, Hamilton, and Welland have developed as iron and steel centres for the same reasons as the lake towns of the U.S.A., combined with the demand in Canada for farm implements and machinery.

3. Alabama District

The industry is centred at the town of Birmingham, which produces the cheapest steel in the world. This is due to the local supplies of coal, iron, and limestone, associated with cheap labour. The great disadvantage of this area is that it is some considerable distance from important markets and about 200 miles from the nearest port. It is therefore unable to enter world steel markets at competitive prices.

4. New England States

The iron and steel industry started first in the New England States. This was because there were :

- (a) Local supplies of iron ore.
- (b) Forests which supplied charcoal
- (c) Many fast-flowing streams which provided power.
- (d) The needs of the early colonists for farming implement and tools.

Competition from the more favourably situated steel areas would have caused the industry to cease in this area if it depended to-day on the above factors. We have here a case of "geographical inertia," an industry continuing to exist because of its early start and the inherited skill of the work-people. The chief steel works are at Sparrow Point, South Bethlehem, Worcester, Philadelphia, and

Waterbury. These towns produce the specialized and high quality iron and steel goods, importing the high grade ores of Spain, Algeria, and Cuba.



FIG. 39.—COAL-FIELDS AND STEEL CENTRES OF EASTERN UNITED STATES

THE ENGINEERING INDUSTRIES OF THE U.S.A.

1. Agricultural Machinery

Chicago and Milwaukee. These supply the farms of the Middle West.

2. Textile Machinery

Worcester. This supplies the New England textile towns.

3. Machine Tools

Philadelphia, Cleveland, and Cincinnati.

4. Motor Cars

Detroit.

5. Locomotives

Localized at the great route focals of Philadelphia, Chicago, Pittsburgh.

6. Engines and Electrical Machinery

Milwaukee, Pittsburgh, Philadelphia, New York, Schenectady.

7. Shipbuilding Yards

Atlantic, Pacific, and Lake-side Ports.

The United States holds second place to Great Britain in the shipbuilding industry. The total tonnage produced in no way compares with that of Great Britain. This is due to the fact that the coal and iron of the United States is some considerable distance from the coastal estuaries and not, as in the British Isles, where the shipbuilding yards are backed by coal-fields on which are situated important iron and steel industries.

IRON AND STEEL INDUSTRY OF THE BRITISH ISLES

Great Britain ranks second to the United States in the total world production of iron and steel goods. It leads the world in the shipbuilding industry, and is noted for the high quality of the goods it produces in all branches of the iron and steel industry.

The more important iron and steel centres owe their origin to iron ore and coal (or charcoal) being found near to one another. As local supplies of iron ore have been gradually exhausted, these centres have carried on with iron ore or pig iron imported from other iron-mining districts of the British Isles, or from Spain and Sweden.

IRON ORES OF GREAT BRITAIN

The chief supplies of British iron ore are obtained from three types of rock :

1. The limestones and sandstones of the Jurassic and Lower Cretaceous provide the greater part of British ore. The ore is obtained both by mining and quarrying. The Cleveland hills of North-east Yorkshire, Scunthorpe in North Lincolnshire, Kettering, and Wellingborough in Northamptonshire, and Westbury in Wiltshire, are the chief mining districts.

2. The finest quality iron ore found in Great Britain is hæmatite. The chief supplies come from the Carboniferous Limestone rocks of the Furness district of North Lancashire and from West Cumberland, while small quantities are obtained from North Wales and the Forest of Dean. The supply of this ore is variable, as it is distributed in irregular pockets in the limestone. Millom, Ulverston and Dalton in Lancashire, and Cleator Moor in Cumberland are the chief mining districts.

3. Blackband ironstone or clay ironstone was mined extensively in certain of the coal-fields from the Coal Measures. Some is still obtained from the coal-fields of South Staffordshire and Lancashire, but the competition of imported ores has greatly reduced the output.

IRON AND STEEL CENTRES OF THE BRITISH ISLES

1. South Yorkshire (Sheffield District)

The origin of the industry here was due to :

- (a) Local ores.
- (b) Forest supplying charcoal.
- (c) Fast-flowing streams providing power.

To-day, coal from the Yorkshire coal-field provides both the power and the carbon for smelting. Present-day supplies of iron ore or pig iron are obtained from Scunthorpe, Middlesbrough, and from Sweden.

Sheffield is the headquarters of this industry here, and

is famous for its cutlery and machinery. Other towns in the area are Rotherham, Doncaster (locomotives), and Chesterfield (stoves). (See Fig. 46.)

Farther north, Leeds, on the river Aire, has important blast furnaces and iron and steel works.

2. The North-East Coast

The iron and steel industry has grown up on the Northumberland and Durham coal-field at centres situated on the estuaries of the rivers Tyne, Wear, and Tees. The chief smelting region of Great Britain is round Middlesbrough, on the estuary of the river Tees. The reasons for this are :

- (1) Iron ore is obtained from the Cleveland hills, 12 miles to the south, and ores from Sweden are easily imported to augment this supply.
- (2) Excellent coking coal is obtained from South Durham, 25 miles away.
- (3) Mid-Durham supplies suitable limestone.
- (4) The Tees estuary permits both easy import of iron ore and export of iron and steel goods.

Most of the pig iron produced is used to manufacture requirements of the shipbuilding industry, steel girders, bridge parts, and railway lines. The chief shipbuilding centre of this region is along the Tyne, concentrating at Newcastle and South Shields. Other centres are Sunderland, on the Wear estuary, West Hartlepool, Middlesbrough, and Stockton-on-Tees.

Darlington manufactures locomotives and bridge parts.

3. The Black Country

This is the name given to the iron and steel industrial area of South Staffordshire and North Warwickshire. It owes its origin to local supplies of ore, charcoal, and limestone. As blackband ironstone was mined with the coal of South Staffordshire this area was once the chief smelting district of Great Britain. This does not apply to-day, as both the best coals and ores are largely exhausted. Pig iron is

imported from the iron-smelting districts of Kettering and Wellingborough.

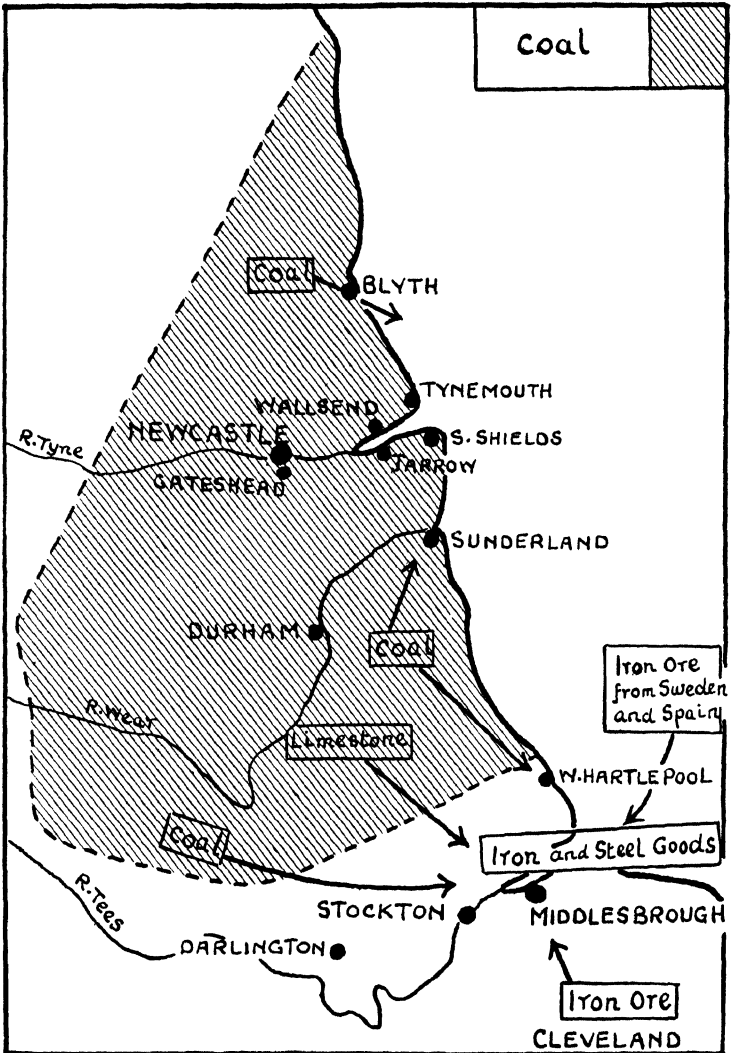


FIG. 40.—NORTH-EAST COASTAL PLAIN: COAL-FIELD AND IRON AND STEEL INDUSTRIAL AREA

Birmingham, with a population of over a million people, is the industrial capital of the district. It manufactures a great variety of iron and steel goods. Other important towns included in this area are Wolverhampton, Walsall, Wednesbury, West Bromwich, Dudley (chains), Redditch (needles), Coventry (motor cars, bicycles).

In comparison with other iron and steel areas of the United Kingdom, the Black Country is some considerable distance from the sea. Thus on all goods to be exported

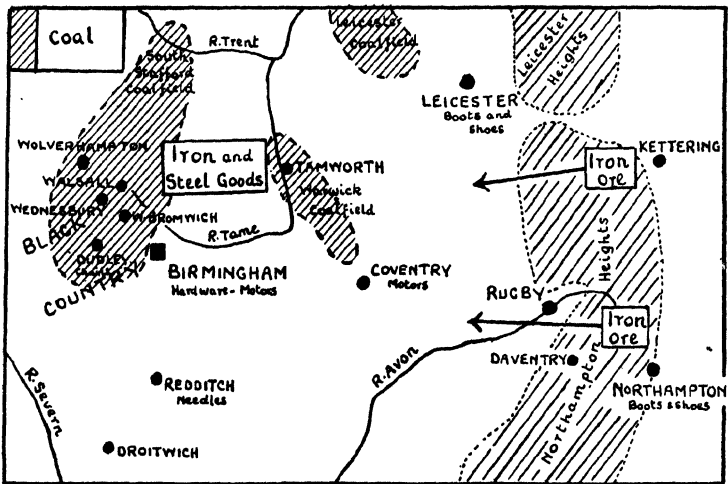


FIG. 41.—THE MIDLAND COAL-FIELDS AND THE BLACK COUNTRY

the transport charges will be heavy. To overcome this disadvantage, the Black Country specializes in producing articles which are small in bulk but high in value, such as motor-cars, bicycles, motor-bicycles, machine tools, small-arms, nails, screws, brassware.

4. South Wales

The local ore of the Brecknock Beacons and the coal of the South Wales coal-field gave rise to the iron-smelting industry of North Glamorganshire, for which the chief centres were Merthyr-Tydfil, Aberdare, and Tredegar. The gradual

exhaustion of this inferior ore led to the importing of cheaper and better grade ores from Spain and Algeria. These ores were imported at Cardiff and Newport. As in the case of the lake-side centres of the U.S.A., important iron and steel works have grown up at these ports of import, where the imported ores met the coal for export, to the detriment of the works in the older-established areas.

Smelting works for the tin and copper ores of Cornwall and the lead and zinc ores of Wales had been established at

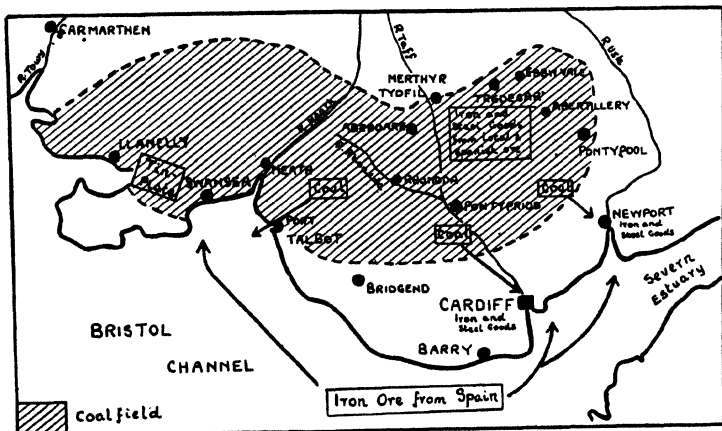


FIG. 42.—S. WALES COAL-FIELD AND IRON AND STEEL INDUSTRY

an early date in the coastal towns of Swansea, Neath, and Cardiff. These metal-smelting industries have greatly developed, especially at Swansea and Llanelli. The association of the iron and steel industry and these metal-smelting industries has given rise to the most famous of South Wales industries—tin-plates and galvanized iron.

To-day the bulk of the tin ores come from Malaya, Bolivia, and Nigeria, and copper from Canada.

5. The Furness and Cumberland Districts

An important iron and steel industry developed in the Furness district of North Lancashire and along the

Motherwell, Airdrie, Hamilton, and Wishaw. These are engaged in producing heavy iron and steel goods of all types, especially those for the shipbuilding industry. Falkirk produces light castings.

The shipbuilding industry of the Clyde estuary is associated with the Lanark iron and steel industry. The Clyde estuary is the largest shipbuilding area of the world. The chief shipyards are at Greenock, Dumbarton, Port Glasgow, Clydebank, Dalmuir, and Glasgow.

ENGINEERING CENTRES OF THE BRITISH ISLES

1. Agricultural Machinery

(a) Towns in iron and steel areas—Sheffield, Leeds, Preston, Derby, Darlington.

(b) Market towns supplying local needs—Ipswich, Bedford, Peterborough, Grantham, Lincoln, Rochester, Chelmsford, Newark, Cambridge, Norwich.

2. Textile Machinery

British textile machinery is world famous, and is one of the chief types of the engineering industry. The chief towns engaged in producing it are in the great textile manufacturing areas. They are: Manchester, Wigan, Oldham, Bury, Bolton, Rochdale, Blackburn, Burnley, Keighley, Leeds, Huddersfield, Bradford, Nottingham, Glasgow.

3. Machine Tools

Sheffield, Birmingham.

4. Electrical Machinery

Works are found in all parts of the British Isles, but the most important are those in the great industrial areas which supply local requirements. London, Manchester, and Birmingham are noted.

5. Locomotives

Swindon (G.W.R.), Crewe and Derby (L.M.S.), Doncaster and Darlington (L.N.E.R.), Ashford (Kent), and Eastleigh (S.R.).

6. Motors and Cycles

London and suburbs, Birmingham, Coventry, Oxford.

7. Aeroplanes

London, Bristol, Yeovil.

8. Shipbuilding and Marine Engineering

The prominence of Great Britain in the world is the outcome of her commerce. Consequently, shipbuilding is one of her chief industries. About two-thirds of the world's total tonnage is built in her shipyards, which produce the finest ships in the world. The superiority of Great Britain in this industry is due to :

- (1) The possession of deep tidal estuaries for launching ships.
- (2) Coal-fields, with iron and steel industries, closely associated with these estuaries.
- (3) The constant demand for merchant ships, fishing boats, colliers, and naval vessels.
- (4) A tradition and an inherited skill from the days of the wooden ship.

The chief shipbuilding areas are :

- (1) The Clyde estuary.
- (2) The estuaries of the Tyne, Wear, and Tees.
- (3) Belfast, on Belfast Lough.
- (4) Barrow.
- (5) Birkenhead.

Marine engineering is carried on in all the great shipbuilding areas and at London, Bootle, Southampton, and Birmingham.

THE IRON AND STEEL INDUSTRY OF GERMANY

The chief iron and steel-producing region of Germany is situated in the basin of the river Ruhr. The industry has become established there for the following reasons :

1. Local coal from the Ruhr coal-field. This is the greatest

coal-field in Germany, producing about 80 per cent. of the total German coal output.

2. Local iron ore. This was mined with the coal and

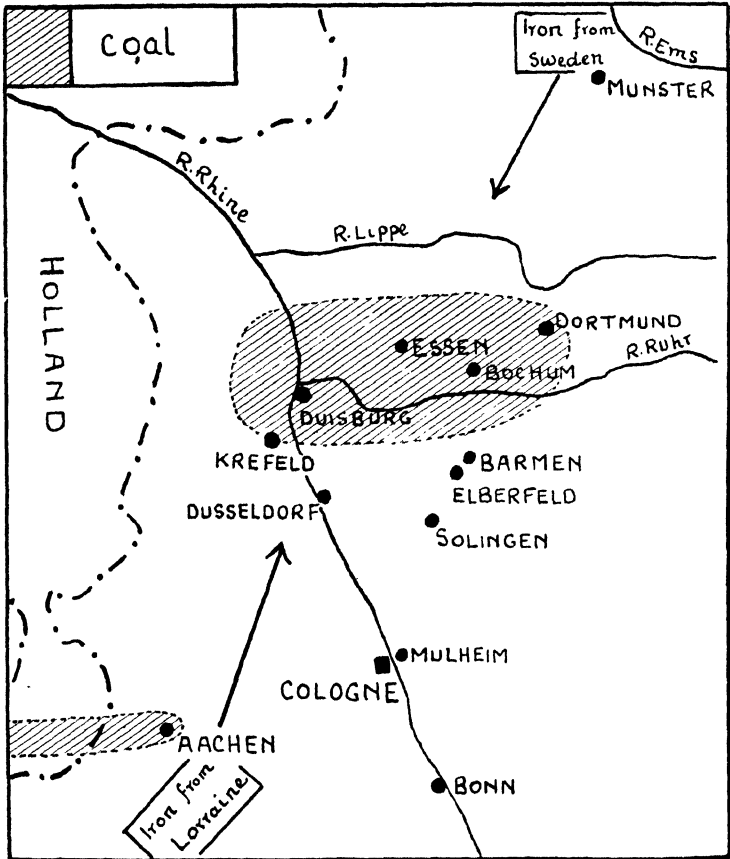


FIG. 44.—RUHR INDUSTRIAL AREA

along the edges of the Westerwald. Supplies are obtained still from the valley of the river Sieg. The great expansion of the Ruhr iron and steel industry, however, was due to the extensive supplies of iron ore from Lorraine and Luxembourg. These are phosphoric ores (minette) which became

available when the basic process for steel production was discovered. These ores were smelted, near their source, on the Saar coal-field, with coke sent from Gelsenkirchen, the chief coking town of the Ruhr area. As return freights for this coke, iron ore, pig iron, and mild steel were sent to the Ruhr coal-field.

Thus, before 1914, there was very close co-operation between the Lorraine ores and the Ruhr coal-field. As a result of the War, Germany lost her chief source of iron ore in Lorraine and, for a period, the Saar coal-field, which had supplied so much semi-manufactured iron and steel goods. The Saar coal-field was returned to Germany as a result of the plebiscite held early in 1935.

For high quality steel Germany had always to import the high grade ores of Sweden. To-day, in view of the loss of the Lorraine ores, greater quantities still are imported from Sweden and Spain. Some of the Lorraine ores are still sent to the Ruhr area, as the full development of these ores still depends on the Ruhr coke.

The third reason for the development of the Ruhr industry is the easy import of raw materials and export of the finished products by the Rhine, the great outlet of this region. Further, the level land of this part of North Germany has permitted the construction of extensive canal and railway connections with the German seaboard and with Mid-Germany.

Towns in the Ruhr Valley engaged in various branches of the iron and steel industry are :

- (a) Heavy engineering, ordnance works, and machinery
—Essen, Dusseldorf, Dortmund, Bochum, Gelsenkirchen, Duisburg-Ruhrort.
- (b) Cutlery—Solingen, Hagen, Remscheid.

Other German iron and steel industries are :

1. Machinery at Gleiwitz, on the Silesian coal-field.
Other important industries were lost to Poland after 1918.
2. Textile machinery at Chemnitz and Zwickau on the Saxon coal-fields.

3. Electrical machinery at Berlin and Magdeburg.
4. Ferro-alloys—Crefeld, Frankfurt.
5. Shipbuilding—Stettin, Lübeck, Kiel, Hamburg, Bremen, Bremerhaven.

IRON AND STEEL INDUSTRIES OF FRANCE

France is now the world's third chief producer of pig iron. Her chief supplies of ore are from Lorraine, which she obtained from Germany in 1918. To smelt this ore France has to obtain the bulk of the coke required from the Ruhr coal-field. The chief towns engaged in producing pig iron from this ore are Longwy, Briey, Metz, and Nancy.

Other engineering districts associated with local coal supplies and iron, either mined locally or imported, are :

1. Motors at Clermont Ferrand.
2. Heavy iron and steel goods, locomotives and ordnance at Le Creusot and St. Etienne.
3. Textile Machinery—Lille, Valenciennes (pig iron sent from Lorraine).
4. Shipbuilding—Le Havre, Marseilles.

OTHER COUNTRIES WITH IMPORTANT IRON AND STEEL INDUSTRIES

1. Belgium—at Mons, Charleroi, Namur, Liège—ore from Luxembourg.
2. Russia—in the Donetz basin.
3. Czecho-Slovakia—at Praha (Prague).
4. Italy—motors at Turin.
5. Japan—local coal, iron ore from China—shipbuilding at Nagasaki and Kobe.
6. India—north of Calcutta (Tata Iron and Steel Works)—coal and iron from Bihar and Orissa.
7. Australia—at Newcastle. Local coal.
8. Canada (other than the lake-side centres)—at Sydney, Cape Breton Island—local coal, and iron ore from Bell Island, off Newfoundland.

CHAPTER II

TEXTILE INDUSTRIES—THE COTTON INDUSTRY

THE term "textiles" is the general name given to all types of woven goods, whatever the fibre that may have been used in their production. Thus the Textile Industries are those concerned with the production of cotton, of linen, of woollen and of silk goods, as well as with the manufacture of sacking from jute.

THE COTTON INDUSTRY

Although cotton had been used from early times, both on the continent of Europe and in Britain, it was not until late in the eighteenth century that it became of any great importance. Inventions altered the whole outlook, making cotton of primary importance instead of being subsidiary to wool with which it had been mixed. These British inventions—Hargreaves' spinning jenny, Crompton's mule, and Cartwright's power loom—came just as Britain, with abundant supplies of coal and iron, was developing industrially. As soon as these inventions were applied, the British cotton industry grew rapidly, giving England the premier position in the world's cotton trade, a position which she still holds in spite of the fact that all the raw cotton has to be imported. While still retaining her superiority in the finer types of cotton goods, England's position to-day is not so commanding. This is due to the keenness of the competition of the United States, of India, and of Japan. Because of their proximity to the raw material and their huge supplies of cheap labour, these countries, especially India and Japan, are able to produce very cheap coarse cotton goods. There is a vast

market for these among the impecunious natives of tropical areas, a market which England once possessed, but one in which her competitors have now a very firm foothold.

WORLD'S CHIEF COTTON MANUFACTURING COUNTRIES

	Spindles.
United Kingdom	45,893
U.S.A.	30,938
France	10,170
Germany	10,109
India	9,572
Japan	9,155
China	4,680
World	156,893

COTTON INDUSTRY OF GREAT BRITAIN

The cotton industry is mainly established on the western side of Great Britain, and chiefly in South Lancashire, where over four-fifths of the total cotton operatives are employed.

Lancashire Cotton District

The chief reasons for the development of the cotton industry in Lancashire are :

1. The existence of the important domestic industries of woollen and linen goods, which were produced by spinners and weavers living in the western valleys of the Pennines.

2. The demand for cotton goods, consequent on the discovery of the Cape Route to India, which created an interest in cotton fibre.

3. The greater success in spinning the cotton fibre in the Lancashire valleys than elsewhere, because of the favourable climatic conditions. These valleys, sheltered from cold east winds and exposed to the warm, moist, westerly winds, have a humid and equable climate which makes the spinning of the cotton fibre much easier. Although to-day the air in the spinning mills can be made moist by artificial means, it is

not considered to be as satisfactory as the natural humidity of the Lancashire area.

4. The supply of water from the Pennine streams for power and for use in the dyeing and printing industries.

5. The development of the South Lancashire coal-field, coal taking the place of water in providing power.

6. The western position of the area, and the existence of a suitable port—Liverpool—facilitated the import of the raw cotton from the U.S.A., and the export of cotton goods.

The Lancashire Cotton Industry To-Day

1. The Lancashire cotton industry is, to-day, characterized by the high degree of specialization which has developed within the industry.

This means that, instead of one mill being responsible for all the processes through which the raw cotton has to pass before becoming the finished article, there will be a number of mills, each of which will be concerned with a few of the processes only. The raw cotton would first be sent to those mills specializing in spinning the fibre into thread. The bulk of these mills are found in the towns of Oldham, Bury, Bolton, etc., which form a crescent 12 miles approximately north and east of Manchester, where the damp air is favourable to spinning. The thread would then be sent to the mills in those towns specializing in weaving. These towns—Blackburn, Burnley, Preston, etc.—are found in the drier Ribble valley along the northern edge of the coal-field. The cloth would then have to be sent to the bleaching, dyeing, or printing, or finishing works. These works are found along the edges of the Rossendale Fells, between the great spinning and weaving areas. The localization of this branch of the cotton industry in this area is due to the plentiful supplies of remarkably soft water coming from the sandstones and grits of these Fells. The finished goods would then be sent to Manchester, where they would be sold in the great Exchange to the buyers who congregate there for that purpose.

2. Other industries, largely dependent on the cotton industry for their markets, have been established in South Lancashire. Thus we have the manufacture of textile machinery at Oldham and Wigan, and the manufacture of

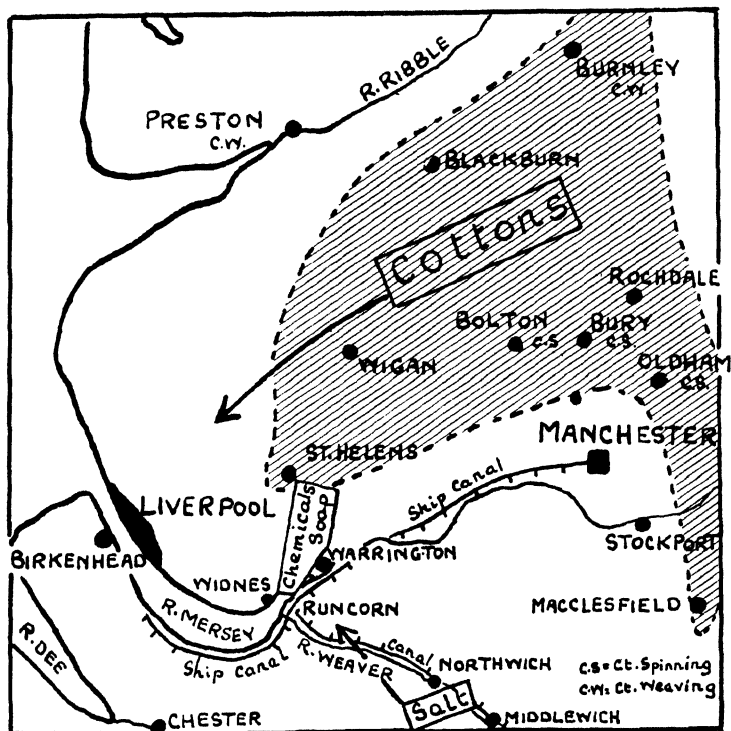


FIG. 45.—LANCASHIRE COAL-FIELD AND INDUSTRIES

the chemicals required in the textile industries at Widnes and St. Helens.

3. Lancashire to-day specializes in the production of the finest cotton goods, hence the greater part of the raw cotton used comes from the U.S.A. and Egypt.

4. As 80 per cent. of the cotton goods produced are exported to India, China, Africa, South America, and Europe, this industry is dependent for its prosperity on foreign trade

and shipping. Owing to the competition of other countries such as the U.S.A., India, and Japan, who have developed their cotton industries enormously since the War of 1914-18, and to the restrictions to foreign trade which have accumulated during recent years, the Lancashire cotton industry is not so prosperous as it was, and is finding it difficult to retain its position as premier producer of cotton goods in the world.

Of the British cotton goods exported, Liverpool exports approximately a half, Manchester one-third, and the remainder from other British ports.

OTHER BRITISH COTTON INDUSTRIAL AREAS

1. Glasgow District

This area had all the natural advantages of Lancashire for the production of cotton goods. That a great cotton industry did not grow was due to the fact that local interests were already concerned with the organization of iron and steel and shipbuilding industries for the production of which there were even greater advantages.

But at Paisley we have the greatest production of cotton thread in the world, and at Glasgow the manufacture of muslin.

2. Nottingham

This city is engaged in the manufacture of lace and hosiery from cotton. Although it is on the drier side of Great Britain, the localization of the industry here is possible because of the thicker threads used which are less likely to snap in the drier atmosphere, and due to local inventions of lace-making machinery.

COTTON INDUSTRY OF THE U.S.A.

The cotton industry of the United States is established in two areas :

1. The New England States (chiefly Massachusetts and Rhode Island).
2. Southern States.

The New England States

The most important of the cotton towns of the New England States are Fall River, Lawrence, Lowell, Providence, Manchester, and New Bedford.

The industry developed in these towns because of the demand of the early settlers for cotton goods. Raw cotton was imported by ship from the southern states, and the falls, at the head of the tidal water, provided power.

These towns, with no real natural advantages and depending on imported cotton from the southern states, still retain their lead in the U.S.A. cotton industry because of :

1. Their early start and the inherited skill of the workers.
2. The cheapness of water and, later, hydro-electric power.
3. The tremendous growth of population in North-east U.S.A., providing a huge local market for the cotton goods produced.

This industry, with others of the New England industries, is an example of “geographical inertia.”

The Southern States

The cotton industry was started in the states at the southern end of the Appalachians at the end of the nineteenth century. The natural advantages that this region possesses are :

1. The proximity to the raw cotton supplies.
2. Cheap coal from the Birmingham coal-field and hydro-electricity supplies from the southern Appalachian streams.
3. Cheap negro labour.

The chief towns engaged in producing cotton goods are Charlotte (N.C.), Columbia, Augusta, and Atlanta.

COTTON INDUSTRY OF GERMANY

Two areas in Germany have important cotton industries. They are :

1. The Ruhr coal-field area.
2. Saxony.

Germany obtains the greater part of her raw cotton from the United States. This is imported at Bremen, which has a considerable American trade.

The Ruhr coal-field area occupies the first place in Germany for the cotton industry, which is established in the towns of Barmen-Elberfeld and Munchen-Gladbach.

Textile industries became prominent on the Saxon coal-field when the metal industries declined owing to the decreasing supplies of the metal ores. The cotton industry is established in a number of towns on the coal-field, already associated with the woollen industry, of which the most important are Chemnitz and Zwickau.

THE COTTON INDUSTRY OF FRANCE

The cotton industry is established in three areas in France. They are :

- | | | |
|--|---|--------------------------|
| <ol style="list-style-type: none"> 1. On the northern coal-field. 2. In the Rouen district. 3. In the country round the Vosges. | } | Both in the Paris basin. |
|--|---|--------------------------|

The Northern Coal-field District

Associated with other textile industries, and with raw cotton imported at Dunkirk and Rouen, an important cotton industry grew up on the northern coal-field of France. The chief towns engaged in producing cotton goods there are Lille, Amiens, St. Quentin, and Valenciennes (lace).

The Rouen District

The cotton industry was first established in France at Rouen. The reasons for this were :

1. Woollen and linen industries had long existed in this area.
2. Raw cotton was first imported at Rouen.

In spite of the competition from other areas and the absence of local coal, this area still retains its position in the French cotton industry because of :

1. The ease with which raw cotton and coal can be imported.
2. The momentum of an early start combined with the inherited skill of its work-people.

The Vosges Area

Probably the most important cotton industry in France is established in the country round the Vosges. Although this area does not possess the same natural advantages of atmospheric conditions and ease of import of raw cotton as the other French areas, its prosperity is due to :

1. The Vosges rivers, which provide power and pure water for bleaching and finishing purposes.
2. An industrious people, from which the labour supplies are drawn.
3. Expert organization.

On the western side of the Vosges the industry is found in the towns of Epinal, Nancy, St. Die, Remiremont, and Belfort. This industry was established in these towns by French manufacturers who left Alsace after it was ceded to Germany in 1870.

After the War of 1914–18, the French regained the towns on the eastern side of the Vosges where the cotton industry had been greatly developed under German rule. Of the many towns in Alsace engaged in manufacturing cotton goods, Mulhouse and Colmar are the most important.

THE COTTON INDUSTRY OF JAPAN

Owing to the introduction of Western methods of manufacture the Japanese cotton industry has developed rapidly during recent years. The reasons which have favoured this development are :

1. The ease with which raw cotton can be obtained from India, China, and the United States.

2. Ample supplies of coal. This has been replaced very considerably by hydro-electricity which Japan has developed extensively.
3. The supplies of cheap labour, due to the low standard of life typical of overcrowded rice-growing areas.
4. The nearness of the vast markets of China and south-eastern Asia for cotton goods.
5. The cheapness of the cotton goods produced, because Indian short-staple cotton is chiefly used, and the low production costs. It is the cheapness of the cotton goods which has enabled Japan to obtain a large share of Great Britain's Far-Eastern market, one in which price, not quality, counts.

The chief Japanese towns engaged in manufacturing cotton goods are Osaka, Kobe, Nagoya, and Tokio.

THE COTTON INDUSTRY OF INDIA

The manufacture of cotton goods has been an important domestic industry in India for centuries. Improved transport now permits the selling of mill-produced cotton goods in nearly every part of India, so that the old domestic industry is gradually dying out.

The chief cotton mills of India are found in Bombay, and in the towns on the "Black Soil" region, to the north-east of Bombay, of which the most important is Ahmadabad. The location of these mills depends almost entirely on the facilities for obtaining the raw cotton used—the coarse short-stapled Indian cotton produced on the "Black Soil" region of the Deccan. In view of the abundance of cheap labour, the production costs of these coarse cotton goods are very low. Thus the Indian mills supply over 60 per cent. of the local consumption of piece goods, and export to an increasing number of markets in the lands round the Indian Ocean. Bombay is the centre of the industry, using for its power hydro-electricity generated in the Western Ghats.

Other countries with important cotton industries are :

1. Italy—in Lombardy and Piedmont. The cotton industry was developed here by Swiss manufacturers. Coarse cotton goods are produced from cotton imported from the U.S.A., India, and Egypt, hydro-electricity supplying the power. The chief markets for these cotton goods are in the Levant and in South America where the large Italian population prefers home-produced goods.

2. Switzerland—the cotton industry is the chief of the Swiss textile industries. Using hydro-electric power the cantons engaged in this industry are Zurich, Aargau, St. Gallen, and Glarus.

3. Belgium.—The chief centres are Ghent and Brussels.

CHAPTER III

THE WOOLLEN INDUSTRY

THE clothes worn in temperate and cold countries are usually made of wool. The reasons for this are :

1. That the source of the raw material, wool, is in temperate countries ;
2. That woollen clothes are warmer, because they keep in the body heat ;
3. That woollen clothes do not easily become soaked with rain.

The bales of wool, which have been collected from sheep farms in many parts of the world are split up when they reach the mills and the wool sorted into long staple and short staple varieties. The long staple, or longer fibres, is usually made into worsteds, while the short staple, or shorter fibres, is usually made into woollens. Thus we have the two main branches of the woollen industry, the manufacture of worsteds and of woollens.

Pure soft water is essential in washing the natural grease from the fleece. Thus the presence of streams of soft water will play an important part in the location of woollen industrial areas.

VARIETIES OF CLOTH PRODUCED IN THE WOOL INDUSTRY

Woollen Cloths—using short fibres

Broadcloth, Cashmere, Tweed, Blankets, Flannel.

Worsted Cloths—using long fibres

Worsted, Merinos, Serges, Hosiery, Carpets.

Shoddy

Cloth produced by mixing some new wool with the fibres taken from old woollen clothes.

Felt

A fabric produced without weaving, but by beating and rolling the woollen fibres together.

THE BRITISH WOOLLEN INDUSTRY

Owing to the unsettled conditions in Flanders, and to privileges offered to them by certain of the English kings, many of the highly skilled Flemish weavers settled in England. This aided and encouraged the further development and specialization of the woollen industry in England, which was firmly established and flourishing by the seventeenth century. In these early days the industry was scattered throughout Britain in areas where there were plentiful supplies of wool and soft water, much of the work being done in the home. East Anglia, with Norwich as the great centre, was the most famous area for wool manufactures. Other well-known districts were the West of England, the West Riding of Yorkshire, Wales, and the Tweed Valley of Scotland. The Industrial Revolution, when coal became the chief source of power and machinery replaced hand labour, changed the whole aspect of the industry. Those woollen areas on or near coal-fields expanded at the expense of those, like East Anglia, which had no coal.

About 20 per cent. of the raw wool used comes from the British Isles. The remainder is imported from Australia, New Zealand, South Africa, and the Argentine.

WOOLLEN INDUSTRIAL AREAS**1. West Riding of Yorkshire**

The reasons for the development of the woollen industry in the West Riding of Yorkshire were :

1. The plentiful supplies of raw wool from the Pennine sheep.
2. The soft water of the rivers Calder and Colne.
N.B.—Nearly all the great Yorkshire woollen towns are in or near the valleys of these two rivers.

3. The settling of Flemish weavers here.
4. An abundant water supply, providing power.
5. The development of the Yorkshire coal-field which, when coal replaced water for power, firmly established the industry in this area and permitted tremendous expansion.
6. The facilities which the area offers for transport by land, river and canal, and sea.

Within the area limited by the rivers Calder and Colne and Aire are found about 85 per cent. of all the woollen operatives of Great Britain. Thus the West Riding holds the same position in the woollen industry that South Lancashire holds in the cotton industry. The chief centres of woollen industry in the West Riding are :

1. Bradford (298,000)—centre for worsted manufacture and the market for the area.
2. Huddersfield (113,000)—centre for high quality suitings (worsted and woollens).
3. Halifax (98,000)—carpets, rugs, blankets, etc.
4. Dewsbury and Batley—"shoddy" goods, blankets.
5. Wakefield—spinning.
6. Leeds (482,000)—an important distributing centre for woollen goods. Manufactures ready-made clothing, is also famous for its leather industry, and has important iron and steel works.

2. The West of England

Wool from the Cotswolds, Marlborough Downs, and Salisbury Plain, combined with the local demand for woollens, caused the development of the woollen industry in the West of England. The chief centres are Bradford-on-Avon, Trowbridge, Frome, and Stroud. These manufacture the famous West of England "broadcloth" and the good quality cloth required for liveries and uniforms. Witney is famous for blankets.

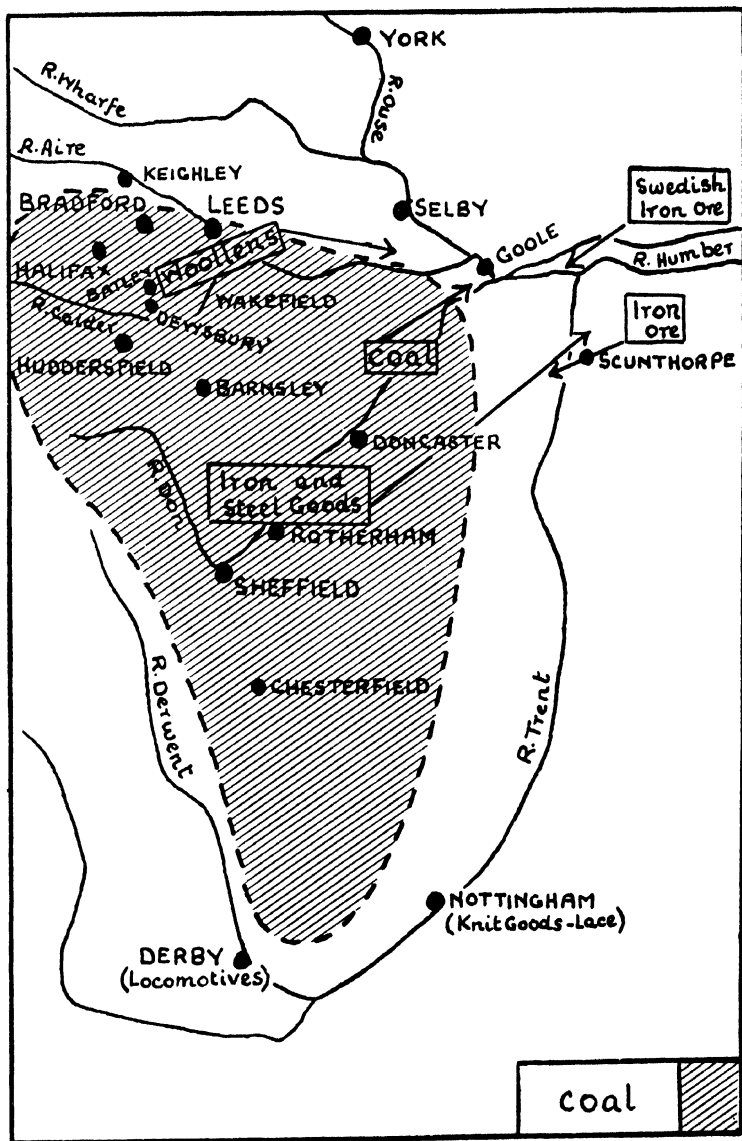


FIG. 46.—YORKSHIRE COAL-FIELD AND INDUSTRIAL AREAS

3. The Tweed Valley

The towns of the Tweed Valley specialize in producing high quality tweed suitings. The industry started here because of :

1. The large supplies of wool from the Southern Uplands.
2. The abundant water supply of the river Tweed and its tributaries.

Although local wool does not supply a tenth of what

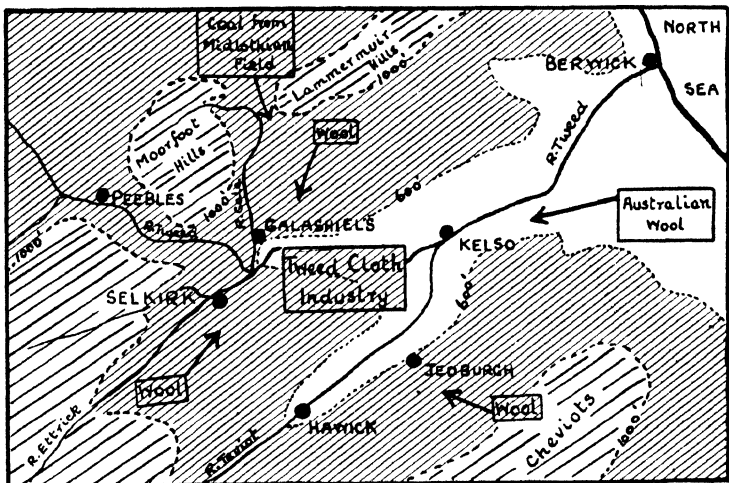


FIG. 47.—WOOLEN INDUSTRY OF TWEED VALLEY

is required there to-day, and coal, replacing water-power, has to be transported some considerable distance, the industry continues to exist, in face of all competition, because of its reputation and the high quality of the goods produced.

The chief towns are Galashiels, Hawick, Peebles, and Selkirk.

Other Scottish centres for tweeds are Dumfries, Kilmarnock, and Dunfermline. Alloa is noted for knitting wools.

4. Leicester

This centre is important for its knit goods, especially hosiery. Fine quality long staple wool from the local sheep and the local coal-field permitted the establishment of this industry here.

5. Hebrides and Highlands of Scotland

“Homespun” are woven by the crofters from the wool of local sheep.

WOOLLEN INDUSTRY OF FRANCE

The woollen industry of France is situated on the northern coal-field. It owes its origin to the local wool supplies from Champagne and Picardy. Much wool is imported, however, at Dunkirk and Havre. This is largely obtained as raw wool from the Argentine and as yarn from England. The chief centres are Roubaix, Tourcoing, Lille, and Fourmies, which are noted for woollen goods of a fine type, like cashmeres and merinos, and for carpets. Other centres in France are Amiens, Rheims, and Sedan. Troyes, on the Upper Seine, is the chief centre for French hosiery.

WOOLLEN INDUSTRY OF GERMANY

The woollen industry is the most important of the German textile industries. This industry is much more widely distributed in Germany than it is in England, but the chief centres are on the coal-fields. Local supplies of wool caused the growth of this industry in the various centres. To-day all centres depend in varying degrees on wool imported from Australia and the Argentine. The more important districts manufacturing woollen goods are :

1. Barmen-Elberfeld—on the Ruhr coal-field.
2. Aachen—on the Aachen coal-field.
3. Saxony—on the Saxon coal-field at Chemnitz, and other towns. The excellent wool from the merino sheep of Saxony gave rise to the well-known cloth known as “Saxony.”

4. Upper Silesia—at the towns of Reichenbach, Schweidnitz, and Peterswaldau. Coal is obtained from the Silesian coal-field.

WOOLLEN INDUSTRY OF THE U.S.A.

This is a growing industry in the United States, especially in the New England States. Philadelphia is the chief centre, especially for carpets. The chief types of woollen goods produced are worsteds and tweeds. Lawrence and Providence are the chief of the New England towns producing these. Boston is the chief wool market of the U.S.A.

Other countries with important woollen industries are :

1. Czecho-Slovakia—at Brno.
2. Italy—at Biella in Novara.
3. Belgium—at Verviers.
4. India—carpets and shawls of Kashmir.

CHAPTER IV

MINOR TEXTILE INDUSTRIES

THE SILK INDUSTRY

THE production of raw silk and some details of the silk industry have been referred to in a previous chapter. We will now consider those countries which lead in the production of silk goods.

1. French Silk Industry

This is established at Lyons and in the district round it, and is the second largest silk-manufacturing centre in the world. It owes its origin there to the supply of silk from the mulberry groves in the Rhône Valley, to the south. The home supply of silk is now far short of the demand, and the greater part of the raw silk used is imported from Italy, China, and Japan. During recent years several changes have taken place in this industry in the Lyons district. The chief are :

- (1) The development of electrical energy from the St. Etienne coal-field and local water-power.
- (2) The distribution of this electrical energy which has brought about the transfer of the silk industry from the large factories in Lyons to the smaller factories and to the cottages in the district round it.
- (3) The production of the better quality silk goods, especially *crêpe-de-chine*, which has taken the place of the production of cheaper goods.

Lyons still remains the organizing centre and market for the industry, while much of the weaving is concentrated in and around the city.

2. The Italian Silk Industry

The silk industry is situated in Northern Italy, in the plain of the Po and in the Alpine valleys. Milan is the chief silk market in Europe and, with the district round it, is the chief silk manufacturing centre in the world. This is due to :

- (1) The large supplies of raw silk produced locally.
- (2) The supplies of cheap labour supplied by the densely populated plains of the Po.
- (3) The availability and cheapness of hydro-electric power.

Owing to the increasing demands of the industry, further supplies of raw silk are imported from the Levant, China, and Japan.

Over 60 per cent. of the silk goods produced are manufactured in Lombardy, and the three chief centres there are Milan, Como, and Bergamo.

3. German Silk Industry

This is situated near the Ruhr coal-field at the town of Krefeld, which is famous for both silks and velvets.

4. Swiss Silk Industry

Starting as a domestic industry, the manufacture of silk goods is now important in the factories of Zurich and Basle.

5. The Silk Industry of the U.S.A.

Facilities for importing the raw material from the East seems to have led to the establishment of the silk industry in Pennsylvania, New Jersey, and New York. Paterson, in New Jersey, is the most important town engaged in this industry.

Other centres are :

6. Great Britain

At Bradford and Halifax in the West Riding of Yorkshire, Macclesfield, Congleton, and Leek in Cheshire, and at Manchester, Derby, and London.

7. China

Mainly as a domestic industry.

8. Japan

Domestic and factory industry (see Japan).

For artificial silk, see Derived Chemical Industries.

THE LINEN INDUSTRY

The chief products of the linen industry are damask, cambric, lawn, Valenciennes lace, huckabacks, and "tics." These are produced from the fibre obtained from the flax plant. For the cultivation of flax a moist soil and a temperate climate are required. Where these conditions are associated with an abundance of cheap labour, there a linen industry can be established.

1. Linen Industry of Great Britain

The linen industry is third in importance of the textile industries of Great Britain. It is manufactured mainly in Northern Ireland, where originally there was an abundance of home-grown flax and cheap labour. All the coal required in the industry is imported, largely from Ayr, as well as the better quality flax, which comes from Belgium and Russia.

The chief centres are Belfast (the most important centre for fine linens in the world), Londonderry (shirts), Newry, and Lisburn.

Other British manufacturing centres are :

Dunfermline (damasks), Dundee (sailcloth), Leeds, and Manchester.

2. Linen Industry of France

The French linen industry is associated chiefly with the other textile industries which have been established on the northern coal-field. Local supplies of flax, the easy import of a better quality flax from Belgium, and the local coal supply caused this industry to develop in the towns of Lille and Cambrai, which are noted for linens, muslins, cambrics, and lawns.

3. Linen Industry of Belgium

The manufacture of linen goods is carried on near the local flax supplies in the towns of Ghent, Courtrai, and Tournai. The home supply of flax being insufficient, further quantities are obtained from Russia. The greater part of the Belgian flax is "retted" in the river Lys, at Courtrai. The water of this river has the property which gives the fibre a

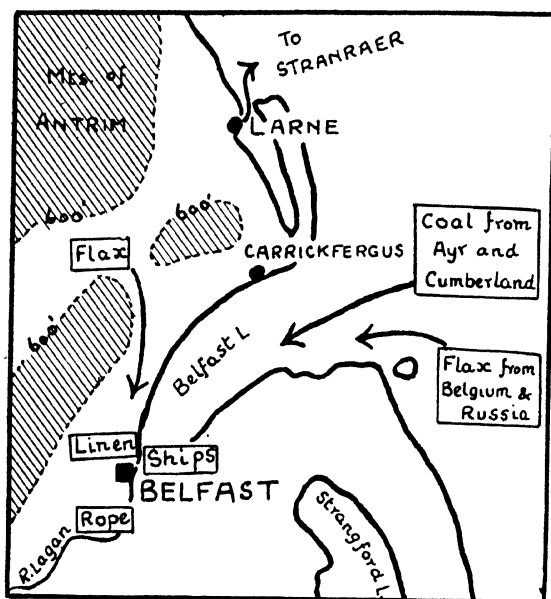


FIG. 48.—POSITION AND INDUSTRIES OF BELFAST

soft and silky appearance. Large quantities of this fibre are exported to Great Britain and Northern France, where it is much in demand for the production of the finer linen goods.

Other countries which produce linen goods are Germany, Czecho-Slovakia, U.S.A., Canada, Poland, and Japan.

THE JUTE INDUSTRY

As you will have seen, practically the whole of the world's jute is grown in the Ganges delta of India. Jute fibre is used

chiefly to produce gunny cloth, from which sacks are made. Although in the past some jute cloth and mats were made by hand in India, the greater part of the raw jute was exported to Great Britain, which supplied countries like the Argentine and Australia with the sacks they needed yet could not produce, and to the United States, which made its own sacks. The modern tendency is for more and more sacking to be made in India, from which the world markets are supplied, and for this purpose huge jute mills have been established in Calcutta, along the Hugli River.

Outside India, an important centre for the jute industry is Dundee, in Scotland. The output of this town has been considerably decreased, however, owing to the development of the Indian mills. The chief jute products of Dundee are sacks and sacking, matting, and cordage.

CHAPTER V

THE CHEMICAL INDUSTRY

As chemistry is applied to so much that is produced in the world to-day—as, for example, in agriculture, in the production of prepared foods, in warfare and in all industries—the Chemical Industry is always considered a key industry.

There are four branches of this industry, which are :

1. The production of heavy chemicals. The important raw material for these is common salt, and the chief chemicals produced are caustic soda, washing soda, sodium bicarbonate, bleaching powder, chlorate of potash, hydrochloric acid, and sulphuric acid. This industry will be usually established where there are supplies of salt and coal near each other.

2. The production of coal-tar chemicals. Coal-tar is obtained as a by-product in the manufacture of gas, and in the production of coke for the iron and steel industry. By distillation a great variety of chemicals are produced, among which are dyes, medicines, disinfectants, explosives, scents, and photographic chemicals. While coal-gas is manufactured in almost every town, the distillation of the coal-tar usually takes place in the larger industrial centres where the chemicals are almost immediately absorbed.

3. The electro-chemical industry. This industry depends on cheap electricity produced by water-power, and its chief products are calcium carbide and artificial manures.

4. Derived chemical manufactures, the chief of which are the soap, glass, leather, and paper industries.

CHEMICAL MANUFACTURING AREAS

GERMANY

The largest manufacturer of chemicals in the world is Germany. The reasons for this are :

1. The presence of large supplies of potash and salt, especially at Stassfurt. With ample supplies of coal from the Ruhr, the heavy chemical industry has grown up in a number of towns in the Elbe basin, of which the chief are Schönebeck and Stassfurt.

2. The establishment of a great number of coking ovens, especially at Gelsenkirchen, in the Ruhr coal-field area, which is the chief seat of the German iron and steel industry. The chief towns engaged in producing chemicals in the Rhine basin, using Ruhr coal, are Essen, Elberfeld, Ludwigshafen, Frankfurt-on-Main, and Oppau.

3. The development of hydro-electricity from the Alpine rivers, which has led to the establishment of large chemical works at Munich and Burghausen.

UNITED STATES

The chemical industry is growing rapidly in the United States. This is largely due to :

1. The presence of extensive supplies of potash.

2. The great number of coking ovens which have been established, especially on the Pennsylvanian coal-field in the Connellsville district.

The chief chemical works are at Buffalo, New York, and Pittsburgh.

GREAT BRITAIN

1. Heavy Chemicals

Possessing abundant supplies of common salt, Great Britain is an important producer of heavy chemicals. The chief manufacturing centres are :

(a) In south Lancashire along the Mersey estuary, using salt from Cheshire and coal from the South Lancashire coal-field. St. Helens, Runcorn, and Widnes are the chief towns producing these chemicals here.

(b) At Newcastle, south-east Durham, and Middlesbrough, using salt from south Durham and coal from the Durham coal-field.

(c) Glasgow, Birmingham, London, and Leeds.

2. Coal-tar Chemicals

These chemicals are produced in many towns, of which the more important are London, Huddersfield, Manchester, Birmingham, and Glasgow.

Since Germany held a monopoly for the production of these chemicals for so many years, Great Britain finds it extremely difficult to overcome the German competition.

NORWAY AND SWEDEN

Both these countries have developed their hydro-electricity resources enormously. Thus, with ample supplies of cheap power, they have established important electro-chemical industries, producing calcium carbide and artificial manures.

Important towns so engaged are Notodden, Ryukanfoss, and Odde.

There are also important electro-chemical works in Switzerland and northern Italy.

France, Poland, Belgium, and Czecho-Slovakia are other producers of chemicals.

CHAPTER VI

DERIVED CHEMICAL MANUFACTURES

THE GLASS INDUSTRY

THE three chief raw materials required in the glass industry are :

1. Silica, which is obtained as flint, quartz, or sand.
2. An alkali, either soda or potash, both of which are obtained from the chemical industry.
3. Cheap coal.

Since cheap fuel is a primary consideration in the glass industry, glassworks are found usually on or near coal-fields and frequently associated with the chemical industries already established there. The silica is obtained from many sources. One of the best-known glass sands is that obtained from Fontainebleau, near Paris.

The chief glass-producing countries are :

1. Germany

The two chief glass-producing areas are (a) Upper Franconia and Upper Palatinate, where large supplies of quartz sand and wood can be obtained from the Bavarian Forest, Nürnberg being the chief manufacturing town ; and (b) Silesia using local glass sand and timber for fuel. Another German centre is Dusseldorf, which has one of the largest glass-bottle-making industries in the world.

2. Czecho-Slovakia

The glass industry developed in the Bohemian lowland, owing to the presence of large supplies of quartz and timber for fuel. Coal is largely replacing timber as fuel to-day. Important towns engaged in this industry here are Hajda, Steinschönau, and Jablonec.

3. Belgium

The excellent sand of the Campine and the abundance of local coal have led to the growth of an important glass industry at Charleroi. This town is the chief manufacturer of window glass in Europe.

4. U.S.A.

The chief glass-producing area of the U.S.A. is Indiana, making use of the natural gas for its manufacture.

5. Britain

The chief glassworks are situated on the coal-fields. The more important centres are at St. Helens, Birmingham, London, and Droitwich.

Other glass-manufacturing countries are Poland, Italy, France, and Japan.

THE SOAP INDUSTRY

The chief requirements of the soap industry are animal or vegetable oils and caustic soda or potash. The more important manufacturing areas are found :

1. Near chemical works, from which the supplies of potash and soda salts are obtained.

2. Near supplies of oil. If the greater part of this oil has to be imported, then the soapworks are found at or near those ports which are also near chemical works.

3. Where the water supply is plentiful.

The chief oils used in this industry are :

1. Tallow—usually a home production.

2. Cotton-seed oil

3. Ground-nut oil

4. Coco-nut oil

5. Olive oil—also imported, except in the south of Europe, where it is a local product.

} imported from tropical and
sub-tropical areas.

The chief soap-manufacturing countries are :

1. Great Britain

In the towns along the Mersey estuary, in London, Hull, Glasgow, and Bristol. The soapworks in these parts depend

largely upon imported tropical oils and the chemicals coming from local chemical works.

2. France

The soap industry is established chiefly in Marseilles. It owes its origin to the extensive local supplies of olive oil, and its growth to the ease with which vegetable oils from the Tropics and East can be imported.

Other important producers of soap are the U.S.A. and Germany.

THE PAPER INDUSTRY

The chief requirements for and the main factors in the location of the paper industry are :

1. Plentiful supplies of soft water. This is by far the most important factor.

2. Nearness to a port where wood-pulp, esparto and alfa grasses can be imported, or near supplies of linen rags and cotton waste.

3. Nearness to chemical and fuel supplies.

4. Nearness to large paper-consuming areas.

The chief paper-producing countries are either those in which there is a huge consumption of paper or those which have large supplies of an essential raw material such as wood-pulp. These countries are the United States, Germany, Great Britain, France, Canada, Japan, and Scandinavia.

THE LEATHER INDUSTRY

The chief requirements of a tannery are :

1. To be near a plentiful supply of hides and skins. Where these are imported the tannery will be at or near the port.

2. A plentiful supply of good water.

3. To be near a supply of chemicals.

4. To be able to obtain a good supply of tanning materials.

Thus any town, noted for its leather industry, will be found to possess or to have possessed all the above requirements. On the other hand, it must be remembered that

there are many towns, *e.g.* Leicester, whose leather industries owed their origin to local supplies of hides and skins, but which to-day depend very considerably on imported supplies. Such towns provide excellent examples of "geographical inertia."

The tanning materials used fall into two groups, mineral and vegetable. Those most widely used are :

- (1) Mineral origin—alum, chromium compounds, and sodium hyposulphite.
- (2) Vegetable origin—oak bark and extract, hemlock bark and extract (U.S.A.), larch bark, quebracho (South America), sumach (Mediterranean), gambier (Malay States), and chestnut extract (north-west Spain and south France).

A supply of hides and skins is obtained in all countries where there is a pastoral industry. The chief exporting countries are, however, those in which the pastoral industry is of primary importance, due to the possession of extensive grasslands or the decided agricultural character of the community. The four most important of these countries are British India, Argentine, Australia, and South Africa.

The U.S.A. is the most important leather-producing country in the world, depending on its own vast supplies of hides and skins. The chief centres are Lynn, Brockton, and Haverhill (New England) for boots and shoes, Gloversville for gloves, Milwaukee and Chicago for leather.

Germany is the biggest producer of leather goods in Europe, specializing in coloured leathers. France takes second place with its manufacture of gloves, especially at Grenoble. Great Britain manufactures a great variety of leather goods, its chief centres being at London (Bermondsey), Leeds, and Manchester.

THE ARTIFICIAL SILK INDUSTRY

Artificial silk or rayon is produced by the action of certain chemicals upon wood-pulp, sawdust, or cotton waste. The rayon industry, a comparatively new one, is usually found established in the older textile industrial areas.

The chief producing countries are the U.S.A., England, Italy, Germany, France, Japan, and Belgium.

THE POTTERY INDUSTRY

1. The British Isles

England is the chief producer of pottery, porcelain, and earthenware in the Western world. Its manufacture is concentrated on the North Staffordshire coal-field, in the area known as "the Potteries," where large deposits of suitable clay provide the essential raw material. This clay is used to-day only for the manufacture of coarse earthenware and for the moulds ("seggars") in which the finer types of porcelain are fired.

All the other raw materials (excepting coal) required by the industry have to be imported into this area—china clay or kaolin from Cornwall and Devon, flints from the chalk hills of south-east England, and chemicals from Cheshire.

Stoke-on-Trent, grown out of the six towns of Hanley, Burslem, Tunstall, Longton, Fenton, and Stoke, is the centre of the industry.

There are many other small potteries in England, of which some of the largest are to be found in London (Doulton's), Bristol, Derby, Worcester, and Barnstaple.

2. Germany

Germany takes second place to England in the production of pottery. The china clay of Schneeberg (Saxony) led to the manufacture of the famous Dresden china of Meissen, on the Saxon coal-field.

Other producing centres are Zwickau and Berlin.

3. France

The largest pottery manufacturing centre of France is at Limoges, where there is a supply of suitable china clay associated with coal.

The famous Sèvres china is produced, however, near Paris.

Other important producing countries are Holland (Delft china), China, Japan, U.S.A., Belgium, and Czecho-Slovakia.

CHAPTER VII

BUILDING MATERIALS

BUILDING materials may be divided into two main classes, natural and manufactured. Natural building materials include stones and timber. These are mainly used to supply local needs. So we find Aberdeen largely built out of the local granite, and Bath from the local limestone. Similarly with timber, to take two examples only, in the forest areas of Canada and Russia we find log huts and in Switzerland wood châlets.

But many districts have no suitable local materials for building and are dependent on imported or manufactured products. Of the latter, the principal are galvanized iron sheeting, cement, and bricks. Galvanized sheeting, which is used extensively for farmsteads in Australia and the Argentine, has already been considered, and it is to the manufacture of cement and bricks that we must now turn.

THE MANUFACTURE OF CEMENT

The three chief raw materials of the cement industry are chalk, clay, and coal. The chalk and clay are broken up and intimately mixed in water to form what the trade calls "slurry." This "slurry" is burnt, at very high temperatures, into a hard clinker. The clinker is ground up into an extremely fine powder, which is cement.

Cement works will be established, then, in those districts where :

1. Suitable chalk and clay can be quarried within reasonable distance of one another.

2. Coal can be obtained comparatively cheaply, because either

- (a) the coal is produced near at hand, or
- (b) the coal can be transported by sea.

3. There are deep water facilities for importing coal and exporting cement.

Almost ideal conditions are found along the estuaries of the rivers Thames and Medway, where the largest cement works of the world are established. Here the true Portland cement and ferrocrete, the rapid-hardening cement, are manufactured.

BRICKS

The raw materials of the brick industry are clay, water, and coal, so that we find this industry established :

1. Where there is a demand for bricks, there being no other suitable building material available.

2. Where there are ample supplies of suitable clay and water near the area where bricks are required.

Coal is usually conveyed to the brickfields because :

1. To transport the clay to the coal would be to take it away from the local market.

2. Brickfields cover a great extent of ground, and this would be dearer in a coal-field area than where the clay existed.

Some of the more important brickworks in England are to be found round London, near Peterborough, and at Bridgewater.

QUESTIONS

SECTION IV

1. Give an account of the cotton industry, indicating the chief sources of supply and centres of manufacture. (L.C.C.)
2. Describe the iron and steel industry of Britain. (L.C.C.)
3. Write brief notes about : linen manufacturing, ship-building, silk goods. (L.C.C.)
4. Relate the large cities of the United States to the U.S.A. coal-fields. (R.S.A.)
5. What do you know of the trade and the importance of (a) Swansea and (b) Belfast ? (R.S.A.)
6. Write a short description of the Appalachian region of North America—with a rough sketch-map, locating the chief centres of industry. (R.S.A.)
7. Write a short account of the iron industry of the Great Lakes. (R.S.A.)
8. Write a short geographical account of the various districts in Great Britain, outside of Yorkshire, where wool industries are carried on. (R.S.A.)
9. Discuss, with a sketch-map, the cotton trade and industry of India, explaining (a) the chief areas where it is grown ; (b) the chief towns where it is manufactured ; and (c) the chief harbours from which the raw or manufactured product is exported. (R.S.A.)
10. Account for the localization of the following industries at the places mentioned : 1. Hardware, in the Ruhr valley ; 2. Manufacture of textiles in N.E. France ; 3. Manufacture of building materials in the Thames valley.
11. Describe the industries of the English Midlands. (L.C.C.)

12. Describe the textile manufactures of Great Britain. (L.C.C.)

13. Describe the chief manufactures of Ireland. (L.C.C.)

14. Give the location of four important coal-fields in Europe outside the British Isles. Describe the industries of two of these coal-fields.

15. Explain why Lancashire developed cotton, and Yorkshire woollen, industries.

16. Write a geographical account of the cotton industry of Lancashire, emphasizing the importance of specialization in this industry.

17. Give a brief account of the textile industries of the United States of America.

18. What do you know of the World's shipbuilding industry? Make special reference to the advantages for this industry enjoyed by Great Britain.

SECTION V

DISTRIBUTION

CHAPTER I

TRANSPORT

TRADE is the process by which goods produced in one district are exchanged for those produced in another. Transport is the carriage of the goods from the one district to the other. The interchange of commodities between nations on a large scale is called Commerce. The commercial prosperity of any nation depends on the means of transport developed to enable it to exchange the surplus of goods it has produced for those commodities which it lacks.

Before the invention of the steamship and railway engine in the early nineteenth century, commerce was limited in type and quantity. Transport was slow, and had only limited cargo accommodation. Consequently, it was only those articles, which were valuable in proportion to their bulk, which could meet the expense of such conveyance. To-day, as the outcome of the enormous industrial expansion which has taken place, Commerce is concerned chiefly with the exchange of the necessities of life. This demands that modern Transport shall be both cheap and fast.

The chief classes of commodities exchanged are :

1. The principal food-stuffs, especially those required in the densely populated manufacturing centres.
2. The raw materials required by the manufacturing industries.
3. Manufactured goods, especially those required by the

countries producing food-stuffs and raw materials on a large scale.

4. The fuels—coal and petroleum.

Cheapness in transport is obtained by :

1. Full cargoes of a few bulky commodities carried in both directions. To keep down the cost of the foods and raw materials imported by the chief manufacturing countries, it is essential that there shall be full cargoes of manufactured goods, fuels, or people exported.

2. Increasing the size of the transporting vehicle. As examples of these increases we have :

(a) The growth in the size of ships, *e.g.* the *Queen Mary*. This is limited, however, by the depth of water in the chief ports the ships have to serve.

(b) The development of the 20-ton railway truck.

(c) The increasing capacity of commercial aeroplanes.

Speed in modern transport is obtained by :

1. The development of areas with large scale production of food-stuffs, raw materials, and manufactured articles. This ensures full cargoes at definite periods, and permits the establishment of a special type of carrier, if required, *e.g.* the meat ships of New Zealand and the Argentine.

2. The development of a few large collecting centres. At such centres machinery can be installed which grades, packs, and loads the commodity with a minimum loss of time. The great grain elevators at the collecting and despatching centres are a feature of the Canadian Wheatlands.

3. Modern inventions such as radio communications.

CHAPTER II

THE ATLANTIC OCEAN AND THE TRADE ROUTES OF NORTH AMERICA

By far the greatest movement of world's shipping takes place between North America and Western Europe. This is due to the fact that the nearest bulk supplies of foods and raw materials, required by densely populated Europe, are to be obtained from North America. On the other hand, Western Europe can supply some of the raw materials, manufactured articles, luxuries, and immigrants required by North America.

The Great Circle route from Liverpool to New York passes through Halifax (Nova Scotia). This emphasizes the fact that Canada is nearer to Great Britain than is the United States. The distance from Liverpool to New York is 3000 miles (approx.), and from Liverpool to Montreal 2800 miles, and Montreal is some considerable distance inland. Furthermore, during the summer months only, Fort Churchill, on Hudson Bay, is nearer Liverpool than is New York. This indicates the advantage the grain-producing regions of Central Canada have over those of the United States by being nearer to Western Europe.

FOREIGN TRADE OF NORTH AMERICA

Canada

The chief exports of Canada are wheat and flour (82 per cent.), timber ($8\frac{1}{2}$ per cent.), wood-pulp (4 per cent.), animals and animal products, cheese and butter, apples, gold, silver, and copper and nickel ores.

Thirty-nine per cent. of these exports are taken by the United States, and 84 per cent. by the United King-

dom. Germany, France, and Belgium are other important purchasers.

The chief Canadian imports are coal and coke, machinery and locomotives, textiles, sugar, tea, chemicals, and fruit. The United States provides 66 per cent. and the United Kingdom 17 per cent. of these imports. France, Germany, British West Indies, India, and Japan supply the greater part of the rest.

Montreal, the largest city and the chief port of Canada, is situated at the head of ocean navigation on the St. Lawrence, where this river is interrupted by the Lachine Rapids. Built on an island at the confluence of the St. Lawrence and Ottawa rivers, Montreal is the meeting-place of four natural highways which are :

1. Down the St. Lawrence to the ocean ;
2. Up the St. Lawrence and through the Great Lakes ;
3. The Ottawa valley, which gives the easiest and the shortest route to the wheat lands of the west ;
4. The Champlain-Hudson route to New York.

Thus Montreal has become a great railway centre and market, the chief port of Canada, and the largest grain port in the world, as it handles a large proportion of Canada's export of wheat. With a population of over 800,000, Montreal is also an important manufacturing town with extensive flour mills.

Quebec is built at the former head of navigation, and at the lowest bridge point over the St. Lawrence. While it functions as a passenger port, Quebec has lost the greater part of its trade to Montreal. Important manufactures of wood-pulp and paper, boots and shoes, and cotton goods have been established.

Three Rivers, situated on the St. Maurice River, and supplied with cheap hydro-electric power from the Shawinigan Falls, is a growing port.

The great disadvantage of these three ports is that they are not available for the four to five months during which the St. Lawrence is frozen.

Halifax, in Nova Scotia, and *St. John*, in New Brunswick, owe their importance to the fact that they are ice-free in winter. In consequence, much of the winter passenger and goods traffic of Canada passes through these ports.

Vancouver, in British Columbia, is the terminus of transcontinental railways and the chief Pacific port of Canada. With the opening of the Panama Canal, it has become an important exporter of wheat, lumber, and fish to Europe and the east of North America, besides developing important connections with Eastern Asia.

Prince Rupert, a terminus of the Canadian National

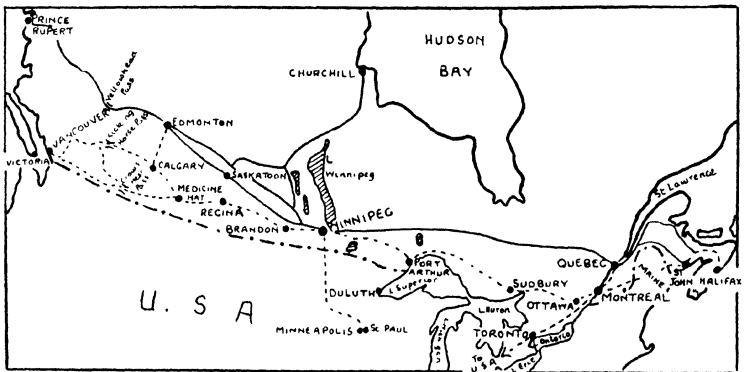


FIG. 49.—CANADA: TRANSCONTINENTAL RAILWAYS

Railways, Victoria, and New Westminster are smaller ports of British Columbia.

RAILWAYS OF CANADA

There are two railway groups in Canada, one of which is Government controlled. They are the Canadian Pacific and the Canadian National Railways. These two systems not only give a good network of railways in the more established parts of Eastern Canada, but also provide transcontinental routes from Halifax and St. John in the east to Vancouver in the west. The map shows the more important route centres of both lines, and it should be noted that the Canadian National lies to the north of the C.P.R., and is assisting in the develop-

ment of the more northerly parts of the wheat lands of Central Canada.

THE GREAT LAKES AND THE ST. LAWRENCE

The St. Lawrence River and the Great Lakes provide an inland waterway, second to none in the world, for both Canada and the United States. The total traffic of this waterway is considerably greater than the combined traffic of the Suez

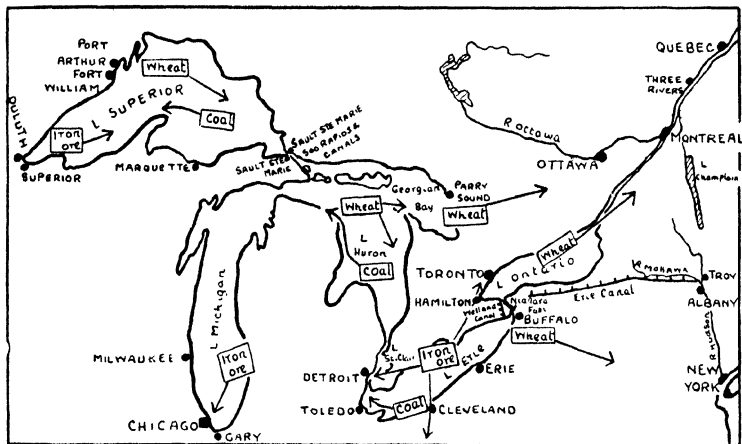


FIG. 50.—THE GREAT LAKES AND THE ST. LAWRENCE: SHOWING THE DIRECTION OF MOVEMENT OF THE CHIEF CARGOES CARRIED

and the Panama Canals in spite of the fact that it is closed by ice for five months of the year.

Canals have been constructed to overcome the obstacles to shipping—the rapids and falls—which exist in the short rivers connecting the lakes and in the St. Lawrence. These canals are :

1. The Sault Ste. Marie ("Soo") Canals, between Lakes Superior and Huron.
2. The Welland Canal, constructed to avoid the Niagara Falls between Lakes Erie and Ontario.
3. The Lachine Canals, to avoid the rapids of that name in the St. Lawrence above Montreal.

The chief commodities carried on this inland waterway are :

1. Wheat and iron ore from the ports of Fort William, Port Arthur, and Duluth downstream to the Lake ports of Chicago, Detroit, Cleveland, and Buffalo, or to the ocean port of Montreal.
2. Upstream cargoes, consisting of coal, timber, oil, and manufactured articles of all kinds.

The United States

Approximately two-thirds of the exports of the United States are manufactured, or partially manufactured, goods, of which the most important are machinery, motor-cars, iron and steel goods, and petrol and other refined oils. Raw cotton provides almost a quarter of the total exports, while the remainder is made up of food-stuffs such as fruits (fresh, tinned, and dried), wheat and flour, and luxuries like tobacco.

Over 40 per cent. of these exports are sent to Europe, the chief customers being the United Kingdom, Germany, France, Italy, Holland, and Belgium. Canada takes over 16 per cent., and the remainder is chiefly sent to Japan, East Asia, Mexico and the West Indies, the Argentine, Brazil, and the other South American countries.

Although the United States is such a large exporter of manufactured goods, over a third of her imports are goods of this type. These largely consist of wood-pulp, chemicals, jewellery, and the luxuries produced by the skilled workmen of Europe. Raw materials, such as rubber, silk, tin, iron ore, hides and skins, make up another third of the imports, and the remainder consists of food-stuffs such as coffee, cane-sugar, fruits and nuts, and vegetable oils. These imports are largely supplied by Canada, Japan, the United Kingdom, Cuba, Brazil, Germany, France, the East Indies, and China.

Another important import of the United States is immigrants. This plays an important part in the shipping

between both the United States and Canada and Europe. Huge cargoes of wheat, cotton, oil, iron and steel goods are sent to Europe. In exchange, only comparatively small cargoes of manufactured articles and some raw materials are sent. This means that for ships the journey to North America is likely to be unremunerative, but the balance tends to be restored by the number of emigrants from Europe.

THE CHIEF PORTS OF THE UNITED STATES

Atlantic Coast

New York, the second largest city in the world, is the chief port and chief manufacturing city of the United States. Over 50 per cent. of the total commerce of the United States passes through it. The chief reasons for the importance of *New York* as a port are :

1. The fine harbour provided by the "drowned" valley of the river Hudson ;
2. The convergence upon it of important land routes from Montreal *via* Lake Champlain ; from the Pennsylvanian iron and steel area, the Great Lakes, and the Middle West *via* the Mohawk gap ; from the south along the coast.

Owing to the convergence of these natural routes upon it, *New York* became the focus of transcontinental and other railway systems of the United States, and of shipping routes from all parts of the world across the Atlantic Ocean. The chief manufactures of *New York* are clothing, machinery, printing, food-stuffs, sugar-refining, and luxuries of the kind usual in a city with a great population.

Philadelphia is situated at the head of the tidal water of the Delaware estuary. Although this port has fairly easy access to the Pennsylvanian coal-field, it could not compete with *New York*, as communication with the Middle West was difficult. The chief industries of *Philadelphia* are ship-building, locomotives, sugar-refining, textiles, and leather goods.

Boston, the port of the New England States, is one of the chief ports of the United States because of its early start, and because it serves a long-established manufacturing area with a large population. Difficulty of communication with the Middle West prevented Boston from becoming a serious

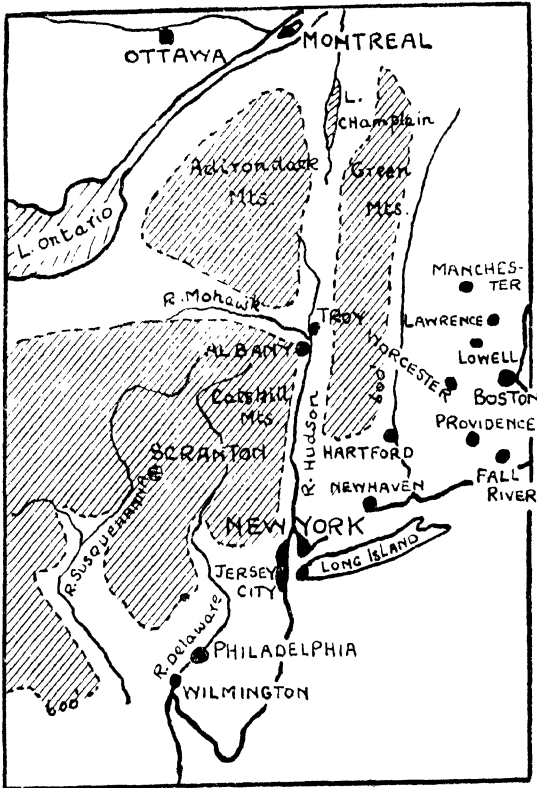


FIG. 51.—NEW YORK AND THE HUDSON GAP

rival of New York. Imports at Boston are greater than exports because of the import of raw materials for the textile and leather industries of the New England towns. Exports are small, since the greater proportion of the manufactured goods are sold within the United States. Boston is the chief wool market of the United States.

Smaller ports along the Atlantic coast are Washington, Richmond (tobacco), Norfolk and Newport News (coal and tobacco), Charleston and Savannah (cotton).

Gulf Ports

New Orleans, the second chief port of the United States,

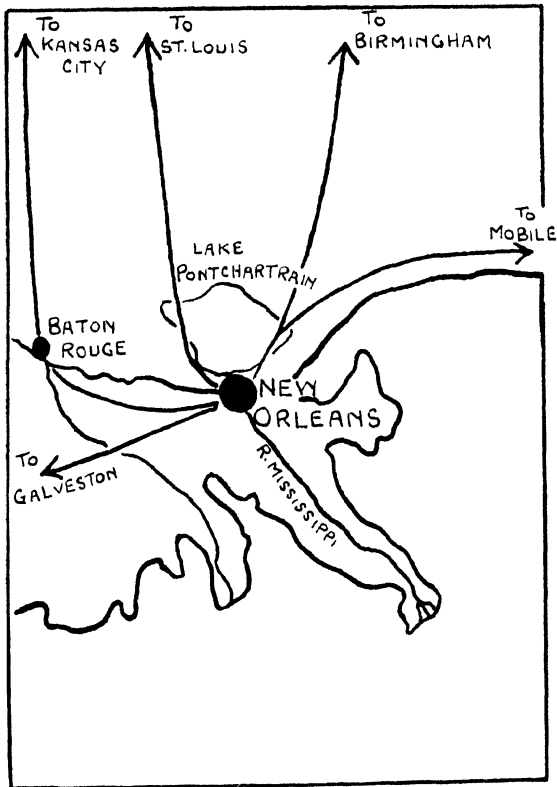


FIG. 52.—NEW ORLEANS

is built 100 miles from the sea in the delta of the Mississippi River. It is the natural outlet of the Mississippi basin, and its chief exports are cotton, wheat, and timber. Its imports come chiefly from the West Indies and South America, and are coffee, sugar, and bananas. The development of railways

from this port caused the Mississippi to lose much of its importance as a means of communication.

Galveston is the chief cotton port of the United States.

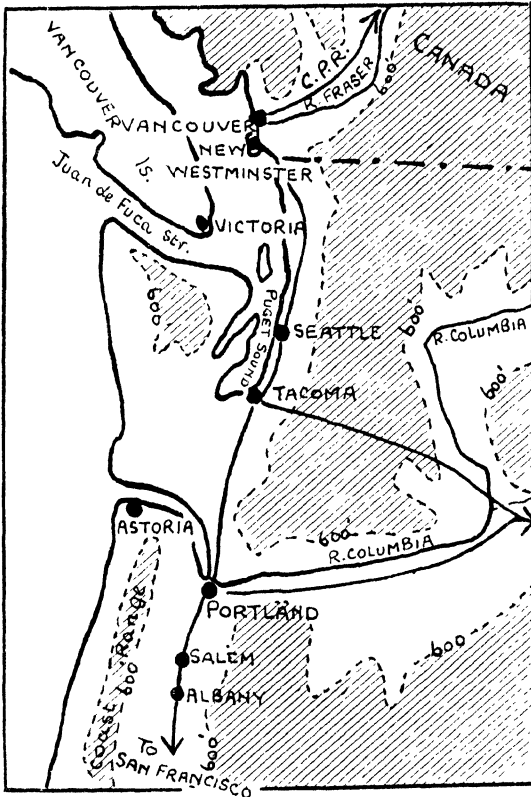


FIG. 53. —PORTS OF N.W. UNITED STATES AND S.W. CANADA

Mobile and *Pensacola* are other ports, and are concerned with the export of cotton.

Pacific Ports

Seattle and *Tacoma* are situated on the “drowned” inlet of Puget Sound. Their chief exports are timber, wheat,

fruit, and fish, and much of their trade is conducted with Alaska and the Far East.

Portland, at the head of navigation on the estuary of the

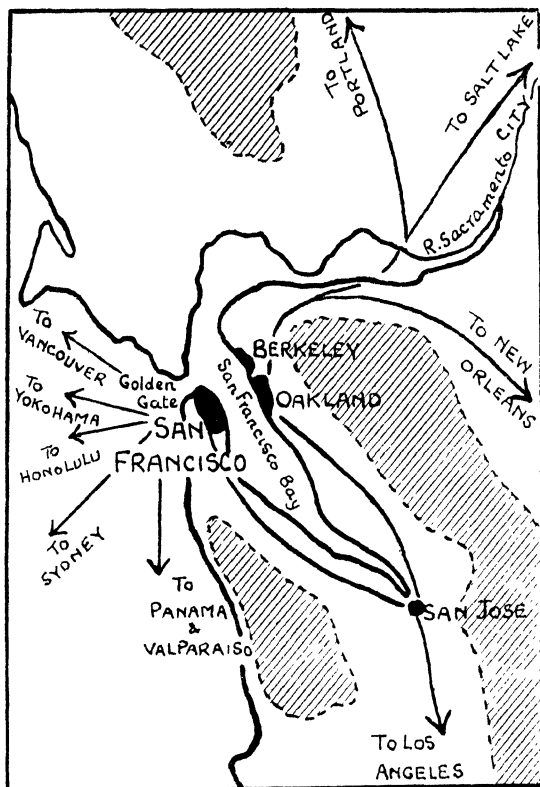


FIG. 54.—SAN FRANCISCO

Columbia River, grew up at the end of the Oregon trail. Timber, wheat, and fruits are the chief exports.

San Francisco, with *Oakland*, is the largest centre of population on the Pacific coast. It stands on the only good harbour along the Pacific coast, south of the Columbia estuary, and, for that reason, has become the focus of routes, not only of California, but also of transcontinental railways. Shipping routes converge on *San Francisco* from Japan and

the Far East, from India and the East Indies, from Australia and New Zealand, and from the Panama Canal. Silk and tea from China and Japan, sacking and tea from India, rubber from the East Indies, and sugar from Hawaii are its chief imports. Exports are the products of the Californian valley, which are fruit (fresh, dried, and tinned) and timber.

Los Angeles, with its port San Pedro, to-day clears a shipping tonnage greater than that of San Francisco in spite of the artificial harbour of San Pedro. This is the outcome of the development of valuable oil-fields in the vicinity and of the growth of manufacturing industries consequent on it. Fruit packing and the film industry have added their quota to the trade of Los Angeles.

RAILWAYS OF THE UNITED STATES

The railways of the United States form such a network, especially in the east, that it is only possible here to describe the more important lines.

Owing to their early start and to their European associations, the eastern coastal plain and the New England States might be said to have always been the centre of American commercial life. For this reason, the chief railways of the United States had their origin in the eastern ports, since railways were necessary when these attempted to increase their hinterlands. The chief barrier to communication westward from the eastern coastal plain is the Appalachian system. Thus New York, which is situated at the seaward end of the only easy natural route through the Appalachians, became the point from which some of the chief railway lines diverged.

The chief lines crossing the Appalachians are :

1. New York to Chicago *via* the Hudson valley to Albany, and then westward along the Mohawk valley through Buffalo and Cleveland.
2. New York *via* Philadelphia, up the Susquehanna valley to Harrisburg, and thence to Pittsburgh.

3. New York to Chicago *via* the valleys of the Delaware and Susquehanna, and through the Pittsburgh iron and steel area.
4. New York along the coastal plain to Washington, and thence, by the Potomac valley, across the Blue Ridge, after which the line branches north to Chicago and south to St. Louis.
5. New York to New Orleans *via* the James gap, through the Blue Ridge to the Tennessee valley, and thence by Chattanooga.
6. New York *via* the Hudson valley and Lake Champlain to Montreal.

New York is also connected with New Orleans by the Great Southern Railway, which runs along the Piedmont plateau and turns round the southern end of the Appalachians.

Railways connect New Orleans with Chicago and with the more important river ports on the Mississippi and its tributaries. River ports, such as St. Louis, which were the starting-points of the great caravan routes to the West, became the starting-points of some of the more important railways to the Pacific coast.

TRANSCONTINENTAL RAILWAYS OF THE UNITED STATES

1. The Great Northern from St. Paul and Duluth meets at Grand Forks, and thence by the Missouri valley to Spokane and on to Tacoma.

2. The Northern Pacific from St. Paul and Duluth follows the Yellowstone valley to Helena. It crosses the Rockies by Millan's Pass and continues to Spokane and Pasco. At the latter town it divides, one branch continuing along the valley of the Columbia River to Portland, the other passing along the Yakima valley to Seattle and Tacoma.

3. Chicago, Milwaukee, and Puget Sound railway lines from Chicago and Milwaukee connect at St. Paul and then proceed westward to Butte, Spokane, and Seattle.

4. The Union Pacific Railway from Omaha and Kansas City. Lines from these two towns meet at Cheyenne, making use of the valley of the river Platte. The line then crosses the Rockies by Evan's Pass and continues to Ogden on the Great Salt Lake. At Ogden the line branches, north to Portland *via* the Snake and Columbia River valleys, south-west to San Francisco *via* the Humboldt River and the Truckee Pass, and to Los Angeles.

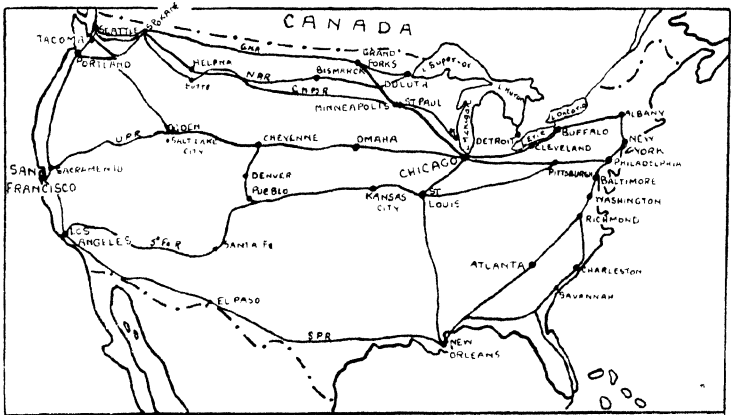


FIG. 55.—TRANSCONTINENTAL RAILWAYS OF THE UNITED STATES

5. The Santa Fé Railway, starting from Kansas City, follows the valley of the Arkansas River to Sante Fé, and then crosses the Mohave Desert to San Francisco.

6. The Southern Pacific Railway starts from New Orleans and makes for El Paso, in the valley of the Rio Grande. From El Paso, the line crosses the desert regions of New Mexico and Arizona and continues to Los Angeles. Lines from Los Angeles connect with San Francisco along the coast, and with Portland *via* the Central Valley of California.

CHAPTER III
TRADE ROUTES OF EUROPE

THE CHIEF PORTS OF THE BRITISH ISLES

London

London, the largest port of the world, conducts over one-third of the total external trade of the British Isles -- 39 per cent. of the total imports and 27 per cent. of the total exports. The reasons which have led to London holding this premier position in world ports are :

1. It is built at the head of ocean navigation on the Thames estuary.
2. It faces the estuaries of the Scheldt and the Rhine, which provided easy communication with the Continent.
3. It is conveniently situated as a terminal for all shipping routes converging on the Straits of Dover.
4. Communication with its hinterland, the English Lowlands, was easy, and to-day London is the focus of all the chief roads and railways of Great Britain.
5. Capital and Trade were attracted from Europe because the island character of the country and the British Navy ensured safety and freedom from political disturbances.
6. The growth and the development of the British Empire, which brought ships from all quarters of the globe.
7. The constantly increasing population, which keeps London the largest city in the world, and which offers a huge local market.

8. The growth of a great variety of industries which make London the largest single manufacturing city in the British Isles.

As ships enter the docks from all parts of the world, London has become the greatest of all entrepôt ports. The chief entrepôt goods dealt with are wool, silk, tea, coffee, rubber, tin, and furs. London's trade is largely with the Tropics, the Far East, and Australasia.

A number of outports have been developed for London in order to reduce the congestion at the docks and to improve facilities for passengers and mails, and the rapid handling of food-stuffs. These are Harwich (for the Hook of Holland and Denmark), Tilbury (the passenger port), Dover, Folkestone, Newhaven, and Southampton (for France).

London is an important focus of air routes. Airports at Croydon, Heston, and Gatwick have been established, and air routes with Europe and the Empire have been developed.

The Mersey Ports

Liverpool is the second largest port of the British Isles. With *Manchester*, the fourth chief port of the British Isles, it is concerned with the import of the raw materials and food-stuffs required by the dense industrial population of Lancashire, and the export of cotton goods from Lancashire, woollen and iron and steel goods from Yorkshire, and iron and steel goods from the Black Country. The chief imports of the Mersey ports are raw cotton, timber and wood pulp, manganese ore, petroleum, wheat, meat, fruits, and the vegetable oils required by the soapmaking towns of Port Sunlight and Warrington. The Mersey ports chiefly trade with the Americas, as do the Clyde ports and Bristol (see Fig. 45).

The Humber Ports

Hull, the third largest British port, is situated where the river Hull enters the Humber, near its mouth. It is the natural outlet for the lowlands on the eastern side of the

Pennines, throughout which communication was simplified by the converging of the Ouse and its tributaries and the Trent on to the Humber. In spite of railway developments, these rivers have retained much of their importance, especially for the conveyance of bulky commodities (*e.g.* coal), as they have been canalized. Hull imports food-stuffs (wheat) and raw materials (wool, iron ore, timber), for the industrial West Riding of Yorkshire, and oilseeds for its great oil-crushing industry, which produces artificial cattle-foods and fertilizers for the agricultural hinterland. Hull is also a great fishing port, serving the Midlands and Northern England. Exports include woollen and iron and steel goods and fish, and much of Hull's trade is conducted with North-west Europe. Other Humber ports are *Grimsby* (the chief fishing port of the British Isles), *Immingham* (with facilities for the export of heavy iron and steel goods and coal), and *Goole* (the chief coal-exporting port of the Humber).

Southampton

This is the fifth most important port and the chief passenger port of the British Isles. Situated at the head of Southampton Water, with two water frontages provided by the rivers Itchen and Test, it has the great advantage of receiving "four tides" a day instead of the two received by other ports. Its convenient position and easy entrance, its ample accommodation, and its development of "rapid handling" methods for loading and unloading, and its participation in London's trade has caused Southampton to be the most rapidly growing port of the British Isles. Its trade is concerned largely with passengers and mails, meat, and perishable food-stuffs, such as fresh fruits, butter, eggs, and poultry.

The Clyde Ports

Although *Glasgow* comes sixth in the list of British ports, it is the only one of the great ports which exports considerably more than it imports. This is due to the fact that

many of the requirements of Glasgow's hinterland come from the Continent, and are imported at Leith and Grangemouth. Imports consist of food-stuffs (wheat), and raw materials (iron ore, cotton) required by industrial Lanarkshire, while exports are largely made up of ships and iron and steel goods. *Greenock*, at the mouth of the Clyde estuary, imports raw sugar for its sugar refineries, and iron ore (see Fig. 43).

The Tyne and Tees Ports

Middlesbrough (river Tees) and *West Hartlepool*, *Sunderland* (river Wear) and *Newcastle* (river Tyne), are the chief ports. These are concerned chiefly with the export of coal, heavy iron and steel goods, ships, and chemicals. Imports are timber (especially pit-props), iron ore, and wheat (see Fig. 40).

Bristol Channel Ports

Bristol, with its outport at *Avonmouth*, has a large import but a very small export trade. Imports are chiefly tobacco, cacao, sugar, and bananas from America and the West Indies, wheat, timber, petroleum, and oilseeds.

Cardiff, *Newport*, and *Swansea* are the chief outlets of the South Wales coal-field. Exports are chiefly coal, but much of this trade has been lost owing to the increased burning of oil-fuel in ships, and to the reduction in their requirements of important European purchasers in view of the development of their hydro-electricity resources. Imports consist of iron ore, copper and tin, and zinc for the metal smelting and plating industries of South Wales (see Fig. 42).

Leith

Leith, the port for Edinburgh, exports coal, machinery, and textile manufactures, and imports timber and the raw materials for the textile and paper industries and food-stuffs.

Belfast

Belfast, the port for Ulster, imports coal from Ayrshire and Cumberland, and iron ore from Spain, with which it has developed its important shipbuilding industry. Tobacco is

also imported. Linen goods and ships are the chief exports (see Fig. 48).

Owing to the density of the population, due to industrial developments, and the small home production of foods, 45 per cent. of British imports are food-stuffs (wheat and flour, meat, rice, fruit, and dairy produce), drinks (tea, coffee, cocoa, wines), and tobacco. In consequence, these items figure on the list of imports for each of the great ports. Raw materials, which make up 25 per cent. of our imports, consist of cotton, wool, iron ore and other metals, timber, vegetable and mineral oils. The remainder of the imports are made up of manufactured articles. These imports are largely supplied by the United States, the Argentine, India, Germany, France, Australia and New Zealand, Canada, and Denmark.

British exports are chiefly manufactured articles, of which the most important are cotton goods, iron and steel goods, woollen goods, machinery and engines, chemicals, and vehicles (ships, motor-cars, and aeroplanes). Coal and coke and fish complete the exports. Our chief markets are India, Australia, the United States, Canada, South Africa, New Zealand, the Argentine, Germany, and France.

THE CHIEF PORTS ON THE CONTINENT OF EUROPE

Ports of Germany

Hamburg is the chief port of Germany, and one of the leading European ports. It conducts three-fifths of the total import and one-half of the total export trade of Germany. The reasons for the origin and growth of Hamburg as a port are :

1. The Elbe provided a navigable estuary, and this has been deepened to accommodate all but the largest ships.
2. The head of ocean navigation on the Elbe estuary coincided with the natural crossing-place where the high sandy Geest approaches both banks.

3. The estuary of the Elbe is the natural outlet of the Elbe basin, which includes the agricultural and industrial Magdeburg district, and industrial Saxony and Bohemia. The inland waterways of Germany concentrate on the Elbe, so that Hamburg's hinterland includes Berlin, the Oder basin, and industrial Silesia.
4. The development of the American trade caused the Atlantic ports to grow at the expense of those on the Baltic.
5. The great industrial development of Germany.

The estuary of the Elbe is kept ice-free by ice-breakers and is comparatively free from fogs. To accommodate the largest vessels, the outports of Cuxhaven and Altona have been established.

Hamburg imports food-stuffs (wheat), tropical products, and coal (from Great Britain), and exports sugar beet, salt, chemicals, and a variety of manufactured goods from Berlin, Saxony, Silesia, and Czecho-Slovakia.

Bremen is situated 50 miles up the estuary of the river Weser. As it is nearer the Atlantic than Hamburg, it has specialized in the American trade, and is the chief German cotton and tobacco port. Bremerhaven, the outport for Bremen, can accommodate the largest vessels.

Emden, at the mouth of the Ems river, exports some of the products of the Ruhr industrial area, which it receives *via* the Dortmund-Ems canal.

Lübeck, Stettin, and Königsberg are the chief German Baltic ports.

The chief German imports are grain and flour ; raw cotton, wool, and silk ; cotton, wool, and silk yarns ; timber ; iron and copper ores ; dairy produce ; coal and petroleum ; hides and skins ; coffee. These imports are largely supplied by the United States, Great Britain, the Argentine, India, Holland, France and Algeria, Australia, and the Dutch East Indies. Exports are iron and steel goods of all kinds, machinery

and locomotives; cotton, wool, and leather goods; coal and coke (to near-by European countries). The United Kingdom, Holland, the United States, France and Algeria, Switzerland, and Italy are the chief customers. It should be remembered that Holland figures largely in the German import trade.

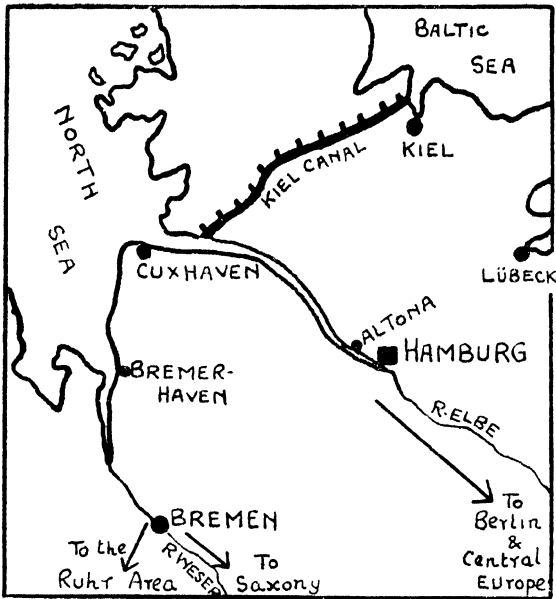


FIG. 56.--HAMBURG AND BREMEN

because the Dutch ports function as entrepôt ports, especially for Germany.

Dutch Ports

Rotterdam is the natural port of the Rhine, therefore much of its trade is connected with the German industrial areas of the Rhine valley, especially the Ruhr industrial area. It receives bulky cargoes such as grain, oil, and petroleum, and is important for its import of raw cotton, sugar, and tea.

Amsterdam is connected with the North Sea by the

North Sea canal, which can accommodate the largest ocean-going vessels. Canals have brought Amsterdam into connection with the rest of Holland and with Germany, and, in consequence, have assisted this port to retain its position as one of the world's chief ports. Its chief imports are the tropical products of the East Indies—rubber, spices, copra, sugar, and cacao—and it is world-famous as a tobacco and a diamond-cutting centre.

Dairy produce, refined sugar, and margarine are the chief exports of Holland, of which Germany and Great Britain are large purchasers.

Ports of Belgium

Antwerp, situated 50 miles up the estuary of the river Scheldt, is the chief port of Belgium, and one of the chief ports of North-west Europe. It is the nearest port to the great industrial areas of Eastern Belgium, Lorraine, and the Rhine valley, to which it is connected by first-class inland waterways and railways. Thus the imports and exports of Antwerp are not only for Belgium, but also for the other densely populated areas. The chief imports are foods (grain, sugar, coffee), raw materials (cotton, wool, hides and skins, iron ore, timber, flax), fuels (coal and petroleum), manufactured goods (machinery), iron and steel goods, locomotives, textiles, and glass. Much of this foreign trade is conducted with France, Germany, Great Britain, the United States, Holland, and the Argentine. Ghent and Bruges are secondary ports. Zeebrugge is connected by train-ferry to Harwich, and Ostend is the packet station for Dover.

North European Ports and their Exports

Oslo, the capital and chief port of Norway, is situated at the head of Oslo Fjord. The chief exports are timber, wood-pulp and paper, chemicals, and fish.

Stockholm, Gothenburg, and Malmö are the three chief ports of Sweden. These ports export timber, wood-pulp, paper, machinery, and dairy produce. Sweden is an important

exporter of iron ore to Germany and Great Britain. Much of this ore is exported from the ice-free Norwegian port of Narvik.

Copenhagen is the capital and chief port of Denmark. Because of its position on the Sound at the entrance to the Baltic, it is an important entrepôt port for Baltic countries. Dairy produce, bacon, and eggs form the bulk of Danish exports. Esbjerg, on the west coast of Denmark, is the port dealing with Danish exports to Great Britain, which amount to nearly 60 per cent. of the total Danish exports. Germany and Sweden are other important customers.

Helsingfors is the capital and chief port of Finland, exporting timber and wood products.

Tallin (Revel) is the capital and chief port of Esthonia, exporting timber, flax, and eggs.

Riga, exporting timber and flax, is the capital and chief port of Latvia.

Memel is the port of Lithuania, exporting timber and flax.

Danzig, at the mouth of the Vistula, was made, after 1918, a free city under the jurisdiction of the League of Nations, and it was to be the port for Poland. The Poles, however, are developing Gdynia as their port, and this exports woollen goods, timber, zinc, salt, and coal.

Ports of France : Atlantic Ports

Havre, at the mouth of the Seine, is the chief Atlantic port of France, and conducts the bulk of the French trade with America. Consequently, it is the largest importer of raw cotton, tobacco, wheat, meat and hides, and coffee. Its industries include shipbuilding, cotton-spinning, and the manufacture of soap and chemicals.

Rouen was, at one period, the chief outlet of the Seine valley, but its importance was lost when vessels increased in size, and were unable to make the difficult river passage. Improvements in the navigation of the Seine have strengthened the position of Rouen, since it has the advantage of being

the port nearest the capital. Coal, oil, timber, and cotton are the chief imports. The manufacture of cotton goods, depending on the import of both coal and cotton, is an old-established industry which persists, owing to tradition and the inherited skill of the workpeople, in spite of the growth of the textile centres to the north.

Dunkirk is the most rapidly growing of French ports, as it has been established as the port of the north-eastern industrial district of France. Imports include wool (from the Argentine), cotton, and linseed, and exports are the textiles produced in the Lille industrial area.

Bordeaux, on the Garonne, is the largest exporter of French wines, and also exports pit-props and fruit. Imports include coal, grain, and coffee.

Calais, *Boulogne*, *Dieppe*, and *St. Malo* are important Channel packet stations.

Cherbourg, on the Cotentin Peninsula, is a port of call for Atlantic liners.

Nantes, with its outpost *St. Nazaire*, is the outlet of the Loire basin, and has important shipbuilding yards.

Mediterranean Ports

Marseilles is the chief port of France and also the only natural outlet of the Rhône valley. It is situated to the east of the Rhône delta on a bay which is kept free of river silt by westerly ocean currents. The trade of *Marseilles* is chiefly with the French colonies of North Africa, Mediterranean countries, and the Far East. Imports consist chiefly of wine, wheat, oilseeds, silk, hides, sugar, and coffee. Growing out of the local supplies of olive oil, *Marseilles* has developed an enormous industry dealing with the refining of oil and the making of soap. The chief exports are silk goods, chemicals, and soap.

The chief French imports consist of wool and cotton, coal and coke, grain, oilseeds and fruits. Cotton goods, silk goods, motor-cars, chemicals, and wine form the chief exports. The greater part of this foreign trade is conducted

with Great Britain (especially for coal), the United States, Germany, Belgium, Italy, Switzerland, and the Argentine.

Ports of Spain and Portugal : Atlantic Coast

Bilbao, Santander, and Gijon, in Northern Spain, export iron ore, especially to Great Britain.

Lisbon, the chief port of Portugal, is the natural outlet of

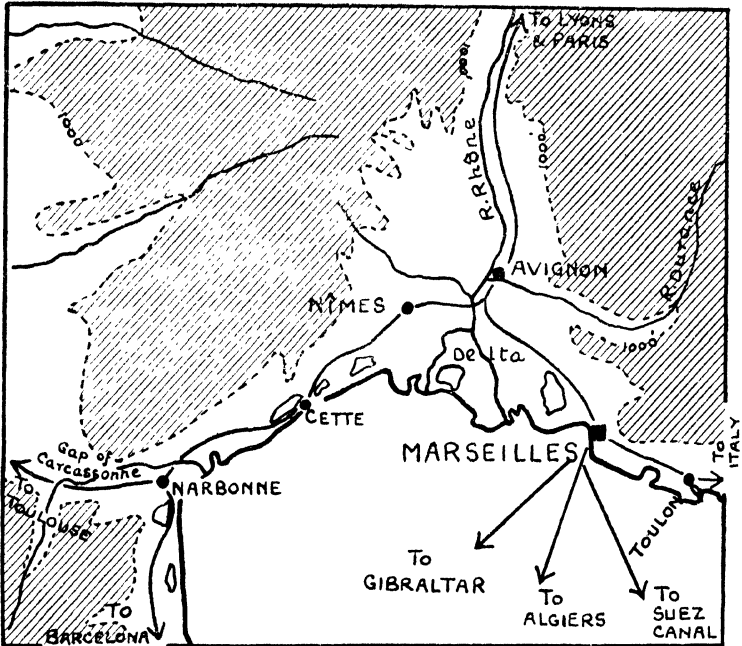


FIG. 57.—MARSEILLES AS A ROUTE CENTRE

Central Spain. It is situated on the fine harbour provided by the Tagus estuary, and its trade is chiefly with Brazil. Oporto, on the Douro estuary, exports port wine.

Cadiz, in South-west Spain, is the chief outlet for the valley of Andalusia, while Seville has been made into a port for large vessels by constantly dredging the estuary of the Guadalquivir. Huelva is the chief outlet for the Rio Tinto copper mines.

Gibraltar (British) is an important coaling station, with excellent dock accommodation.

Mediterranean Coast

Barcelona, on the coast of Catalonia, is the chief outlet for the chief manufacturing district of Spain and of the Ebro valley. Consequently, it is Spain's chief port, importing coal from Great Britain to supplement the local supplies of hydro-electric power, and the raw materials for the cotton, woollen, leather, and metal industries. Valencia, Alicante, Cartagena, Almeria, and Malaga export wine, oranges, and other fruits.

Raw cotton, timber, machinery, and chemicals are the chief Spanish imports, much of which are supplied by the United States, Great Britain, France, Germany, and the Argentine.

Great Britain, France, the United States, Germany, the Argentine, and Italy are the chief customers.

Italian Ports

Venice is the natural outlet of the Plain of Lombardy, and for Central Europe, *via* the Brenner Pass. Trieste and Fiume, on either side of the peninsula of Istria at the head of the Adriatic Sea, are developing as outlets for the central Danube basin and as rivals of Venice.

Genoa, on a fine harbour on the northerly curve of the Ligurian coast, is the second chief port of Italy. The Bocchetta Pass, over the Apennines, gives Genoa access to the industrial western end of the Lombardy Plain. Consequently, it exports the manufactured products of, and imports some of the raw materials required by, the industrial areas round Milan and Turin.

Naples, the third largest seaport, has a fine harbour. It imports the grain and manufactured goods required by densely populated Campania.

Brindisi, on the Straits of Otranto, is the terminus of the overland route to the Far East from North-west Europe.

A great saving of time is effected by passengers and mails who travel overland to this port and take fast packet steamers to Port Said, where boats to the Far East can be joined.

The chief imports of Italy are wheat and other food-stuffs, raw cotton and wool, coal, petroleum, and other minerals. Exports include silk goods and silk, cotton goods, fruit, vegetables, and wine. Much of Italy's trade is conducted with the United States, Great Britain, Germany, France, and the Argentine and Brazil.

The Ports of the Balkan Peninsula

Istambul (Constantinople) and Salonika are not only the two chief outlets of the Balkan Peninsula, but also important Mediterranean outlets for the Danube basin.

Istambul stands on the fine harbour, "The Golden Horn," on the Bosphorus. It controls the sea route from the Black Sea to the Mediterranean through the Bosphorus, the Sea of Marmora, and the Dardanelles, and the land route from Europe to Western Asia. To-day *Istambul* is chiefly an entrepôt for Asiatic produce.

Salonika is situated at the southern end of the great trans-European route *via* Belgrade and through the Macedonian mountains by the valleys of the rivers Morava and Vardar. It has important carpet, cotton, tobacco, and leather industries.

Athens, with its port Piræus, is the chief outlet for Southern Greece. Tobacco (60 per cent.) and currants are the chief exports of Greece.

Black Sea Ports

Burgas and *Varna* are the ice-free ports of Bulgaria, exporting grain and flour, eggs, hides and skins.

Galatz, *Braila*, *Salina*, and *Constansa* are the chief Rumanian ports, exporting petroleum, grain, and timber.

Odessa, the chief Black Sea port of Russia, is situated east of the mouth of the river Dneister. It was the chief wheat-exporting port of Russia.

RAILWAYS OF GREAT BRITAIN

The chief railway groups of Great Britain are: 1. The London and North-Eastern; 2. the London, Midland, and Scottish; 3. the Great Western; 4. the Southern. Amalgamation of a number of companies to form each of these groups was effected in 1922, with a view to reducing running expenses and rates, and to increase speeds.

THE CHIEF RAILWAYS OF EUROPE

Paris is the focus for routes from the French channel ports of Calais, Boulogne, Dieppe, Havre, Cherbourg, and St. Malo. In view of this, Paris is the starting-point of a number of important transcontinental railways, which are:

1. Paris *via* Orleans and Bordeaux to Bayonne on the Spanish frontier. This railway then connects, with a break of gauge, with the line from Cadiz and Madrid.

2. Paris *via* the Seine and Yonne valleys to Dijon, and then south through the Saône-Rhône valley to Lyons and Marseilles. A number of important lines branch from this route. These are:

(a) To Milan from Dijon *via* Lausanne, the Rhône valley, and the Simplon Tunnel. From Milan the line continues to Venice and Trieste, and thence by the Save valley to Belgrade and Istanbul. This is the shortest route to Istanbul.

(b) To Turin from Maçon *via* Chambéry, the valleys of the Isère and Arc, and through the Mont Cenis Tunnel. The line continues from Turin *via* Alessandria, Piacenza, Bologna, Ancona, to Brindisi. Other lines from Turin connect with Genoa and with Florence, Rome, and Naples.

(c) To Barcelona and the towns along the east coast of Spain from Tarascon.

The Orient Express leaves Paris for Iſtambul. The line follows the valley of the Marne to Châlons, and then, by the route of the Rhine-Marne canal, through Nancy to Strasbourg. From here, the line continues to the valley of the Neckar, which it follows through Stuttgart to Ulm, on the Danube. The railway does not take the valley of the Danube from Ulm, but proceeds eastwards through Augsburg, Munich, and Salsburg. At Linz the line rejoins the Danube valley, which it follows through Vienna, Bratislava, and Budapest to Belgrade. From Belgrade, it follows the valley of the river Morava to Nish and thence to Sofia, and the Maritza valley to Adrianople and Iſtambul. From Nish, a branch leaves due south for the Vardar valley and Salonika. The Anatolian railway begins at Haidar Pasha, opposite Iſtambul. This gives rail connection with Konia, which is to be connected with the Baghdad-Basra railway.

Using the St. Gotthard Tunnel, railways converge on Milan from Calais, Ostend, and the Hook of Holland. These are :

1. Calais, Amiens, Rheims, Châlons, Marne valley, Basle, Lucerne, St. Gotthard Tunnel, Ticino Valley, Como, to Milan.
2. Ostend, Brussels, Liège, Aachen, Cologne, and then up the valley of the Rhine to Basel. From here the route is the same as that from Calais. A branch leaves this route at Mainz for Vienna *via* Frankfurt, Nürnberg, Ratisbon, Linz, and the Orient Express route.
3. Hook of Holland, Rotterdam, Nijmegen, to Cologne, and thence by the same routes as from Ostend.

Berlin is the second great focus of railway routes on the continent of Europe. Converging upon it are lines from Calais, Ostend, Hook of Holland and Rotterdam, Hamburg and Stettin, thus giving Berlin easy communication with the Atlantic and Baltic shipping routes. Using the Brenner and Semmering Passes through the Alps, lines from Berlin

reach the Mediterranean at Venice and Trieste. From Berlin, railways run eastwards to Leningrad, and to Moscow *via* Warsaw, where they connect with the Trans-Siberian Railway. As the Russian railways are on a different gauge from the standard European gauge, break of bulk takes place at Riga on the Leningrad line, and at Warsaw on the Moscow line. A third line leaves Berlin in a south-easterly direction for Breslau, Cracow, and Odessa.

Moscow is the important railway centre of Russia, and lines converge upon it from the Baltic and Black Sea ports.

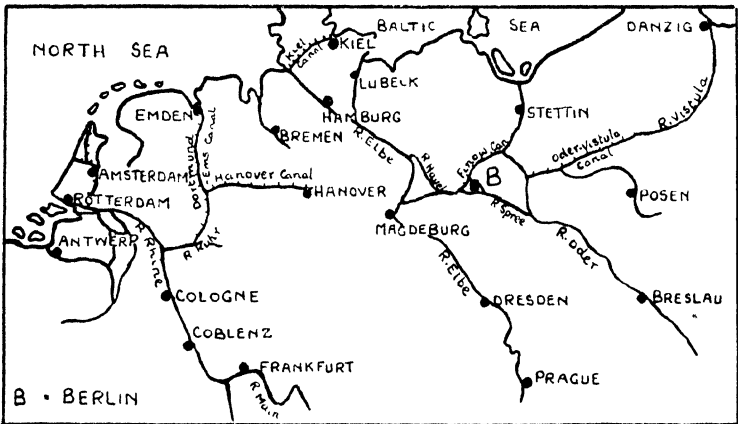


FIG. 58.—INLAND WATERWAYS OF GERMANY

From Esbjerg, in Western Denmark, a railway connects with Copenhagen and Stockholm, train-ferries carrying the trains over the Little Belt, the Great Belt, and the Sound.

INLAND WATERWAYS OF EUROPE

The Rhine is the chief inland waterway of Europe, and is navigable for large barges as far as Strasbourg. Although the Rhine is connected by canals with the Rhône and the Danube, very little use is made of these routes. The connection with the Seine, the Rhine Marne canal, is much more important. This canal uses the Saverne Gap through

The Danube, like the Rhine, is an international river highway. It is navigable for steamers from Ulm for ten months in the year, being obstructed by moving ice during the other two. The great disadvantage of the Danube is that its banks, especially below Budapest, are so marshy and indefinite that few river ports have been able to develop. In consequence, the value of the Danube as a waterway is considerably restricted.

Russia has also an abundance of natural waterways. The Dnieper is the chief river highway to the Black Sea. The chief disadvantage of the Volga, which gives with its tributaries over 7000 miles of inland waterway, is that it flows into the landlocked Caspian Sea. Nevertheless, it plays an important part in the internal movement of goods, and, being connected with the Neva by canal, has an outlet at Leningrad. The Northern Dvina provided the route to Archangel for the timber lands of Northern Russia.

CHAPTER IV
TRADE ROUTES OF INDIA AND THE
FAR EAST

INDIA

THE chief commodities exported from India are jute manufactures and raw jute (25 per cent.), raw cotton, and cotton manufactures (24 per cent.), rice (10 per cent.), tea ($8\frac{1}{2}$ per cent.), oilseeds ($8\frac{1}{2}$ per cent.), hides and skins ($4\frac{1}{2}$ per cent.), lac and lac dyes, wool, wheat, coffee, timber, manganese ore, mica, and petroleum. Five ports deal with the greater proportion of these exports.

Calcutta is built at the head of ocean navigation on the Hugli, the most navigable distributary of the Ganges delta. Although it is approximately 100 miles from the ocean, on a river in which navigation is difficult, and off the main ocean routes of the world, Calcutta is the greatest port of India, because :

- (a) It is the natural outlet for the wealthy Indo-Gangetic plain ;
- (b) It was the capital and the first centre of British influence, and this caused it to be the focus of railway routes from all parts of India ;
- (c) It is near the Raniganj coal-field, which has allowed the development of manufacturing industries ;
- (d) It has developed a great jute-manufacturing industry, being near the great jute-producing region of the Ganges delta ;
- (e) It is associated with a growing iron and steel industry, and especially with that of the Tata Iron and Steel Company.

The chief exports of Calcutta are jute manufactures and raw jute, tea from Assam, oilseeds, rice, and manganese.

The chief railways converging on Calcutta are :

1. From the North-west Frontier and Punjab, *via* Delhi (the capital of India) and Allahabad.
2. From Darjeeling and Assam.
3. From Madras.
4. From Bombay *via* Allahabad, and *via* Nagpur.

Bombay, the rival of Calcutta, is the most important port of Western India. Built on Bombay Island, it is connected to the mainland by an embankment. Bombay has a fine harbour, the only good one on the west coast, and is the natural terminal for the Suez route to India. It was not, however, until communications with the interior were improved that Bombay obtained its present important position. Bombay is connected to the interior by the following railways :

- (a) To Agra and Delhi *via* Baroda.
- (b) To Allahabad and Calcutta, crossing the Western Ghats by the Thalghat, and using the valleys of the rivers Tapti and Narbada.
- (c) To Madras, crossing the Western Ghats by the Borghat.

The lines enable Bombay to tap the cotton and wheat lands of the Deccan, and the manganese-producing areas of Mysore and the Central Provinces. Important manufacturing industries have been established in Bombay, of which the chief are cotton and iron and steel goods. The chief exports are raw cotton and cotton goods, oilseeds, wheat, and manganese.

Calcutta and Bombay are together responsible for about 80 per cent. of Indian trade.

Madras has the only harbour on the south-east coast, and this has been made only at great expense and constant dredging. As its hinterland can in no sense be compared in size or wealth with that of Calcutta or Bombay, the trade

of Madras is approximately one-sixth the value of the trade of these ports. Its chief exports are cotton, oilseeds, hides and skins, coffee, and teak.

Railways tap the hinterland of Madras, and the chief lines are :

1. Northward along the coastal plain to Calcutta.
2. Westward, crossing the Western Ghats by the Palghat to Calicut and Mangalore.
3. Southward to Trichinopoly and Madura.

Karachi, the natural outlet for the Indus basin, is built on a splendid harbour to the west of the Indus delta. Originally a military port, it developed as a commercial port, exporting the products of the Punjab and Kashmir. Oilseeds, wheat, cotton, hides, and silk are the chief exports. Of recent years, Karachi has become prominent as the air-port on the route to India from Europe.

A railway connects Karachi with Lahore, *via* Hyderabad and Multan.

Rangoon, the natural outlet of the Irrawaddy River basin of Burma, is built to the east of the delta of this river. The selection of a site away from the delta, as in the case of Karachi, is to avoid river silt and the diseases coming from the low-lying delta lands. Over 80 per cent. of Burmese trade passes through Rangoon, the chief exports being rice, teak, and petroleum. Rangoon exports about 90 per cent. of the rice exported from India. A railway connects Rangoon with Mandalay, in the Irrawaddy valley of Upper Burma, while shorter lines connect it to Bassein and Moulmein, smaller Burmese ports.

The chief imports of India are textiles, especially cotton goods, machinery, iron and steel goods, rolling stock, motor-cars, sugar, and oil. About 50 per cent. of these come from the United Kingdom and $7\frac{1}{2}$ per cent. from each of the United States, Germany, and Japan. Belgium, France, Italy, and the Dutch East Indies also enter this trade.

The chief customers for Indian exports are the United

Kingdom (22 per cent.), Japan (12 per cent.), the United States, Germany, France, Italy, Ceylon, and Belgium.

CEYLON

The chief exports of Ceylon are tea (50 per cent.), rubber (23 per cent.), coco-nuts, copra, coco-nut oil, coir, cinnamon and cacao. *Colombo* is the chief port, possessing an excellent artificial harbour on the western side of the island. The world-wide importance of Colombo is due to the fact that it is the focus of all the sea routes of the Indian Ocean, and is an important coaling station. Because of this, Colombo has an important entrepôt trade. Ceylon's chief customers are the United Kingdom (40 per cent.), the United States (24 per cent.), Australia, New Zealand, Germany, and India.

Rice forms over 25 per cent. of Ceylon's imports, and she buys this from India. Other imports are cotton goods, coal (especially for bunkers), sugar, and manures. Of this import trade, almost 50 per cent. is conducted with India, and 25 per cent. with the United Kingdom.

MALAYA AND THE EAST INDIES

Rubber and tin are the chief exports of Malaya. *Singapore*, built on the island of that name at the southern end of the Malay peninsula, is not only the chief port of the area, but also the great entrepôt and coaling station for the Far East. Its harbour will accommodate ships up to 36 feet draught, and it has large shipbuilding and ship-repairing yards.

Rice, cotton goods, and coal are the chief imports. Rice is supplied by India and Siam, and the cotton goods and coal by the United Kingdom. The United States is the largest customer of Malaya, followed by the United Kingdom.

The majority of the islands of the East Indies belong to the Dutch. Java and Madura are the two most important of their possessions. The chief exports are rubber, coffee, sugar, cinchona, pepper, capok, tobacco, tin (from the

islands of Banka and Billiton), and petroleum (from Borneo). *Batavia*, the capital of the Dutch East Indies, is the chief port, having an import and export trade similar to that of Singapore.

THE PHILIPPINE ISLANDS

Manila is an important port of call, and the chief port of the Philippine Islands. It chiefly exports manila hemp, sugar, tobacco and cigars, and copra, the greater proportion of this trade being with the United States.

CHINA

It has already been emphasized that the geography of China is the geography of three river basins. Thus we find that the chief outlet of China's trade is the natural outlets of these river basins.

Nearly 50 per cent. of Chinese exports consist of raw silk and silk goods, and beans and bean-cake. Of the remainder, vegetable oils and seeds, raw cotton, tea, hides, and tin are the most important. The chief countries to which these goods are exported are Japan, Hong Kong, the United States, Russia, France, the United Kingdom, Germany, Straits Settlements, and India.

Manufactured goods and food-stuffs form the bulk of the imports. The chief are cotton, woollen, and metal goods; machinery; sugar, rice, flour; cigarettes; timber, and paraffin (lamp oil). Japan, Hong Kong, the United States, the United Kingdom, India, Germany, and the Dutch East Indies are the chief countries from which these imports are obtained.

Chinese foreign trade is carried on almost entirely at the Treaty ports. These are the ports at which foreign merchants are allowed to live and to own property, and foreign vessels to load and unload. At one period, the number of Treaty ports was extremely limited, but they now include all the chief seaports and the largest river ports of China.

Shanghai, built on the Wusung, a tidal creek at the mouth of the Yang-tze Kiang, is by far the most important of the Chinese ports. Harbour accommodation has been improved to take the largest vessels, and to obviate the need of an outpost at Wusung. Shanghai is not only the natural outlet of the largest and the most productive of the three river basins, but also the outlet for Northern China. This is due to the fact that no other large and suitably situated ports have developed north of the mouth of the Yang-tze Kiang, owing to the uniform nature of the coast-line. Shanghai is not only a port, but also a growing manufacturing city with cotton, silk, and tobacco industries.

The triple town of *Hankow* (Hankow, Hanyang, Wu-chang), situated at the confluence of the Yang-tze and its chief tributary, the Han River, is at the head of navigation for ocean-going vessels on the Yang-tze River. With excellent communications, especially those provided by the Yang-tze and Han Rivers, it is the chief outlet for Central China. Hankow is also an important manufacturing town, with cotton, silk, and iron and steel industries.

While South-east China provides excellent harbours, the mountainous character of the country restricts their hinterlands, and so prevents the development of any large port. Hangchow, Foochow, and Amoy are the most important of the ports of this coast.

Canton is the natural outlet of the Si-Kiang basin, the river providing the only good means of communication throughout the basin. Unfortunately, Canton is not accessible to large ocean-going vessels, and communication with its outpost, Whampoa, 14 miles downstream, is so limited that the trade of Canton is of necessity very restricted.

Hong Kong, on the north side of the estuary of the Si-Kiang, is a British island. Owing to the restricted nature of the port of Canton, and to the safety of being under British rule, Victoria, the port of Hong Kong, has become the chief entrepôt, not only for Southern China, but also for the whole of that country. Thus statistical tables will

show Hong Kong taking second place, both as a purchaser of Chinese exports and a supplier of Chinese imports.

As has already been stated, there are no great ports for Northern China. Peiping (Peking), until 1928 the capital of China, was the focus of routes from Mongolia, Manchuria, and the plains to the south. For this reason, and being the capital, it became the centre of the railway system of China. Two ports serve Peiping: Tientsin, which can only be reached by coasting steamers, and Taku, accessible only to the smaller ocean-going vessels.

Rivers and canals provide the greater part of the means of communication in China, and for this reason there has been no great development of the vast mineral resources of this country. In Northern China, the Hwang-ho is of little value for communication, as it flows too rapidly, and its course is frequently obstructed by the silt deposited on the river bed. The Yang-tze Kiang is navigable for ocean-going vessels to Hankow, and for river steamers to Ichang, approximately 1000 miles from its mouth. Above Ichang, navigation on the Yang-tze is made difficult for over 400 miles by a series of rapids, after which it becomes the chief means of communication in the rich province of Sechwan, with Chungking as a great river port. As mountains cut Sechwan off from the rest of Eastern China, the Yang-tze provided the only route into this province. Shallow draught junks, hauled by gangs of Chinese, were used to navigate the Ichang rapids, but to-day, during the eight months of high water consequent on the summer Monsoon, specially constructed boats, with cargo floats in tow, are used, to the detriment of the junk traffic.

The Si-Kiang is navigable more or less throughout its whole course for native craft, but only to Wuchow for large steamers.

The Grand Canal, one of the great waterways of ancient China, connects the port of Hangchow, south of Shanghai, with Tientsin, the port of Peiping. This canal crosses both the Hwang-ho and the Yang-tze Kiang, and Chinkiang grew as an important port at the crossing on the latter

river. Much of this canal has fallen into disuse, owing to silting, to lack of repair, and to the failure to make improvements to suit modern conditions.

As has already been stated, Peiping is the centre of the Chinese railway system. The chief lines from Peiping are :

1. Southward over the Great Plain to Hankow and thence up the Siang valley to Changsha. This will eventually be connected with the railway from Canton.
2. Southward to Tientsin and thence to Nanking and Shanghai. A branch line runs from Tsinan to Tsingtao.
3. Westward by Kalgan to Inner Mongolia.
4. North-eastward by Tientsin to Moukden in Manchuria, and connecting with the Trans-Siberian Railway at Harbin.

JAPAN

The imports of Japan are mainly foods and raw materials. The chief foods imported are rice, sugar, beans, and wheat; the chief raw materials are cotton, wool, and iron. Other imports are iron and steel goods, machinery, locomotives, timber, oilcake, and paraffin (lamp oil). The bulk of these imports is supplied by the United States (29 per cent.), India (15 per cent.), China (10 per cent.), United Kingdom, Germany, and Australia.

Forty-five per cent. of Japan's exports are raw silk and silk goods. Cotton goods provide another 23 per cent., and of the remainder, coal, porcelain and earthenware, paper, bamboo and wood, and matches are the chief. The United States (42 per cent.), China (19 per cent.), and India and the East Indies are the chief customers.

Owing to the mountainous nature of the Japanese islands, good roads and railways are few. The island character of the Japanese empire has caused intercommunication to be largely by sea, and we find that nearly all the large towns of Japan are seaports.

Tokyo, the capital, can be reached by small ships only. *Yokohama* has developed as its outpost, and is able to take vessels of all sizes. Not only is Yokohama the chief port of Japan and the terminal of important Trans-Pacific shipping routes, but it is also an important entrepôt for both China and Japan. Yokohama is chiefly concerned with the export of raw silk.

Osaka, the centre of the cotton-spinning industry, is

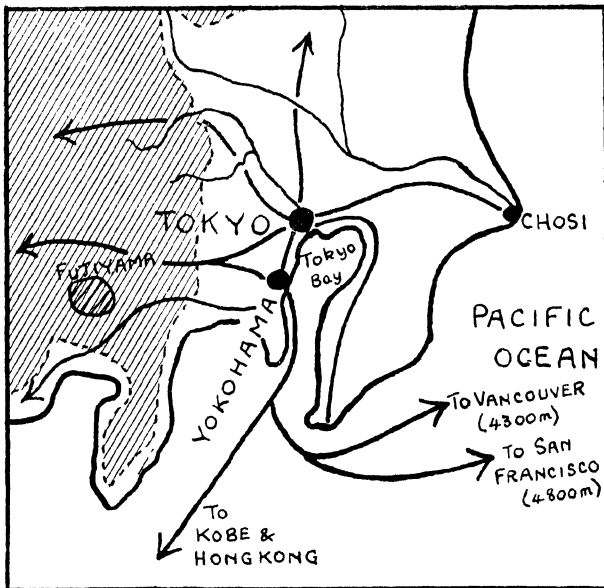


FIG. 60.—TOKYO AND YOKOHAMA

similar to Tokyo, in that it is accessible to small vessels only. *Kobe* has developed as the port for Osaka, and is primarily concerned with the import of raw cotton. Yokohama and Kobe are responsible for approximately 75 per cent. of Japan's foreign trade.

Nagasaki, with an excellent harbour, has become an important coaling station, and exports a considerable amount of coal from the local coal-field. It has also developed an important shipbuilding industry.

TRANS-SIBERIAN RAILWAY

The most important means of communication in Siberia is the Trans-Siberian Railway, as the rivers which flow to the Arctic Ocean are frozen for over five months in the year. This line starts from Chelyabinsk, on the border of Russia and Siberia, where lines from Leningrad and Moscow meet. It proceeds eastwards to Omsk, on the river Irtysh, through Novo-Nikolaievsk, where a branch leaves for Semi-

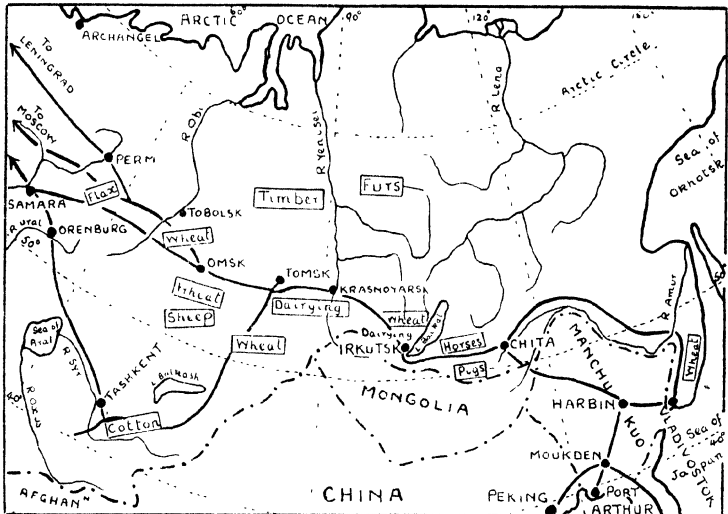


FIG. 61.—ASIATIC RUSSIA AND THE TRANS-SIBERIAN RAILWAY

palatinsk and Tashkent to the south, to Irkutsk, on Lake Baikal. The line is carried round the southern end of this lake to Chita. From here it is continued across Manchuria, *via* Harbin, to Vladivostok. A branch leaves Harbin for Port Arthur. The all-Russian route from Chita, built as a result of the Russo-Japanese war, continues down the Amur valley, crossing this river at Khabarovsk, and then turns southwards along the Ussuri valley to Vladivostok.

This railway has stimulated not only internal trade with Russia, but also the export trade of Siberia with China and Europe. The internal trade consists of the movement of

immigrants, agricultural and other machinery, and general manufactures into Siberia, and the movement of wheat, meats, hides, and wool to Russia. The chief external exports are butter and furs, while silks and tea from China are important imports.

By this railway, Yokohama or Shanghai can be reached from Western Europe in eighteen or twenty days.

SHIPPING ROUTES TO INDIA AND THE FAR EAST

The chief shipping route from Europe to India and the Far East is *via* the Suez Canal. After passing through the Suez Canal and the Red Sea, the great volume of shipping divides. One section, largely composed of empty oil-tankers in ballast, makes for the Persian Gulf; another section makes for Bombay and Karachi; while the third goes to Colombo, in Ceylon. A further section and a very small one makes for the ports of East Africa. A further division takes place in that section of the shipping which has arrived at Colombo. The largest subdivision moves northward to Calcutta and Madras; a second crosses the Bay of Bengal to Rangoon; a third moves in a southerly direction to Australia; while the fourth continues to Singapore, Hong Kong, Shanghai, and Yokohama.

Of the ships that pass through the Suez Canal, nearly 50 per cent. are employed in the Indian trade. This is largely due to the fact that the Suez Canal has shortened the route from Europe to India by some 4000 miles, and provides the shortest route to India from Eastern North America.

Other important shipping routes converging on Eastern Asia are those that cross the Pacific Ocean. Thus we find Yokohama the natural terminus for routes from Vancouver, San Francisco, and the Panama Canal. While the Panama Canal has made no difference to the routes from Western Europe to the Far East, it has effectively shortened the distance from Eastern U.S.A. to China and Japan. In consequence, there is intense competition for this Far-Eastern trade between the manufacturing regions of Western Europe and Eastern U.S.A.

CHAPTER V

TRADE ROUTES OF SOUTH AMERICA

SOUTH AMERICA might be said to have four chief trading areas, which are :

1. The hinterlands of the Plate estuary.
2. The coastal lands of Eastern Brazil.
3. The Western seaboard.
4. The river basins of the north.

THE HINTERLANDS OF THE PLATE ESTUARY

The Plate estuary is the natural outlet for the south-east of South America. On to this gateway, which carries ocean-going vessels some 400 miles inland from the coast, converge the products of the Pampas and the Chaco forests.

The chief commodities for export are frozen meat, wheat, wool, linseed, hides and skins, and quebracho extract (tanning), and these are conveyed by rivers and railways to the ports that have developed along the estuary.

Buenos Aires, the chief port of this area, is the sixth largest city in the world, and the largest city of the Southern Hemisphere. It is built where a good harbour was provided by the mouth of a small river which flowed into the Plate estuary. To improve this harbour accommodation when the size of ships increased, the river was dredged and docks constructed, and this established Buenos Aires as the first port for this area. Good railway connections having been established throughout the hinterland, Buenos Aires handles a large proportion of the exports and the bulk of the imports of this trading area. *La Plata*, about 50 miles down the estuary, acts as an outport for Buenos Aires, and relieves it of some of its congestion. *Monte Video*,

the capital and chief port of Uruguay, exports frozen meat, wool, and hides. Ocean-going steamers penetrate, however, to Rosario, some 200 miles farther up the estuary from Buenos Aires. To cut down the costs of carriage, this port has become the chief grain concentration dump of the Argentine, and exports a tonnage of this commodity second only to that of Buenos Aires. River steamers bring the products of Paraguay to Rosario, since the river Parana is navigable

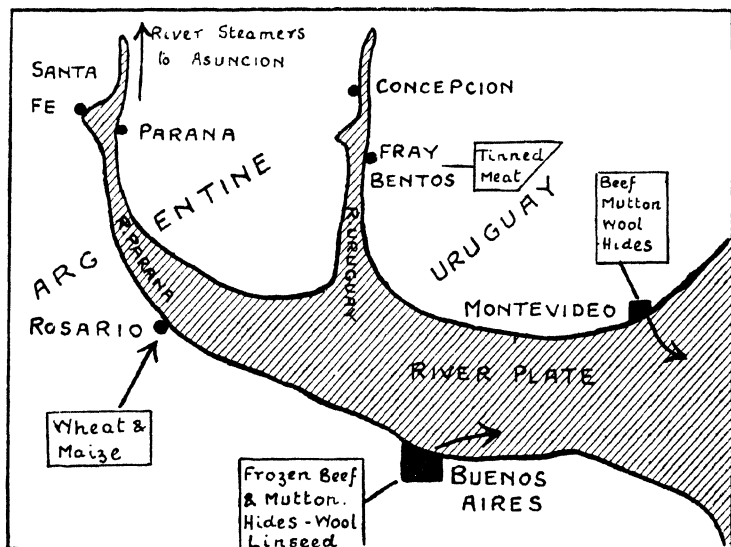


FIG. 62.—PORTS OF THE PLATE ESTUARY

to Asuncion for vessels of 2000 tons deadweight capacity, and for smaller vessels, to Corumba, in Brazil, near the Bolivian frontier. The river Uruguay is navigable for ocean-going vessels to Paysandu, and this port and Fray Bentos have become world-famous for their export of meat products. Bahia Blanca, which has good harbour accommodation, is a growing port for the export of the products, especially wheat, of the southern portion of the Pampas.

Railway connections have been established between all the ports and the interior, but, unfortunately, full use cannot

be made of them as they have been constructed on different gauges. The chief long-distance lines are :

1. Buenos Aires to Valparaiso (Chile) *via* Mendoza and Santiago, and crossing the Andes by a tunnel in the Uspallata Pass. This is the only trans-continental railway of South America.
2. Rosario to the Bolivian frontier *via* Tucumen. This links up with the Bolivian railway from La Paz, making the Plate estuary an important outlet for Bolivian products.
3. Rosario to Paraguay.

As the Plate estuary hinterland is a bulk producer of foods and raw materials, it needs to import manufactured articles of all kinds, such as textiles, rolling stock, iron and steel goods, building materials (galvanized iron), agricultural implements and motor cars, fuels (coal and petroleum), and food-stuffs.

THE COASTAL LANDS OF BRAZIL

The chief ports along the east coast of Brazil are Rio de Janeiro, Santos, Bahia, and Pernambuco. As Brazil is the world's largest producer of coffee, this commodity forms about 70 per cent. of the total of Brazilian exports. This is exported chiefly from Santos and Rio, making Santos the largest coffee-exporting port in the world. Rio also exports tobacco, hides, and manganese. Bahia and Pernambuco export sugar, cotton, and cacao, the products of the Equatorial coastal lowlands.

As a result of the growth of the coffee industry, a network of railways brings this commodity to Santos and Rio, and also connects with the railways of Uruguay. Farther north, a few short lines supply Bahia and Pernambuco.

The imports of Brazil are largely manufactured goods and food-stuffs.

THE WESTERN SEABOARD

Valparaiso is the chief port of Chile, and exports wool, wheat, fruit, copper, and nitrates.

Antofagasta and *Iquique* are the chief exporters of nitrates, iodine, and borax, exporting also the copper and silver of Northern Chile, and the copper and tin of Bolivia. Arica, in Northern Chile, provides the shortest sea connection with La Paz, the capital of Bolivia.

The chief exports of Peru are copper, silver, and other metals and ores, sugar, cotton, and petroleum, and these are dealt with by the ports of Callao, Mollendo, and Chimbote.

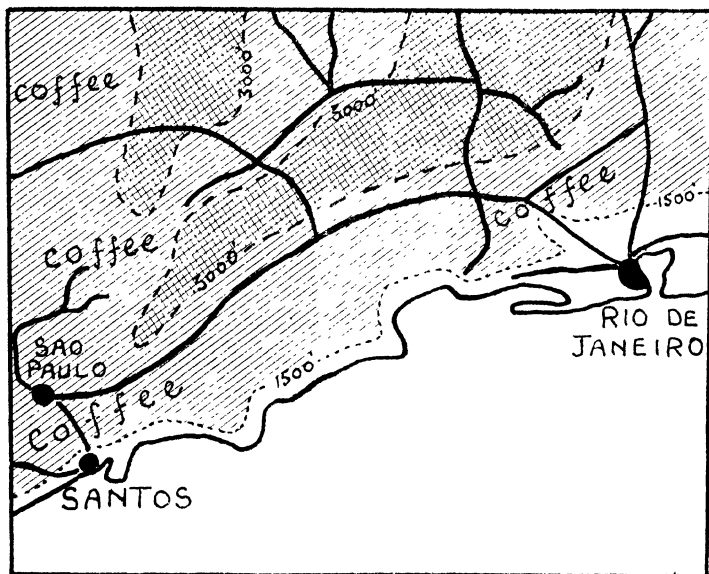


FIG. 63.—RIO DE JANEIRO AND SANTOS

Guayaquil, the only port of Ecuador, and connected to Quito by railway, exports cocoa, coffee, and ivory nuts.

The chief railway in Chile runs along the central valley, parallel to the coast, from Arica in the north to Puerto Monte in the south. Branches leave this line, tapping the ports on the coast and the mining camps of the Andes. In Bolivia, a railway line runs from La Paz and Lake Titicaca to the southern frontier, where it connects with the Argentine

railway. This line also connects in the north with the Chilean ports of Arica and Antofagasta. A railway connects Callao and Lima with the hinterland, but the chief Peruvian railway runs from Cuzco to Lake Titicaca, and then south-west to the port of Mollendo.

Manufactured goods form the chief imports of these countries.

THE RIVER BASINS OF THE NORTH

The river Magdalena forms the chief channel of communication for Colombia, and short railway lines act as feeders to this. The chief exports are gold, silver, petroleum, sugar, cacao, bananas, coffee, and hides. The ports are Barranquilla, Puerto Colombia, and Cartagena.

Although Venezuela lies in the basin of the river Orinoco, it has no port at the mouth of that river. Sea-going vessels can, however, reach Ciudad Bolivar, making that town a seaport. The two chief Venezuelan ports are La Guaira and Puerto Cabello, connected by rail to Caracas, the capital, and Valencia respectively. Venezuela is the world's third largest producer of petroleum, hence this forms the chief Venezuelan export. It is obtained from the fields round Lake Maracaibo, and exported from the port of that name. Other exports are coffee, cacao, hides, and balata.

Georgetown, at the mouth of the river Demerara, is the port and capital of British Guiana, and exports sugar, gold, hides, and balata.

The river Amazon ranks as an inland waterway of first-class importance, but no great port has developed at its mouth, as the natural resources of the basin have not been explored to their fullest extent. Ocean-going liners can reach Manaos, 1000 miles from the ocean, and small cargo vessels can go as far as Iquitos, in Peru, 2200 miles from the mouth. These ports have become collecting centres for their immediate hinterlands, and with Para (Belem), at the mouth of the river Tocantins, export rubber, nuts, timber, dyewoods, and cacao.

The chief imports of these river basins are manufactured articles and food-stuffs.

SHIPPING ROUTES TO SOUTH AMERICA

It will be seen that the chief demand of the South American States is for fuels, manufactured articles of all types, and food-stuffs, which they exchange for their surplus raw materials, minerals, and foods. Thus the chief direction of trade from South America is to the industrial countries of the Northern Hemisphere—the United States, the United Kingdom, Germany, France, Holland, Belgium, and Italy.

Ships leave British ports for South America with cargoes of coal, coke, and manufactured articles such as iron and steel, machinery, cement, and textiles. Coal and coke form about 85 per cent. of the cargoes to the Argentine and Uruguay, about 80 per cent. of those to Brazil, and over 50 per cent. of those to the west coast ports of South America. In return, cargoes to Great Britain chiefly consist of :

1. Frozen meat, wool, grain, linseed, and some sugar from the Argentine and Uruguay.
2. Sugar, cotton, and some rubber from Brazil. Great Britain is not an important market for the chief Brazilian export—coffee.
3. Nitrates, cotton, sugar, and metals from the west coast ports coming *via* the Panama Canal.

Cargoes from the United States to South America consist of petroleum, coal, machinery, and other manufactures, and of flour to Brazil. In return, Brazil sends cargoes of coffee, cacao, rubber, and manganese ore, since the U.S.A. is her chief customer, while the Argentine and Uruguay send small quantities of wool, hides, linseed, and quebracho. Owing to the construction of the Panama Canal, which has brought the west coast of South America much nearer to the east coast of North America, the United States does the greater proportion of the trade with the countries of Western South America. The United States takes the whole of the Chilean

export of iron ore, and shares the exports of copper and nitrates equally with Europe.

Western Europe also enters the South American trade, and for cargoes of miscellaneous manufactured goods Germany, France, and Italy receive frozen meat, wheat, and wool from the Argentine, and coffee from Brazil.

The Canary Islands form an important port of call, especially for European-bound ships from South America. First, they are important as a coaling station, and ships from South America can purchase coal more cheaply here than in South American ports. Then, again, these islands, having cable and wireless connections with London and the chief European markets, can direct ships to deliver cargoes where there is the greatest demand for them.

CHAPTER VI

TRADE ROUTES OF AFRICA

THE chief trading areas of Africa are :

1. The Union of South Africa and the Rhodesias.
2. The Forests and Savannas of West Africa.
3. East Africa.
4. Egypt and the Nile Basin.
5. North-West Africa.

THE UNION OF SOUTH AFRICA AND THE RHODESIAS

The chief exports of British South Africa are mineral products (gold, 50 per cent., diamonds, 10 per cent., and coal), wool (15 per cent.), hides and skins, wattle bark, maize, fruit, sugar, and mohair. The Rhodesian exports are chiefly metals and ores (gold, 50 per cent., copper, lead, chromium, asbestos), and tobacco. The products are concentrated at the following ports :

Cape Town, the second largest city of South Africa, is the most important port. Its importance is due to the fact that it exports the gold and diamonds which form, in value, over 60 per cent. of the total South African export. The actual tonnage of goods exported from Cape Town is comparatively small. Fruit and wool are other exports.

Durban, in Natal, deals with the largest tonnage, and exports coal, sugar, gold, hides and skins, and wattle bark. It is the second largest port of South Africa. *Port Elizabeth* and *East London*, on the south-coast, are the chief exporters of wool and mohair.

While Transvaal and the Rhodesias are in rail communication with the ports of the Union of South Africa, their natural outlets lie in Mozambique (Portuguese East Africa). Lourenço Marques exports the bulk commodities (coal) of the Transvaal, and Beira for the Rhodesias.

The rivers of South Africa are valueless for communication. Commodities are concentrated for export at the ports by railways. Johannesburg, the largest city of South Africa and the headquarters of the gold-mining interests of the Transvaal, is the point to which nearly all the South African railways converge. The chief railways are :

1. A line from Cape Town through Kimberley to Johannesburg. The "Cape-to-Cairo" railway leaves this line at a point just north of Kimberley, and continues northward to Bulawayo, to the Victoria Falls, and to the Katanga Copper Mines of the Belgian Congo.
2. The lines from Port Elizabeth and East London which converge on Bloemfontein, and then on to Johannesburg.
3. The line from Durban *via* Pietermaritzburg (capital of Natal), Newcastle, and Ladysmith to Johannesburg.
4. The line from Lourenço Marques (Mozambique) to Johannesburg.
5. The line from Northern Transvaal to Pretoria (capital of Transvaal), to Johannesburg.

Another line is that from Walvis Bay (*via* Windhoek) and Luderitz Bay which connects with the Cape Town-Kimberley line at the De Aar junction, and proceeds in a south-easterly direction to Port Elizabeth and East London.

Manufactured articles, such as textiles, machinery, iron and steel goods, are the chief imports of South Africa. The chief countries exporting to South Africa are the United Kingdom (50 per cent.), the United States, and Germany, while the chief buyers of South African exports are the United Kingdom, India, France, Germany, Australia, and Canada.

THE FORESTS AND SAVANNAS OF WEST AFRICA

Railways constructed from the Upper Niger basin and from St. Louis concentrate the products of the French Sudan

and Senegal at the port of Dakar. The chief exports are ground nuts, palm kernels, and other oilseeds, which are sent to Marseilles.

The river Gambia, which is navigable for large vessels up to 150 miles, is the chief means of communication in Gambia, a British colony. Ground nuts, the only export of importance, are exported from Bathurst, the capital and port.

Konakri, the chief port and capital of French Guinea, exports palm kernels, hides and skins, and some rubber.

The chief exports of Sierra Leone, a British colony, are palm kernels, palm oil, kola nuts, and ginger. The capital and chief port is Freetown, an important coaling station. The interior of the colony has been tapped by railways from Freetown, which has done much to develop the trade in palm oil.

The trade of Liberia, the free negro republic, is hardly developed, although it is reported to be rich in mineral wealth, as well as being capable of producing products similar to the other West African colonies. Monrovia is the chief town.

Abidjan and Grand Bassam are the ports of the French Ivory Coast. Palm oil, palm kernels, and mahogany are exported.

Takoradi, Accra, and Sekondi are the chief ports of the British colony of the Gold Coast and the protectorate of Ashanti. Cacao is the chief export, the Gold Coast producing over 50 per cent. of the world's total production. Other exports are gold, manganese, and diamonds. Railways have been constructed from Sekondi and Accra to Kumasi.

The French colony of Dahomey also consists of the greater part of the former German protectorate of Togoland. Short railways convey the products to the ports of Lome, Porto Novo, and Kotonau, which export palm oil and palm kernels.

The largest, and perhaps the one with the best future, of the regions of West Africa, is the British colony of Nigeria.

The chief exports are palm kernels and palm oil, cacao, tin ore, cotton, rubber, and mahogany. Although the river Niger and its tributary provide important navigable highways, they do not serve the most developed area of Northern Nigeria. Railways constructed from the chief ports of Lagos and Port Harcourt to Zaria and Kano have overcome this difficulty, and now form the main trade artery of Nigeria.

Ivory, rubber, palm oil, palm kernels, and gum copal are the chief agricultural products exported from the Belgian Congo. The importance of this area is the outcome, however, of the development of one of the richest copper-fields in the world at Katanga. The Congo and its tributaries provided the outlet for the agricultural products, the falls being avoided by short lengths of railway. As this river could not function in a similar capacity for this mineral wealth, railways have been constructed from Katanga to various ports. These are :

1. Katanga to Benguela, in Angola.
2. Katanga to Bulawayo, giving a connection with Beira.
3. Lake Tanganyika to Dar-es-Salaam.
4. Katanga to the river Kasai, which gives river communication with Brazzaville, on Stanley Pool, and this town is connected by rail to Pointe-Noire in French Equatorial Africa.

Although Boma is the capital and river port on the Congo, Matadi is the chief port for the whole of the interior. Although this town is 100 miles from the mouth of the river, it can be reached by ocean-going vessels.

Loanda, Benguela, and Mossamedes are the chief ports of Angola, and export coffee, rubber, palm oil, and ivory.

The British colonies of West Africa are chiefly markets for the manufactured goods of the United Kingdom, although a proportion is sent from the United States and Germany. The exports from these are sent chiefly to the United Kingdom, United States, Germany, and France.

EAST AFRICA

The chief exports of Kenya Colony are coffee, sisal, hides and skins; of Uganda, cotton and cotton seeds, coffee, and skins; of Tanganyika Territory, sisal, coffee, cotton, ground nuts, hides and skins; and of Nyasaland, cotton, tobacco, coffee, and tea.

A railway from Entebbe and Kisumu, ports on Lake Victoria Nyanza, brings the products of Uganda and Kenya *via* Nairobi, the capital of Kenya, to Mombasa for export. In Tanganyika Territory, a line runs from Kigoma, on Lake Tanganyika, to the port of Dar-es-Salaam. The products of Nyasaland are sent by railway from Blantyre to the Portuguese port, Beira.

The chief trading centre of this area is Zanzibar, built on an island of that name off the coast of Tanganyika Territory. The chief commercial product of this island, and especially of the island of Pemba near by, is cloves.

The chief imports of West Africa and East Africa regions lying within the Tropics are textiles (especially cottons), iron and steel goods, agricultural implements, motor-cars, and food-stuffs. These come chiefly from the United Kingdom, India, the United States, and Germany. The United Kingdom, Germany, France, and the United States take the bulk of the exports.

EGYPT AND THE NILE BASIN

The chief exports of Egypt are cotton, cotton seed, and cotton-seed oil. Other exports include eggs, onions, and cigarettes. The greater part of this export trade is dealt with by Alexandria, a port situated just west of the Nile delta. Alexandria, too, deals with the bulk of the imports, which consist of cotton goods, iron and steel goods, flour, and manures. The remainder of the Egyptian trade is conducted by Port Said, which is much more important, however, as a coaling station and an entrepôt port at the Mediterranean end of the Suez Canal.

The Anglo-Egyptian Sudan exports cotton, gum, ground nuts, and hides, chiefly from the port of Port Sudan, on the Red Sea. This is reached by a railway from El Obeid *via* Khartoum and Berber.

The Nile is the great natural highway of both Egypt and the Anglo-Egyptian Sudan. A railway runs parallel to it from Alexandria, through Cairo, the great trading and route centre of Egypt, to Aswan, at the first cataract. River steamers are used from Aswan to Halfa at the second cataract. From here, the railway crosses the desert to Abu Hamed, and then runs parallel to the river once more through Berber to Khartoum. The largest buyers of the Egyptian exports are the United Kingdom, U.S.A., France, Italy, and Germany, while the countries from which Egypt buys the bulk of her imports are the United Kingdom, France, Italy, and Germany.

NORTH-WEST AFRICA

This area includes the French possessions of Morocco, Algeria, and Tunisia, the Spanish zone of Er Rif, and Tangier, the international zone.

The chief exports from Algeria and Tunisia are the agricultural products, wine, wheat, sheep, alfa grass, silk, and cigarettes; and the minerals, iron ore and zinc. The most important ports exporting these are Oran, Algiers, and Tunis. Motor-cars, clothing, sugar, paper, coal, and petroleum are the chief imports.

Morocco chiefly exports wheat, eggs, wool, and almonds from the port of Casablanca.

The greater part of the trade of this area is with France and the United Kingdom.

OCEAN ROUTES TO AFRICA

A great volume of traffic leaves the United Kingdom and North-West Europe for Africa with passengers, mails, and cargoes of manufactured goods, following the Great Circle route to the Canary Islands, the great coaling station for

routes to the Southern Hemisphere. After leaving the Canary Islands, ships bound for West African ports leave the main stream. Some of these return directly to Europe with full cargoes, while others proceed farther south to rejoin the main stream of ships. Off St. Vincent, the main volume of traffic is joined by a very much smaller one from Eastern United States and Canada. Cape Town is the great port for which these ships are making. It is interesting to note what happens to these ships that have arrived at Cape Town. Some return directly to Europe and North America, particularly those carrying passengers and mails. Some proceed to the other South African ports, especially Durban, and return either *via* the Cape or the Suez Canal. Those that return *via* Suez deal with the trade of East African ports. A third group use Cape Town as a port of call and coaling station, passing on to other countries. Two other small streams of ships which make for Cape Town are the homeward-bound ships from Australia and those from the Argentine and Brazil. Ships from Australia and the Argentine unload wheat and flour, and from Brazil coffee, for South Africa.

From Durban, a group of ships leave, carrying coal to India and to the coaling stations of the Indian Ocean and the East Indies. This coal has not only driven British coal from the South African markets altogether, but has become a strong competitor in the coal markets of the East.

A small group of ships proceed to South Africa *via* the Mediterranean and the Suez Canal. These have Durban as their terminal, and are largely engaged in the East African trade. Some return *via* the Cape, but the majority return *via* Suez.

Much of the trade of North-West Africa is with the home country, France. Hence, an important trade route is that from Marseilles to the ports of Morocco, Algeria, and Tunisia. The remainder of the North African trade is with the manufacturing countries of North-West Europe, with Italy and the U.S.A. This is carried as return cargoes in boats which have carried coal to Italy and to other Mediterranean countries from Great Britain and the United States.

CHAPTER VII

TRADE ROUTES OF AUSTRALIA AND NEW ZEALAND

AUSTRALIA

AUSTRALIA is a bulk producer of food-stuffs and raw materials, and these, with minerals, are her exports. The chief products exported are wool (40 per cent.), wheat and flour (19 per cent.), hides and skins, butter, meat, gold, lead, fruit, timber, tallow, with a little coal, and copper and tin ores. Thus, Australia, being primarily an agricultural country and her manufacturing industries only in their infancy, the chief imports are manufactured goods. These are textiles, machinery, motor-cars, agricultural implements, iron and steel goods, paper, chemicals and manures, sacks, tea, rubber, and petroleum.

The chief countries buying Australian produce are the United Kingdom (38 per cent.), France (10 per cent.), Japan (8 per cent.), New Zealand, the United States (4 per cent.), Germany (6·7 per cent.), Belgium (6 per cent.), Italy, India, and South Africa. The greater proportion of Australian imports come from the United Kingdom (40 per cent.), the United States (25 per cent.), Dutch East Indies, India, Japan, France, Canada, Germany, and New Zealand.

Practically the whole of Australia's import and export trade is dealt with by five great ports, which are also developing important manufacturing industries. These are :

1. Sydney

This, the capital of New South Wales, and with a population of over a million inhabitants, is built on one of the finest harbours in the world. Sydney deals with over 40 per cent.

of Australian foreign trade, exporting the dairy produce and meat of New South Wales, and wool and wheat. North of Sydney is Newcastle, the chief coal-mining town and coal port. Coal is exported to India, the East Indies and Malaya, to South America, as well as to the other Australian ports.

2. Melbourne

This is the capital and chief port of Victoria. It is built on the river Yarra, a short distance from its mouth, and can be reached by vessels of a moderate size. The outports of Port Melbourne and Williamstown accommodate the largest ocean-going liners. Although Melbourne exports wool, wheat, and dairy produce, its imports are more than double the exports. About 23 per cent. of Australia's foreign trade is dealt with by Melbourne.

3. Adelaide

Adelaide, the capital of South Australia, is situated near the east side of the Gulf of St. Vincent. Accommodation for large vessels is provided by the outport, Port Adelaide. Wheat, flour, and fruit are the chief exports.

4. Brisbane

Brisbane, the capital of Queensland, is built on both sides of the river Brisbane, at the head of navigation for ocean-going vessels. Like Adelaide, it deals with about 8 per cent. of Australia's foreign trade, exporting meat, hides and skins, and wool.

5. Fremantle

This town, in Western Australia, is the port for Perth, which is built 12 miles up the Swan River. The chief exports are wool, wheat, and gold.

Other ports are Hobart, in Tasmania, built on the excellent harbour provided by the estuary of the river Derwent, and exporting wool and apples; Darwin, with possibilities of developing an export of frozen meat, is much better known

as the terminus for long-distance aeroplane flights, and the terminus of a north-south transcontinental railway.

AUSTRALIAN RAILWAYS

Australian railways have been built from the great ports to assist the collection of exports and the distribution of imports, and to open up the country for settlement. In order to weld the Australian states into a single unit, these separate railway networks have been linked by transcontinental lines. Unfortunately, intercommunication is obstructed by the different gauges used in the construction of the railways in the various states.

Grouping the Australian railways we have :

1. The State systems converging on the five great ports of Sydney, Melbourne, Adelaide, Fremantle and Perth, and Brisbane.

2. The coastal line from Sydney to Cairns in Northern Queensland. The Eastern Highlands of Australia have been a great obstacle in the establishment of railway communications between the east and south coastlands and the interior. Long branches, tapping the interior plains of New South Wales and Queensland, have been constructed from the coastal railway line.

3. The Trans-Continental line from Port Augusta, or Spencer Gulf, across the dry Nullarbor Plain to Kalgoorlie, links Perth and Fremantle to Sydney.

4. The partially-constructed North-South Trans-Continental line from Darwin to Adelaide. Up to the present, Darwin is connected to Daly Waters in North Australia, and Adelaide to Alice Springs in Central Australia.

Aeroplane routes are being established, and motor roads extended throughout the Commonwealth.

NEW ZEALAND

The chief exports of New Zealand are dairy produce (butter, cheese), 37 per cent. ; frozen meat and meat products, 24 per cent. ; wool, 28 per cent. ; skins and hides,

4.4 per cent.; tallow, gold, flax, timber, and kauri gum. The United Kingdom buys over 75 per cent. of these exports. Other countries purchasing New Zealand produce are the United States, Australia, Canada, France, and Germany.

Manufactured goods form the chief New Zealand imports. These are motors, machinery, iron and steel goods, textiles, tobacco and cigarettes, paper, chemicals, boots and shoes. Other imports are sugar, tea, and fruit. Over 50 per cent. of these imports come from the United Kingdom. Other countries from which New Zealand buys are the United States, Australia, Canada, Dutch East Indies, India, Fiji, Ceylon, Japan, Germany, France, and Belgium.

The great cities of New Zealand are the great ports.

Wellington, although not the largest city, is the chief port, doing over 30 per cent. of New Zealand's trade. Situated on the north shore of Cook's Strait, its medial position makes it the most convenient port for the whole of New Zealand. Wellington exports dairy produce, wool, meat, and hides.

Auckland, on a fine harbour on the north-eastern side of North Island, is the largest city. Its foreign trade almost equals that of Wellington, its chief exports being dairy produce, timber, wool, meat, and hides.

Christchurch, on the river Avon, six miles from the sea, with its outpost of Lyttelton, is the outlet for the Canterbury Plains of South Island. Its chief exports are meat, wool, hides, and tallow.

Dunedin, with its outpost of Port Chalmers, is built on Otago Harbour. Besides exporting wool, meat, dairy produce, and hides, it is the chief outlet for the gold-producing region of the south of South Island.

Invercargill, Greymouth, and Westport are other small ports.

RAILWAYS OF NEW ZEALAND

In North Island, the main trunk line runs from Wellington to Auckland. Branches leave this for the dairy district round Mount Egmont and the sheep district of Hawke Bay.

In South Island the chief line runs from Christchurch, *via* Dunedin, to Invercargill. Branches tap the Canterbury Plains and the province of Otago, and one line connects Christchurch with Greymouth and Westport, the two coal ports on the west side of South Island.

OCEAN ROUTES TO AUSTRALIA AND NEW ZEALAND

The most important shipping routes to Australia and New Zealand are those from North-West Europe, since the United Kingdom is responsible for such a great proportion of the trade. To-day there is a choice of three routes—round the Cape of Good Hope or *via* the Suez or Panama Canals.

In the days of sailing ships the Cape route was the only route to Australia, as advantage was taken of the westerly winds of the Southern Ocean. Making use of the same winds, the homeward journey was *via* Cape Horn. When steam replaced sails, the Cape route held a prominent position in the Australian trade, in spite of the fact that Cape Town was the only convenient coaling station in the Southern Hemisphere, and relied on expensive Welsh coal for its supplies. Supplies of cheaper coal from Natal improved conditions somewhat, and tended to make Durban grow at the expense of Cape Town. To-day, only about 20 per cent. of shipping in the Australian and New Zealand trade goes this way. A number of reasons have led to this.

1. The opening of the Panama Canal brought New Zealand some 1500 miles nearer Liverpool and 2500 miles nearer New York. In consequence, all shipping to New Zealand was diverted to this route and no longer formed a part of Australian trade. Thus the outlook of New Zealand is to the Pacific, with routes from Panama, San Francisco, and Vancouver.

The Panama Canal also brought Eastern Australia nearer Eastern United States and Canada. Consequently, trade with these countries was diverted to the Panama Canal from both the Suez and the Cape routes.

2. The divergence of shipping to the Suez route took place partly because London was about 1000 miles nearer Melbourne by this route, but chiefly because this route offered a number of opportunities in the Mediterranean for picking up passengers and mails. Further, Colombo provided another possible port of call on this route.

3. Of the ships that go to Australia *via* the Cape a number return *via* the Suez Canal. The reasons for this are the greater expense and loss of time involved in sailing against the Westerlies on the Cape route, and the demand for regularity of sailings by the wool and meat markets in London.

Thus the routes to Australia are :

1. From North-West Europe :
 - (a) *Via* Gibraltar, Malta, Suez Canal, Aden, Colombo, Fremantle ;
 - (b) *Via* Cape Town.
2. From North America :
 - New York *via* the Panama Canal to Sydney ;
 - San Francisco and Vancouver to Sydney.
3. From Japan and the East Indies.

To obtain the greatest economy in working, modern opinions consider that bigger ships with greater speeds should be developed. Should this be applied to Australian and New Zealand shipping, a reversion of ships to the Cape route would be seen. The size of ships capable of using the Suez and Panama canals is limited, and the time gained by using these shorter routes will be more than made up by the greater speeds and carrying capacity of the boats using the Cape route. Arising from this, in the future trade may be restricted to fewer ports. Only a few ports can offer harbour accommodation to very large ships. Thus the import and export trade of Australia and New Zealand may become concentrated at even fewer ports.

CHAPTER VIII

THE DISTRIBUTION OF POPULATION

THE distribution of population is the expression of the influence of geographical controls and economic factors on man's life and work. We have seen how the relief of the land, the soil and the climate determine the type of vegetation and crops ; how the kind of rocks determine the presence or absence of minerals ; how relief and economic conditions influence the exchange of world products. Upon all of these depend man's work and life so their influence may also be seen in his distribution, which we must now examine.

AREAS OF DENSE POPULATION

The most populous areas of the world are :

- (1) The industrial areas.
- (2) Agricultural areas with particularly favourable conditions of soil and climate.

(1) **The Industrial Areas.**—These areas are mainly in the Eastern United States and Western Europe, Great Britain, France, Belgium, and Germany where coal and the presence of or ease of obtaining necessary raw materials made the coal-fields important centres of industrial production and led to the concentration of labour and the growth of large cities.

Industrial areas using electrical powers, the Lake-side industrial centres of Canada and U.S.A., Northern Italy and Switzerland, are also areas of dense population, but these centres are less concentrated.

(2) **Agricultural Areas**—with particularly favourable climate and soil conditions. These conditions allow a very

intensive system of crop cultivation, often two or more crops per year, and result in large returns from small areas. The low standard of living prevailing in many of the regions in which these conditions exist increases the concentration of population.

The Monsoon lands of S.E. Asia provide the most extensive example. Their very wet, very hot summers and drier cool season make them extraordinarily productive, especially where favourable soils are also found as in the river valleys of China, the Ganges and coast plains of India, the lower Irrawaddy valley of Burma, and the volcanic soil areas of Japan. Certain areas in the East Indies, notably Java, and the Nile Valley are other examples. Holland, with an average of over 600 people to the square mile, is an illustration of intensive agriculture resulting from the force of economic conditions.

AREAS OF MODERATE POPULATION

The chief regions falling into this section will be agricultural areas in which intensive agriculture is made possible by natural conditions or made necessary by the demands for foodstuffs. Many of our own farming areas and of the agricultural areas of Western and Central Europe, the Mediterranean lands and other areas with similar climate conditions, the coastal areas of S.E. Australia, the West Indies, the agricultural and plantation areas of Malaya, and the Dutch East Indies, are all within this group.

AREAS OF LESS DENSE POPULATION

Several groups may be distinguished here, but they may generally be described as farming areas where the demand for labour is limited or where labour is employed only in limited areas such as irrigated lands or plantations. Mining areas situated where the land is otherwise unproductive form a

separate group. The following examples will illustrate these points :

1. Farming areas where extensive systems operate and machinery limits the demand for labour, such as the wheat-growing areas of Canada and U.S.A.
2. Areas of pastoral industries ; the cattle lands of Argentine ; the sheep areas of Australia ; the savannas and veld of Africa.
3. Plantation areas such as the cotton belt of U.S.A. ; the east coast of South America ; the Sudan and west coast of Africa.
4. The gold-mining centres of Western Australia and the nitrate centres and ports of North Chile.

AREAS OF SCANTY POPULATION

Included in this section are the many areas which might be described as "economic deserts," regions in which the natural conditions prohibit economic development on an extensive scale ; the cold deserts of the north of Canada and Asia ; the dry deserts of Chile, Sahara, Arabia, South Africa, and Central Australia ; the mountain deserts of the Rockies and Andes, of Tibet and Central Asia ; the forest desert of the Amazon. In each of these examples, the factors operating against development and settlement are easily understood.

QUESTIONS

SECTION V

1. Describe in detail (*a*) the cheapest, (*b*) the quickest route for the transport of goods from London to Wellington (N.Z.). (L.C.C.)

2. Give an account of the railways of either (*a*) Australia or (*b*) South Africa. (L.C.C.)

3. Describe in detail a continuous water route for the transit of goods from the Mediterranean across Europe to the North Sea. (L.C.C.)

4. Analyse the position of *two* of the following great ports: Southampton, Hamburg, Colombo, Buenos Aires, Montreal. (L.C.C.)

5. Discuss the geographical background of the export trade of Australia and New Zealand. (L.C.C.)

6. Discuss the export trade of New York. (I. of T.)

7. Discuss the statement, "The North Sea traffic route is the busiest in the world." (I. of T.)

8. Give an account of the canal system either of France or Germany.

9. Discuss the trade resources of Japan. (I. of T.)

10. Compare the trade of London with that of New York. (I. of T.)

11. Discuss the importance of the Great Lakes of North America from the commercial standpoint. (I. of T.)

12. Name, and locate, the chief ports and describe the typical trade along the Suez route from England to Ceylon. (R.S.A.)

13. Compare the Suez and the Panama routes from England to the East Indies. (R.S.A.)

14. Summarize the economic geography of any one of the following: Argentina, China, South Africa, New Zealand.

having special regard to their usefulness as markets for British goods, or as sources for raw materials for British industries. (R.S.A.)

15. Describe shortly any two railway routes by which you could cross North America from the Atlantic to the Pacific coast. (R.S.A.)

16. Discuss the importance of the Suez and the Panama Canals. (R.S.A.)

17. Analyse carefully the geographical position and the comparative importance of the two towns in each of the following pairs: (a) Hankow and Shanghai; (b) Aden and Panama; (c) San Francisco and New Orleans; (d) Winnipeg and Chicago; (e) Tokyo and Osaka; (f) Singapore and Gibraltar. (R.S.A.)

18. Analyse the positions and compare the advantages as ports of the two towns in each of the following pairs: (a) Mombasa and Lourenço Marques; (b) Adelaide and Melbourne. (R.S.A.)

19. Describe and compare any two transcontinental railways, of which one is in Canada and the other in the U.S.A. (R.S.A.)

20. Compare the St. Lawrence with the Mississippi as a great waterway. (R.S.A.)

21. Locate and explain the importance of the ports with which we do most trade (a) on the east coast of South America, and (b) India.

22. Describe, and compare the value of, the chief north-and-south routes in Europe.

23. Analyse carefully the positions of: Buenos Aires, Cairo, Chicago, Delhi, Hankow, Bombay, Irkutsk, Rio de Janeiro, and San Francisco.

24. Give a brief description of the Trans-Siberian Railway.

25. Make a rough sketch map of "the Cape Route" to New Zealand, and write short notes on the chief ports along it.

26. Locate and explain the importance of the harbours on the west coast of South America and the west coast of Africa.

27. Describe and account for the chief trade routes of the Argentine.

28. What are the advantages and disadvantages of (a) Buenos Aires, and (b) Rio de Janeiro, as receiving and distributing centres ?

29. Describe the chief railway routes of India.

30. Write notes on the importance of the following as routes : (1) The Hudson-Mohawk Valley ; (2) The St. Lawrence Basin ; (3) The Panama Canal.

APPENDIX

THE MIDDLE WEST OF U.S.A.

IF we refer to Fig. 27 we shall notice the extension of the Prairies southward into the middle west plains of the U.S.A.

The general physical conditions of surface and soil are the same as in Canada, but their southward extension here results in varying climatic conditions. These conditions create fairly well-defined production belts which it will be convenient for us to consider.

THE SPRING WHEAT BELT

This is an extension of the wheat area of Canada and covers the eastern part of North and South Dakota and the south and west of Minnesota. There is a large export of wheat through the Lake ports, especially Duluth; considerable milling at Minneapolis and St. Paul, the twin cities on the Mississippi using power from the St. Anthony Falls, and extensive manufacture of wheat products such as cereals.

Oats and barley are also grown, together with flax. The production of the latter, grown only for seed, is on the decrease.

THE WINTER WHEAT BELT

Farther south in Middle Kansas and the neighbouring parts of Nebraska and in much of the so-called corn belt, winter wheat is grown. Sown in autumn as in England, it grows a few inches high and then survives the milder winters of this region till spring, when growth is rapid. Winter wheat is a hardier variety than spring wheat, is less liable to disease, and generally speaking has a higher yield.

THE CORN OR MAIZE BELT

The United States produce some three-quarters of the total world's supply of maize; half of this is grown in the belt running from Kansas and Nebraska in the west through Missouri, Iowa, Illinois, and Indiana to Ohio in the east. It should be noted that much maize is also grown farther north for green fodder, and some farther south as a secondary crop to cotton.

The demand for maize as a human food and for other purposes is limited so that the bulk of the production is fed as fattening food to cattle and pigs. This maize belt lies between the drier western ranching areas and the industrial regions of the Lakes and North-East. From these ranching plains cattle are brought to the corn belt farmer who

fattens them and markets them "on the hoof" to the meat-packing concerns of Kansas City, Omaha, St. Louis, and Chicago. From the factories in these centres, meat and canned products together with a wide range of by-products are marketed in the industrial regions of the North-East and in Europe.

THE RANCHING PLAINS OF THE WEST

To the west of these crop belts where the land rises to a height of 5000 ft. and rainfall becomes scantier, there are great plains of sparsely grassed natural pastures where ranching predominates, but where dry farming and irrigation make some crop production possible.

This ranching area, on which cattle are grazed in the east and sheep in the even drier west, is linked economically as we have seen above with the Corn Belt. The cattle are sent in autumn for fattening to the farms of the Maize Belt and so to the meat-packing centres of the large cities.

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